# CULTURE, SCIENCE AND SUSTAINABLE DEVELOPMENT IN AFRICA



*Refereed Papers From*
*The First University of Cape Coast and*
*University of Ilorin*
*Joint International Conference*


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## FOREWORD

The animating idea behind this collection is *Sustainable Development in Africa* across the full range of disciplines and professions in culture and science. Our central objective is the study of the achievement of growth, in all its aspects, in Africa within acceptable levels of global resource depletion, and the avoidance of environmental and mental pollution.

We hold this volume to be the first in a continuing series to grow out of our joint conferences in order to sustain the vision of home-grown scholarship. Our aim is to provide a forum for scholarly presentations and debate that will itself be sustained in the coming years. The point is for our two Universities to shine new light on shared problems in our sub-region and Africa, to synthesise current research, and to highlight best practices towards balanced continental development for our benefit and that of mankind.

We take this opportunity to express our deep appreciation to all who made this fine publication a reality. Finally, we look forward to growing this collaboration into a permanent feature of our universities.

*Vice Chancellor*
*University of Cape Coast*

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## INTRODUCTION: A NEW TRADITION FOR THE FUTURE

South-to-South cooperation remains one of the more effective ways by which Africa can reinforce its institutions of development, particularly in the University. As a method, such trans-national cooperation, especially among neighbours, lends strength and scale to the frail and the challenged, opens up new vistas, unleashes new energies, and generally confirms the sweet wisdom of the adage that counsels the benefits of two heads over one.

Within these pages are presented the refereed papers from just such a tack: the first Joint International Conference of University of Cape Coast and University of Ilorin. This conference was held under the theme which has provided the title for this book: *Culture, Science and Sustainable Development in Africa.* The original idea that became the conference - and this collection - began life as a conversation between the then Vice Chancellors of the University of Cape Coast and the University of Ilorin three years ago. The broad plan was to institute an annual international conference each with a theme predicated on some aspect of Africa's total development, and to alternate venues between the two Universities. The first took place in September 2009 at Ghana's University of Choice, in Cape Coast.

The recent global financial crisis, from which the world is still to recover, and the many unnatural wash of natural disasters of apocalyptic dimensions – earthquakes, tsunamis, nuclear disasters - have served to underline the urgent need for responsible sustainable development in all parts of the globe. At its best, globalisation collapses distances for all our benefit - between peoples, economies, cultures and histories; between nascent hope and its fruiting. This is best illustrated by how ICT today works to make all the cultural and scientific heritage of the entire world open-sourced. The scale of this achievement alone is astounding, and we are yet to see its full transformational impact. This is a situation that would have been impossible to imagine a mere generation ago.

Unfortunately, there is globalisation's distaff side; this is where the dangers of unbounded greed and the old familiar evils of deep exploitation lurk, such as enslavement and colonisation, whose jagged edges still extrude into our daily living, and whose lessons must remain as permanent guideposts, for our sake.

Today, we find our world caught in the epic swirl of globalisation's many contradictions. According to the World Bank, world trade contracted in 2009, the first such contraction in nearly three decades. With some recovery in progress now, it is easy to forget that at its height, only a few years ago, there were those who argued that the benefits of globalisation were boundless and unqualified. There was talk of globalisation as a modern extension of an old beneficent pattern in world trade that is keyed, in this digital age, to bring the nearly prelapsarian benefits of modern technological living to even the most benighted reaches of our world. Others spoke of globalisation as an effect of communism's fall in the old USSR and Eastern Europe, and capitalism's inevitable triumph over all comers. This view accounts in part for the now largely discredited triumphalism of scholars like Friedman and Fukuyama, who generally saw globalism as the unabashed victory of the "idea" of the West over its adversaries.

Be that as it may, the truth is that from an African viewpoint, globalisation presents no theory of justice or equity. As is often pointed out, the globalised financial system, through the instrumentation of the WTO, the World Bank and the IMF privileged the West over the rest of us, and because Africa's leaders for the most part remained unable or perhaps even unwilling to properly define and safeguard the national and continental interest, globalisation led on the whole to the increased marginalisation of Africa. And so, Africa, as ever burdened by debt and debilitating, voracious charities, continued to pay tribute in blood to new and old conquerors, east and west. Thus, paradoxically, in unravelling and reconstituting itself, as seems to be happening, globalisation may unclench its coils and thereby afford Africa some respite.

The papers collected here, each in its own way, speak to the continuing impact of globalisation on African culture, African science and the sustainable development of both. One of the difficult effects of globalisation has been the unearned focus it has placed on the cultural and scientific scholarship of Africans who live and work abroad, the brain-drained. A lot has been said in justification of the scooping of the top soil of African skilled and technical labour to fertilise foreign land. This collection is one of a growing number to redress the imbalance. Ranging across the disciplines in science, agriculture, social sciences and the arts, the book provides a roadmap into the complex world of sustainable

development by examining the notion of its aetiology, its theoretical frameworks, its practice and its impact. And because these are ideas conceived and presented by African scholars in Africa, there is a lingering effect of deep intimacy, akin to eavesdropping on a conversation among family members who, by reason of lived-in familial ties, are not afraid to tell each other the hard but redeeming truth.

Better yet, the book's themes collect around the core markers of African culture and African science and how these respond to change in a changing world. The many case studies that form the basis of a number of these essays provide a rich array of insights that altogether constitute one of the fullest profiles today of Africa and Africans in their struggle for sustainable growth and development. We find sober statistics that lend substance and nuance to positive alternatives Overall, there is clarity here about difficult issues, a measured consideration of what needs to be done to take the full shape of sustained, ultimately beneficent growth.

Given the manner in which African living is bracketed by seemingly insoluble dilemmas, African intellectuals have a social and moral responsibility to be imaginative and courageous even if, like the rage for change sweeping across Arab North Africa today, they must be disruptive of received traditional notions. In its range and depth, this seems to be the tradition this Joint Conference of our two West African universities, Cape Coast and Ilorin, wish to build for themselves and their common future.

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***Editor-in-Chief***
***University of Cape Coast, Ghana***
***April, 2011***

# SECTION ONE

# AGRICULTURAL SCIENCE

# AN ASSESSMENT OF RELATIVE POVERTY SITUATION IN NIGERIA: THE CASE OF THE RURAL HOUSEHOLDS IN OSUN STATE, WESTERN NIGERIA

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**Abstract**

*This study carried out an analysis of the rural poverty in Osun State, Nigeria. Descriptive statistics, headcount index and the Tobit regression model were the main tools of analysis used for this study. Data used for this study were collected from a total of one hundred and eighty rural households using a three-stage random sampling technique. The study shows that the majority of the rural households are married. A majority of the heads of the plural households are older than forty years of age and take farming as their major source of income. This study shows that rural households had an average monthly per capita expenditure of N1, 600.74 which was not affordable to 45.50% of the households. With a poverty line estimated at N 1,067.00 monthly per capita expenditure, this study shows that about 33% of the rural households in the study area are poor. The major factors affecting the incidence and severity of poverty among the rural households are rural households' major sources of occupation, monthly income, expenditure and household size. The study recommends the need for increased income generating venture among the rural households.*

## Introduction

The problem of poverty and strategies to alleviate its burden have been issues of great concern in the developing world since the 1980's (Inoni et. al., 2007). The World Development Report 1990 estimated that about one billion people in the developing world live in absolute poverty, surviving on US $1.00 per day. Poor people are unable to obtain adequate income to maintain healthy living conditions. They also have no access to the basic necessities of life such as food, clothing and decent shelter. They are unable to meet social and economic obligations; they lack skills and employment; they have few, if any economic assets; and they also lack self-esteem (Inoni et. al., 2007).Very often, the poor

lack the capacity to escape from their situation by themselves. This characteristic is what causes the social conditions of extreme poverty to persist and to be transmitted from one generation to the next (Osinubi, 2003; Inoni et. al., 2007). Hence, reducing inequality and poverty is an important socio-political responsibility which governments are expected to perform. This is even considered more important than issues of economic efficiency and provision of public goods which most economists are pre-occupied with (Sahn and Younger, 1998).

Poverty is a multifaceted concept. It manifests itself in different forms depending on the nature and extent of human deprivation (Olaniyan and Bankole, 2005). Poverty is defined as the inability to attain a minimal standard of living (Aigbokhan, 2000). Looking at poverty from another perspective, it can be defined as a situation of low income or low consumption (Osinubi, 2003). In absolute terms, poverty suggests insufficient or total lack of basic necessities like food, housing and medical care. It embraces the inadequacy of education and environmental services, consumer goods, recreational opportunities, neighbourhood amenities and transport facilities (Olaniyan and Bankole, 2005). Generally, the poor in most developing countries are to be found among four identifiable economic groups the rural landless, the small farmers, the urban underemployed and the unemployed. As such, the poor are usually disproportionately located in rural areas and slums in urban areas (Osinubi, 2003). Poverty is especially severe in rural areas, where social services and infrastructure are limited or non-existent. The great majority of those who live in rural areas are therefore poor and dependent on agriculture for food and income (International Fund for Agricultural Development, IFAD, 2006, 2007a).

Nigeria has plentiful good agricultural land covering a wide range of agro-ecological zones and allowing for diverse crop and livestock production (IFAD, 2007b). As such, agriculture is the mainstay of the Nigerian economy. It accounts for 45 per cent of gross domestic product (GDP) and provides employment to over 60 per cent of the labour force (IFAD, 2007a). About 90 per cent of the country's food is however produced by small-scale farmers cultivating tiny plots of land and also depending on rainfall (IFAD, 2007a). Incidentally, agricultural sector is the predominant sector in the Nigerian economy. It plays some fundamental roles, which include job creation at relatively low unit costs, and thus remains the most important growth priority of the country (Olaniyan and Bankole, 2005). Nigeria also has abundant natural resources such as oil, gas and various minerals. As such, Nigeria is one of the

world's largest oil producers and ranks fifth internationally in natural gas reserves. The country experienced an oil boom in the 1970s and since that time has become highly dependent on the oil sector for revenue. At present, oil provides about 20 per cent of GDP (IFAD, 2007b).

With its wealth of resources, Nigeria has the potential to build a prosperous economy, reduce poverty significantly and provide the health, education and infrastructural services its population needs (IFAD, 2007b). Despite its plentiful resources and oil wealth, poverty is widespread in Nigeria (Osinubi, 2003; Olaniyan and Bankole, 2005; IFAD, 2007a,b.; Inoni et.al., 2007). This is quite disturbing as both the quantitative and qualitative measurements attest to the growing incidence and depth of poverty in the country. This situation, however, presents a paradox considering the vast human and physical resources that the country is endowed with. It is even more disturbing that despite the huge human and material resources that have been devoted to poverty reduction by successive governments, no noticeable success has been achieved in this direction (Olaniyan and Bankole, 2005; IFAD, 2007a,b). Rather, the situation has worsened since the late 1990s, to the extent that the country is now considered one of the 20 poorest countries in the world. Over 70 per cent of the population is classified as poor, with 35 per cent living in absolute poverty (IFAD, 2006, 2007a).

In the Nigerian case, poverty is a rural phenomenon with agriculture being the most predominant activity (Olaniyan and Bankole, 2005; Federal Repulic of Nigeria, 2005). In spite of the significant level of diversity in the roles that agriculture plays in the socio-economic development of nations, particularly poor developing countries whose economies are largely agrarian, rural poverty remains a serious threat to food and nutrition security in sub-Saharan Africa including Nigeria (Asuming-Brempong, **2004**; Ogunlela and Ogungbile, 2006). Rural poverty has far-reaching dimensions and implications for the social harmony and stability of the entire global community. Poorly functioning agricultural systems tend to heighten rural poverty, which in turn provides a fertile ground for discontent and ultimately, political unrest (IFAD, 2002). The poorest groups eke out subsistence living and often go short of food, particularly during the pre-harvest period. A high proportion of rural people suffer from malnutrition and other diseases related to poor nutrition. The HIV/AIDS pandemic has also taken a heavy toll among the rural population (IFAD, 2006). Also, poverty and violence are often closely interconnected as both religious and ethnic tensions continue to brew in different parts of Nigeria.

Poverty therefore poses a threat to the peace and stability of the entire world and not just to the developing countries directly affected by it (IFAD, 2007a).

**Problem Statement**

According to the United Nations reports (1999), Nigerian human poverty index (NPI) which was 41.6% placed her amongst the poorest nations of the world. The rural dwellers however accounted for a larger percentage (70%) of the share. There is therefore the need for government to make and implement policies directed at this set of people. Failure to address the plight of the rural poor is largely responsible for the dangerous trend of migration from the countryside to the cities, a common and worrying feature of most developing countries. The social infrastructural facilities in such urban settlements rapidly become inadequate and overstretched, resulting in social tension and sometimes in outbreaks of violence. Tackling the problem at source - in the rural areas where poverty is most prevalent and most deeply entrenched – is the only effective way of combating hunger and poverty in a lasting manner (IFAD, 2002). Considering the fact that rain-fed agriculture is one of the sectors most sensitive to global warming and bio-fuel development, rural households in Nigeria are faced with renewed threats especially in the area of food and nutrition security, poverty and hunger reduction, economic development and the attainment of the Millennium Development Goals. Since poverty and hunger are more devastating than weapons of mass destruction, more attention should be given to them than war on terror (Yaradua, 2008).

Designing strategies and policies that can alleviate poverty and improve household food security and nutritional well-being is thus one of the most important challenges facing government policy makers in developing countries. The choice of effective strategies and policies however depends in large part on in-depth knowledge of the determinants as well as understanding the dynamics of poverty (Pinstrup-Andersen, 1993; Aigbokhan, 2000).

This study was therefore designed to answer the following research questions:

1. What are the socio-economic characteristics of the rural households in study area?
2. What is the poverty status of the rural households in study area?
3. What are the factors affecting the severity of poverty of the rural households in study area?

**Objectives of the study**

The main objective of this study is to examine the poverty situation in rural households in Osun State, Nigeria. The specific objectives of this study are to:

1. determine the socio-economic characteristics of the rural households in the study area;
2. analyse the poverty status of the rural households in the study area; and
3. identify the factors affecting the severity of poverty of the rural households in the study area.

**Methodology**

*The study area*

The Federal Republic of Nigeria lies on the Atlantic coast of central Africa and is bordered by Niger and Chad to the north, Benin to the west and Cameroon to the south. The country covers an area of 923,678 $km^2$. Nigeria's geography is diverse, with a wide range of climatic variations and corresponding variations in vegetation. The arid plains in the north give way to savannah in the central hills and plateaux, merging into tropical rain forests in the southern lowlands and mountains to the south-east. With more than 130 million inhabitants, Nigeria is one of Africa's most populous countries. It constitutes 47% of West Africa's population (IFAD, 2007a).

Osun State located in the South Western part of Nigeria covers an area of approximately 14,875 $Km^2$. The State is bounded by Ogun State in the South, Kwara State in the North, Oyo State in the West and Ondo State in the East. Osun State comprises 30 local government areas (L.G.As) and one area council. namely: Ayedaade, Ayediire, Oshogbo, Olorunda, Ede North, Ede South, Iwo, Ife North, Ife South, Ife Central, Ife East, Ilesha West, Ilesha East, Atakumosa West, Atakumosa East, Obokun, Ila, Boluwaduro, Borripe, Ifelodun, Orolu, Egbedore, Ifedayo, Irepodun, Irewole, Isokan, Ejigbo, Odootin, Oriade and Modakeke (Ife area council). Traditionally, the people engage in agriculture and produce food and cash crops for domestic consumption and inputs for agro-allied industries as well as for exports. Other occupations of the people include cloth weaving, mat weaving, cloth dying, soap making, wood carving.

*Sources of data*

The data used for this study were from primary and secondary sources. The secondary sources consisted of official records from the National Poverty

Eradication Programme (NAPEP), Central Bank of Nigeria (CBN). The primary sources of data include information collected directly from the respondents. Also, World Bank reports for several years were also consulted and relevant points tapped from them.

*Sampling technique*

A three-stage random sampling technique was used for this study. The first stage comprised a random selection of six out of the thirty local government areas of Osun State. The selected local government areas are Ayedaade, Ayediire, Egbedore, Ilesha west, Olorunda and Orolu L.G.As. The second involved a random selection of two villages from each of the selected local government areas as follows: Lagbaka and Logun from Ayedaade L.G.A; Telemu and Ogbagba from Ayediire L.G.A; Ido Osun and Apopo from Egbedore L.G.A; Igangan and Iwara from Ilesha West L.G.A; Dagbolu and Obaoke from Olorunda L.G.A; Okiti and Idiereko from Orolu L.G.A. The third stage comprised a random selection of fifteen households from each village. A total of one hundred and eighty sampled rural households were therefore used for this study.

*Method of data analysis*

Descriptive statistics including frequency distribution, percentages and mean were used to describe the socio-economic characteristics of the rural households as well as the coping strategies adopted by the poor households. Other analytical tools used in this study to examine the poverty situation of the rural households in the study area are headcount index, poverty gap index and the Tobit regression model.

*Estimation of the poverty line*

The poverty line for this study was estimated at two-thirds of the mean per capita household expenditure. All households whose mean per capita expenditure was below the poverty line were considered poor. Those above the line were considered non-poor.

*The headcount index*

To determine the number of the poor in the poor household category in the entire study area, the headcount index was calculated.

Headcount Index (HI) for poor = total number of poor households members /total households' members in the sample.

*Tobit regression analysis*

Tobit analysis was used to determine effect of some factors on the poverty situation of the rural households. Tobit regression model was specified for this study as follows:

$V_i = x_i + e_i$ (1)

$V_i = V^*_i$ if $V_i > 0$

$V_i = 0$ if $V^* \leq 0$

$_i = 1\text{--}n$

$V^*_i$ = limited dependent variable. It is the measure of severity of household poverty. It is defined as

$(Z-Y_i)/Z$ (2)

Where Z= poverty line

$Y_i$ = per capita expenditure

= parameter estimates

$X_i$ = vector of explanatory variables

$X_1$= age of the household head

$X_2$= educational status of the household head

$X_3$= dependency ratio

$X_4$= monthly income

$X_5$= occupation where a dummy variable is used: farming = 1 and 0 Otherwise

$X_6$= household size

$X_7$= gender where a dummy variable is used: male = 0; Female = 1

$X_8$= total monthly expenditure

$e_i$ = error term.

## Results and Discussion

*Socio-economic characteristics of the respondents*

Socio-economic characteristics are expected to play important roles in households' incomes and expenditures. The effects of the socio-economic characteristics such as the sex, age, educational qualification, occupation and marital status of the rural households are identified in this study. Table 1 shows the socio-economic characteristics of the respondents.

**Table 1: Distribution of Socio-Economic Characteristics**

| Socio-Economic Characteristics | Frequency | Percentage (%) | Cumulative % |
|---|---|---|---|
| **Gender:** | | | |
| Male | 156 | 86.7 | 86.7 |
| Female | 24 | 13.3 | 100.0 |
| Total | 180 | 100 | |
| **Age of the households heads:** | | | |
| Below 30 | 45 | 25.0 | 25.0 |
| 31 to 40 | 21 | 11.7 | 36.7 |
| 41 to 50 | 41 | 22.7 | 59.4 |
| 51 to 60 | 38 | 21.2 | 80.6 |
| Above 60 | 35 | 19.4 | 100.0 |
| Total | 180 | 100.0 | |
| **Occupation of the households heads:** | 108 | 60.0 | 60.0 |
| Farming | 72 | 40.0 | 100.0 |
| Non farming | 180 | 100.0 | |
| Total | | | |
| **Households Heads' Educational Status:** | 87 | 48.3 | |
| Non-literate | 93 | 51.7 | 48.3 |
| Literate | 180 | 100.0 | 100.0 |
| Total | | | |
| **Marital Status:** | | | |
| Married | 151 | 83.9 | |
| Single | 24 | 13.3 | 83.9 |
| Widowed | 4 | 22.2 | 97.2 |
| Divorced | 1 | 0.6 | 99.4 |
| Total | 180 | 100.0 | 100.0 |
| **Households sizes:** | | | |
| ≥ 6 | 111 | 61.7 | 61.7 |
| 7 - 9 | 59 | 32.8 | 94.5 |
| 10 - 12 | 10 | 5.6 | 100.0 |
| Total | 180 | 100.0 | |

Source: Field Survey, 2006

Table 1 shows that rural households were predominantly headed by males. About 80% of the households' heads are married and fall in the active age category. Farming was the major occupation of most of the rural households in the study area. The literacy level of the rural households was very low as nearly 50 of the households' heads are not literate. From Table 1, it can be seen that majority of the households have household sizes that were not more than 6 persons with a percentage share of 61.7%.

*Distribution of households' monthly income and expenditure*

**Table 2: Distribution of household monthly income**

| Variable N | Frequency | Percentage (%) | Cumulative (%) |
|---|---|---|---|
| **Monthly Income** | | | |
| 2,000.00 - 6,300.00 | 32 | 17.8 | |
| 6,500.00 - 9,300.00 | 41 | 22.8 | 17.8 |
| 9,500.00 - 13,500.00 | 51 | 28.3 | 40.6 |
| 13,500.00 - 20,500.00 | 52 | 28.9 | 68.9 |
| >20,500.00 | 4 | 2.2 | 97.8 |
| TOTAL | 180 | 100.0 | 100.0 |
| **Expenditure** | | | |
| 1,700.00 – 8,800.00 | 96 | 53.3 | |
| 8,800.00 – 12,200.00 | 45 | 25.0 | 53.3 |
| 12,250.00 – 20,000.00 | 39 | 21.7 | 78.3 |
| TOTAL | 180 | 100.0 | 100.0 |
| **Monthly per capita expenditure** | | | |
| 283.33. – 812.50 | 35 | 19.4 | |
| 833.00 -- 1312.50 | 47 | 26.1 | 19.4 |
| 1333.00 – 1900.00 | 43 | 23.9 | 45.5 |
| 1916.67 –3000.00 | 44 | 24.4 | 69.4 |
| 3166.67 – 8150.00 | 11 | 6.1 | 93.8 |
| TOTAL | 180 | 100.0 | 100.0 |

Source: Field Survey, 2006

The distribution in Table 2 reveals that more than half of the households earn between N 9,500.00 and N 20,500.00 with just about 2% earning above N 20,500.00. The average monthly expenditure of households is N8, 837.00. The mean per capita household monthly expenditure (MPCHHE) is N1, 600.74.

*Poverty status of rural households*

In order to construct poverty line of the study area, the per capita household expenditure of the household was divided by the household size to get the MPCHHE. A threshold level for rural household poverty was estimated at two-thirds of the mean per capita household expenditure (2/3MPCHHE). This amounted to a monthly household expenditure of N 1067.16. As such, households with monthly expenditure below N1067.16 were considered poor while those who could afford such expenditure were considered non-poor. On this basis, headcount poverty index was estimated for the rural households.

*Headcount index of the study area*

The headcount index is a measure of the number of the poor relative to the total number of the sampled household members. As revealed from Table 2, this study shows that 33.33% of the total household members were poor as they fell below the poverty line.

*Determinants of poverty severity*

The result of the Tobit regression model specified for the determinants of the severity of poverty among the rural households in the study area are as presented in Table 3.

**Table 3: MLE result of the determinants of severity of rural household poverty in Osun State, Nigeria**

| Variable | Coefficient | Standard error | Z- statistics | P(value) |
|---|---|---|---|---|
| Constant | 2.72E-01 | 2.79E-02 | 9.74 | 0.0000 |
| X1 | -4.30E-04 | 4.24 E-04 | -1.02 | 0.3081 |
| X2 | 8.76E-03 | 1.19E-02 | 0.74 | 0.4625 |
| X3 | 2.07E-04 | 2.93E-04 | 0.71 | 0.4790 |
| X4 | -3.16E-06* | 1.52E-06 | -2.08 | 0.0376 |
| X5 | -2.37E-02* | 1.25E-02 | -1.90 | 0.0569 |
| X6 | 1.08E-01** | 3.82E-03 | 28.35 | 0.0000 |
| X7 | 0.003282 | 1.46E-02 | 0.23 | 0.8225 |
| X8 | -1.32E-04** | 3.93E-06 | -33.63 | 0.0000 |

Source: Data Analysis, 2006

R-Squared = 0.978632
Adjusted $R^2$ = 0.977500
Standard Error of Regression =0.027810
Sum of Squared Residue = 0.131478
Log likelihood = 92.21435
Average Log Likelihood = 0.512302

The results of the MLE estimate of the Tobit regression analysis are as presented in Table 3. The results show the effect of the explanatory variables on the severity of rural household poverty. The coefficient of multiple determination of 0.98 indicates that only 98 percent of the variations in extent of poverty among the individual households were accounted for by the regressors

included in the model. This means that the variables considered in the model accounted for a greater part of the poverty extent in the study area.

The signs of the Tobit regression coefficients show the relationship between the severity of poverty and the explanatory variables. The Tobit regression coefficients were found to be negative for age of the household head, monthly income, occupation and total monthly expenditure. It is however positive for educational status, dependency ratio, household size and gender. The results further show that monthly income, occupation, household size and total monthly expenditure were the significant determinants of the severity of poverty among the rural dwellers of Osun State.

The significance of household income as the determinant of poverty may be explained by the fact that income is directly related to both purchasing power and standard of living. When household income increases, the purchasing power of such household increases and the household becomes more capable of purchasing more of the essential items to meet its basic needs. The household is thereby able to have reduction in the severity of poverty being experienced.

The fact that occupation of the heads of rural households is significant may be due to the fact that occupation is the major source of income for the rural households. The negative sign of the coefficient however shows that households having other forms of occupation other than farming have reduced severity of poverty than those for whom farming is the main source of occupation.

Household size of the respondents has a significant effect on the severity of poverty level of the rural households. The significance of the size of the household may be due to the fact that the number of the dependants increases as the household size increases thereby reducing the per capita income of the household.

Finally, the fact that the household expenditure is significant shows that the ability of the households to make expenditures which have significant effects on the severity of poverty of the households. Such expenditures reduce the deprivations to the basic requirements of life which poor households face.

Education has an insignificant effect on poverty index. The insignificant effect showed that education was not important in the determination of living standard of the respondents. Also, dependency ratio is insignificant. This may be as a result of the fact that rural households use even those members who may be considered as under-aged in taking part in agricultural activities thereby contributing to the household income generation. The study further revealed that gender does not have a significant effect on the living standard of the people.

## Conclusion and Recommendations

This study carried out an assessment of the poverty situation of Osun State rural dwellers. This was achieved by examining various socio-economic characteristics of the people as well as examining the poverty status of the households. The study shows that farming serves as the source of income for 60% of the respondents. This therefore confirms the general notion that farming serves as a major occupation of the rural dwellers. The major factors affecting the incidence and severity of poverty in the study area were monthly income of the households, monthly expenditure, household sizes and of course occupation o the households. The situation where about 30% of the rural households are relatively poor compared to their counterparts is undesirable. Allowing this situation to continue will pose a very serious problem especially in the area o food security in the state where rural farmers are the sole producers of food. To solve this problem, the following recommendations are suggested:

1. Rural farming households must be assisted to have access to other income generating activities especially during off-season. This requires the intensification in the drive by government agencies such as the National Directorate of Employment to reach out to the rural areas and train the rural dwellers on various income generating activities that will enhance their incomes. For the fact that income generating capacities of these rural dwellers are low, the establishment of agro-allied industries could also be facilitated to create employment opportunities for the people and also provide them with means of diversifying their sources of income into other sectors.
2. Larger households should be encouraged to adopt modern family planning methods by providing incentives to those households that present themselves for the adoption of such methods.
3. The rural households should organise themselves into cooperatives for the provision of essential goods in the rural areas.
4. Since the majority of the populace are farmers, there is need to embark on radical resuscitation of the food production sector and the living conditions of the rural farmers. The focus and attention of the government should therefore be directed to encouraging every aspect that contributes to the improvement of agricultural production.
5. The government should institute measures to ensure more credible and realistic poverty alleviation programmes that will have positive effect on the populace both in the long term and short term periods. In this respect, agency of government saddled with the responsibility of poverty alleviation and reduction

such as the National Poverty Eradication Programme (NAPEP) should be more pro-active in addressing the poverty situation of the poor rural households.

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# ANIMAL WASTE MANAGEMENT AMONG LIVESTOCK FARMERS IN OJOO FARM SETTLEMENT, LAGOS, NIGERIA: IMPLICATION FOR EXTENSION PROGRAMME DEVELOPMENT

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## Abstract

*Livestock production is often accommodated in the urban centres but the environmental effect of pollution caused is underestimated. The paper investigated the management of animal waste among the livestock farmers of Ojoo settlement in Lagos, Nigeria. Specifically, it examined selected personal characteristics as well as environmental effects of animal waste management among farmers within the settlement. Eighty-five respondents were randomly sampled among poultry and pig farmers. Questionnaire was used to elicit information and the data were analysed by using percentages, chi square, mean and ranking. It was found that majority of the respondents were above 30years of age and had post secondary education. It was also observed that majority of the respondents were not affected by environmental degradation and they prefer information on animal health and safety from agricultural extension agents. The study concluded that most of the farmers were aware of the dangers associated with animal waste. Therefore, extension education programmes on proper waste management could be jointly organized by agricultural extension and environmental protection agents to enhance effective waste management. Mass media is also a means to enlighten farmers on the implication of animal waste in the environment.*

## Introduction

Animal waste is a broad term that refers to a rather complex array of by-products originating from the production or use of animals by humans. Animal waste includes livestock and poultry manure, bedding and litter and even wasted feed. Dead animals from livestock and poultry farms may also be included in the class. Animal wastes are usually toxic to the water and environment where it is deposited (Ronald et al, 2000).

Huang (2008) submitted that animal wastes could degrade the surrounding environment and become a threat to human health and food safety through the air, water and soil in which it is deposited. Traditionally, rearing livestock has been an important financial source for rural families in developing economies. So far, livestock still constitutes the main source of family income for many middle-classes (Burton and Turner 2003). The livestock industry in Nigeria is developing strongly and plays an important role in local economic development. However, it has also generated an array of problems such as environmental pollution, public fear over food safety or the potential to cause illness via contamination.

Improper collection and disposal of unwanted livestock wastes can harm ground water and human health. In addition, dangerous and offensive odours and other air pollutants are also emitted, often making life intolerable for neighbours (Agtech 2002). Consequently therefore, it becomes expeditiously necessary to address the problems of waste management among livestock farmers as it relates to environmental protection and quality of life. More so, the level of environmental degradation is gradually increasing as a result of improper handling. This paper therefore assessed the attitude of livestock farmers to proper waste management. The main objective of the study was to examine the management of livestock wastes among livestock farmers in the study area with a view to making recommendations. Specifically, it determined:

- The ways, methods or system of animal waste management frequently used by livestock farmers in the study area.
- The impact of livestock waste on environmental degradation
- The preferred sources of information on animal health and safety.

Livestock production has become an inevitable part of the lives of both rural and urban lives. The animals are used as source of protein. In the process of rearing these animals they produce wastes, which are becoming a menace to the society. Addressing ways of turning this potential havoc to a fortune is therefore paramount. The findings of this research may therefore be of immense benefit to individuals, groups and organizations involved in livestock production. Furthermore, it may assist government and other agencies in addressing issues of environmental protection.

## Material and Methods

The study was conducted on Ojoo farm settlement of Lagos State, Nigeria. Lagos State was selected because of its high urbanization. More so, houses have

been built close to the farm settlement due to high population density. A total sample size of eighty-five livestock and poultry farmers was used for the study. This was made up of sixty poultry farmers, ten piggery farmers and fifteen poultry and piggery farmers. Primary data were generated through interview schedule while secondary data were obtained from journals and literature review. Descriptive statistical analysis such as frequencies, percentages and ranking were used, while chi-square was used to analyse the hypothesis.

## Results

### *Personal characteristics of respondents*

The personal characteristics of the selected livestock farmers were sampled. This is presented in Table 1. The age distribution of the respondents showed that all the respondents are adults. Livestock farming in the area involved both men and women. Almost all (91.8%) of the sampled farmer are married, divorced or widowed. A substantial number of the livestock farmers had considerable education. About 41.2% had post-secondary education, while a few (7.1%) had adult education.

*Table 1: Personal Characteristics of respondents (n=85).*

| Attribute | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| <_30 | 8 | 9.5 |
| 31-40 | 35 | 41.2 |
| 41-50 | 32 | 37.7 |
| 51-60 | 8 | 9.6 |
| **Marital Status** | | |
| Single | 7 | 8.2 |
| Marriage | 81.2 | 41.2 |
| Divorce | 5 | 5.9 |
| Widowed | 4 | 4.7 |
| **Level of Education** | | |
| Adult Education | 6 | 7.1 |
| Primary Education | 19 | 22.4 |
| Secondary education | 25 | 29.4 |
| Post Sec Education | 35 | 41.2 |

**Methods of Livestock Waste Management**

The methods of handling waste by the farmers were investigated, and t result is as presented in Table 2. The most adopted method of livestock wa disposal among the farmers is depositing in pits. They make use of both deep a shallow pits. This finding is in agreement with Burton and Turner (2003) w submitted that deep and shallow pits are one of the best methods of handli manure. About Eighty-nine percent of the farmers adopt this method. One of t respondents was honest enough to disclose that he usually deposit wastes fro his farm in the lagoon. The remaining respondents, who accounted for only ni percent, employed solid and liquid separation of waste method. Hence, it evidenced that the farmers made effort to deposit their farm wastes properly.

The farmers interviewed also made effort to empty their waste on certa regular basis. The study showed that 40.6% of the farmers empty their pits fo number up to 10 times in a week. This category of farmers is those with bigg farms and large number of animals. Another 49.4% empty their waste about times in a week. The efforts of the farmers in adopting some safe methods waste disposal and storage could be attributed to their level of education a government influence.

***Table 2: Livestock Waste Handling by the Farmers***

| Attribute | Frequency | Percentage |
|---|---|---|
| **Manure handling** | | |
| Drop in pit | 39 | 45.9 |
| Lagoon | 1 | 1.2 |
| Solid and liquid separation | 8 | 9.4 |
| Shallow pit | 37 | 43.5 |
| **Frequency of Disposal/week** | | |
| Less than | 42 | 49.4 |
| 3-6 | 32 | 37.7 |
| 7-10 | 7 | 8.3 |
| Above 10 | 4 | 4.8 |
| **Utilization of Animal Wastes** | | |
| Use as manure | 60 | 70.6 |
| Sell off | 52 | 61.2 |
| Livestock Feeding | 20 | 23.5 |

*Multiple responses*

The field study made effort to assess how the farmers eventually utilize their farm wastes after collection and storage. As a way of turning waste to wealth, several of the farmers reuse the wastes from their farms. In fact, most of them adopt a combination of one or two methods from reuse of the waste to selling it off for additional income. A large percentage (70.6) of the farmers used their animal wastes as manures for vegetable farms and 61.2% sold theirs out. Another 23.5% processed animal waste as sources of protein and nutrients for other animals to produce balanced feed.

**Hypothesis:** There is a significant relationship between age of respondents and the use of particular manure management system in Ojoo settlement of Lagos State. This could be attributed to the fact that younger livestock farmers in the area are more innovative and vibrant than the older farmers.

*Table 3: Chi square test*

| Characteristics | X2 | Df | P | Comment |
|---|---|---|---|---|
| Age | 1.385 | 1 | 0.239 | RejectH0 |
| Level of education | 0.148 | 3 | 0.986 | Reject H0 |

Significant at 5%

The chi square further showed that there is a significant relationship between the level of education and the use of a particular manure management system. This showed that it is likely that the more educated livestock farmers have adopted better management methods than the less educated ones.

**Information on Animal health and safety**

The study made effort to obtain information from the farmers as to their preferred source of obtaining information on animal health and safety topics. The result of this finding is presented in Table 4. It was revealed that the farmers preferred agricultural extension agents the most as their source of information. Safety demonstration will also be another effective method of disseminating information to the farmers. They prefer the agricultural extension agents most to others because it is an informal method and promotes quick absorption of knowledge and skills unlike the other methods, which they said, are formal or too technical for them.

*Table 4: Preferred Source of Information on Animal Health and Safety.*

| Delivering media preferred (%) | Most preferred (%) Mean | Rank | | More preferred (%) | Preferred (%) | Least |
|---|---|---|---|---|---|---|
| Video tape | 29.4 | 37.6 | 24.7 | 4.2 | 2.85 | 3rd |
| Fact sheets | 8.2 | 30.6 | 42.4 | 18.8 | 1.95 | 5th |
| Safety - Demonstration | 44.7 | 23.5 | 27.1 | 4.7 | 2.94 | 2nd |
| Safety checklist | 11.8 | 11.8 | 17.6 | 58.8 | 1.66 | 6th |
| Health & safety-Newsletter | 7.1 | 37.6 | 17.6 | 37.6 | 2.06 | 4th |
| Agric extension Agent | 76.5 | 12.9 | 7.1 | **3.5** | **3.95** | **1st** |

## Conclusion

This study was initiated due to the fact that increase in population has led to increase in environmental pollution from livestock farms. The study found out that majority of the respondents evacuates their waste pit regularly. It was also discovered that majority would prefer to relate with agricultural extension agents than with other agricultural information dissemination methods in acquiring knowledge. They generally know the importance of environmental degradation as a result of animal waste. Since animal waste is agreed to be a source of problem, management programmes for animal waste must reflect their value as a resource and a realistic appraisal of the negative effects that waste constituents may have on the environment. Before animal waste can be effectively controlled, government must have some policies directed towards livestock farming. Frequent visits to poultry houses and livestock farm by government agencies in collaboration with extension agents could also assist.

## Recommendation

- Livestock farms should be sited far away from residential areas, however, where distance could not be observed, deep litter system should be put in place.
- Agricultural agencies in collaboration with government should intensify environmental awareness programme for livestock farmers using the media.

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# HIGHER AGRICULTURAL EDUCATION AND THE CHALLENGES OF SUSTAINABLE AGRICULTURAL DEVELOPMENT IN AFRICA

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**Abstract**

*The issues facing higher agricultural education and training (AET) include relevance and cost in the face of a growing and sophisticated local and international consumer market. Agriculture continues to make significant contribution to livelihoods and to poverty reduction in most of the developing economies in sub-Saharan Africa. Yet agriculture in the region is confronted with current and emerging challenges that threaten its sustainability. Despite the infusion of development dollars that run into billions of dollars, most sub-Saharan African countries are unable to feed their growing populations let alone compete in an international market where efficient value chains operate and food quality and safety standards are high. The paper explores what higher agricultural education and training can contribute to meet this imminent challenge of sustainable agricultural development in the medium and long run. Among issues discussed is the need for a paradigm shift that will enable higher AET to contribute effectively to agricultural development through curriculum reform and revitalization, research and technology development, innovative agricultural extension services, microfinance options, gender and HIV issues, and policy initiatives that involve climate change, land tenure reform, microfinance and market oriented support services. Recommendations are made for expanding and improving access to AET, ensuring quality and relevance of AET, incorporating ICT for development and global competitiveness, management and coordination of AET, funding and mobilizing resources for sustainability, building partnerships and linkages and International Co-operation in AET.*

## Introduction

Agriculture continues to occupy centre stage in the affairs of developing economies because of its contribution to national GDPs and to poverty reduction, social and industrial peace and sustainable livelihoods. In addition to the provision of food and fibre, the agricultural sector makes significant

contribution to several other sectors including industry, employment, health and finance. Immediately following political independence, many sub-Saharan Africa countries pursued agricultural policies aimed at making them food self-sufficient and promoting export in commodities they believed they had relative advantage in producing. This policy direction was reflected in the higher education agricultural curriculum. As world markets have become more globalised and highly competitive, so has the need for African agriculture to innovate and meet the demands of the local and international marketplace increased.

**Some Current and Imminent Challenges**

Some of the challenges that have dogged the development of agriculture in general and higher agricultural education include:

- **Dogmatic policies and ad hoc interventions.** Agricultural development policies in many African countries south of the Sahara, especially during the years of military interventions in the politics of these nations, have in some case been inconsistent, erratic and ill-conceived. Investment in agricultural education in general and higher agricultural education in particular has been, at best, minimum.
- **Global marketplace competition.** Another challenge facing agricultural development in Africa and higher agricultural education has been the rapid development in international trade and agribusiness. The competitive nature of the global marketplace calls for curricula reform to produce the type of human capital that will produce the new farmers and entrepreneurs who can combine relevant knowledge and appropriate technology and other resources efficiently to function along the value chain; and meet food quality and food safety standards demanded by consumers in today's marketplace.

- **Research and technology issues due to climate change.** The world's environment is changing as a result of climate change. This has impacted soil fertility and rainfall distribution and intensity negatively and led to decline in productivity. Research is needed to respond to this challenge in terms of generating the needed relevant and appropriate innovations in technology and biotechnology.

- **Financing issues.** Declining budgetary allocations and budgetary suppor is another challenge to be confronted. Access to affordable financing i terms of loans and credit is currently an important issue that must b confronted.
- **Information support.** There is insufficient information support due to lac of sustained development and poor funding in the agricultural educatio research and extension sector by African governments. Poor research an extension linkages have also contributed to the poor state of informatio support in the agriculture sector.
- **Issues related to land, gender, HIV-AIDS.** Policies on land, gender an HIV-AIDS in many African countries are still not clearly defined. Acquisitio of land for commercial production often involves long and comple bureaucratic procedures. While land distribution and other productiv resources are mostly male-dominated. The threat of HIV/AIDS and disease like malaria continue to negatively affect agriculture.

## What's Needed in Higher Agricultural Education?

A World Bank report in 2000 noted higher education institutions clearl needed well-designed academic programmes, a clear mission, high-qualit faculty, committed and well-prepared students, and sufficient resource Johnson and Bentley (1992) noted that the issues affecting higher agricultura education included relevance, curricular planning, balance, new thrusts, jo opportunities, efficient resource use and financial support. Suggestions hav been made for higher agricultural education to innovate and become mor relevant to their societies (Maguire, 2001). Maguire (2001) noted that th ingredients for institutional reform included curriculum change, clear visio dynamic leadership, network and partnerships for change and government an donor support.

## A New Vision

The vision of higher agricultural education should be to have a agricultural education system that is versatile in responding to current an emerging challenges in agriculture and that prepares people to operat efficiently, successfully (profitably) and sustainably in a competitive local an global marketplace.

**A New Kind of Agriculture Graduate**

The vision expressed above calls for a new kind of agriculture graduate. In 2002, some conclusions were offered at Session III in the international seminar series "Sustainability, Education and the Management of Change in the Tropics" (www.changetropics.org) in Jinja, Uganda. These included the fact that higher agricultural education has to be prepared as an academic discipline to produce graduates who have the following characteristics:

- Thorough understanding of agricultural value chains and market demands of both local and domestic markets
- Good entrepreneurial skills and business minded
- Good communication skills—including use of ICT
- Positive attitude towards agriculture
- Lifelong learning skills and information retrieval skills that allow independent access and use of information and technology
- Good leadership and team skills
- Systems thinkers who can harness synergies in the systems in which they operate
- Environmentally conscious—sustainable production oriented and natural resource manager—to ensure long-term sustainable profitability
- International outlook that facilitates linkages for information and technology sharing.

**Paradigm Shift for a New Kind of AET System**

To enable higher agricultural education to develop a new kind of graduate in a competitive agricultural environment there is the need for a paradigm shift that creates an educational and training system with the following characteristics:

- Demand-driven responsive curricula that is oriented towards innovative, entrepreneurial and environmentally sustainable agricultural systems
- Student-cantered learning
- Flexible, practical, problem-solving and experiential learning environment
- Lecturers and teachers who function more as facilitators of learning
- Strong linkages with communities and stakeholders
- Financially responsible and sustainable
- Networking with other institutions

**New AET Policy Direction**

A policy shift is needed to support higher agricultural education and training for sustainable agricultural development. New policies should have the following components:

- Expanding and improving access to AET
- Ensuring quality and relevance of AET
- Incorporating ICT for development and global competitiveness
- Improving management and co-ordination
- Enhancing monitoring, evaluation and quality assurance
- Ensuring funding and mobilizing resources for sustainability
- Building partnerships and linkages
- Forging international co-operation.

***Expanding and Improving Access to AET***

The following will be needed to expand and improve access to AET:

- Provide a data-base on agricultural manpower requirements and capacities of the AET Institutions
- Expand and improve post-basic AET
- Expand and improve post-secondary AET
- Expand and improve Tertiary AET
- Provide and disseminate information on opportunities in the Agriculture sector
- Promote equity in AET for youth, females and PWDs.
- Promote private sector participation in the provision of AET
- Provide Distance Education programmes in AET at tertiary institutions
- Enhance AET delivery by the non-formal and informal sectors

***Ensuring Quality and Relevance of AET***

The following will be needed to ensure quality and relevance of AET:

- Provide a data base on Agricultural Labour Market Skills
- Improve the quality of training at AET institutions
- Ensure relevant education and training for employability through curriculum reform
- Ensure effective research backing for AET
- Provide standards for measuring quality and relevance of AET programmes
- Reduce drudgery in agriculture through development and utilization of technology

- Mainstream HIV/AIDS into the curricula of AET institutions and providers.

***Incorporating ICT for Development and Global Competitiveness***

The following will be necessary to ensure the successful incorporation of ICT for development and to promote global competitiveness.

- Promote ICT in AET institutions
- Integrate computer education into the curricula of AET institutions
- Provide Agricultural Education and Training ICT-based Teaching/Learning Materials
- Create and manage Websites for Agricultural Education and Training
- Equip all institutions with ICT laboratories
- Ensure competency and proficiency of tutors and students use of ICT for AET
- Promote extensive use of ICT applications in research, teaching and learning with widespread use of the internet.

***Management, Coordination, M&E and Quality Assurance***

To improve management, coordination, monitoring and evaluation and ensure quality assurance it is necessary to:

- Establish effective management and coordination system for AET
- Ensure effective assessment system for AET institutions and students
- Establish relevant criteria for assessment
- Establish practical examination system for all AET programmes
- Establish farms or gardens in all institutions for practical teaching of agriculture
- Strengthen linkages between AET institutions and the agricultural industry.

***Funding and Mobilizing Resources for Sustainability***

The following will be necessary to ensure adequate funding and sustainability:

- Provide adequate funding for AET institutions
- Set up an AET fund
- Promote income generation by AET institutions
- Ensure effective and transparent accounting systems for AET projects

***Partnerships, Linkages and International Cooperation***

- Strengthen linkages among AET providers and stakeholders
- Promote career progression in AET

- Establish a communication media between AET providers
- Strengthen linkages between AET system and the Agricultural Industrial system
- Establish international co-operation among AET institutions world-wide
- Promote Exchange programmes and Study Tours of AET systems world-wide
- Promote AET models that can address agricultural development goals of the country

**Curriculum Reform**

The need to reform and revitalize higher agricultural education to make it relevant and responsive to the needs of sub-Saharan African countries cannot be overemphasized. Curricula should be revitalized to respond to the demand of local and international markets in terms of satisfying food quality and food safety standards and emphasizing the quality demands along all the various agricultural value chains. Curriculum reform should also ensure that the teaching and learning of agriculture emphasizes agribusiness and results in producing graduates with entrepreneurial acumen who can compete successfully on the global market. It is important to have a system that systematically mainstreams new research and development information into the curriculum to keep it up-to-date and relevant. All the factors discussed under the various sections above should be considered in efforts aimed at improving curriculum reform and delivery.

**Conclusion**

African countries south of the Sahara find themselves in a very challenging environment with respect to agricultural development in the light of globalized markets with its attendant value chain, food quality and food safety issues. Along with the challenges however are opportunities offered by technological advances in agriculture and comparative advantage for several agricultural enterprises. However to be able to take full advantage of these opportunities and overcome the challenges offered, African higher education needs to be reformed. The reforms must be backed by new policies that are designed to produce agricultural education systems and graduates who can compete effectively in a globalized environment and contribute to the development of their nations. To achieve this, we need a fundamental transformative shift in thinking, values, and action by all of society's leaders who

influence policy, and professionals in the agricultural and educational sectors as well as the general population. To quote Albert Einstein, "The significant problems we face cannot be solved at the same level of thinking we used when we created them" (Calaprice 2000, p. 317). The change in mind-set necessary to achieve this vision must be a sustained long-term effort to transform education at all levels.

Despite the efforts of many individuals and groups within the formal educational system, agricultural education that adequately addresses these emerging challenges doesn't seem to be a high priority to governments of African countries that are most affected by these new challenges. While most of them profess agriculture to be the backbone of their economies, the commitment of needed resource to AET does not proof the assertion. The professionals that run our educational systems are often bulked down by 'professionalism' which places certain limitations on how much change they can make at a time. Higher education is generally organized into highly specialized areas of knowledge and traditional discipline. Designing a sustainable AET that adequately responds to all the emerging challenges requires a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation. In order for higher education to be empowered to provide the appropriate and effective education in AET, the academic staff need a thorough re-examination of the issues and challenges that confront the sustainable development of agriculture in the African continent.

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# DETERMINATION OF SUSTAINABLE AGRICULTURAL PRACTICES AMONG FARMERS IN OGBOMOSO FARM SETTLEMENT IN OYO STATE, NIGERIA

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**Abstract**

*This study was conducted to determine sustainable agricultural practices among farmers in Ogbomoso farm settlement, Oyo state, Nigeria. A farmer's self examination sustainable agricultural index was developed and applied to farmers in the study area. In terms of sustainable agricultural practices included in the index, farmers who raised livestock were compared with farmers who grew crops only. It was discovered that majority of the farmers (87%) raised animals on commercial scale on the farm while 6% practiced otherwise. 39% of the farmers indicated to have been involved in only crop production between 15-30 years while 57% of the farmers indicated to have been involved in mixed farming for over 30years. There were some differences between the mixed farmers (MF) and crop producing farmers (CPF) in terms of sustainable agricultural practices. The majority of MF did not practice long term rotation (75%) but more than half of CPF practiced crop rotation (53%). 87% of MF were engaged in the use of animal manure but 45% of CPF engaged in the use of animal manure. 89.7% of CPF owned rangeland while 57.6% of MF had the same. It was also discovered that 60.6% of MF were not involved in the forestation of environmentally less advantaged areas but only 28.2% of CPF were not involved in the practice. The major constraints to production as expressed by both MF and CPF are insufficient capital and cost of production/input. Results showed that as farmers grow leguminous crops, use animal manure, take adequate measures to protect publicly owned rangelands, get personally involved in product marketing etc, they tend to raise livestock in their farms. Therefore, mixed farmers make significant contribution to sustainable use of agricultural and natural resources.*

## Introduction

Sustainable agriculture describes farming systems that are capable of maintaining their productivity and usefulness to the society indefinitely. Such system must be resource-conserving, socially supportive, commercially competitive and environmentally sound (Ikerd, 1990). Falvey (2004) reported that when farmers grow and harvest crops, they deplete some of these nutrients from the soil without replenishment, thus making the land unusable for further farming practices. Sustainable agriculture depends on replenishing the soil while minimizing the use of sustainable resources. The World Communication on Environment and Development (1987) believed that sustainable agricultural practice is meeting the need of present generation without compromising the ability of the future generation to meet their own needs. This implies that in order to meet the present needs, the present generation have no right to overuse natural resources, which will threaten the living standards of the future generation. . Berry (1990), in his view, saw sustainable agriculture as a practice that produces abundant food without depleting the earth's resources and polluting its environment. It is agriculture that follows the principles of nature development system for raising crops and livestock that are, like nature, self-sustaining. No matter how elegant the system of agriculture is or how accomplished the farmer is, no agriculture is sustainable if it's not profitable i.e. having the ability to provide a healthy farming income and a good quality of life. The importance also lies in the fact that agriculture that is profitable but not sustainable will lead to fall in socio-economic status of the farmer (Sustainable Agriculture Network, 2002). Due to this reason, the importance of sustainable agricultural practices cannot be undermined. The yield and quality of agricultural products are largely dependent on the sustainable agricultural practices applied in the cause of production, regardless of perceived benefits. Despite various national efforts, the depletion of agricultural resource continues to be a serious problem in Nigeria, which has led to a decline in the contributions of the nation's agricultural sector to foreign exchange earnings and employment. The objectives of this study were: (i) to verify the adoption of some sustainable agricultural practice, (11) to determine the effect of each selected sustainable agricultural practice on the probability of producing livestock in the farm and (iii) to determine the production constraints faced by these farmers.

## Methodology

The study was carried out in Ogbomosho farm settlement, Ogbomosho, Oyo State, Nigeria. The study engaged basically two distinct groups of farmers in the settlement, the crop-only producing farmers (CPF) and mixed farmers (MF). The settlement had a total population of one hundred and eight farmers, out of which 75% was chosen. 45 were mixed farmers while 35 were crop-only producing farmers, giving a sample size of 80 farmers. In order to compare farmers who raised livestock on their farm with the farmers growing crops only, a farm level sustainable indicator, in form of a questionnaire, was developed. This indicator included various practices which were assumed to have positive influence on the sustainable use of agricultural lands and socio-economic structure of the population living in rural areas. The study used the chi-square contingency test independence to determine whether significant differences existed between livestock producers and non-producers in terms of the selected 17 sustainable agricultural practices. The formula for the test is

$$X^2 = \Sigma \frac{(ni - Ei)}{Ei}$$

Where ni represents the observed frequencies in the K categories and Ei represents the expected frequencies (Frend and Wilsen 1993)

The dependent variable was coded whether respondents raised livestock in their farms.

(y = 1), or not (y = 0)

The logic model is

$$\text{Prob}(y\text{-}1) = \frac{e^x}{1 + e^K} = f(X)$$

Where Prob (y = 1) is the probability of 1, e is the base of the natural logarithm, $f(x)$ is the standard logistic distribution function, x is the explanatory variable vector, which includes the selected sustainable agricultural practices.

## Results and Discussion

***Table 1: Differences between the application of sustainable agricultural practices by mixed farmers (MF) and crop- only producing farmers (CPF)***

| Sustainable Agricultural Practices | MF No. | % | CPF No. | % | $X^2$ | P |
|---|---|---|---|---|---|---|
| **Long term Crop Rotation** | | | | | | |
| Yes | 8 | 24.2 | 21 | 53.8 | 6.512 | 0.010* |
| No | 25 | 75.8 | 18 | 46.2 | | |
| **Using leguminous crops** | | | | | | |
| Yes | 25 | 75.8 | 30 | 76.9 | | |
| No | 8 | 24.2 | 9 | 23.1 | 0.013 | .563 |
| **Using animal manure** | | | | | | |
| Yes | 29 | 87.9 | 17 | 43.6 | | |
| No | 4 | 12.1 | 22 | 56.4 | 15.198 | .000* |
| **Proper use of pesticide** | | | | | | |
| Yes | 29 | 81.9 | 34 | 87.2 | | |
| No | 4 | 12.1 | 5 | 12.8 | .008 | .608 |
| **Burning Residues** | | | | | | |
| Yes | 20 | 60.6 | 19 | 487 | | |
| No | 13 | 39.4 | 20 | 5131 | 1.018 | .220 |
| **Growing Cover Crops** | | | | | | |
| Yes | 22 | 66.7 | 23 | 59.0 | | |
| No | 11 | 33.3 | 16 | 41.0 | .451 | .335 |
| **Proper use of chemical fertilizer** | | | | | | |
| Yes | 33 | 100 | 37 | 94.9 | | |
| No | - | - | 2 | 5.1 | 1.741 | .290 |
| **Taking adequate measures against soil erosion** | | | | | | |
| Yes | 33 | 84.8 | 34 | 87.2 | | |
| No | 5 | 15.2 | 5 | 12.8 | .916 | .632 |
| **Proper use of irrigation system** | | | | | | |
| Yes | 2 | 6.1 | 6 | 15.4 | | |
| No | 32 | 93.9 | 33 | 84.6 | 1.573 | .191 |
| **Using fallow system** | | | | | | |
| Yes | 21 | 63.6 | 30 | 76.9 | | |
| No | 12 | 36.4 | 9 | 23.1 | 1.527 | .165 |
| **Taking adequate measurement on owned rangeland** | | | | | | |
| Yes | 19 | 57.6 | 35 | 89.7 | | |
| No | 14 | 42.4 | 4 | 10.3 | 9.865 | 0.002* |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Forestation of environmentally less advantaged farm environment** | | | | | | |
| Yes | 13 | 39.4 | 28 | 71.8 | | |
| No | 20 | 60.6 | 11 | 28.2 | 7.654 | 0.006* |
| **Conducting soil test** | | | | | | |
| Yes | 12 | 36.4 | 5 | 87.2 | | |
| No | 21 | 63.6 | 34 | 12.8 | 5.493 | 0.019* |
| **Personal involvement in product marketing** | | | | | | |
| Yes | 30 | 30.9 | 34 | 87.2 | | |
| No | 3 | 9.1 | 5 | 12.8 | .252 | .454 |
| **Proper use of farm machinery and equipment** | | | | | | |
| Yes | 30 | 90.9 | 34 | 87.2 | | |
| No | 3 | 9.1 | 5 | 12.8 | .252 | .454 |
| **Intention of purchasing more land and enlarging farm** | | | | | | |
| Yes | 19 | 57.6 | 13 | 33.3 | | |
| No | 14 | 42.4 | 26 | 66.7 | 4.255 | 0.034* |
| **Intention of leaving farm to one's heir only** | | | | | | |
| Yes | 18 | 45.5 | 13 | 33.3 | | |
| No | 15 | 54.5 | 26 | 66.7 | 0.025 | .531 |

Results as shown in Table 1 revealed that 6 out of the 17 factors were found significant at 0.05 level of probability or better. The significant factors were long term crop rotation, using animal manure, taking adequate measurement for publicly owned rangeland, forestation of environmentally less advantaged farm environment, conducting soil test, intention of purchasing more land and enlarging farm .These findings show that CPF have more tendency of engaging in long term crop rotation 53%compared to MF 24%.These findings show that MF have higher tendency to use animal manure87% compared to CPF These results indicate that CPF have higher perception of taking adequate measures to properly protect publicly owned rangelands89.7% compare to MF 57%. These results show that CPF have a higher tendency of planting trees in environmentally less advantaged farm surroundings 71.8%compared to MF 39%. These result shows that CPF have higher tendency of conducting soil test71.8% compared to MF 36%. The last significant sustainable indicator was intention of purchasing more land and enlarging farm. This had a 57.6% Yes and

42.4% No responses amidst MF. The responses amidst CPF were 33.3% and 66.7% respectively. According to these results, more MF have the intention of purchasing more land and enlarging farm 57%compared to CPF 33%.

**TABLE 2: Logistic Binomial Model estimation for mixed farmers and crop-only producing farmers**

| Sustainable Agricultural Practices | Coefficient | Standard | Wald $X^2$ | P Value |
|---|---|---|---|---|
| Long term Crop rotation | -12.9581 | 6.9099 | 3.5167 | .0608 |
| Growing leguminous crops | -3.0256 | 2.4655 | 1.5060 | .2198 |
| Using Animal manure | -13.7694 | 7.1387 | 3.7205 | .0537 |
| Proper use of pesticide | -1.5374 | 4.3132 | .1270 | .7215 |
| Burning residues | -9.1551 | 5.6670 | 2.6099 | .1062 |
| Growing Cover Crops | 3.6933 | 2.6840 | 1.8935 | .1688 |
| Proper use of chemical fertilizer | 7.0189 | 109.6271 | 0.0041 | .9489 |
| Taking adequate measure against soil erosion | -1.1779* | .6040 | 3.8035 | .011 |
| Proper use of irrigation water | -10.9582 | 6.5959 | 2.7601 | .0966 |
| Using fallow | 6.9315 | 3.1868 | 2.3947 | .1217 |
| Taking adequate measurement on publicly owned land | -14.9537 | 7.9528 | 3.5355 | .0601 |
| Forestation of environmentally less advantaged farm environment | -.4101 | 1.2315 | .1109 | .7391 |
| Conducting soil test | 12.3585 | 7.0657 | 3.0593 | .0803 |
| Personal involvement in product marketing | 16.4009* | 8.5004 | 3.7227 | .05 |
| Proper use of farm machinery and equipment | -7.6798 | 4.8050 | 2.5345 | .1100 |
| Intention of purchasing more land and enlarging farm | 1.3108 | 1-6707 | -6156 | .4327 |
| Intention of leaving farm to one's heir only | -3.1671 | 2.4672 | 1.6539 | .1984 |
| Constant | 1.4856 | 219.6457 | .0000 | .9946 |

The logistic binomial model estimation for MF and CPF is presented in Table 2. Logistic regression analysis was used to estimate the probability of respondents that are mixed farmers with the 17 explanatory variables. The full model was statistically significant, $x^2$ (17, N 72) = 99.31, P < 0.01. The model had a -2log likelihood statistics of 99.31, a cox and snell R square of 0.617 and a Negelkerke R square of 0.825. It was able correctly to classify 93.94% of the mixed farmers and

87.18% of the crop-only producing farmers for an overall success rate of 90.28%. Out of the 17 explanatory variables, 2 had significant partial effects at 0.05 level probability or better. These were taking adequate measure against soil erosion and personal involvement in product marketing.

**Table 3: Most limiting constraints to production**

| Constraints | Crop - only producing farmers | | Mixed farmers | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Capital | 20 | 51.3 | 20 | 60.5 |
| Transportation | 2 | 5.1 | 3 | 9.1 |
| Storage | 2 | 5.1 | 2 | 6.1 |
| Cost of production input | 9 | 23.1 | 3 | 9.1 |
| Marketing | - | - | 2 | 6.1 |
| Production uncertainty | 1 | 2.6 | 2 | 6.1 |
| Low government intervention | 2 | 5.1 | - | - |
| Labour | 2 | 5.1 | 1 | 3.0 |
| No response | 1 | 2.6 | - | - |
| **Total** | **39** | **100** | **33** | **100** |

Table 3 shows the most limiting constraints the farmers were faced with. 51.3% of CPF and 60.5% of MF were faced with problem of capital. This is the most prominent limiting factor indicated by the respondents. 23.1% of CPF signified their most limiting factor to be the cost of production while 9.1% of MF signified the same. Also 5.1% and 9.1% of CPF and MF respectively said their most limiting factor was transportation of both produce. In the same vein, 5.1% and 6.1% respectively felt their most limiting factor to production was unavailability of storage facility.

**Conclusion and Recommendation**

The study found that more of the mixed farmers applied various sustainable agricultural practices than crop-only producing farmers. It is considered as a contributing and risk reducing enterprise when sustainable agricultural practices are properly integrated with production. The results of this study showed that in order to increase the level of adoption of sustainable agricultural practices, mixed farming should be promoted more than crop farming. The government should proffer solutions to the constraints the farmers are faced with in the course of production. Since the study area is a farm settlement, it showed that a collective adoption of sustainable agricultural

practices will be the order of the day. Therefore, government and related stakeholders should find a way of educating the farmers on the benefits and importance of sustainable agricultural practices.

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# EVALUATION OF KWARA STATE GOVERNMENT INITIATIVES AND EXTENSION CHALLENGES IN AGRICULTURAL DEVELOPMENT

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**Abstract**

*A great deal of attention is required for agriculture in Africa to meet the great and continually rising food and industrial needs. Extension services are expected to help farmers, who constitute the largest percentage of the workforce in Nigeria and most of Africa, to do away with less productive traditional practices and replace them with research proven practices. Assimilation of these initiatives is determined by the success or otherwise of the extension services. Against the background of myriad development programmes and initiatives targeted at achieving different goals, this study aims at investigating the past and current agricultural initiatives of the Kwara State government in agriculture, the stages of assimilation they had reached, challenges faced by both the farmers and extension workers, and the cultural practices militating against assimilation. The survey design was adopted and the Focus Group Discussion used to obtain data from a sample of farmers and agricultural extension workers from three communities representing the Senatorial Districts in Kwara State, Nigeria. Results indicated that the government initiatives were treated with some apprehension at the beginning and followed with slow but progressive measure of assimilation observed with time. It was recommended that attention should be given to the concerns and challenges faced by both the farmers and extension workers.*

## Introduction

The frontiers of knowledge are extended daily by research. For universities and research institutes, research is an on-going exercise. The scientific method majors in discovery and innovation both for the advancement of knowledge and improvement of practices everywhere in the world. Researchers are often enamoured at new discoveries and excited abou

opportunities to introduce changes capable of bringing about improvement in all spheres of life. Advancement in agricultural science continues to demand changes in the practices among agriculturists. Sometimes these affect the cultural practices of the people involved and hence the merger of science, the innovations deriving from the research enterprise and progress recorded as these changes become part and parcel of life.

There is however the interface between new discoveries, research based innovations and integration of these to practice in all fields. It is the phase that transforms the human elements that would either implement or benefit from the changes occasioned by innovations from their old state into a new state in which the knowledge produced comes into use. It involves a set of activities targeted at changing the knowledge base, orientation, behavior and skills of a group of practitioners. These are adults who go through the educational process often referred to as agricultural extension. This specialist area of agriculture makes the adult farmer, a largely illiterate population in Nigeria, to imbibe newly discovered scientific and technological innovations. Extension in agriculture was described by Saville (1965) as education outside of the school system for people in rural places. Although this gives the impression that urban centres do not benefit from extension, Leeuwis, and van den Ban, (2004) however describe it the process of developing and inducing innovations through a series of embedded communicative interventions with the view to bringing solution to certain problems.

Problems of agricultural practice in Kwara State were focused under different projects. The different agricultural initiatives expected to bring innovations to farmers had been packaged under eight projects implemented through both the State Ministry of Agric and Agricultural Development Project include:

1. Roots and Tuber Expansion Programme
2. National Special Programme for Food Security
3. Community Based Agriculture and Rural Development Project
4. Kwara State Rice Project
5. New Nigerian Farmers' Project
6. Fertilizer Loan Scheme
7. Cassava Initiative
8. Fadama Development Project

Of these eight projects, the NSPFS has the most extensive coverage. Areas covered by it include crop production, livestock farming, fishery, agro-processing, forestry, agro-marketing and food and nutrition. The others cover one or a few agricultural activities. The Fadama project in its next phase, which is yet to commence, is expected to have such wide coverage.

The main objectives cutting across the eight projects include:

i. Increasing agricultural productivity
ii. Empowerment of farmers
iii. Alleviation of poverty/raise the standard of living of the farmer
iv. Improve rural infrastructure
v. Transform agricultural practices
vi. Reduce/remove wastages

The critical nature of extension service comes into the fore when the farmers' culture and traditions are affected. Change becomes difficult to achieve when the farmer holds on to tradition. Apart from the tendency that culture promotes resistance to change, research relating to concerns about innovation suggests that implementers pass through various stages. According to Cheung, Hattie and Ng (2001), the first stage is that of indifference where implementers have not adopted any attitude concerning the innovations. This is followed by the stage of informational-personal where effort is made to know the nature of the innovation, how it is implemented and its likely benefits and the individual involvement required. The third stage is where information about the management of the innovation is sought and this is followed by the fourth stage that talks about consequence-collaboration where implementers begin to relate with colleagues to ensure the success of such programmes. The final stage is that of refocusing which involves the concern of implementers for the universal benefits of the innovation. Owolabi and Ogunjimi (2008) found that the concerns of Lagos State secondary school teachers about the introduction of school Based Assessment at the initial stages covered only two stages of the Cheung's Stages of Concern i.e. informational-personal and consequence-collaboration. Extension personnel, in some measure, implement the innovation packaged into the objectives of different agricultural programmes of the Kwara State government. It is necessary to find out what these innovations are while it is not clear what the response of extension personnel is to the innovations.

**Research Questions**

The study aimed at obtaining answers to the following research questions:

1. What innovations were brought to farmers' agricultural practices by the different projects?
2. Do these innovations lead to changes in the people's culture and in what respects?
3. What are the challenges militating against the assimilation of these agricultural innovations?
4. What are the extension challenges to these innovations?
5. To what extent has farmers assimilated the agricultural innovations?
6. In what ways could these challenges be addressed?

**Methodology**

The survey design was used in this study. The area under study was Kwara State which, as is the case all over Nigeria, has majority of the rural dwellers engage in subsistence agriculture. The population under investigation includes all farmers in Kwara State. The state had 1.55 million people during the 1991 and by projection 2.5 million in 2009. Going by the estimate that 90% of the rural population in Nigeria is engaged in agriculture, not less than 0.8m rural farmers live in Kwara State. There are three Senatorial Districts in the State and the sample selected for this study was stratified along these lines. One community was purposively selected from each Senatorial District and farmers were randomly selected through their cooperative groupings. The three communities sampled for the study include Osi in the southern, Alapa in the central and Lade in the northern senatorial districts of Kwara State. All the Extension Assistants engaged by the Kwara State Agricultural Development Project to provide services to farmers in each sampled community were involved in the study. Researchers developed two schedules that were used for carrying out focus group discussion with the farmers and extension agents respectively.

Farmers were grouped along their product lines. They were grouped under crop production, livestock farming, agro-processing and fishery. Focus group discussion was held with one group each in these communities. Breakdown of farmers that participated in the discussion groups is as follows:

Osi - four groups comprising a total of 31 farmers
Lade - one group comprising 9 farmers
Alapa - one group comprising 6 farmers

In all, 7 extension agents operating in these three communities were involved in the study.

Dave's model of programme evaluation was adopted for evaluating the challenges to extension service in these agricultural projects. The model has every programme broken into five elements. These are environment, implementation, process, outcome (immediate) and long range outcomes. The acronym EIPOL had thus been adopted to represent each of the elements. Environment refers to the context within which the projects were introduced or the existing circumstances at the period in which the project started. Implementation is the component that involves setting up the structure that would create and sustain opportunity to successfully achieve programme objectives. The resources human, material and financial committed into the programme are part of the implementation. Process covers the pursuit of the different objectives of the project by exploiting the management of the established structure to function to achieve results. In essence, process tends to be the procedural follow up component that combines the structure with the resources. Outcome refers to the results of the programme implementation processes. It is the effects in terms of changed behaviours and products of these changed behaviours. The last element is the long range programme outcomes and this is very important as it helps to assess the extent to which the impact of programmes implementation lasts.

Dave identified four stages of programme implementation to which the elements of his evaluation model should apply. These are pre-planning, planning, implementation and assimilation stages. This is a study of programmes that were already at either implementation or assimilation stages.

**Results**

The research questions were answered with the data obtained from both the extension workers and farmers one after the other.

1. What innovations were brought to farmers' agricultural practices by the different projects?

The summary of data from the responses of farmers during the focus group discussion sessions indicated that the innovations in crop production included the following:

- Land preparation method including use of machines
- Planting technology to achieve improved productivity e.g. maize doubling

- Chemical use for weed and pest control
- New fertilizer application procedures e.g. ring instead of broadcast method

Responses from livestock farmers indicate the following innovations:

- Construction of poultry house and pen for the animals
- Stocking of special (agric) species of animals in place of local varieties
- Procedures for feeding the animals
- Preventive and curative treatment procedures
- Health/sanitation and animal care practices

Those involved in agro-processing indicated the following innovations:

- Acquisition of food processing machines
- Maintenance procedures of the processing machines

Fish farmers stated that the following innovations came up:

- Fish farming came as a completely new agric practice to one of the communities (Osi)
- Rearing fish along the cultivation of rice was introduced

There seemed to be a consensus among the farmers that the innovations affected their agricultural practices in the areas of increases in farm yield/productivity, increase in income from sale of farm produce, reduction in the use of energy sapping implements like hoes and cutlasses and increase in farm holding by individual farmers. Changes were indicated in the standard of living of farmers as they attested to the fact that many of them had purchased motor-cycles which are deployed to facilitating farm work. There seemed to have arisen a cooperative attitude to solving the farmers' problems in a way slightly different from the communalism in African tradition. The new cooperative attitude seems to be coming with the principle of equality and it is more outward looking. Relationships with the outside world had increased tremendously.

2. Do these innovations lead to changes in the people's culture and in what respects?

This research question deals with cultural changes associated with these agricultural innovations. The responses of farmers suggest that reliance on

traditional working implements appears to be reducing due to the introduction of modern ones to the farmers. Wrongly held impressions and attitudes to the use of fertilizers and chemicals which used to infringe on farmers' preparedness to use them seem to be giving way as they now embrace their uses. Livestock and fish farmers indicated that the traditional belief that whoever is not into crop production is a lazy farmer had given way as keeping livestock for livelihood had gained general acceptance within their communities. Rather than working on individual or family bases, farmers have started to work in groups in such a way that mutual trust and confidence has grown among them. Lade people expressed categorically that rice is their native product and every farmer is expected to plant it.

3. What are the challenges militating against the assimilation of these agricultural innovations?

Both the farmers and agricultural extension staff of the Kwara State Agricultural Development Project who participated in this study tend to agree that the challenge faced by farmers in the assimilation of these agricultural innovations include:

- Difficulty in getting farmers to repay loans taken by them,
- Problems relating to sourcing for fund to continue with the agricultural innovations
- Handling the increased production that flowed from the innovations

4. What are the extension challenges relating to the agricultural initiatives?

The course on focus group discussion with the extension agents indicated the following extension challenges:

- Timing of release of funds to farmers is sometimes delayed
- Sufficiency of farm inputs
- Coping with past failures in terms of loans granted
- Changing to the bottom-up approach
- Directing funds to agriculture
- Attitude to government programmes

5. To what extent has farmers assimilated the agricultural innovations?

Farmers in the three centres visited were found to be in different stages of assimilation of these agricultural innovations. Alapa farmers seem to be the

most advanced in terms of assimilation relative to the others. These farmers had a mother union comprising five other cooperative groups who operate joint farming venture with bank loans secured both in 2008 and 2009. This is suggesting some form of sustainability as the initiative as well as negotiation and repayment for 2008 was with little or no intervention by government officials. Farmers at Osi had recycled part of the NSFSP loan repaid by farmers for their farm operations in 2009. This was operated through the bank account opened in the name of a cooperative union of the farmers. These suggest steps in the way of assimilation of the objectives of agricultural innovations. Lade farmers are essentially producers of rice. Although the rice farmers depend on both bank loan and farm input supports from the government in collaboration with a private investor called Ollam, the farmers complement the hectares cultivated by each of them under this programme with personal holding of not less than three hectares. The level of dependence on government, banks or other agencies appears to be heaviest with the Lade rice farmers.

6. In what ways could these challenges be addressed?

Both the farmers and extension agents made suggestions along the following lines:

- Timely disbursement of loans
- Provision of more tractors and other farm inputs
- Concrete arrangements for facilitating sale of farm produce e.g. opening up market channels
- Government initiatives should not be left in the hands of *political farmers*
- Areas/individuals that did not disappoint in loan repayment should be encouraged by increased access.

**Conclusion**

This study revealed that farmers in Kwara State are exposed to many agricultural innovations. These innovations are affecting, in some ways the people's culture. Indicators of development are reflecting not only in agriculture but in the standard of living of farmers and their access to infrastructural facilities. There are signs of assimilation of the innovations in the three Senatorial Districts of Kwara State sampled for study. There is however the need to sustain these programmes and intensify the bottom-up extension approach to cover the whole of Kwara State.

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# "THEY KNOW IT LET US ASK THEM": FARMERS' UNDERSTANDING OF CLIMATE VARIABILITY IN BONGO DISTRICT, UPPER EAST REGION, GHANA

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**Abstract**

*Climate variability is having adverse effect on rural households. There are predictions of harder times ahead. Do rural farmers appreciate the changes in climate and what are their understanding of the causes, effects and mitigating strategies? Focus group discussions were held and 325 people were interviewed in the Bongo District, Upper East Region. Data was analysed using the three generational analyses. The people are aware of the changing climate and think there are both physical as well as spiritual causes of these changes they experience, spiritual as retribution for wrongs against the gods. They are of the opinion that if nothing is done about the situation it could get worse in the future. Solutions suggested include physical: tree planting, prevention of bush fires, reduction in indiscriminate felling of trees and spiritual: pacifying the gods and reduction in evil doings. The causes, effects and suggested mitigation strategies vary according to generations. They are not aware of the effects of global influences of climate change. They are calling on all who can assist them implement their perceived strategies to come to their aid. It is recommended that in finding solutions to issues of climate change and its mitigation, farmers' concerns should be taken into consideration. There is the need for their knowledge base on climate change to be broadened.*

## Background to the Paper

Adverse climatic situations are characteristic of all dry lands resulting in climate variability and particularly potent in Africa (Ellis, 1995:37). Drought, flood and high wind speed, are common in the semi-arid regions of West Africa with drought occurring most, hence drought prone (Howel et al, 1996). Wilhile (1996:147), David et al (1994:104), World Meteorological Organisation (1997), Findings (1998) find drought representing a considerable climatic risk in semi-arid regions, common of climates in virtually all climate regimes. But Patrick

(2003) considers drought as a normal part of climate, characteristic of drier areas occupied by some 40% of world's population.

Over two decades ago WMO (1987) suggested future occurrences of climatic risks in several forms as also IFPRI (1998), Glantz (1994) and IPCC (2003). The intensity and frequency of extreme meteorological events, such as drought, may increase, given projected changes in climate associated with increasing concentrations of carbon dioxide and other atmospheric trace gases (Wilhile, 1996). Some of these gases come from activities such as bush/plant biomass burning and greenhouses. The gases contribute to global warming and deplete the ozone layer (Global Change, 1994; UNEP/GEMS, 1987; and Tivy, 1990). Global warming does not mean that temperatures would rise uniformly or rainfall change uniformly all over the globe but rather some areas will likely become much warmer than others and bring about higher evaporation rates as well as drought in some areas and floods in others (UNEP/GEMS, 1987). The effect of droughts in the dry lands particular in Sub-Saharan Africa cannot be overemphasised especially since there are neither well-planned warning systems nor disaster management strategies.

The suggestion is that worse conditions are likely to occur in the future in the West African sub-region (van den Born et al, 2004). Nations and peoples of the semi-arid regions of the world have long histories of planning for, coping with, rebuilding after, and responding to variations in their climates (Ribot, 1996). Several countries are learning from their past mistakes and drafting strategies to help farmers cope with climatic risks. These include both mitigation and adaptation policies within a sustainable development framework (Denton et al, 2001). In Ghana, and the semi-arid zone in particular of which the Upper East Region is part, rainfall data show clearly that there have been droughts or near drought situations in 1962/63, 1967, 1970, 1975-77, 1981, 1983-84, 1990-91, 1995-97, the 1997/98 El Nino and 2000 (see Dietz et al, 2004:155; Obeng, 2005). These have been years of severe food insecurity especially in the Bongo District leaving memories hard to remove since the main occupation of the area is farming. National Drought Mitigation Centre (1999) reports the 1997/98 El Nino as the cause of food shortage in the Northern and Upper East Regions of Ghana.

Climate variability could be considered as one of the causes of increasing poverty in the study area as well as other areas with similar climatic conditions. A scientific analysis of the people understanding of the causes of variability will

help policy makers and implementers to adopt more feasible and best solution options to break the vicious cycle of poverty in the Bongo District, and similar poverty-stricken areas of Ghana.

Hence the objectives of this paper is to present analyse of farmers in the Bongo District's understanding of the causes of climate variability specifically drought and how their understand affects their personal and communities development; with the view to making policy recommendations in dealing with issues related to climate in the area. It also considers mitigation strategies already in place in the area and suggested mitigations.

**Theoretical Framework**

Climate change has become of great significance that both scientists and laymen have become conscious of the future effects of small changes in climate. In fact it is the branch of climatology that has received and continues to receive most attention. Arguments as to the causes of these changes in climatic elements are going on without definite proof but some occurrences suggest the causes.

It is not clear in Ghana whether there has been climate change in the savannah zone but temperature study by Ontoyin (1993) reveals an increase in temperature from 1961-1990 as against the 1931-1960 periods. Ofori-Sarpong (2001) shows with clear graphs the increasing trend in temperatures and continuous annual decline in rainfall. Rainfall and temperature data available at Bolgatanga, Bawku, Navrongo and Zuarungu show wide fluctuations. There has been some significant change in the temperature and rainfall amounts over the years especially since 1970. Though trends may not be clearly seen, there is a change. This paper considers climate variability rather than climate change because all relevant data to confirm a change or otherwise in climate are not available. Also the variations are year-to-year issue and more relevant than the issue of change that is a long-term phenomenon.

**Climate Change and Climate Variability**

The concept of 'climate variability' was introduced into the climate change debate on grounds that data in many developing countries are not enough to establish clear climate change. Arctic Climatology and Meteorological Glossary define climate as statistical weather information that describes the variation of weather at a given place for a specified interval. In popular usage, it could be best described as the prevailing and hence the expected sequence of the

states of the atmosphere (loosely, weather) at a given locality, covering regions, hemispheres or even the whole globe (Encyclopaedia Britannica, 1994-1999b). Climate change then is the shift of this sequence to some new apparently lasting state or a secular trend that produces a change in the average climate (Berger, 1980). Ofori-Sarpong (2001) adopted Kelly and Hume's (1993) reference to climate variability as short-term variability such as year-to-year variability of individual climate parameters around longer-term mean values caused by natural mechanisms or by human activity, and Berger's (1980) definition of climate change as a secular trend that produces a change in the average climate. Climate variability is defined by Hare (1985:41), as the observed year-to-year differences in values of specific climate variables within an averaging period (typically 30 years). Climate change, on the other hand, is defined as a longer-term change of such climate variables between averaging periods, either in the mean values of climate variables or in their variability. Climate variability is often used to denote deviations of climate statistics over a given period of time (specific month, season or year) from the long-term climate statistics relating to the corresponding calendar period http://nsidc.org/arcticmet/glossary/climate_variability.html. IPCC (2001) considers climate variability as referring to the variations in the mean state and other statistics (such as standard deviation, the occurrence of extremes, etc) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forcing (external variability). Variability is also considered as the departure from normal or the difference in magnitude between climatic episodes as such it includes both bad and good seasons. Climate variability can occur whether the long-term climate is stable or changing (Verhagen et al, 2004). The climate change debate acknowledges the variations in climate in all the areas studied but the problem is whether the variations put together can be considered as a change. From the discussion above it could be said that the difference between climate change and climate variability is the duration. The major element of climate that cause variations in the study are is drought hence could be considered as a proxy for climate variability.

**Indigenous Understanding of Causes Drought**

Farmers, especially on the African continent, claim to have known the causes of drought ever since and in some cases claim to have the solution to drought whilst scientists are busy looking for the causes. Scoone et al (1996) reveal that Zimbabweans attribute drought to moral decline and lack of respect, prostitutes singled out by many, hence it is seen to result in retribution from God or the ancestors. Ofori-Sarpong (1985) finds in Sokoto over 73% of farmers interviewed claim that droughts are punishment from Allah for the sins of the people. Oguntoyinbo and Richard (1978) and Mortimore (1973) find similar reasons in other parts of Northern Nigeria.

Similarly, the Holy Bible in 2 Chronicles 6:26-27 attributes the cause of drought to sin. 1 Kings 17:1 says that the Prophet Elijah proclaimed a three and a half-year drought as punishment to Israel because of their sins. In 1 Kings 18 we read that the prophet again declared the drought over and prayed for rains and there were rains henceforth.

In Ghana such teleological reasoning hold strong in almost all cultures. Every tribe has its own ways and beliefs about rain and drought. Rainmaking and spiritual interpretations of calamity are common phenomenon. They claim to know the causes and also the solution.

**Effects of Drought**: Drought is one of man's worst natural enemies in semi-arid lands. Its beginning is subtle, its progress is insidious and its effect can be devastating (Hounam et al, 1975). The effects of drought in semi-arid areas could have environmental, economic, social and cultural dimensions (WMO, 1997). Two insidious characteristics of drought make it different from other natural hazards. First, as the effects of drought often accumulate slowly over a considerable period of time and may linger for years after the termination of the event, the onset and ending of droughts are difficult to determine. Second, the impacts of droughts are less obvious and are generally spread over a larger geographical area than the damages that result from other natural hazards. In the view of Glantz (1994), droughts by themselves seldom lead to famine. It is said that "often, drought is a 'creeping' phenomenon that combines with other underlying societal and environmental conditions to produce famine-like conditions. Pandey (2003) and FAO/WFP (2002a) discusses an effect in Eastern India, Ahmad et al (2004) presents one in Pakistan. Effects of climate variation in Upper East Region are recorded by Tonah (1993), Graham (1995), (www.

drought.nul.edu/risk/world/nino498.pdf-1998) http://countrystudy.us/ghana/77.htm. All these show situations of water stress resulting in various levels of food insecurity. In Africa, 80% of deaths associated with natural hazards are the result of drought/famines (Patrick, 2003).

## Methodology

A combination of focus group discussions and questionnaire interviews were used in data collection. Bongo District was divided into seven clusters based on the seven sub-districts. Two communities, Kunkua in the Gowrie Zone and Zorkor in the Zorkor Zone, were chosen at random for the focus group discussion. These did not form part of the interview sample since the sampling of communities was random. **Seven clusters** were created based on the sub-district. One community each was chosen at **random** from each cluster. Four, five or six **compounds** each were selected using purposive and snowball sampling from each of the seven chosen communities based on having three generations (grandfather, father and grandson). In all 35 compounds were chosen and all members above 14 years formed part of the interviewed sample. Some Participatory Rural Appraisal (PRA) tools such as checklists, focus group discussions and key informants interview, surveys, observations as well as semi structured questionnaires were employed for primary data collection from the field and from respondents in phases and stages.

Data were analysed using descriptive statistics and results are presented as graphs and tables. Genealogical analysis using three generations (den Ouden 1989) was used as a data collection tool and employed in the analysis to capture trends and differences in understanding of causes of climate variability. This was used to prevent gaps in the data since the generation have different experiences and perspectives.

## Findings/Results

### Socio-economic characteristics of respondents

Some demographic characteristics influence the understanding and perceptions of the people hence are discussed.

**Educational status:** The study shows that 64.9% of the respondents, made up of 71.1 % of the total females in the sample and 58.5% of the males, do not have any form of formal education (Table 1). All the compound heads, apart from two who

had night school education (functional literacy), had no formal education and no respondent above 60 years of age had any formal education. Educational levels influence their way of thinking and understanding.

**Table 1 Age and Educational Status of Respondents**

| Educational level | 14-24 | | 25-45 | | 46-60 | | >60 | | Male | | Female | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fre* | (%) | Fre* | (%) | Fre* | (%) | Fre* | (%) | Fre* | (%) | Fre* | (%) | Fre* | (%) |
| No formal education | 19 | 19.2 | 89 | 78.1 | 67 | 89.3 | 37 | 100 | 93 | 58.5 | 118 | 71.1 | 212 | 64.9 |
| Primary School | 30 | 30.3 | 13 | 11.4 | 3 | 4.0 | - | - | 18 | 11.3 | 28 | 16.9 | 46 | 14.2 |
| Middle School | | | 3 | 2.6 | 1 | 1.3 | - | - | 3 | 1.9 | - | 0 | 4 | 1.2 |
| Junior Secondary School (JSS) | 38 | 38.4 | 5 | 4.4 | 2 | 2.7 | - | - | 30 | 18.9 | 16 | 9.6 | 45 | 14.2 |
| Senior Secondary School (SSS) | 9 | 9.1 | 3 | 2.6 | - | - | - | - | 9 | 5.7 | 3 | 1.8 | 12 | 3.7 |
| Tertiary | 1 | 1.0 | | | | | - | - | 2 | 1.2 | - | 0 | 1 | 0.3 |
| Night School | 1 | 1.0 | 1 | 0.9 | 2 | 2.7 | - | - | 4 | 2.5 | - | 0 | 4 | 1.2 |
| Vocational/Technical | 1 | 1,0 | - | - | - | - | - | - | - | 0 | 1 | 0.6 | 1 | 0.3 |
| Total | 99 | 100 | 114 | 100 | 75 | 100 | 37 | 100 | 159 | 100 | 166 | 100 | 325 | 100 |

Source: Field survey, Bongo

**Fre* = Frequency**

**Religious Inclination:** The major religion in the district is traditional worship comprising of 62.2% followed by Christianity 31.4%, a few Muslims 5.5% and an insignificant 'Non-align'. This explains the strong belief in the spiritual causes of drought or 'bad years'. None of the respondents above 60 years is a Christian suggesting that Christianity is a new religion in the district. The elders see Christianity as a challenge to their way of worship and claim that 'Christianity has driven away our gods and ancestors'.

**Occupations of the Respondents:** During the wet season the major occupation of the majority of the respondents, both male and female, is farming (76.6%). Schooling (20.7%) follows after farming, mainly young people between the ages of 14 and 25. Only 3.1% of the respondents have other jobs and hence do not engage in farming. In the dry season the people are involved in a lot more income generating activities than in the wet season. Only 4.9% of the people do nothing in the dry season. The 20.7% will still be in school while the remaining 73.8% **are**

involved in animal rearing (18.8%), weaving of baskets and hats for sale (17.3%
trading (10.8%), dry season gardening, rope making, rice processing, *pi*
brewing and firewood fetching for sale. The idea of an additional job even in th
dry season is sound and is a coping behaviour to prepare for a future bad yea
The main occupations also inform their understanding of variation in th
climate. Temporary migration to the cities, especially Kumasi and Accra, to wor
is a major dry season activity in northern Ghana but surprisingly, the data sho
that only 1.2% of them are involved in this activity contrary to findings by Ober
(2004), Ofori-Sarpong (2001).

**Climatic Elements Showing Variation**

From the focus group discussions and the questionnaire interviews, a
the men, women and youth (except five youth) said they have noticed variation
in climate over the years. They noticed variations in rainfall, temperature, win
and harmattan. **All the elderly agreed that since 1972 (30 years) they hav
been experiencing more frequent variations.**

**Rainfall Variation:** This paper concentrates on rainfall (drought). Rainfa
intensity, they say, is now low as compared to the past. There used to be intens
and heavy rainfalls sometimes with ice pellets. The shallow rivers overflowe
their banks and the resultant short-lived floods carried away animals, destroye
crops and sometimes houses collapse. These do not occur in recent times. Th
last flood in the area was in 1971/72. Now rainfall is so low that sometimes crop
wilt and die.

According to the people rains used to commence in March and end i
November but now the period is shortened, starting from April and sometim
May and ending in October. The sowing period has been affected because aft
clearing the land they have to wait for sometime (up to two months) from th
normal sowing period before sowing can be done due to late rains. Yields of cro
were better in the past than they are today but this cannot be wholly attributed d
climate change. There used to be short dry spells necessary for harvesting an
drying of some crops, especially early millet but in recent times the dry spells a
longer thus affecting other crops on the field.

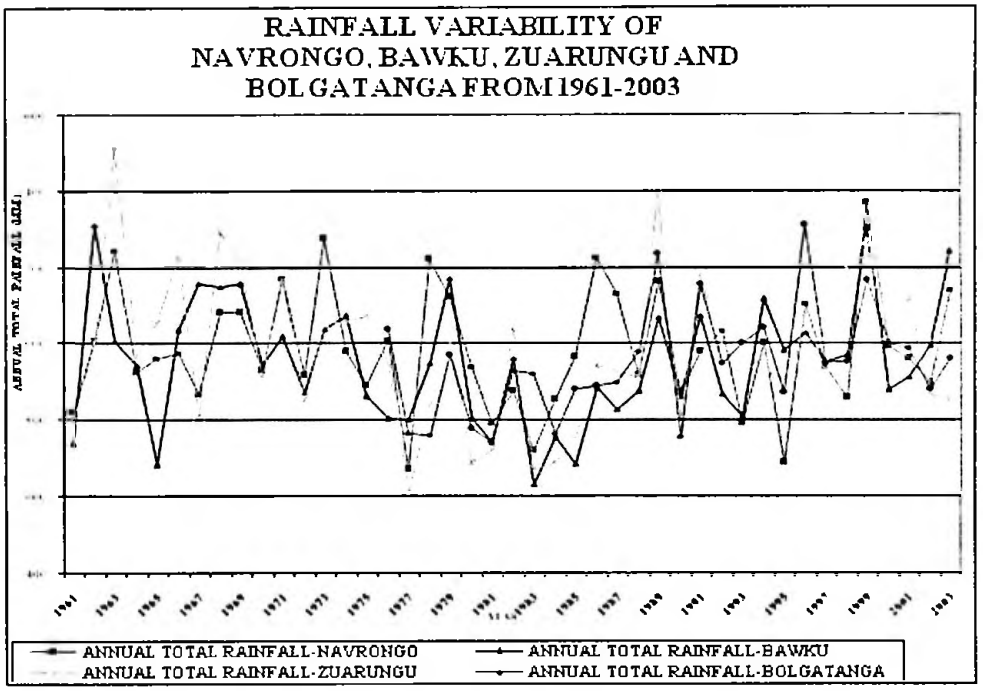


Figure 1
Source: Constructed with data from Meteorological Services Department

There is no Meteorological Station in the Bongo District, instead Navrongo, Bolgatanga, Zuarungu and Bawku, which are all in the nearby semi-arid zones have one each. The people of Bongo claim that there are more rains in Bolgatanga and Zuarungu than in Bongo District. For this reason data from Navrongo and Bawku that fall within the same latitude are used as proxy and the whole data is presented graphically in **figure1**. From the data it is clear that commencement of rains has moved from March to April and sometimes May as the people have observed. From 1995 through to 2003 there has been no meaningful rainfall during the period except for 1995 in Bawku confirming the people's assertion. On the other hand data for a 43-year period (1961 – 2003) indicate that 35% of the times there have been rains in November with an average of 3.6 millimetres. These periods are evenly distributed hence their claim that the rainy period has shifted from November to October could not be

wholly true. Meanwhile November rains are not useful to crops because most o the crops would have been harvested and those yet to be harvested rather nee sunshine to dry. The data confirms that rainfall intensity and volume have bee decreasing considering the long-term average, as also by Ofori-Sarpong (2001) The finding also confirms Dietz et al (2004).

**Observed Drought Years**

During *the focus group discussion it came out that: 'For over 20 years no there has been a kind of 'waari' (drought) every year but there were some that were so severe that we cannot be forgotten'* because of the bitter experiences.

**2001** Affected early millet

**1998** Affected most crops. Pest also invaded the farms

**1983** This was a nationwide drought and it affected all crops

**1981** (President Limann's days) affected groundnut, bambara beans, earl millet, upland rice, late millet and sorghum

**1977** General crop failure. This drought is always remembered, never to b forgotten, because there was grain shortage so they travelled t Yelwongo in Burkina Faso to purchase grains mixed with stones and the had difficulty separating them.

**Farmers' understanding of Causes of Climate Variability**

The reasons given for the causes of climate variations and specificall drought, from both the focus group discussions and the questionnaire interview were classified into two major groups: Teleological (Spiritual) reasons an Physical reasons.

**Teleological (Spiritual) Causes of Climate Variability**

The people have these to say about the causes of worsening climate variation:

> *'Our grandfathers used to consult the soothsayer who performed sacrifices and the gods gave us good rains but now this is not done. There is no respect for the Tindana (the owner of the land) who leads us in the sacrifices and the 'religious people' refuse to sacrifice. Every living thing begs God for water but because these living things like Dawadawa, shea trees have reduced and there is not enough water to support life.'*

*'The elders used to pacify the gods hence there were solutions to adverse climatic situations but they are dead and the youth are not interested in their ways. Instead they are interested in looking for jobs outside the district. Circumcision of men instead of female genital mutilation (FGM) has also affected the gods. The rules of the Tindana are not obeyed. Rules like: feed those who do not have especially your relations; sex should be in the room in secret not in the open are not respected any longer. Now people go to drink to insult their elders. There used to be local laws or taboos that prevented them from felling trees in June; sorghum stalks were not carried along the road and the stalks should not be stored after second weeding of sorghum and millet fields'.*

*'The gods are not able to move about in the night hence they are restless. They used to move in the night when all people were asleep but now we don't sleep and keep disturbing throughout the night thus affecting the gods'.*

*'Lack of prayers of appreciation and thanksgiving to the gods is another cause of the changes. In the past, the whole community performed sacrifices before sowing began but now the Tindana is left to do it alone, hence it is not very effective. The elders go to consult before the farming season to get instruction from the gods. The gods tell them when to sow and what crops will do well in the coming year. Christianity has brought about a change. People fear to tell the community what the gods say after consulting the gods so they keep the messages to themselves'.*

*'God causes drought because he does not send the rains to give water. He decides when to give us water and when not to. Other sacrifices such as those before and after harvest are no more performed'.*

*"In the past, women will gather and go to the Tindana dressed in 'Lunea' leaves to dance and complain that they are thirsty. Rituals will be performed and the rains will come."*

Four things are clear from the spiritual causes of drought. These are sin and retribution, disrespect for God or gods, not performing the sacrifices and rites, and the encroachment of the groves.

**Table 2** presents the statistics of the responses for spiritual causes of drought as given by the various age groups. Their spiritual stand point is not different from the findings by Scoones et al (1996) in Zimbabwe, Ofori-Sarpong (2000) in Sokoto State of Nigeria, Oguntoyinbo and Richard (1978) and Mortimore (1973) in parts of Northern Nigeria. It is important to note that though 62.2% of the respondents are traditional worshippers, they claim that the 31.4% Christians have affected their beliefs and norms. If the trend where the youth are becoming Christians continues there is the tendency that by the next generation some aspects of culture and traditions of the people would have been lost.

**Table 2 Teleological Reasons for Variations in Climate by Age Groups**

| Reasons | Age of Respondent | | | | | |
|---|---|---|---|---|---|---|
| | 14 – 24 | 25 – 45 | 46 – 60 | > 60 | Total | % |
| God's punishment | 2 | | | 2 | 4 | 1.2 |
| God's work/Act of God, he controls the weather | 25 | 34 | 14 | 7 | 80 | 24.6 |
| Now people do not pacify the gods as was done in the past so the gods are not pleased | 9 | 11 | 14 | 1 | 35 | 10.8 |
| Our ancestors were the cause | | | 2 | 2 | 4 | 1.2 |
| Our gods are annoyed because they are wronged | 5 | 13 | 8 | 5 | 31 | 9.5 |
| The shrines are encroached | 1 | 1 | 4 | 1 | 7 | 2.1 |
| The Tindana is not doing his work well | | 3 | 1 | 5 | 9 | 2.8 |
| Our parents used to pacify the gods for rain but it is not done now | 1 | | 3 | 1 | 5 | 1.5 |
| People refuse to worship God as required | 7 | 2 | | | 9 | 2.7 |
| Of late we are neglecting the gods and joining other religions so the gods cause this to let us know that they are there | | 1 | 2 | 1 | 4 | 1.2 |
| In the past people observe traditions but now do not hence the calamities | | | 2 | 1 | 3 | 0.9 |
| We don't pray to Allah | 2 | 1 | | | 3 | 0.9 |
| In the past people regarded the Tindana as their spiritual head and obeyed him, but not now hence the gods are not consulted nor pacified | | 1 | 4 | 1 | 6 | 1.8 |
| It is believed that Christianity has come to stay so the people are not pacifying the gods | | 2 | | 1 | 3 | 0.9 |
| We have abandoned our first love for God so God has left us | 1 | 1 | 1 | | 3 | 0.9 |
| Others (all spiritual) | 12 | 21 | 7 | 8 | 47 | 14.4 |
| Natural, I don't know and no response | 34 | 23 | 13 | 1 | 71 | 21.8 |
| Total | 99 | 114 | 75 | 37 | 325 | 100 |

Source: Field survey, Bongo

The causes of the variations observed in the climate across age groups are attributed to various spiritual reasons. All those who gave the response 'Natural', 'I don't know' and physical (21.8%) believe there are only physical reasons and not spiritual. The responses are summarised in figure 2. Most of the respondents in the first and second generations believe that the causes of climate variation are spiritual while the third generation think slightly differently. In all, 254 respondents (78.2%) believe that the causes are spiritual.

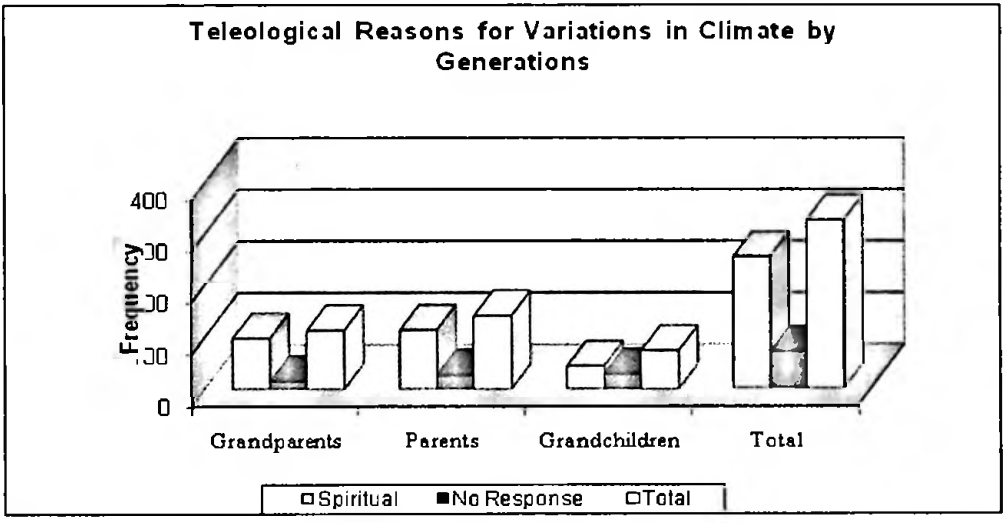


**Figure 2**
**Source: Field data, 2003**

**Physical Causes of Climate Variability**

Though the people seem to belief in spiritual things, about 52% of them think there are some physical causes of drought. The majority of these gave felling of trees and not replacing them, bush burning (bushfire), physical and not spiritual as the reasons for drought (table 3). As many as 156 respondents (48%) believe only in the spiritual causes of drought and therefore, may not be contributing in any physical way to reduce future occurrence of droughts. This is important because most of these people are the elderly who own the land and have control over the young and they could be a hindrance to change introduced by the young as a result of new knowledge acquired.

**Table 3 Physical Reasons for the Variations in Climate by Age Groups**

| Reasons | Age of Respondent | | | Total | % |
|---|---|---|---|---|---|
| | Grand parents | Parents | Grand children | | |
| Felling trees and not planting any | 15 | 17 | 19 | 51 | 15.7 |
| Felling of trees and burning of bush | 11 | 18 | 14 | 43 | 13.2 |
| Physical | 4 | 11 | 5 | 20 | 6.2 |
| Bush burning/Bush fire | 5 | 8 | 3 | 16 | 4.9 |
| Human activities/poor farming practices | 5 | 5 | 4 | 14 | 4.3 |
| Lack of trees | 3 | 1 | 2 | 6 | 1.8 |
| Destroying of trees for charcoal and fire wood | 4 | 1 | | 5 | 1.5 |
| Encroaching into the shrines | 4 | | 1 | 5 | 1.5 |
| Unreliable rainfall | 3 | 1 | | 4 | 1.2 |
| Advancement of the Sahara desert | | 2 | 2 | 4 | 1.2 |
| Natural disaster that affected the whole country | 1 | | | 1 | 0.3 |
| No responses/ I don't know (Spiritual) | 57 | 76 | 23 | 156 | 48.0 |
| Total | 112 | 140 | 73 | 325 | 100 |

Source: Field survey 2003, Bongo

More of the third generation have knowledge of the physical causes of drought There were some people who believe that there are both spiritual as well as physical causes of drought. These could understand and facilitate projects and activities to mitigate drought.

The reasons given during the group discussions in all the centres were grouped into four major headings and ranked. The people strongly believe that lack of respect for and not sacrificing to the gods was the major reason for droughts hence they rank it first. This was followed by bush burning and farmland preparation methods as second. Absence of trees was third and the 'Hallelujah people' as fourth. Since they earlier on claimed that the Pentecostal Christians have influenced the people against performance of sacrifices the first and the last points could be put together.

The people felt strongly that the main reason for the variations in climate is spiritual and that Christianity has affected their traditional practices negatively causing a breakdown of spiritual and moral values of the land but this cannot be proven scientifically since there is no data to confirm or otherwise. This raises the issue of incorporating the traditional believes into modern environmental improvement paradigms and development theories.

**Farm Families Experiences during Droughts**

People in the study area had experiences from the drought years of the past, which guides them in planning. The effects of the drought, they say, were both negative and positive.

**Negative Effects of Drought:** The people said that droughts affected sorghum, groundnut or early millet, the major crops of the area, at various stages of growth hence causing reduction in yield. Apart from the very severe drought years mentioned earlier there has not been a year when 'waari' affected all the crops. It affected one or two crops but not all. The people also observed changes in the farming periods due to droughts. Droughts brought about hunger affecting both humans and animals. They enhanced armyworms infestation. Most of the water sources dried up and there was difficulty in getting water for domestic use and for animals. They had to travel long distances in search for water. There was no feed for animals to eat and no shade for animal confinement. People migrate, in some cases the whole family and their animals moved to places where there was water and food. They used the appearance of certain leaves to detect planting time but now the trees do not give those signals anymore. Droughts have affected eating habits and strategies. For instance in the past harvested millet was graded, and the bad grades eaten first till February and then the good grains later but during drought years there is not much to keep. The people ate low quality food most of the times once a day. It made them poorer. In some communities, droughts have caused both men and women to take to drinking and sometimes in groups. Traditional norms are broken, for instance women no longer respect the men because the 'men go and they also go' (both work and earn separate income). Some of their observations are similar to that of Tonah (1993), Pandey (2003) and Ahmad et al (2004).

**Positive Effects of Drought include:** reduction in sexual; more women into income generating activities; provision of boreholes in the communities; introduction of hybrid crops that are early maturing; many group or community meetings to solve the problems; reduction in the cold (harmattan) period.

**Mitigation Activities Going on in the Communities**

Table 4 shows the activities in place been done to reduce further deterioration of the climate though 33.6% of the people think there is nothing going. The rest are aware of some activities as indicated on the table. To assist the

communities protect the environment, environmental improvement projects are running in the district by NGOs, the Savannah Resource Management Programme, the Forestry Department and MOFA/IFAD Soil and Water Conservation Project.

**Table 4 Efforts at Minimising the Occurrence of Bad Climatic Years**

| Activities carried out | Generation | | | | |
|---|---|---|---|---|---|
| | Grand parent | Parent | Grand children | Total | % |
| Nothing | 31 | 49 | 29 | 109 | 33.6 |
| Sacrifice to the gods | 41 | 30 | 14 | 85 | 26.2 |
| Tree planting | 22 | 46 | 14 | 82 | 25.2 |
| Anti-bushfire campaign | 6 | 9 | 11 | 26 | 8.0 |
| Agro-forestry | 5 | | | 5 | 1.5 |
| Contribute money for sacrifice when called for | 3 | | | 3 | 0.9 |
| Christians are praying | | 2 | | 2 | 0.6 |
| Others (combination of two listed above) | 3 | 4 | 5 | 12 | 3.7 |
| Total | 111 | 140 | 73 | 324 | 100.0 |

Source: Field survey, Bongo

The people think the climate cannot be made better but can be prevented from further deteriorating. Majority, 77.2% suggested different activities that could be carried out to minimise the occurrence of future bad years. Over 35% of them think tree planting is very important in this respect this is by the young people, who are mainly in school, and the educated elderly people. 24.9% of them gave spiritual solutions (**table 5**). Educational campaigns are very important not only for Bongo District but also for the entire nation, leading to a Ghanaian behaviour change. This is where Behaviour Change Communication (BCC) and its counterpart Participatory Technology Development (PTD) are very relevant (Dittoh, 2003).

**Table 5 Suggestions to Minimise Effects of Future Bad Climatic Years**

| Activities carried out | Genealogy | | | | |
|---|---|---|---|---|---|
| | Grand Parents | Parent | Grand Children | Total | % |
| Plant trees | 15 | 24 | 19 | 56 | 17.8 |
| Stop felling trees but plant trees | 5 | 11 | 12 | 28 | 8.6 |
| Stop bushfires and plant trees | 8 | 10 | 10 | 28 | 8.6 |
| Educate the people on the causes of bad climate | 6 | 5 | 3 | 14 | 4.3 |
| Stop bush burning/bushfire | 6 | 4 | 3 | 13 | 4.0 |
| Good farming practices | 2 | 2 | 2 | 6 | 1.8 |
| | | | | | 45.1 |
| Regular sacrifices | 24 | 22 | 1 | 47 | 14.5 |
| Believe seriously what the gods say | 10 | 9 | 3 | 22 | 6.8 |
| Tindana should do his duties well | 2 | 7 | 2 | 11 | 3.4 |
| Intensify soothsaying | 3 | 1 | | 4 | 1.2 |
| | | | | | 24.9 |
| Others (a combination of two listed above) | 8 | 8 | 4 | 20 | 6.2 |
| Christians ha ve driven the gods away hence nothing can be done | 9 | 11 | 6 | 26 | 8.0 |
| Nothing can be done | 14 | 26 | 8 | 48 | 14.8 |
| Total | 111 | 140 | 73 | 324 | 100 |

Source: Field survey 2003, Bongo

## Conclusion

Farmers in the Bongo District, all the three-generations, are aware of variations in the climate. They think there are both spiritual and physical causes of the variations. Unfortunately they seem not to be aware of the international dimension of climate variability. They are trying to mitigate the problem by performing sacrifices, planting trees an encouraging less burning. They think that the way out is to continue performing the sacrifices properly, plant tree, stop indiscriminate tree felling and stop wild bush fires.

A very important issue that the information from farm families brings to the fore is how to incorporate 'spiritual thinking' into scientific thinking, policy formulation and future planning. But are these spiritual things true? How can these be part of World Bank, IMF and governments' political mode of treating the climate variability issue? Interventions will be affected by their beliefs.

There is an indication that in the next generation the teleological information may be lost and the religious aspects of culture and tradition of the people may not be remembered.

## Recommendations

Since the people confirm that climate variability is real in the study area and that the variation will continue, there is the need to reconstruct the causes of the variations as indicated by the people to help reduce the future occurrences. These include performance of their sacrifices, planting trees and intensifying the campaign against bush fires.

The Ghana Meteorological Agency should be well equipped to collect accurate and relevant data to help facilitate an early warning system that will inform the people in advance of weather changes and also advice on what should be done.

Government must, as a matter of urgency, begin an education on the use of LPG and kerosene stoves to reduce the over-dependence on fuel wood. The prices of these energy sources must be subsidised in a way to encourage their usage and reduce the pressure on the forest and trees in the district.

For those who are interested in Cosmovision it will be worthwhile investigating the possibility of using spiritual means for preventing droughts.

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# FORECASTING MINING-INDUCED VULNERABILITY AMONG FARMING COMMUNITIES: A CONCEPTUAL FRAMEWORK

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## Abstract

The problems of extractive industry-induced displacement, resettlement and poverty pose major risks to the sustainability of many resource-endowed communities in the developing world. Millions of people have been made vulnerable to poverty and related impoverishment risks. Vulnerability risks increase with the convergence of critical resettlement factors: rich mineral deposits that are found in areas with relatively low land acquisition costs, deposits are being exploited with open-cast mining, in areas of high population density, on fertile and peri-urban lands, with poorly defined land tenure systems, lack of supportive regulatory framework, as well as politically weak and powerless communities. From a critical review of concepts and regulatory frameworks for mitigating mining-induced vulnerability, the paper proposes a framework for forecasting vulnerability, as well as vulnerability prevention and management strategies using industry data from a farming community in the Eastern region of Ghana.

## Introduction

The Newmont Akyem Gold Mine Project, which is at the exploratory stage, is located in the Birim North District of the Eastern Region. The project site is located 18 kilometres south of Nkawkaw, approximately 130 kilometres northwest of the capital city Accra. The project involves excavation of an open pit mine, construction of waste rock disposal facilities, construction of mill and process plants, tailings, water storage, and other ancillary infrastructure such as access roads, maintenance and gas service stations, offices, and employee accommodation. These activities will expectedly cover an area of 1915 hectares of land currently occupied by human settlements, used as farmlands, and

common resource forest lots. Overall, the scale of intervention will result in the physical and economic displacement of 242 households living in the Mine Area; and economic displacement of an additional 1,443 households having some farms in the mine area but residing outside the mine area. There are also opportunities that will come with the development of the project. The project will require 1500 workers during construction period of 36 months, approximately 524 and 44 permanent Ghanaian and expatriate workers respectively, and over 350 contractors during operation; create market opportunities, diversify and expand local economy, contribute to Ghana's foreign exchange earnings, increase revenue in the form of royalties and tax revenues, and contribute to meeting district and national level development objectives through partnerships and collaboration (Newmont, 2008).

The planned project will have as neighbours ten (10) communities with an estimated population of 18,848 (Ghana Statistical Service, 2000). The communities include New Abirem, (the District capital), Mamanso, Afosu, Ntronang, Hweakwae, Adausena, and Yayaso. Like many other mining areas in Ghana, the Akyem communities are largely subsistence agrarian, with few commercial farms, producing both food and tree crops. The climatic conditions in the area are conducive for large scale plantations of cocoa, oil palm, citrus, and kola, which are normally inter-cropped with food crops such as plantain, maize, cassava, and cocoyam. Land tenure systems are typically based on shared-cropping. Other main economic activities include small-scale industrial activities, artisanal gold mining *(locally termed 'galamsey')* and commerce. Agriculture and related activities employ majority of the economically active force (63.7%) in the area which compares favourably with the national average of 66.1%. Guaranteed market and field schemes provided by the Ghana Cocoa Board (COCOBOD) and the Ghana Oil Palm Development Company (GOPDC) directly incentivize the production of cocoa and oil palm respectively in the area. The area also serves food stuff to proximate cities such as Accra and Kumasi through market intermediaries. Some 0.5% of employed persons aged over 15years work in mining and quarrying (GSS, 2005) mainly around the Noyem and Ntronang *galamsey* sites.

**Potential vulnerability risks**

International experience indicates that extractive industries such as mining, particularly when it involves displacement and involuntary resettlement, may result in both direct and indirect convergence of potential risk

factors that may threaten livelihoods and lead to increased poverty, shocks an other symptoms of vulnerability (Downing, 2002; Marsden, 1998). These ris factors include;

- Landlessness- irreplaceable loss of land assets and common pool resources;
- Joblessness- loss of workplaces and markets;
- Homelessness- loss of shelter and marginalization;
- Food insecurity and malnutrition; and,
- Social disarticulation including loss of social status.

The livelihoods of people depend on the kind and quantum of capita assets[1] they own or control; the productive activities they undertake; and the capabilities and opportunities available to them. Households combine these factors to make a living by converting them to gain access to basic needs – income, water, food, and shelter; whilst relying on quality social networks fo psychological, emotional as well as financial support (Ellis, 1999). In particular social capital translated into returns (i.e. access to food, shelter, psychologica and emotional support) often guarantee safety net for individuals in times o shocks. Any event or activity, both internal and external, that threatens the availability of these assets and the stability of current social relations wil multiply the vulnerability of households/individuals to impoverishment risks (Downing, 2002; McMahan and Remy, 2001). The elderly, women, farmers and others engaged in land-based economic activities are particularly vulnerable to these mining-induced vulnerability risks (Cernea & McDowell, 2000 Agbesinyale & Owusu-Koranteng, 2008).

Vulnerability risks increase with the convergence of critical resettlemen factors: rich mineral deposits that are found in areas with relatively low land acquisition costs, deposits are being exploited with open-cast mining, in areas o high population density, on fertile and peri-urban lands, with poorly defined land tenure systems, lack of supportive regulatory framework, as well as politically weak and powerless communities. At the Akyem project area, existence and intensity of these risks would vary with the project development cycle. As projec

[1]Capital assets is a pentagon of five main capitals-human, natural, physical, social, and financial which are convertible to access to means of subsisten and contribute to livelihood portfolios of individuals (1) human capital include labour, skills, experience, knowledge, creativity and resourcefulness; ( natural capital include resources such as land, water, forests and pastures , but also minerals; (3) physical capital include houses, tools and machinery, foo stocks or livestock, and farm equipment, (4) financial capital is money in a savings account in a bank or in an old sock, a loan or credit; and (5) social c pital the quality of relations among people, for example, whether one can count on support from one's family or (mutual) assistance from neighbours (s urce: http://www.livelihoods.org/info/docs/leiden1.pdf)

progresses to land acquisition and construction, the host communities will inevitably face these risks, some of which occur simultaneously. Project construction activities will create temporary risk factors and confront the sustenance of current livelihood systems of the project-affected-communities. In addition, there are unidentified individuals, for which the company has little to no knowledge regarding their size and conditions, and who may not necessarily belong to the identified households, but currently live and depend on them, working as farm-wage labourers. Any project-induced movement will disarticulate these social and economic relationships.

These project-affected-households and individuals, both identified and unidentified, will suffer differential impacts based on gender and exposure to the aforementioned hazards; and failure to mitigate those hazards might worsen off their lives. Certain groups in the project area are already classically vulnerable[2], with or without project intervention.

Those include the elderly (65+years), the very poor (in national terms food poor), severely sick and malnourished, physically-challenged persons, landless widows, and people living with HIV/AIDs. Those groups will be more exposed to project-induced changes.

Derived from the "Mining-induced Displacement and Resettlement Contingency Clause (MIDR-CC) (Downing, 2002), and in line with best practice, as well as broader corporate commitments and obligations, the project is taking steps-including assessments, set goals, made cost commitments, and created institutional arrangements -to identify and mitigate impacts in the short term; whilst contributing to long-term sustainability by ensuring that ***host communities and PAPs do not become "worse-off" if not "better-off"***[3] as opposed to their pre-project living standards. Indeed, the MIDR-CC is proposed as pre-condition in project preparation, and is consistent with World Bank/IFC standards and related international best practices (Pedro, 2006; Warner, 2007; see also Appendix 1b below). The planned Resettlement Action Programme, the Livelihood Replacement Programme, the on-going livelihood skills training for potential PAPs, social investments projects (construction and rehabilitation of school blocks, and provision of school sanitation facilities), and compensation payments calculated on the bases of crops and properties lost to the project would benefit individually and collectively to project-affected communities. The

[2]IFC Community Development Resource Guide for Companies, December 2000 (p.12)
[3]Newmont Summary Resettlement Action Plan, Akyem Project, June 2008 ( p.17)

company recognizes that its construction activities constitute multipliers o risks and hazards in the project area: farmlands will give way to mining activities local food prices will be distorted; population influx will disturb the socia structure, heighten competition for fewer jobs and social amenities, but alsc create market opportunities; vehicular traffic will increase risk of accidents tc local population and domestic animals; whilst social disarticulation resulting from relocation and resettlement may disrupt current coping strategies fo existing vulnerable individuals including cash transfers, food support, access tc herbal medicine, and access to farm-related jobs. *The object of the envisaged vulnerable prevention and management programme is to plan and implement special preventive programmes, and/or create a temporary safety net for identified vulnerable households (using both company informed data, and limited self-reporting, where each apply), whilst linking them to these wider company programmes and identified national level initiatives to attain self-sufficiency.*

The company understands that these compelling hazards are situational and temporal, not absolute deprivations and can be mitigated both at the short and long terms. It is proposed that the directly project-affected-households and individuals will constitute the immediate priority for the company's vulnerable prevention and management programmes. This conviction informs the company's efforts towards *predicting* (ex ante) PAPs that face the highest risk of susceptibility to the hazards, and to plan and implement programmes that increases preparedness towards confronting the eminent project-related shocks and trends.

**Goal and Objectives**

The purpose of the study was to propose a framework for predicting households and individuals likely to be acutely vulnerable to impoverishment risks as a result of mining activities at Akyem during the first four years of mine development in order to better target services to them.

Specifically, the objectives of the study were to:

1. Identify the factors related to mining-induced impoverishment and vulnerability;
2. Use these factors to create a forecast framework and
3. Discuss implications for implementation within the context of relevant regulatory practices.

The main research question is: How could the company identify and select high-risk vulnerable project-affected households for transitory support?

## Study Design and Methods

For purposes of the study and selection processes, a vulnerable household in Akyem is referred to as; a person/household, living in the project area prior to land acquisition, that *lacks capabilities and opportunities to absorb and then reverse project-related shocks confronting his/her livelihood sources,* and as a result is at risk of exposure to increasing food insecurity, decreasing income, deteriorating health, social isolation and extreme poverty.

**Table 1 Categories of Vulnerable Groups and Potential Risks**

| Category of Vulnerability | Vulnerable to what? | Likely explanatory hazards | Existing/potential coping mechanisms |
|---|---|---|---|
| **Directly impacted vulnerable**<br><br>*PAPs* | •*Food insecurity*<br>•*Little or no income*<br>•*No shelter*<br>•*Changing distance to schools ( Yayaso & Yaw Tano)*<br>•*Lack of access to potable water* | •*Loss of access to farmlands*<br>•*Movement/land acquisition*<br>•*Sell-off livestock and poultry*<br>• *If Yayaso school is impacted*<br>•*If water systems at Yayaso is impacted*<br>•*Limited/No access to streams* | •*Sell-off movable assets*<br>• ***Utilize compensation monies***<br>•*Sell-off livestock and poultry*<br>•*Support from friends and families*<br>•*Transfers from relatives* |
| **Indirectly Impacted vulnerable**<br><br>•*Caretaker farmers*<br>•*Farm-wage labourers*<br>•*Landless single widows* | •*Food insecurity*<br>•*Little or no income*<br>•*No shelter* | •*Loss of opportunity for farm labour*<br>•*Separation from host family due to movement and resettlement.*<br>•*Lack of diversified skills*<br>•*Dependence on forest products for income e.g. palm wine tappers, kola dealers,* | •*Living on diversified sources*<br>•*Transfers from relatives and friends*<br>•*Move to other farmlands*<br>•*Relocate to join their families* |

| | | | |
|---|---|---|---|
| **Pre-existing Vulnerable**<br>•*Physically-challenged*<br>•*Elderly*<br>•*Severely sick and malnourished*<br>•*Orphans*<br>•*PLWHAs* | •*Food insecurity*<br>•*Deteriorating health conditions/lack of health insurance cover*<br>•*Lack of access to public opportunities*<br>•*Immobility*<br>•*HIV* | •*Physically-challenged*<br>•*Lack of access to health care*<br>•*Consequence of population influx* | •*Soliciting for food and money*<br>•*Free health cover from the national health insurance scheme (for aged)*<br>•*Live on charity sponsored support systems*<br>•*Personal aids from family members*<br>•*periodic support from district social welfare office* |

* The *issues are based on analysis of OICI survey (directly impacted), informal discussions with 10 caretakers/farm-wage labourers, and literature review (in the case of pre-existing vulnerable). The issues are not mutually exclusive. It is possible for persons in various categories to maintain overlapping characteristics.*

## Data Collection and Analysis

The potential number of households, and their quantitative and qualitative characteristics were determined using data on potential project-affected households in the Akyem IMS database. Data on project-affected households and persons include size of land affected, types of crops and assets on them, and the likely compensation based on current negotiated rates, and household sizes were extracted from the Akyem IMS. Data on household access to land and other productive assets outside the mine area, remittances and transfers, and other income and food sources were also accessed. Finally, individual household characteristics from the database (number of household members chronically sick, elderly without regular income sources, disabled, single parent female-headed households, etc).

Income and consumption dynamics proxies were used to estimate household survivability (GSS, 2007. GLSS Survey 5 Report; NSPS, 2007), and hence predict vulnerability. Expected cash compensation and estimates of food expenditure per adult per annum of all potential affected households were calculated. Using the GLSS established consumption expenditure estimate per adult per year for the lowest GLSS 5 quintile, the vulnerable groups were identified. The final groups for support were identified after weighting and ranking using the other predisposition characteristics identified above. As

shown in Table 2 below, the multi-stage method was used to answer three critical questions:

a. How much money will project-affected persons get as compensation, and as household disposable income?
b. What is the minimum household income required to live through transitional hardships (4 years) i.e. the period between land acquisition and the completion point of livelihood replacement intervention? The GLSS established consumption expenditure estimates per adult per year is used as the minimum criteria (a lower poverty line of 288.4 GHC per adult per year; and upper line of 370.89 GHC per adult per year).[4]
c. Will (**a**) compared to (**b**) be sufficient for the PAPs to live through the transitional hardships given the household size, and composition?
d. Are there other factors that already predispose households to vulnerability and stand the chance of making them destitute? Such factors as households with members who are severely sick, disabled members, very poor single parent households, and very elderly people with no dependable source of food.

This multi-stage identification process, plus limited self-reported assessment of the situation of small-holder subsistence caretaker farmers and farm-wage labourers was then used to *test* predict (ex ante) those households that stands the highest chance of being acutely vulnerable or destitute as a result of project during the transitional period. These project-affected households (primary group) are expected to be assisted through preventative programmes.

**Discussion of Results**

The resulting framework and steps for assessing acute vulnerability among project-affected households are presented in Figure 1 below. Step I, The number of farmers who cannot survive through transitional hardship (by daily survivability) measured against standard poverty line (GSS, 2007) is determined as **x1.** Step II, Dummy variables (access/ no access to other assets) are used to determine farmers out of x1 who are less prepared to live through transitional hardships by lack of access to land outside mine area, remittances and transfers, **x2.** In step III, the 'acutely vulnerable households' , **x3**, are determined after consideration of such factors as health, number of infants in the household, etc.

[4]GLSS estimates based on market prices in 2006/2007. These estimates may be reviewed to reflect changes in prices.

The final number of households is determined after the validation process by community-based 'vulnerable committee'.

A test run with actual field data in the database yielded the followin results, as shown in Figure 2:
**x1**= 680; **x2**= 556; **x3**= 124. It must be stressed that the focus of the vulnerabilit prevention programme is to plan for the susceptibility of identified vulnerable and the essence of the forecast framework is to enable the project service thos identified, **over and above all** compensation and entitlements due them for los of lands, crops and assets due to displacement and resettlement. As outlined in Appendix 3 below, there are international best practices, regulations, laws and norms that govern compensation and entitlements for mining-induced risks and losses.

**Regulatory frameworks for mitigating project-induced vulnerability**

*International standards*

International best practice and operating standards require companies to make best efforts that are technically and financially feasible to manage both short and long term adverse impacts associated with project life spans. The performance standards (PS) 1 & 5 of the IFC underscore the importance of, and specify the procedures for managing adverse social and environmental impacts of projects throughout the project life.[5] The key objectives of these standards relevant to our current effort to understand and manage vulnerability include;

> *To avoid, or where avoidance in not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment (IFC PS 1, objective bullet 2)*
> *if land acquisition for the project causes loss of income or livelihood, regardless of whether or not the affected people are physically displaced, the client will...provide transitional support to economically displaced persons, as necessary, based on a reasonable estimates of the time required to restore their income earning capacity, production levels, and standards of living (IFC PS 5, Economic displacement bullet 6)*

[5]IFC Performance Standards on Social and Environmental Sustainability, April 30, 2006.

> *... identify, assess, and address the potential economic and social impacts of the project that are caused by involuntary taking of land (e.g., relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood, whether or not the affected person must move to another location) or involuntary restriction of access to legally designated parks and protected areas (World Bank, Environmental and Social Safeguard policies, OP/BP 4.30)*

To this end, project managers are required to establish management systems; undertake thorough impact assessments; design, implement and continuously monitor programmes aimed at mitigating adverse social and economic impacts and improving the living conditions of the displaced people. NGRL is committed to these guidelines, and strives to attain industry leadership and be '*a company of choice' which* in part rest on how responsive and proactive it is in dealing with community level impacts associated with its projects around the world.

The study results are expected to help assess, predict, and mitigate project-induced vulnerability in the Akyem project area is consistent the letter and spirit of IFC PS 5, but goes beyond what any other company has done so far.

*National laws and regulations*

Ghana's mining regulations are limited in scope regarding specifications for addressing socio-economic impacts of projects. There is a lot emphasis for companies to compensate project-affected-people, with or without efforts for addressing short and long term adverse effects. The Minerals and Mining Amendment Act of 2006 (Act 703) requires that a mineral right holders must compensate for any disturbance to the rights of owners or occupiers and for damage done to the surface of the land, buildings, works or improvements, or to livestock, crops or trees in the area of mineral operations. Further the mineral right holder must compensate for the deprivation of the use or a particular use of the natural surface of the land or part of the land.[6] Though the legal provisions do not provide specific recommendation for dealing with project-induced vulnerability, they partly provide guidance for company operations.

[6]Extract from Akyem Resettlement Action Plan. See footnote 5.

Additionally, there is a national commitment for creating wealth, reducing poverty, and providing safety nets for extremely poor households. These programmes resonate with the company's vulnerable prevention and sustainable development objectives. For instance, the Ghana Poverty Reduction Strategy (GPRS) paper sets out the national priorities and strategies for achieving growth, *"accelerated poverty reduction, and protection of the vulnerable and excluded within a decentralized, democratic environment"*.[7] Part of the strategies for achieving this objective includes direct "investment in support programmes for the vulnerable and excluded". The National Social Protection Strategy (NSPS) specifically outlines the government's blueprints for reaching out to the extreme poor.

> *The national social protection strategy (NSPS) is an innovative people-centred national intervention aimed at providing livelihood support and empowerment to the extreme poor in society, and related vulnerable and excluded target populations ( NSPS, March 2007; p.30)*

Subsequently, the government has carried out assessments and designed the livelihood empowerment against poverty (LEAP) programme aimed at mitigating short-term stresses and hazards confronting the extreme poor, whilst promoting complementary programmes for them to attain long-term self-sufficiency. LEAP awards bi-monthly cash transfers to vulnerable households in 21 pilot districts across the country as a short-term mitigation measure, whilst linking beneficiaries to wider national programmes-business advisory services, enterprise development schemes, national health insurance, and skills training services- so as to help them become self-sufficient. These programmes resonate with the company's sustainable development principles based on assisting people to be self-sufficient, and do present opportunities for company-local government-community collaboration.

*Newmont's social responsibility commitments*

Mining companies, for various reasons are currently incorporating sustainable community considerations into their business decisions (Warner, 2003). At several fronts, the company's demonstrates its commitment to

[7]Ghana Poverty Reduction Strategy 2003-2005: An Agenda for Growth and Prosperity. Analysis and Policy Statement; Vol. 1 pp. I. February 2003.

successful operation and closure of mines around the world. In particular, a major policy document asserts that

> *Newmont's future is dependent on its ability to develop, operate, and close mines consistent with our commitment to sustainable development, protection of human life, health, the environment, and to adding value to the communities in which we operate -Social Responsibility Policy Statement.*

Practically, the company has outlined procedures for managing resettlement effects (see NEM-CER-S.037-G.01 – Resettlement and Displacement of People). The social investment principles of the company revere thriving sustainable development in host communities linked to its business needs. The company believes in leveraging resources aimed at contributing to long-term sustainability of communities.

> ***Displacement as 'development'*** *- Physical, cultural and/or economic displacement should always be conceived and executed as a sustainable development programme, with affected people provided sufficient opportunities to share in project benefits. As with any sustainable development programme, care must be taken that dependency on the company or a resettlement agency does not occur as a result of the physical, cultural and/or economic displacement" (NEM-CER-S.037-G.01 section2.1)*

These internal principles and guidance should guide the entire process of understanding, identifying, and possibly managing potential vulnerable. To do this, the company intends to use these results and other tools to predict upfront the social and economic hazards associated with the Akyem project, and to take collaborative steps and processes with partners for redress. To this end, the scope of the company's support for vulnerable households will aim at preventing first, and/or mitigating later, temporal hazards-food insecurity, lack of income source, lack of access to health care services and education, and social isolation-through vulnerability prevention programmes which will be determined through consultation with the target beneficiaries to a point where they become self-sufficient.[8] A comparative analysis of the three regulatory/best practice regimes is presented in Appendix 2b below.

[8]NGRL SIA Best Practice Guidelines. This will be determined by the systematic assessment of a person's capability for fulfilling or reversing the described hazards: food availability, access, and utilization; health insurance; and access to source of income.

It is instructive to note that transitional vulnerability is specific with respect to events (in this case, the Akyem project) and time, ranging from when anticipated project-related shocks will occur to when mitigation measures will deliver 'adequate' returns to offset effects of shocks (see Appendix 1a below). The company projects this period to be 4 years with the anticipation that its planned mitigation and community development programmes - livelihood replacement, livelihood enhancement, the resettlement action plan, influx management plan, and labour pool - will individually and collectively deliver significant returns to off-set some impacts of the shocks over the period.

Whilst these programmes are not specifically designed to mitigate vulnerability, they do address issues that lead to long-term vulnerability. For instance, the livelihood replacement programme will replace lost farm and land assets for PAPs ( curbing landlessness, joblessness, and food insecurity); the resettlement action plan will deliver buildings, water and sanitation facilities, and other essential services for PAPs ( resolve homelessness & health issues); the livelihood enhancement programme will focus on enhancing agro-businesses and entrepreneurial skills in project-affected-communities (joblessness); the influx management plan will focus on mitigating adverse impacts and maximizing opportunities associated with population influx ( curbing crime, diseases, and mortality); whilst the labour pool programme will mitigate joblessness among local unskilled labour.

**Conclusions**

The level of impact the project will have on each household will depend on its preparedness, available coping mechanisms, and resiliency. Impacts will also apply differently to different members of the household-men, women, adults, and children. Irrespective of these differences, it is expected that most project-affected-persons will immediately rely on compensation payments for their daily basic consumption needs. Consequently, the issues that warrant a vulnerable prevention programme include:

- That compensation monies may not suffice consumption expenditure for some households through the transition period to re-establishment;
- That most planned programmes will not be implemented before land acquisition and hence leave a fertile gap for transitional vulnerability;
- That some persons by their predisposition to existing factors cannot take advantage of the planned programmes i.e. very aged persons, severely sick, etc;

- That some are not entitled to critical mitigation programmes or they may just fail to succeed through the interventions, if not given special attention.

Given this scenario, the risk is that for the 'vulnerables' the compensation payment may not suffice daily requisite household expenditure caused by project-induced decreasing food and animal stock, increasing prices of food and consumer goods, and lack of immediate access to farmlands; thus making them vulnerable until the mitigation programmes start to deliver. Small landowners can quickly run through compensation monies and swell the ranks of the landless poor.[9] There is also an anxiety (based on informal interviews) among caretaker farmers and 'squatters' who presently depend on social networks for food and shelter that they may lose these networks as a result of movement. Women also believe that men might squander compensation money without investing in household expenses and this will increase their responsibility in food provision for the household. The classically vulnerable persons who cannot immediately readjust to alternatives are more likely to be impacted most. Using the test results, 124 households would be protected, and supported to survive the shocks and hopefully, thrive.

*Given that most potential vulnerable are experienced farmers, they have a much chance of such in re-establishment of their livelihoods if they continue their farming activities. It is suggested that planned interventions should focus on their access to land, farm inputs, extension services and markets. Such access and value-addition opportunities are more likely to facilitate increased productivity, enhanced incomes and ultimately lead to sustainable improvements in their lives. Lessons should be learnt from the Ahafo Land Access and Agricultural Improvement Programme where over 3000 project affected farmers were assisted to successfully establish thriving cash and tree crop farms. The ultimate goal is to enhance, over time, the preparedness and capabilities of vulnerable households to mitigate food insecurity, through to gainful employment and productive economic activities, as shown in Table 2 below.*

[9]Newmont Gender mainstreaming diagnosis report, October 2008

## *Figure 1: Akyem Vulnerability Assessment Criteria*

Using a company generated data; the four -layered process for forecasting acute vulnerability among PAPs is as follows.

**First Step:** Calculate households vulnerability (by daily survivability) using crop compensation, household siz e (converted to approx. adult units per household), and national food poverty estimate of GHC 288.4/adult/year). **Output:** $x^1$ *number of farmer who cannot survive through transitional hardship (by daily survivability) measured against the lower poverty line* (Lowest quintile on the GSS GLSS 5 consumption scale).

**Second step:** Of $x^1$, identify those households that are less capable to confront the temporary hardships over the gestation period[10] of a replaced farm or land by creating dummies ***(0= without access; 1=w ith access)*** for the following factors: Access to land outside mine take area; Access to remittances \ identified transfers from families, friends, and relatives. ***Output*** = $X^2$ *farmers who are less prepared to live through transitional hardships by lack of acc ess to land outside area, remittances/transfers [* $X^1$ *minus farmers with access to land outside, remittances/transfers].*

**Third Step:** From $X^2$ above, identify potential destitute or "acutely vulnerable households" by creating dummies ***(0=No; 1=Yes)*** for the fo llowing variables: household size (above national average of 5) and composition, members chronically sick, household head aged (65+), disabled members, household with more than 2 children under 5 years, landlessness/tenant and household headed by a single -parent. Each factor will count one and of equal weight, and a sum total of all factors will help determine the relative standing of each household with respect to intensity of predisposal to vulnerability factors. ***Output:*** $X^3$ *number of destitute households ranked according to relative vulnerability.* **Fourth Step:** $X^3$ will be validated by a community - based vulnerable committee; and households who get validated will constitute the target group for a vulnerable prevention programme.

[10]Assuming that it takes about 4 years to re-establish a farm for a lost farm or replace a livelihood capacity equivalent to the farmer's lost farm.

**Figure 2: Test run of the Assessment Framework**

| Step | Purpose | Process | Output |
|---|---|---|---|
| First | Identify PAPs who cannot afford to live through transitional hardships given their cash compensation entitlement | 1. Calculate the net cash compensation per farmer (y) ;<br>2. Using food poverty estimates of the Ghana statistical service (GH¢ 288.4 per adult per year), compare Y to household size ( in approx. adult) to determine whether or not the household will have enough to live through the transition (4 years) | # of PAPs with little cash compensation than enough to afford food during the transitional period. **[ 680 households]** |
| Second | From output above, identify PAPs who, by lack of access to land outside mine area, remittances/transfers, will not have coping capacity. | 1. Create dummy ( 0=without access; 1=with access) for the following variables: access to land outside area; access to remittances/identified transfers; and earning from non-farm employment<br>2. Using (1), identify PAPs who do not have coping strategies | # of PAPs who do not have access to the variables, and thus would be ill-prepared to produce and secure household food demands **[556 households]** |

| | | | |
|---|---|---|---|
| Third | From output in 2nd step, identify PAPs who are characterized by characteristics that predispose them to severity of vulnerability. This allow for identification of households that require social insurance | 1. Create dummy (0=No; 1=yes) for the following variables: household size (above national average of 5) and composition, members chronically sick & disabled, Household Head aged (65+) , more 2 children < 5yrs, no land holding (less than an acre), and single parent female-headed, landless households<br>2. Identify households that require social protection consistent with national social protection strategy (LEAP) | # of PAP households that require special protection and preparation against transitional hardships.<br><br>**[124 households]** |
| Fourth | From output above, validate existing situations through committee and confirm access to alternative farms, remittances, transfers, and wage income of each selected PAP. | Selected PAPs (from step three) will appear individually before the committee, and accessed. | List of PAPs/farmers validated and targeted for vulnerable prevention and management programme. |

**Table 2. The Traditional Relief to Development Continuum**[11]

| Short-term ⟵ | Timeframe | ⟶ Long-term |
|---|---|---|
| **(Relief and recovery )**<br>Programme focus<br>(vulnerable management)<br>• *Food and non-food distribution*<br>• *Provide cash transfers*<br>• *Emergency health(NHIS)*<br>• *Psychosocial counselling*<br>• *Accommodation for caretakers and farm-wage labourers.*<br>• *Targeted Labour pool employment for vulnerable households* | **( Rehabilitation )**<br>Programme focus<br>• *Provide food until crop harvest*<br>• *Replace buildings for households*<br>• *Replace infrastructure and other services*<br>• *Provide land access and agriculture extension* | **(Sustainable development stage)**<br>Programme focus<br>• *Promote agriculture productivity including market access ( LRP)*<br>• *Promote small enterprise development(OICI work)*<br>• *Improve local procurement and develop local business skills*<br>• *Develop local services: water, health, and education*<br>• *Develop local capacity through partnerships with district level institutions.* |

[11]Adopted and reworked from Bond, et al (2000) " Report of proceedings from the forum on Operationalizing Participatory Ways of Applying Sustainable Livelihood Approaches" p.84

## Appendix 1a: Probable Project-Induced Changing Situations of Livelih

| Livelihood Indicators | Project Phases: Pre-project | Moratorium/land acquisition | Mine construction/movement | Mine Operation (planne mitigation measures.) |
|---|---|---|---|---|
| Assets portfolios<br><br>(OICI survey) | • *Farmlands /Food stocks*<br>• *Cash crops*<br>• *Buildings/shelter*<br>• *Loans & cash savings*<br>• *Livestock/poultry*<br>• *Communal water bodies*<br>• *Access to game and forest food* | • *Limited access to farmlands*<br>• *No expansion to farmlands*<br>• *No expansion to buildings*<br>• *Decreasing cash savings /crop compensation*<br>• *Limited access to game and forest food* | • *No access to farmlands*<br>• *No farms*<br>• *No property /buildings*<br>• *No food stocks*<br>• *Exhausting cash savings*<br>• *No access to game/ forest food* | • *LRP-replace farms farmlands*<br>• *Access to "managed" farmlands*<br>• *RAP-replace buildings an provide associated social amenities*<br>• *Potential vulnerable programme* |
| Activities<br><br>(OICI survey) | • *Farming*<br>• *Sublet lands*<br>• *Rent out buildings*<br>• *Non- farm activities*<br>• *Schooling ( school children)* | • *Limited opportunities for farm labour*<br>• *Schooling ( school children)*<br>• *No impact on school buildings*<br>• *Non-farm activities* | • *No opportunity for farm labour*<br>• *Increased non-farm activities*<br>• *Impacted school buildings ( Yayaso)*<br>• *Changing distance to school( Yaw Tano and Yayaso)*<br>• *LEEP-provide opportunities for economic activities* | • *LEEP-provide opportunit for economic activities*<br>• *Increased non-farm activities for income*<br>• *Social investment projects/ RAP will provide school blocks* |
| Capabilities & opportunities | • *Farm labour*<br>• *Stable social networks*<br>• *Access to remittances*<br>• *Current health conditions ( refer to Health survey)*<br>• *National Health Insurance Scheme*<br>• *GoG free basic education* | • *Limited demand for farm labour*<br>• *Stable social networks*<br>• *Undisturbed access to health facilities*<br>• *Available National Health Insurance Scheme*<br>• *GoG Free basic education* | • *No collateral for loans*<br>• *Destabilized social relations*<br>• *Population influx can increase vulnerability to HIV*<br>• *Disturbed distance to health facilities can impede access*<br>• *Available National Health Insurance Scheme*<br>• *GoG Free basic education*<br>• *Lack of social and psychological support.* | • *Labour Pool-provide limited quota-based work opportunities*<br>• *Procurement opportunities*<br>• *Market created by population influx / opportunities for vendor businesses - influx management*<br>• *Health education*<br>• *National Health Insurance scheme*<br>• *GoG Free basic education* |

| | **Best Practice** *(Ref: IFC, world Bank, and Peer Review)* | **Newmont** *(Ref: ESR policies, SOPs,& SI principles, Ahafo )* | **Ghana** *( Minerals Act,2006,Act 703, EPA Act, GPRSPs, & national programmes)* |
|---|---|---|---|
| **Definition of vulnerable households** | *Vulnerable households can include households headed by women, victimized by HIV/AIDs that are headed by children, made up of aged or handicapped, impoverished, & those socially or economically (or both) marginalized*[1]. | *a person/household, living in the project area prior to land acquisition, that lack capabilities and opportunities to absorb and then reverse project-related shocks confronting his/her livelihood sources, and as a result is at risk of exposure to increasing food insecurity, decreasing income, deteriorating health, social isolation, and extreme poverty.* | *Households "characterized by severe livelihood insecurity and are unable to cope with multiple life-cycle risks and shocks"*[2]. *Further include lack of access to opportunities and capabilities. Typically, 18.8% of Ghanaians extremely poor, and worse-off by existing factors such as aged poor, disability, OVCs, PLWHAs, & subsistence farmers.* |
| **Focus of Regulation(s)** | • *Protect environment & human life*<br>• *Enhance Peoples' lives, not worsen off* | • *Protect environment & human life*<br>• *Create value for local community* | • *Protect environment and human life(Environmental laws)*<br>• *Compensate adequately for lost surface access and properties(Minerals Act)* |

[1] IFC Handbook for preparing a Resettlement Action Plan, p.40

[2] The National Social Protection Strategy (NSPS), March 2007. P.26

| | | | |
|---|---|---|---|
| **Objectives** | *Avoid if avoidable; minimize, mitigate, or compensate for adverse impact; "provide transitional support to economically displaced persons..."*[1] | *Avoid displacement, or execute it as a sustainable development programme. Focus on providing opportunities that allow PAPs to participate in sharing project benefits including livelihood replacement and creating temporary safety nets for vulnerable.* | *Protect environment for sustainable development; pay compensation to project-impacted households; and assist host communities in their development process.* |
| **Requirements** | • *Assess impacts thoroughly*<br>• *Design and implement mgt. projects & programmes.*<br>• *Compensation and sharing benefits*<br>• *Consultation and grievance mechanisms*<br>• *Continuous monitoring and reporting* | • *Established standard operating procedures*<br>• *Access impacts to the best of company's ability can(EIS,OICI survey, SIA, etc)*<br>• *Plan and work the plan*<br>• *Leverage; don't create dependency(MOUs)*<br>• *Established consultation and grievance procedures*<br>• *Continuous* | • *Explicit EIS procedures and compensation for loss of access and property; but less emphasis on mitigating adverse impacts on local communities.*<br>• *National Initiatives for addressing hazards: LEAP, NHIS,REP, Free Basic Education*<br>• *A drive on public private partnership(guidelines available)* |

[1] See foot note 8. P. 22

| | | | |
|---|---|---|---|
| **Implications for Akyem vulnerability work** | • *Continuous improvement of company systems through reviews and five star and social compliance audits;*<br>• *Understand project specific vulnerability*<br>• *Fill in data gaps on vulnerability* | • *Update and utilize existing data to forecast vulnerability beforehand.*<br>• *Assess existing situations of caretakers and farm-wage labourers and incorporate into current vulnerability work.*<br>• *Examine company's readiness to implement proposed programmes for preventing acute vulnerability/destitution.* | *Opportunities exist for partnership with national level initiatives aimed at facilitating national development objectives and reversing project vulnerability.* |

# EFFECT OF GOLD MINING ON COCOA PRODUCTION: A CASE STUDY IN TH ASUTIFI DISTRICT OF THE BRONG AHAFO REGION, GHANA

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**Abstract**

In Ghana, major cocoa growing areas have also been found to be well endowed with minerals including gold, diamond and manganese. Many of thes cocoa growing areas are being used for mining purposes. A case study wa conducted to determine the effect of the activities of gold mining companies on cocoa farmers and cocoa production in the Asutifi District of the Brong Ahafo Region of Ghana. Data was collected through interviews of fifty (50) key informants whose cocoa farms have been affected by mining activities in the district. The results showed that half (50%) of the respondents had lost between 1-5 hectares of cocoa farms to mining activities while about one-third had los between 6-10 hectares of cocoa farms. Compensation paid was equivalent to US$ 13,430.35 per hectare for mature cocoa trees; medium cocoa trees: US$ 10,072.75 per hectare; small cocoa trees: US$ 6,070.98 per hectare, and Seedlings US$ 4,047.33 per hectare.

Shortage of labour was a major problem to cocoa production due to drif into mining activities. Affected farmers in the district were not satisfied with the compensation packages offered by the mining industry. This raised sustainable development and livelihood security concerns in the community though the mining industry had instituted programmes for sustainable agricultural and livelihood restoration and development. There is therefore the need fo continuous dialogue among major stakeholders in cocoa production and gold mining sectors on alternative livelihoods options and mining systems that facto in the livelihoods security of the people.

## Introduction

Both agriculture and mining contribute immensely to the growth of the economy of Ghana. While cocoa (*Theobroma cacao)* contributes the largest part of agricultural GDP, Gold mining tops the mining sector's contribution.

Ghana is Africa's second most important producer of gold after South Africa, the third largest producer of manganese and aluminium and a significant producer of bauxite and Diamonds (Coakley, 1999). Ghana also produces 10% of the world's gold and ranks second in African production (Firman, 2008). Mining also contributes about 12% of government revenue, 7% of Ghana's total corporate earnings and 41% of total export earnings (Aryee and Aboagye, 2008). All mining activities (both large and small scale) in Ghana account for an area of 31,237 $km^2$, representing a share of about 13.1% of the country's total land area. Reconnaissance licenses, which by definition and practice permit concurrent economic activities such as farming, cover 12,478 $km^2$ - about 40% of total land covered by mining activities (Chamber of Mines, 2006). Mining accounts for 5% of the country's GDP and minerals make up 37% of total exports, of which gold contributes over 90%. By 1999, about 230 companies had been listed by the Mineral Commission and over 40 of these companies had actually received mining leases by 2004 to develop new mines and carry out actual operations but about 90% of the investing was directed to Gold mining (Mineral Commission of Ghana, 2005). Multinational mining companies are mining in the Western, Eastern, Ashanti and in the Brong Ahafo Regions which are areas that constitute the food basket of the country. It is estimated that concessions of mining companies could cover land areas from 50 to 400 $km^2$ and these mining concessions are agricultural lands that form the economic base for many mining communities. The multinational mining companies such as AngloGold Ashanti, Golden Star Resources, Newmont Ghana Gold Limited, Goldfields Ghana Limited, and Chirano Gold Mines hold large tracts of agricultural lands as mining concessions. Many of the affected communities have lost their economic livelihood through displacement and areas that used to be important food production areas have become areas of net food deficit.

Cocoa, on the other hand, is the dominant tree crop in Ghana, accounting for 20.5% of Ghana's export earnings and the sub-sector also employs 24% of labour force (MoFA, 2002). Ghana is the second highest producer of cocoa in the world after Côte d'Ivoire with Ghana contributing 25 percent of global consumption (Dizolele, 2005).Cocoa accounts for 55% of the total household

income among cocoa farmers in Ghana (IITA, 2002). It is estimated that there a 500,000 cocoa farmers in Ghana (Takrama, 2006). Aryeetey (2004) reported a average household size of approximately seven (7) in rural forests in Ghar which happens to be where cocoa production takes place. Hence, abo 3,500,000 individuals earn their livelihood through cocoa farming.

Because of the significant contribution of both gold mining and coc production to Ghana's Economy, it is vital that the advantages of one are n needlessly traded off for the other, since the latter has a lot of implications t sustainable livelihoods of people in Ghana.

As part of the Ghana's Economic Recovery Programme (ERP) launched i 1983, the mining sector underwent significant reforms beginning in 198 According to **Twerefou and Aryeetey (2007),** Ghana in response to the globa call for policy changes under the Structural Adjustment Programme (SAP focused its attention on the promotion and regulation of private investmen rather than direct participation in mining activities, hence1993, the country ha made significant strides in attracting FDI into the sector. They asserted that the mining sector reforms under the broader framework of the ERP/SAP focused on addressing the concerns of financiers and investors as well as other stakeholders in the industry. Though the legislative framework for mining in Ghana, including gold mining, entrusts all the minerals within the country to the state as exclusive owner of the resources, custodians (owners or occupants of the lands) are to be compensated for their investments on the land to ensure that their livelihoods are not affected negatively.

Despite the efforts by mining industries, through series of sustainable projects to ensure sustainable livelihoods of farmers affected by mining activities, some affected farmers and anti-mining NGOs claim that affected farmers are not duly compensated to ensure their livelihoods are sustained. The anti-mining NGOs have even predicted food catastrophe and famine in places where new mining concessions (example Asutifi District in the Brong Ahafo Region) have been granted by the government, because of the deplorable conditions of communities in previous mining concession in Tarkwa and Obuas in the Western and Ashanti Regions of Ghana respectively. Moreover, the exten to which the activities of gold mining industry in the district have affected coco farmers and their production have not been fully examined. Also, the extent o success of the Livelihood Restoration Programmes instituted by the minin industry (Newmont Ghana Gold Ltd) in the mining areas need to be examined.

Therefore the main objective of the study was to investigate the effect of the activities of gold mining industries on cocoa farmers in the Asutifi District in the Brong Ahafo Region. The Livelihood Restoration Programmes instituted by Newmont Ghana Gold Ltd was also examined to determine the extent to which the programmes had impacted their sustainable livelihood.

## Methodology

A case study was used and interviews were held with 50 key informants whose cocoa farms had been affected by the gold mining activities in the Keyansi area (the district has four paramouncies, namely: Kenyasi No.1 Kenyasi No.2, Hwidiem and Acherensua). (http://www.ghanadistricts.com/districts/?news&r=10&_=32).

Secondary data was taken from Newmont Ghana Gold Ltd on their operations in the District. The interview schedule solicited affected farmers' views on, their background characteristics, production constraints and compensations issues. The interview was held in the Akan (Twi) language and responses translated by the researchers into the English language. The data collected were coded and summarised to provide logical explanation to the situation in the study area. With the help of SPSS (version 15) and Microsoft Excel (2003), Charts and frequency distribution tables were used to analyse the data.

## Results and Discussion

### Background Characteristics of Cocoa farmers

The results of the study showed that 72% of the respondents were males with more than half (54%) of the affected cocoa farmers having no formal education ( Figures 1 and 2). The Male: Female ratio seems to be consistent with other studies in Ashanti and Eastern Regions of Ghana. For example, Cocoa Research Institute of Ghana (CRIG ) (1995) survey in the Ashanti Region of Ghana showed 71% male and 29% female of cocoa farmers, Dankwa's (2002) survey in Ashanti Region of 200 respondents indicated 135 (84.4%) males and 25 (15.6%) females and Bosompem (2006) reported 75% males and 25% females of 200 cocoa farmers interviewed in the Eastern Region of Ghana.

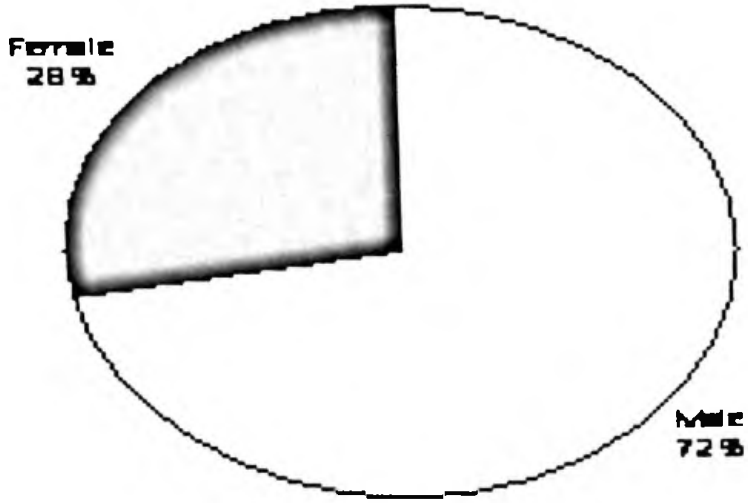


**Figure 1: Sex distribution of respondent cocoa farmers (n=50).**
Source: Field Data (2009)

The low educational level in the study area also agrees with other studies in Ashanti and Eastern Regions of Ghana, of which about 50 – 55% of cocoa farmers were found to have had no formal education (Dankwa, 2002; Kumi, 2003). This may affect the level of adoption of innovative programmes designed for affected cocoa farmers to ensure their sustainable livelihoods (Byrness and Byrness, 1978).

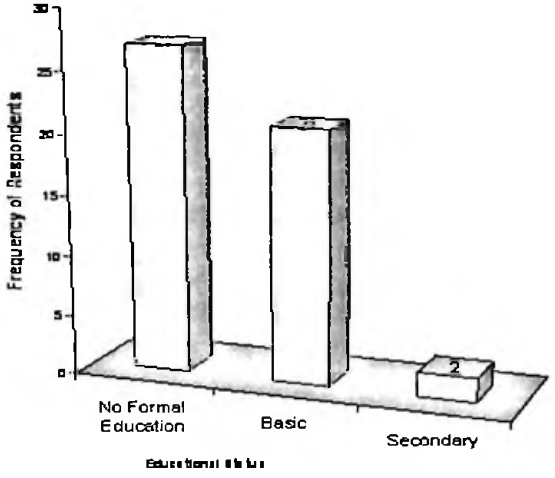


**Figure 2: Education background of respondent cocoa farmers (n=50)**
Source: Field Data (2009)

As shown in Figure 3, about 56% of the cocoa farmers were more than 40 years old while 44 % were 40 years or less ( 21-40 years). This indicated that there were fewer youth than the older farmers whose farms have been affected by gold mining in the area.

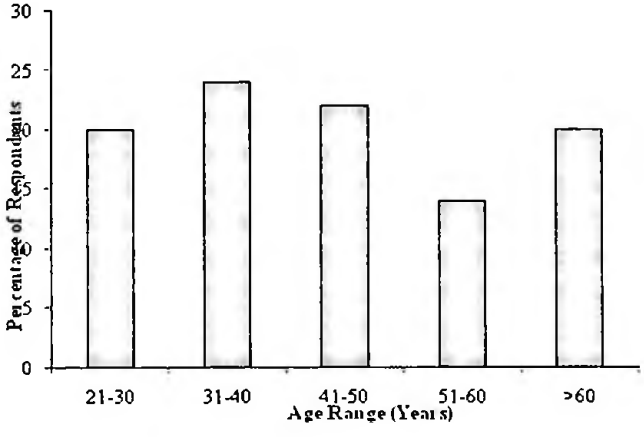


**Figure 3: Age distribution of respondent cocoa farmers (n=50).**
Source: Field Data (2009)

**Cocoa production constraints, compensations issues and Livelihoods Restorations initiatives of affected cocoa farmers**

Table 1 shows the sizes of cocoa farms of respondents affected by gold mining. Half (50%) of the respondents had lost 1-5 hectares of cocoa farms to mining activities while about one-third lost 6-10 hectares of cocoa farms, resulting in about 92% of the cocoa farmers losing 1-10 hectares of cocoa farms to the Newmont Ghana Gold Ltd. If the average national annual yield in Ghana (350 kg/ha or140 kg/acre) reported by Appiah (2004) is taken into consideration then the loss to cocoa farmers and the overall national output can be sizeable or significant.

**Table 1: Respondents Size of cocoa farms affected by Gold mining.**

| Farm size (Hectares) | Frequency | Percentage | Cumulative Percentage |
|---|---|---|---|
| <1 | 6 | 12 | 12 |
| 1-5 | 25 | 50 | 62 |
| 6-10 | 15 | 30 | 92 |
| 11-15 | 2 | 4 | 96 |
| > 20 | 2 | 4 | 100 |
| Total | 50 | 100 | - |

n=50, Source: Field Data, 2009

Table 2 shows the compensation paid to cocoa farmers by Newmont Ghana Gold Ltd (NGGL) in the area. The age of cocoa farms or trees affects the value of compensation given to farmers. Most cocoa farms start bearing fruits at the age of 5 and this span to about 40-50 years, however, the yield reduces after about 25 years. These factors, among others, are taken into consideration during the valuation of cocoa farms for compensation purposes. The Crop Rates Review Committee which consists of cocoa farmers' nominees meets with NGGL representatives to review the prices annually, based on the rates in consultation with the Lands Valuation Board.

**Table 2: Monetary Compensations paid to Cocoa Farmers By Newmont Ghana Gold Ltd**

| Age of Cocoa trees | Amount paid (US$) per Hectares |
|---|---|
| Mature | 13,430.35 |
| Medium | 10,072.75 |
| Small | 6,070.975 |
| Seedlings | 4,047.33 |

Source: Field Data, 2009

Hence, compensation paid was ranged between US$ 13,430.35 and US$ 4,047.33 per hectare for mature cocoa trees and Seedlings respectively (Table 2). These estimates were based on the assumption that there are an average of about 1350 cocoa trees per hectares (540 trees per acre). Aside these monetary compensations, Newmont Ghana Gold Ltd provides "Livelihoods Restorations and Associated Economic Initiatives" on affected people to sustain their livelihoods. These programmes include 1.Agricultural Training Component of the Livelihoods Enhancement and Community Empowerment Programme (LEEP), (2) Agricultural Improvement and Land Access Programme (AILAP), (3) Ahafo Agribusiness Growth Initiative ( AAGI), and (4 )Ahafo SME Linkage Programme (ALP ). The first three programmes (LEEP, AILAP and AAGI) are targeted at improving agricultural productivity, total production, crop diversity, and market access that exceed pre-mine levels of the affected farmers including cocoa farmers.

Agricultural training component of the Livelihoods Enhancement and Community Empowerment Programme (LEEP) trains beneficiaries in alternative farming, such as livestock (poultry and sheep),and non-traditional farming (grass cutter production, mushroom production, snail rearing). Training also encompasses soap making, batik tie and dye, vegetable and construction of household storage structures (http://newmontghana.com, 2009). Since February 2005, approximately 500 farmers have participated in LEEP agriculture courses.

The aim of Agricultural Improvement and Land Access Programme (AILAP) is for mine-impacted farmers to gain access to replacement land and maintain or exceed pre-project levels of crop productivity. AILAP provided, improved agricultural inputs, sufficient for two acres (for area of cropped land as

part of the overall compensation package) for one crop season, to every perso who was compensated by the Company for cropped land in the Mine Take Are and who has arable land of two or more acres. This is supposed to serves as 'kick-start' such that the affected farmers can become self-sustaining. AILAP als facilitates land access for every person who was compensated by the Compan for cropped land, and who, originally and post-mine, did not have access to lar for cropping, or who had access to less than two acres of arable land. More the 3,200 farmers in the area have since registered as part of the Agricultur Improvement & Land Access Programme (AILAP). Table 3 shows the impact c AILAP on farmers in the District.

**Table 3: Results of AILAP**

| Type of farming | Affected Land area (Hectares) | Land area cultivated under AILAP (Hectares) | Percentage of Increase of Land Size |
|---|---|---|---|
| Cocoa | 488 | 1320 | 170 |
| Plantain | 367.6 | 2440 | 563 |
| Citrus | 8.4 | 165.6 | 1871 |
| Maize | 1.44 | 480 | 33233 |

Source: Secondary Data: Newmont Ghana Gold Ltd (2009).

About 488 hectares ***of cocoa farm were compensated for at the Distri but, more than*** 1320 hectares ***are now being cultivated in the District by AILA farmers (an increase of 170%).*** Other crops that were compensated for ar their respective land area covered under the, ***AILAP are also presented in Tab 3. Productivity has also improved as a result of the programme. For maiz the average cumulative yield is now 3.74 metric tonnes per hectare (mt/h as opposed to the baseline yield at the beginning of the project of 1.74 mt/h*** (Newmont Ghana Gold Ltd , 2009) and f***or plantain, the average cumulati yield of AILAP farmers is now 10 mt/ha as opposed to 8.6 mt/ha previous*** Ahafo Agro-business Growth Initiative (AAGI) is an added value initiative th target participants from broader areas than the affected communities (Sala and Giovannetti, 2008). Result from the secondary data shows that beginning April 2006, many farmers – both mine-impacted and non mine-impacted - ha participated in the AAGI to gain from high-impact training in agriculture a small business management plus active involvement in specialized cr associations with market access and input credits. Since 2008, 2264 farmers h

taken part in training; 750 farmers have accessed input credit and 2220 acres were under cultivation by AAGI farmer groups. Table 4 shows sales made by AAGI participants since 2008.

**Table 4: Sales from AAGI farmer groups**

| Type of Crop | Sales (Kg) |
|---|---|
| Chili pepper | 85,800 |
| Plantain | 78,210 |
| Soybean | 14,000 |
| Ginger | 104,850 |

Source: Secondary Data: Newmont Ghana Gold Ltd (2009)

Despite the aforementioned strategies implemented by the Newmont Ghana Gold Ltd, respondents pointed to shortage of labour as a major problem to cocoa production as a result of the drift to illegal gold mining (Galamsey) activities in the area. Also all the farmers interviewed were not satisfied with valuation, monetary and land compensation received from the mining company (Table 5).

**Table 5: Extent of agreement of respondents to valuation, monetary and land compensations by NGGL**

| Extent of agreeing with valuation | Frequency | Percentage |
|---|---|---|
| Strongly disagree | 46 | 92 |
| Disagree | 4 | 8 |
| Agree | - | - |
| Total | 50 | 100 |

n=50, Source; Field Data (2009)

The study conducted by Agbesinyale and Owusu-Koranteng (2008 p. 247), on both individual and local communities perceptions and feelings about surface mining in Wassa West District also showed "nearly 70% of the respondents perceiving mining in their respective communities as a curse, and complained bitterly about how it had ruined their livelihood, their health and their environment".

A greater percentage (58%) of the respondents was still into cocoa farmin and were benefiting from the AILAP initiatives related to cocoa farming (Table 6 The others are into other farming and small scale business.

**Table 6: Current occupation of respondents**

| Occupation | Frequency | Percentage |
|---|---|---|
| Cocoa farming | 29 | 58 |
| Farming (other crops) | 5 | 10 |
| Trading | 4 | 8 |
| Other business | 12 | 24 |
| Total | 50 | 100 |

n=50, Source; Field Data (2009)

**Conclusions and Recommendations**

The following conclusions and recommendations are made from the results and discussion.

Majority of the affected cocoa farmers were males and aged with more than half of the respondent having no formal education. Half of the respondents had lost between 1-5 hectares of cocoa farms to mining activities, while about one-third had lost between 6-10 hectares of cocoa farms. Compensation paid raged between the equivalent of US$ 13,430.35 - US$ 4047.33 per hectare depending on the age and maturity of the cocoa trees.

Aside these monetary compensations, Newmont Ghana Gold Ltd provided Livelihoods Restorations and Associated Economic Initiatives targeted people to sustain agriculture and livelihoods of affected farmers. These programmes were Agricultural Training Component of the Livelihoods Enhancement and Community Empowerment Programme (LEEP), Agricultural Improvement and Land Access Programme (AILAP), Ahafo Agribusiness Growth Initiative (AAGI) and Ahafo SME Linkage Programme (ALP).

Approximately 500 farmers have participated in LEEP agriculture courses since February 2005, More than 3,200 farmers in the area have since registered as AILAP. About 488 ha ***of cocoa were compensated for at the District but, more than*** 1320 ha ***are now being cultivated in the district by AILAP farmers (an increase of 170%)***. Also at present, 2264 farmers have taken part in training; 750 farmers have accessed input credit; 2220 acres are under cultivation by AAGI farmer groups.

Despite these strategies implemented by the mining industry, respondents pointed to shortage of labour as a major problem to cocoa production as a result of gold mining due to the drift to illegal mining (locally known as "Galamsey") activities in the area. Also all the farmers interviewed were not satisfy with valuation, monetary and land compensation received from the mining company. A little over half of the respondents (58%) are still into cocoa farming therefore benefiting from AILAP initiatives related to cocoa farming. The others are into other farming and small scale business.

It is therefore recommended that there should be a continuous dialogue among major stakeholders (farmers, Ghana COCOBOD, mining industries, opinion leaders, chiefs.) in the cocoa production and gold mining on alternative livelihoods options and mining systems that factor in the livelihoods security of the people. There should also be transparency during the valuation processes. Also, other stakeholders in the extractive industries could learn from the Livelihoods Restorations and Associated Economic Initiatives programmes instituted by Newmont Ghana Gold Ltd on affected communities to ensure sustainable agriculture and livelihoods development.

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# LESSER KNOWN SEED: A RENEWABLE PATHWAY FOR SUSTAINABLE ANIMAL PRODUCTION IN AFRICA

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**Abstract**

*The study was conducted to compare the effect of soybean meal based diet and Mucuna pruriens seed meal on feed intake, digestibility and body weight changes of West Africa dwarf sheep (WAD). Thirty sheep with a mean body weight of 12.30 ±1.45kg were used in a completely randomized design model for a 112 day period. The three dietary treatments consisted of soybean meal alone (control diet, A) , 50% soybean meal +50% Mucuna seed meal (diet B) and 100% Mucuna seed meal (diet C) were randomly assigned to each sheep. The animals were fed and watered ad-libitum throughout the experimental period. The results revealed improvement ($p<0.05$) in the acid detergent fibre (ADF), neutral detergent fibre (NDF) , cellulose and lignin intakes of animal fed diet B compared to diets A (control) and C. The dry matter intake (DMI), crude protein intake (CPI) and ether extract intake (EEI) were similar between diets A and B and the least was diet C. The apparent digestibility of Mucuna seed meal based diets B and C was significantly higher than that of the control diet A. Animal fed diet B had significantly higher body weight gain and feed efficiency. Additionally, the cost of feed per kg was cheaper in diet C followed closely by diet B and the least was diet A ((control). It was concluded that 50% of the soybean meal can be replaced with 50% Mucuna seed meal without any detrimental effect on the animal.*

## Introduction

Sustainable agriculture is one of the major wide spectrums of production methods that support the environment. It is also the fastest growing sector of agriculture production in the world today. This type of agriculture can be complementary to rural people's livelihood as it can increase food production at relatively low cost as well as contributing to other vital functions. Hence, Africa has the potential to feed its people and to export. For example millet, sorghum

and cassava production in Africa have increased greatly over the past 10 ye and this placed Africa as the largest producer of these crops.

Therefore, Africa needs a systematic approach to ecosyst management and food production. There should be proper integration of pla and animals for positive interactions and optimize biological processes l recycling of nutrients, biomass production, building-up of soil organic mat and regulation of harmful organisms (Amadou, 2007).

It is noteworthy, that environmental protection and good natu resource management is the key to agriculture sustainability. All the potentials African countries have not been fully tapped since Africa is well position geographically between the 40th parallels and is divided by the equator into tw almost identical parts in terms of land and plant diversity, making it possible f African farmers to grow all the different world crops.

Mucuna which is a native of eastern India and southern China is no found growing extensively all over the world. It is an intriguing crop which grow extremely well like a weed in various conditions and often producing hig biomass (10-124DM/ha) with high seed yield. The nutritive parts of the plant ar the seed although; studies have revealed presence of active principles in th stems and leaves. Unfortunately, there are scanty and conflicting information c its utilization as food /feed (Pugalenthi *et al.*, 2005). Hence, the present study wa to evaluate the efficacy of Mucuna seed meal on the performance characteristi of West African dwarf sheep.

## Materials and Methods

*Sources of Mucuna seed*

The Mucuna seed used for this experiment was obtained fro International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria ( Figs **1,** and 3). Stones and other debris were removed before milling to form the mea The meal was kept in a clean container and later used in the formulation of th experimental diets.

*Location of the experiment*

The experiment was conducted at the Animal Pavilion of the Departme of Animal Production, University of Ilorin, Nigeria. Ilorin is located at th geographical and cultural confluence of the northern and southern part Nigeria. The temperature in Ilorin is seasonally uniform.

*Diet Preparation*

The Mucuna seed meal which was used as protein source was included in a total ration to replace Soybean meal at 50 and 100% levels (Diets B and C respectively) while Diet A (control) was soybean meal based diet) (Table 1).

*Animals, experimental design and management*

Thirty (30) male West African dwarf sheep (mean initial body weight, 11.30+0.36kg) used for this study were bought from a local market in Ilorin, metropolis, Nigeria. The animals were housed in individual pen under a common roof and treated against ecto and endo parasites using Ivomec containing ivermectin and clorsulon (manufactured by Merck and Dohme, B.V, Netherlands). The animals were fed *ad libitum* twice daily (09.00 and 16.00hr). Ort was removed daily before the fresh diet was given to the animals. During the period the sheep also had free access to fresh clean water. Samples of the experimental diets and the orts were taken weekly for DM and other proximate determination. The experiment lasted for 112 days.

Body weight gain was determined on the first day of the experimental period and the last day of the period while body weight gain was calculated by the difference between mean body weights at the start and end of the experimental period. Hence, average body weight gain was calculated as the difference between the initial body weight gain and final body weight gain divided by the number of the experimental days (112days).

Feed intake was calculated as feed offered –feed ort multiply by nutrient composition of the experimental diets.

*Digestibility trial*

The digestibility trial was conducted during the last two weeks of the experimental period. The animals were housed in metabolic cages with slatted floor covered with a fine wire netting that allows the passage of only urine. While a collecting tray was used to collect the faeces daily before feeding. Total faeces voided by each sheep was weighed daily and only about 25% of the sample was taken for dry matter determination at 100°C for 24 hours and the remaining was dried at 70°C for 48 hours.

Faeces of each sheep was bulked and milled with a simple laboratory milling machine and later stored in airtight containers until needed for the analysis. Diet offered and the orts were also analysed for proximate composition. Apparent digestibility coefficient was calculated as thus:

$$\frac{\text{Feed intake} - \text{Faecal output}}{\text{Feed Intake}} \times 100$$

**Analyses**

The proximate analysis of the diets, orts and the faeces were done in triplicate using the method of A.O.A.C (2000). Dry matter was determined by drying the sample at $100^{0c}$ for 24 hours. The metabolic energy was determined by calculation (Capenter and Clegg 1956). The calcium and phosphorus contents were determined by using atomic absorption spectrophotometer. All data collected were subjected to analysis of variance (ANOVA) of a completely randomized design model while the means were separated using Duncan (1955) multiple range test.

**Results and Discussion**

*Proximate composition*

The dry matter content of Mucuna seed meal seems consistent with most leguminous seeds (Leucana leucocephala seed, Glyricidia sepium seed and Glycine max seed) (Giral et al. 1978). The crude protein (CP) content of Mucuna seed meal was higher than the value reported for most leguminous seeds (Leucana leucocephala, Glyricidia sepium , Etanda Africana and stylosanthes guyanensis etc) which are used as supplement in the diet of ruminant animals in the tropics . The CP of the seed was consistent with the report of Belewu et al (2007), Iyayi et al., 2005).The amount of protein is vital than quality of protein and legumes are good source of protein for sheep. The crude fibre content of the seed meal which fell between 20 and 23 percents reported for some leguminous seeds (Leucana leucocephala and Glyricidia sepium ) agreed with the work of Belewu et al. (2007) who used similar seed. Additionally, the meal was found to be rich in most of the mineral contents. This agreed with the reported values of Iyayi et al. (2005) and Belewu et al. (2007). However, the value for the mineral content was higher than values reported for some leguminous seeds. The high mineral content of the mucuna seed meal shows that it can satisfy the mineral needs of growing sheep (NRC, 1985). The fibre fractions (ADF, NDF, and lignin) are consistent with the work of Belewu et al. (2007).

*Experimental Diets*

The CP and ether extract contents of the Mucuna based diets was slightly lower than that of soybean meal based diet (control). The fibre fractions (ADF, NDF, cellulose, lignin) increased in Mucuna meal based diets while the CP and ether extract decreased with the incremental levels of Mucuna seed meal in the mixed ration. However, the CP value of every dietary treatment was above the minimum requirement needed for moderate growth in sheep (NRC 1985). Additionally, the metabolizable energy was adequate for animal of this age (NRC, 1985 ).The concentration of the minerals (macro and micro ) were higher than the minimum requirement (NRC , 1985 ) due probably to the fact that legumes have been implicated as an excellent source of calcium and phosphorus (NRC,1985).

*Feed intake*

There was a significant intake in most of the parameters evaluated (CP, EE, ADF, NDF, Lignin, Cellulose and Hemicellulose). This observation was consistent with the work of Belewu *et al.* (2007) who reported higher intake and utilization of *Etanda africana* (Leguminous seed) seed meal in a total mixed ration for goat fed *ad libitum*. However, the CP intake of diets A and B were similar. It is noteworthy that leguminous seeds have a more rapid digestion rate than grass (Buxton, 1996) hence they are consumed more than grass (Aregheore, 2004). The higher dry matter intake of diet B could be due to the complementary effect of both soybean meal and Mucuna seed meal.

*Average daily gain and feed efficiency*

Average daily gain of sheep on diets A, B and C was 2.30, 2.81 and1.76g respectively (Table 4). Average daily gain (ADG) was higher for diet B compared to the average of diets A and C which are similar. The weight gain may show changes in rumen fill as much as changes in body tissue (Aregheore et *al.*, 2007). Feed efficiency [gain (g)/feed intake (kg)] was 7.46 (A), 8.94(B) and 6.74(C). The CP content of all the diets was higher than the level recommended as adequate for animal of this age for moderate weight gain in sheep. NRC (1985) reported a minimum of between 6 and 8% CP for maintenance purpose in ruminant animals hence, all the diets had above this level of CP content. The difference in ADG might be due probably to the higher intake of nitrogen and energy as observed in diet B (Aregheore, 2007). The feed efficiency followed similar trend as the body weight gain. The improvement in the body weight gain and feed

efficiency could be explained by the fact that feed intake by sheep in relation to weight gain tends to increase as it grows rapidly with improved feed efficiency.

*Digestibility coefficient*

There was no significant difference in the dry matter digestibility and crude protein digestibility among the diets, although the diets had different nutrient concentrations mostly crude protein and energy. Nutrient digestibility increased with the increasing inclusion of Mucuna seed meal. The ether extract content of Mucuna seed meal based diets was higher and this may be implicated for its higher digestibility. Additionally, the digestibility of the fibre fractions of the Mucuna seed meal based diets was significantly higher than soybean meal based diet (control) due probably to its higher content before inclusion in the diet.

*Nutritive value index (NVI) and Economic analysis*

Nutritive value index was similar between diets B and C followed by diet A which was the least hence inclusion of Mucuna seed meal improved NVI of the total ration. NVI is one of the indices used to evaluate the quality of diet since it is a measure of the voluntary intake of digestible dry matter. Animals on diet B had the highest digestible dry matter intake coupled with higher ADG. Also, the feed cost of diet C was lower than that of A and B by 84.6 and 42.4 % respectively. This revealed that Mucuna seed meal can be used as a cheap source of protein supplement in the diet of growing sheep up to 100% level without detrimental effect on the health status of the animal, however, the 50% level of inclusion of Mucuna seed meal was the best.

**Conclusion and Implications**

The results of this study revealed that Mucuna seed meal is a promising source of cheap protein in the diet of growing sheep with better weight gain (increasing tissue deposition).

- It could be concluded that Mucuna seed meal is a valuable cheap source of protein which can be used in the diet of sheep.
- Another point of concern is that the meal has no nutritional value in the diet of human hence; its cultivation should be encouraged among farmers in West Africa.

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**Table 1: Composition of the Experimental Diets**

| Ingredients (%) | Diet A | Diet B | Diet C |
|---|---|---|---|
| Soybean meal | 20.00 | 10.00 | - |
| Mucuna seed meal | - | 10.00 | 20.00 |
| Rice husk | 23.00 | 23.00 | 23.00 |
| Cassava waste | 55.00 | 55.00 | 55.00 |
| Vitamin -mineral premix | 1.00 | 1.00 | 1.00 |
| Salt | 1.00 | 1.00 | 1.00 |
| Total | 100.00 | 100.00 | 100.00 |

**Table 2: Proximate and Mineral Composition of *Mucuna* seed meal and Soybean meal (Dry matter basis)**

| Parameters (%) | Mucuna seed meal | Soybean meal | ±SEM |
|---|---|---|---|
| Dry matter | 92.00 | 90.10 | NS |
| Crude Protein | 39.00 | 42.00 | NS |
| Crude fibre | 19.30a | 7.50b | * |
| Ether extract | 7.50a | 4.00b | * |
| Metabolizable energy M.cal/kg | 4.20a | 2.70b | * |
| Acid detergent fibre | 36.50 | 10.58 | * |
| Neutral detergent fibre | 66.20 | 15.90 | * |
| Calcium | 0.14a | 0.20b | * |
| Phosphorus | 0.49a | 0.65b | * |

Mean with similar superscripts are not significantly different from each other ($p>0.05$)

**T able 3: Proximate Composition of the Experimental Diets (Dry matter basis)**

| Parameters (%) | Diet A (Control) | Diet B | Diet C |
|---|---|---|---|
| Dry matter | 95.66 | 93.75 | 93.30 |
| Crude Protein | 18.06 | 16.33 | 13.84 |
| Crude fibre | 6.64 | 6.21 | 6.70 |
| Ether extract | 4.39 | 3.25 | 3.11 |
| Ash | 8.31 | 10.45 | 10.48 |
| Acid detergent fibre (ADF) | 20.14 | 25.01 | 30.24 |
| Neutral detergent fibre (NDF) | 50.48 | 52.43 | 54.37 |
| Lignin | 5.85 | 4.68 | 3.97 |
| Cellulose | 14.29 | 20.38 | 28.85 |
| Hemicellulose | 30.34 | 27.41 | 24.14 |

**Table 4: Nutrient intake, Feed efficiency and Body weight gain of the Experimental animals**

| Parameters (%) | Diet A (control) | Diet B | Diet C | ±SEM |
|---|---|---|---|---|
| Dry matter | $3501.10^{a}$ | $3642.18^{a}$ | $3214.09^{b}$ | 116.52* |
| Crude Protein | $632.31^{a}$ | $594.77^{a}$ | $444.83^{b}$ | 18.90* |
| Crude fibre | $232.48^{b}$ | $226.18^{b}$ | $275.93^{a}$ | 83.21* |
| Ether extract | $153.70^{a}$ | $118.37^{b}$ | $87.09^{c}$ | 11.33* |
| ADF | $290.95^{b}$ | $380.61^{a}$ | $335.87^{a}$ | 29.52* |
| NDF | $705.14^{b}$ | $910.91^{a}$ | $971.94^{a}$ | 18.74* |
| Lignin | $204.82^{a}$ | $168.63^{b}$ | $127.60^{c}$ | 5.65* |
| Cellulose | $462.81^{c}$ | $742.28^{b}$ | $844.35^{a}$ | 77.58* |
| Hemicellulose | $1063.45^{a}$ | $998.33^{b}$ | $775.89^{c}$ | 31.98* |
| Feed efficiency | $7.46^{b}$ | $8.94^{a}$ | $6.74^{b}$ | 0.17* |
| Weight gain(g/d) | $230.00^{b}$ | $281.50^{a}$ | $176.23^{b}$ | 10.17* |

Mean followed by different superscripts are significantly different ($p<0.05$)

**Table 5: Apparent digestibility coefficient and Nutritive value index of t Experimental Diets**

| Parameters | Diet A (control) | Diet B | Diet C | ±SEM |
|---|---|---|---|---|
| Dry Matter | 55.98 | 60.88 | 64.19 | 2.76NS |
| Crude Protein | 80.04 | 75.53 | 82.53 | 4.16NS |
| Crude fibre | 70.63 | 69.43 | 71.78 | 3.02NS |
| Ether extract | 361.58$^{b}$ | 329.71$^{c}$ | 423.31$^{a}$ | 12.69* |
| Acid detergent fibre | 61.53$^{b}$ | 69.29$^{b}$ | 76.36$^{a}$ | 2.06* |
| Neutral detergent fibre | 63.78$^{b}$ | 73.36$^{a}$ | 72.94$^{a}$ | 2.18* |
| Lignin | 76.14 | 71.54 | 74.19 | 1.64NS |
| Cellulose | 63.35$^{b}$ | 71.18$^{ab}$ | 78.88$^{a}$ | 1.95* |
| Hemicellulose | 65.26$^{b}$ | 72.75$^{a}$ | 68.07$^{b}$ | 1.39* |
| Nutritive value index | 1959.92 | 2217.36 | 2063.12 | |

Mean with same superscripts are not significant ($p>0.05$)

**Table 6: Economics analysis of Feeding *Mucuna* seed meal based diets to West African dwarf sheep**

| Parameters | Diet A (control) | Diet B | Diet C |
|---|---|---|---|
| Total feed consumed(kg) | 392.12 | 407.92 | 359.98 |
| Total Feed$^{a}$ cost(#) | 6612.00 ($41.85) | 3812.00 ($24.13) | 1012.00 ($6.41) |
| Feed cost(#) /kg | 66.12 ($0.42) | 38.12 ($0.38) | 10.12 ($0.10) |
| Total weight gain$^{b}$(kg) | 44.80 | 47.04 | 33.60 |
| Feed cost/kg weight gain$^{(a/b)}$ | 147.59 (9.34) | 81.04 (5.13) | 30.12 (1.91) |
| % Cost of saving | - | 42.35 | 84.69 |

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# OPTIMAL FOOD COMBINATION FOR RURAL HOUSEHOLDS' FOOD SECURITY IN KWARA STATE, NIGERIA

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**Abstract**

*This study developed optimal food consumption plan for the rural households in Kwara State, Nigeria. A two-stage simple random sampling technique was employed in collecting data used for the study between October, 2005 and January, 2007. The main tool of analysis used in this study was the Linear Goal Programming (LGP) model. The result shows that rice, maize, cowpea, gari, fish and palm oil consumed at 4.17Kg, 18.59Kg, 2.92Kg, 2.66Kg, 8.53Kg and 3.10Kg per week respectively constituted the least-cost food plan for the rural households. With an average household size of eight male adult equivalents, this plan has a cost implication of N73.73 per person per day. This shows that the cost of meeting this least-cost food plan was 38% lower than the one U.S. Dollar World Bank poverty line per person per day. This study recommends the need for the rural households to be educated on the nutritional implication of the consumption of various food items.*

## Background to the Study

Food is of high importance in matters of human wellbeing and economic productivity. Hence, the need for food in Nigeria, like other parts of the world, has become a policy issue. Besides, the nutrients contained in food are necessary for proper body functions (Olayide, 1982). To be food secure, sufficient resources are usually required to produce or purchase adequate food. However, this does not guarantee good nutrition and health as we can see from the diet-related health problems among even more affluent population groups. Even though eating well is vital for a healthy and active life, many people in virtually all countries do not eat well because of poverty and a lack of nutrition education. To have food security and be adequately nourished, an individual needs an understanding of what constitutes an appropriate diet for good healthy condition as well as the resources, skills and motivation to make good food choices (FAO, 2005a).

Developing policies and interventions to increase food secu therefore requires an understanding of each of these factors, their in relationships and their relevance to particular groups of people (FAO, 2004— can therefore be seen that the task of providing nutrition education especiall— the low income countries must be accorded the necessary priority. Since i important for the people to know how best to use their resources to ens— nutritional wellbeing, nutrition-education is therefore a key for developing skills and motivation needed for the people to eat well (FAO, 2005a). Bliss Stern (1978) observed that small increases in food consumption can bring ab substantial improvement in productivity.

Goldsmith et.al.,(1967) and de Ville de Gouyet et. al., (1979) observ that given most national food patterns, protein needs can be met if the calo supply is adequate and the diet corresponds to the national average. This m explain why most studies on food security focus more on the calorie availabil and consumption (Feleke et al; 2003, Makinde, 2000). An analysis of trends in t supply of dietary energy can therefore help to reveal patterns that provide a ba for assessing the adequacy of the food supply, from which nutritional inferenc can be drawn. Carbohydrates, fat and protein comprise the three princip sources of energy in the human diet. Individual foods contain differe proportions of the three principal macronutrients. Animal products (meat a dairy) are rich sources of protein and fat, while cereals, fruits and vegetabl contain a large proportion of carbohydrate. The quantity and quality of ea component is particularly important when analyzing nutritional adequa (Kennedy, 2001).

In a study on food security, Olayemi (1998) gave the threshold for fo security as the ability of a household to meet 2260 Kcal of energy and 65g cru protein per capita below which a household was classified as food insecure. Th is however at variance with Olayide (1982) who gave daily consumption of 24 kcal of energy and 65g of protein per capita as the bench mark for food securi In the views of Joseph and Ajayi (2002), the recommended minimum nutrie requirements to be consumed per day per capita includes the 2191Kcal and 6 86g crude protein out of which at least 35g or (40%) must be animal prote Unlike vitamins and minerals, which sometimes perform unique functions meet the body's needs, fats, carbohydrates, and proteins substitute for o another to some extent to meet the body's energy needs (National Academ of Sciences, 2002). On the basis of the analysis of the recommended daily calo

distribution by the National Academies of Sciences (2002) and Honfoga and van den Boom (2003), 45% to 65% of the calorie supply should be made from carbohydrates including cereals, roots/tubers and fruits; 20% to 35% form fats and oils including lipids from oil crops and animal products; and 10% to 35% from protein including animal products and pulses.

Unlike nutrition related studies in the livestock industry, very few studies appear to have been done in the general area of human dietary combination and optimization. Many nutrition-related articles, especially in Africa, report results of studies of the nutrient composition of food without indicating the optimal levels desirable for human consumption, despite awareness about daily recommended levels required of the different nutrients (Ogunyinka and Norman, 2003). In view of this, there is hardly any study that identifies the optimal food consumption plan that will meet the food security need of the rural households at least costs from the locally available food items.

**Objectives of the Study**

The main objective of this study is to analyse the level of food consumption of rural households.

The specific objectives of the study are to:

1. determine the level of rural households' food consumption;
2. develop optimal food consumption plan for the rural households' food security.

**Justification for the Study**

Developing optimal food plan for the food insecure households may be needed to reduce the problems associated with ignorance on nutritious and low cost food items faced by some poor rural households. Furthermore, such plan can be useful in determining the costs of living in the rural areas of Kwara State. This study also holds implications for the poor, many of whom are vulnerable to specific health hazards because of their lack of knowledge about the appropriate (i.e., healthy) composition and level of nutrient intake. The results of this study will therefore indicate the least cost diet from among the food items consumed in the rural areas.

## Methodology

*Study area*

This study was conducted in Kwara State, Nigeria. Kwara state lies w the North Central geopolitical zone of Nigeria. It has a land area of about 32 square kilometres. According to the 2006 National Population Census fi Kwara State has a total population of 2,371,089. This is made up of 1,220, males and 1,150,508 females. The State is bounded in the north by Niger Stat the South by Osun and Ondo States, in the East by Kogi State and in the We Oyo State. Kwara State shares an international boundary with the Republi Benin (Taiwo, 2005). Kwara State is located between latitudes 7°45'N and 9°3 and longitudes 2°30'E and 6°25'E. The topography is mainly plain lands to s gentle rolling. The annual rainfall ranges between 1000mm and 1500m Average temperature ranges between 30°C and 35°C (KWADP, 1996).

There is a total of One thousand, two hundred and fifty eight ru communities in Kwara State (National Population Commission, 1991). M than 90% of the rural populations who constitute about 80% of the to population are engaged in farming (Yusuf, 2000). Kwara State is divided into fc zones. This classification is in consonance with agro-ecological and cultu characteristics of the areas. The zones are as follows: Zone A: Baruteen a Kaiama LGAs; Zone B: Edu and Patigi LGAs; Zone C: Asa, Ilorin East, Ilorin Sou Ilorin West and Moro LGAs; and Zone D: Ekiti, Ifelodun, Irepodun, Isin, Offa, Ol Ero and Oyun LGAs.

*Sampling technique*

This study was carried out between October, 2005 and January, 2007 two-stage simple random sampling technique was employed for this study. T first stage comprised random selection of twenty five villages which constitu about two percent of the total villages in the study area. The selected villa were distributed across the four agro-ecological zones in proportion to distribution of the villages in each zone. This was done by selecting two perc of the total villages in each zone. This sampling frame for the villages obtained from the 1991 National Population Commission village listing.

The second stage involves random selection of seventeen househo from each of the selected villages. Information on the number of the t households in each village was obtained from the village council. This was u in preparing the list of the households that form the sampling frame from wh

the random selection of the households was carried out. Every other household was thereafter randomly selected from the list. A total of four hundred and twenty five rural households were selected for this study. Responses from a total of four hundred and eleven rural households were however found useful for this study. This is as distributed in Table 1.

**Table 1: Sample Distribution**

| Zones | Villages distribution | Sampled villages | Households sampled | No of households with valid responses |
|---|---|---|---|---|
| A | 217 | 4 | 68 | 64 |
| B | 237 | 5 | 85 | 84 |
| C | 483 | 10 | 170 | 166 |
| D | 311 | 6 | 102 | 97 |
| Total | 1258 | 25 | 425 | 411 |

Source: Field Survey, 2005/07

*Method of data collection*

Data used for this study were collected over a period of sixteen months, between October, 2005 and January, 2007. The primary source was through the use of a well structured questionnaire administered by trained enumerators.

*Analytical technique*

The tool of analysis used in this study was the Linear Goal Programming Model. It was used to develop optimal food plan for rural households in Kwara State. Following Manyong and Degand (1995), the model was used as follows:

$$\text{Minimize } Z = \sum_{i=1}^{g} (W_i.n_i + W_i.p_i)$$

Subject to

$$\sum_{i=1}^{g} a_{ij}X_j + d_i^- - d_i^+ = a_i$$

$$\sum_{i=1}^{m} a_{kj}X_i \leq bk$$

$$X_i, d_i^-, d_i^+ \geq 0$$

Where Z = Objective function. It includes the total cost per kilogramme in grai= food items available to the households as well as the positive and nega■ deviations for the goals.

$d_i^-$ = negative deviation if $a_i$ is under-achieved

$d_i^+$ = positive deviation if $a_i$ is over - achieved

$W_i$ = weight attached to deviation $d_i^-$ or $d_i^+$

$a_{ij}$ = matrix of the marginal contribution of $X_j$ to satisfying $a_i$

$X_j$ = $j^{th}$ food item consumption measured in kilogramme. In line wit■ United State Department for Agriculture (USDA, 2007), food items consumed at least twenty five percent of the sample were included in this analysis.

$a_{kj}$ = coefficient of use of $b_k$

$b_k$ = available level of resource k. This was determined by the averag food consumption in Kilogramme;

m = number of resource(s) which in this study equals 1;

$a_i$ = aspiration levels for the $i^{th}$ goal. i is the total food consumpti and it measured in Kg.

g = number of goals. Given that household calorie requirement estimated at 2470kcal per day per adult equivalent, there we four goals to be achieved. These according to the National Academy of scienc (2002) are given as follows:

- 65 % of calorie estimated at 1605.5Kcal per day per adult equivale from carbohydrates
- 20% of calorie estimated at 494 Kcal per day per adult equivalent fro fat
- 15% of calorie estimated at 370.5 Kcal per day per adult equivalent fro protein. Since protein comprises both animal and vegetable sourc energy supplied from protein was estimated at 171 kcal per day p adult equivalent from vegetable protein; and
- the remaining 199.5 Kcal per day per adult equivalent from anim protein.

Matrix of the model for rural households' food security is as presented in Table

**Table 2: Structure of the Weighted Goal Programming Model for the Rural Households' Food Security.**

| Goals | Goal Statement: Achievement of | Objective function to Minimize | Deviational variable in objective function | Priority level | Weight |
|---|---|---|---|---|---|
| Meeting the minimum vegetable protein consumption | 171kcal per day per adult equivalent from vegetable protein | Under achievement | $d_i^-$ | 1 | 5 |
| Meeting the minimum animal protein requirement | 199.5 Kcal per day per adult equivalent from animal protein | Under achievement | $d_i^-$ | 1 | 5 |
| Meeting the minimum fat requirement | 494 Kcal per day per adult equivalent from fat | Under achievement | $d_i^-$ | 1 | 5 |
| Meeting the minimum carbohydrates | 1605.5Kcal per day per adult equivalent from carbohydrates | Under achievement | $d_i^-$ | 1 | 5 |

*Limitations to the study*

There is a general lack of accurate data on the number of households in the rural areas of the study area. In developing the sampling frame, this study relies on information given by the members of the village councils. The accuracy of such data however depends on the ability of the council to recollect all the households in the village. In preparing food with least cost to the rural households, the study assumed that the prices of the food items remain constant. Besides, the study assumes that the food items are available in the rural households all year round.

## Results and Discussion

*Rural households 'food consumption*

In view of its importance to the nutritional wellbeing of individuals, fo constitutes a larger proportion in the expenditure pattern of most ru households. Food consumption levels of rural households in Kwara State, Nige are as presented in Table 3.

**Table 3: Distribution of Food Consumption in the Rural Households Kwara State**

| Food items | Percentage Calorie (%) | Quantity Consumed(Kg) | Value( ₦ |
|---|---|---|---|
| Rice | 11.46 | 5.77 | 646.24 |
| Sorghum | 9.26 | 4.66 | 199.72 |
| Maize | 10.47 | 5.12 | 196.92 |
| Cowpea | 4.81 | 2.56 | 216.62 |
| Gari | 7.11 | 3.68 | 184.00 |
| Lafun | 9.18 | 4.75 | 158.32 |
| Yam | 13.33 | 21.33 | 888.82 |
| Elubo | 5.79 | 3.19 | 348.00 |
| Meat | 1.42 | 1.11 | 555.00 |
| Fish | 0.77 | 1.03 | 257.50 |
| Egg | 0.14 | 0.26 | 62.40 |
| Milk | 0.04 | 0.13 | 119.99 |
| Palm oil | 6.55 | 1.28 | 223.26 |
| G/nut oil | 2.66 | 0.52 | 104.00 |
| Orange | 1.39 | 6.13 | 559.79 |
| Okra | 0.08 | 0.45 | 60.00 |
| Tomato | 0.14 | 1.19 | 96.22 |
| Onion | 0.12 | 0.68 | 57.63 |
| Vegetable | 0.15 | 0.54 | 17.82 |
| Melon | 0.03 | 0.21 | 80.00 |
| Pepper | 0.06 | 0.40 | 72.23 |
| Sugar | 1.32 | 0.60 | 69.23 |
| Bread | 1.28 | 0.99 | 176.00 |
| Others | 12.45 | 20.58 | 1,418.50 |
| **Total** | **100** | **87.16** | **6,768.21** |

Source: Data analysis, 2007

Table 3 shows the percentage distribution of food consumption among the rural households in Kwara State. Food items which are consumed by less than 25% of the rural households in Kwara State were categorized as others. The food items are millet, soyabean, groundnut, cheese, bush meat, margarine, mango, pawpaw, cashew, beverage, honey, soft drink and alcohol. It can be seen that the rural households in the study area did not comply with dietary recommendation which specifies a minimum requirement for the supply of energy from carbohydrate, legumes, animal protein and fats/oils. For the purpose of this study, carbohydrate food includes cereals, fruits and vegetables. Rural households derived more of their energy from carbohydrates at the expense of other classes of food items. The study reveals that cereals together with root and tuber products contributed 67.88% of the households' weekly calorie intake. This was followed by fats and oils with 9.21%, animal products with 2.37% and lastly fruits and vegetables with 1.97% of the total weekly calorie intake among the rural households.

This study also shows that a rural household had an average weekly expenditure of N6,768.21 on food items. This was estimated at a sum of N119.96 daily per capita food expenditure. Hence, the next sub-section of this study was embarked upon with a view to developing least cost-food items that would include the right proportion of energy from the various food classes highlighted.

*Optimal food plan for rural households in Kwara State*

Rural households require good health to be able to carry out agricultural production activities which are usually labour intensive. The optimal food plan ensures that resource-poor rural households meet their minimum food requirements at least possible cost. Apart from having the least cost to the rural households, the plan also satisfies the food preferences of the rural households. This is because the plan was based on the commonly consumed food items in the study area. Table 4 presents the optimal food plan.

**Table 4: Optimal Food Consumption Plan for the Average Rural Household**

| Food items | Optimum quantity (Kg) |
|---|---|
| Rice | 4.17 |
| Maize | 18.59 |
| Cowpea | 2.92 |
| Gari | 2.66 |
| Fish | 8.53 |
| Palm oil | 3.10 |

Value of the Plan: N 4159.30
Source: Data Analysis, 2007

The minimized value for the food plan in the study area was N 4159.30 p week. With mean adjusted household sizes of eight male adult equivalent, th amount to N 73.73 per person per day. The food plan has cost implication that below the poverty line set by the World Bank at One U.S. Dollar per person pe day.

*Attainment of goals*

The extent to which the food plan satisfies the goals of rural household food consumption is as presented in Table 5.

**Table 5: Goals Attainment**

| Goals | Target | Optimal plan Value | Under-achievement | Over-achievement | Degree of attainment |
|---|---|---|---|---|---|
| Rice Calorie | 14589.73 | 14589.73 | 0 | 0 | Achieved |
| *Gari* Calorie | 9056.32 | 9056.32 | 0 | 0 | Achieved |
| Other Carbohydrate Calorie | 66917.15 | 66917.15 | 0 | 0 | Achieved |
| Animal product calorie | 11253.41 | 11253.41 | 0 | 0 | Achieved |
| Legume Calorie | 9645.79 | 9645.79 | 0 | 0 | Achieved |
| Fat and oil Calorie | 27865.60 | 27865.60 | 0 | 0 | Achieved |

Source: Data Analysis, 2007

As shown in Table 5, all the goals of the rural households' food consumpti are achieved. As such, the plan satisfies the minimum food requireme necessary for the rural households' food security. This shows that the goals meeting the minimum calorie requirement from carbohydrate, animal produc legumes and animal products are achieved without any deviation.

*Constraint to the attainment of optimal food consumption plan*

Attainment of optimal food plans among rural households is affected by the level of available food. Table 6 presents the results of the analysis of the constraint to the attainment of optimal food plan among the rural households.

**Table 6: Analysis of Constraint to Optimal Food Plan**

| Constraint | Status | RHS | Slack or surplus | Shadow price |
|---|---|---|---|---|
| Available food | Loose | <= 66.603 | 26.638 | 0 |

Source: Data Analysis, 2007

The average food available was in excess by the amount indicated in the slack/surplus column. This implies that the available food can be combined in such a way that an average rural household can meet the minimum food requirement with the possibility of such household having some returns from the sale of the surplus.

## Conclusion

Food consumption of most of the rural households may not be appropriate as carbohydrate constitutes about 70% of the total calorie consumption among the rural households in the study area. Optimal food plan for the rural households in Kwara State is about 38% lower than the one U.S. Dollar World Bank poverty line per person per day. With a food expenditure of just about N 73.73 per person per day, poor rural households may be food secure by merely readjusting their food combination toward rice, maize, cowpea, *gari*, fish and palm oil which constitute the least - cost food items for the rural households.

## Recommendations

- Considering their limited resource base, rural households need to be educated on the nutritional implication of the various food items. This is necessary for the food insecure households to be able to make appropriate choices in matters of food consumption.
- Farmers should be assisted to embark on dry season farming. This is to guarantee that the necessary food items are made available for the rural households at reasonable prices all year round.
- There is the need for improvement in the processing of the local food

produce. This is with particular reference to *gari* to minimise contaminati and impurity. This is particularly necessary as the food item is an importa component of the least cost food items in the rural areas of Kwara State.

- Since agriculture constitutes the main stay of the rural household livelihood, their food security may be seriously threatened in event of cr failure due to bad weather or pests and diseases. It may therefore necessary for the efforts at improving food security in rural areas to put place functional and accessible agricultural insurance scheme for farmer in the rural areas. Apart from helping the farmers to improve the agricultural production activities, it will enable the rural households to gai better economic access to their food need.
- Rural households should be educated on the need to diversify their sourc of income from agriculture. This will ensure regular incomes for th households. Participation of poor rural households' in cooperative societie may be necessary for them to be able to acquire the necessary fund required. Besides, agencies of government such as the National Directorate of Employment should be made to go and give training to rural household on small scale enterprises.

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# PARTICIPATORY APPROACH TO SUSTAINABLE AGRICULTURAL DEVELOPMENT IN AFRICA

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**Abstract**

*There have been vicious cycles of famine and food insecurity in Africa. A combination of natural and human causes has militated against increased agricultural development in Africa. There is no question of the fact that government in every of the African countries have programmes that are geared towards increased agricultural production. Yet the problem of food insecurity persists in Africa.*

*A critical analysis of past agricultural development efforts in Africa shows that they were based on the Top – Bottom approach, where experts decide what was best for the farming population. Beneficiaries of agricultural development projects were rarely contacted in the planning, implementation, monitoring and evaluation of the projects. Most projects using this approach depend on the governments/donors for sustainability.*

*The participatory approach to agricultural development is based on a Bottom – Top strategy in which agricultural development projects are based on the needs of the beneficiaries. The beneficiaries take part in the planning, execution and evaluation of the projects along with government/donor agencies. The involvement of the beneficiaries at every stage of agricultural development is crucial to sustainability.*

*A case study of the "Integrated Agricultural Development" by the Walalane (Kaolack) Community in Senegal and Caritas De Kaolack (A Catholic Charity donor agency) highlights the concepts involved in participatory approach to agricultural development.*

## Introduction

Sustainable agriculture was defined (FACTA,1990) as an integrated system of plant and animal production practices having a site-specific application that will over the long term, satisfy human food and fibre needs, enhance environmental quality and the natural resource base upon which the

agricultural economy depends. Such a system must also make efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls. The system must sustain the economic viability of farm operations and enhance the quality of life for farmers and the society as a whole. It is apparent from this definition that sustainability of agricultural development in Africa is still farfetched.

That there is a looming world food crisis is not news. Both the print and electronic media are awash with news from all over the world of increase in food prices. Recently, there were demonstrations in many parts of the world to protest increase in food prices. In 2008, the United States of America announced she was increasing food aids to poor nations through the United Nations by close to One billion dollars. The situation in Africa is not different. Production of arable crops for consumption has falling to the extent that majority of the population cannot afford decent food. Food insecurity is a regular feature of sub-Sahara Africa. This is despite the fact that each country claims to spend huge sums of money on agriculture and its development.

It is only natural to ask the question of what went wrong with agricultural policies and development in Africa. A critical analysis showed that agricultural policies in Africa were characterized by a top-bottom approach to development.

**The Top-Bottom Approach to Agricultural Development**

The top-bottom approach encourages agricultural projects/policies to be developed by government/donor agencies and literarily imposed on the beneficiaries. The system essentially assumes that the beneficiaries are illiterate while the donors are experts. It assumes that the rural dwellers are targets for outsider's ideas and initiatives, persons to be manipulated in accordance with their benefactor's views of what is best for them and not what they know is best for themselves. According to Chambers (1998), "Those with formal education and training believe that their knowledge and skills are superior and that uneducated and untrained rural people must, by definition be ignorant and unskilled. It is common assumption that science based knowledge is sophisticated, advanced and valid, and conversely, that whatever rural people may know will be unsystematic, imprecise, superficial and often plain wrong."

The top-bottom approach to agricultural development is therefore characterized by policies/projects that were developed by "experts" who might have not been to the target areas (usually, there is a prototype for the country). Content of action is standardized. Implementation is rapid and widespread.

Leadership is positional and changing. Management focus is that of spending the budget and completing the projects on time. Communication is vertical, order down, reports up. Errors in the policies are usually buried in bureaucracy. Evaluation is external and intermittent. Sustainability is near zero. In Nigeria, agricultural development projects that fit into the top-bottom approach include the Green Revolution, Integrated Agricultural Development Projects (ADPs), The River Basin Development Authorities, The Nigerian Agricultural and Cooperative Bank (NACB), People's Bank, Directorate of Food and Road Infrastructure (DIFRI), National Land Development Agency (NALDA), Directorate of Employment (NDE), Better Life for Rural Women, Family Support Programme (FSP) and lately Poverty Alleviation Programme. In between these populist policies were minor ones targeted at individual crops like wheat and cassava.

If agricultural productivity, sustainability, and poverty level in Africa are used as yardsticks of the success of agricultural projects/policies, then the policies are real failures.

It can be summarized that most of the agricultural development projects/policies failed for several reasons.

- Beneficiaries (mostly rural dwellers) were not consulted in the planning, execution and monitoring of the policies.
- There were no inbuilt sustainability attributes in the policies. Some were financed with World Bank loans. Such projects died when the loan was exhausted
- Many viewed the projects as their share of the national cake.
- Since many of the agricultural communities did not contribute to the planning and establishment of the projects/policies, people did not consider themselves as stakeholders. Therefore, when there was breakdown, people waited for government/donor agencies to come and repair. When such a repair does not come, the project is abandoned.
- An unstable policy. Different governments had different desires to impress. A new government in most cases scrapped the policies of the previous government. There is no continuity in policies.

Although many past administrators boast that their policies were based on people's needs, it is apparent that such perceived needs are at variance with agricultural needs of the people.

**Participatory Approach to Agricultural Development**

Unlike the top–bottom system, participatory agricultural development uses the bottom – top approach. It involves the activities of both donors and beneficiaries of agricultural development projects. In participatory approach the ideas for agricultural development originate from the people who are experiencing the agricultural problem first hand. The main resources are the people and their assets (time, money). Where new ideas/technologies are involved, implementation is gradual, local and at peoples pace. Economic capabilities and eating habits of beneficiaries are taking into consideration in introducing new varieties of crops. Unlike the top – bottom approach, communication is lateral, mutual learning and experience sharing by both donors and beneficiaries. Errors are therefore easily identified. Participatory approach must empower the beneficiaries. Because the beneficiaries are involved from the beginning, sustainability is guaranteed.

Hitherto, the top-bottom approach seems to be entrenched in agricultural development in Africa. There is need for attitude and behavioural change on the part of governments/donor agencies to embrace the participatory approach to agricultural development in Africa. Government and donor agencies must recognize in the agrarian community that they want to assist, a profound and detailed knowledge of the ecosystem and species in their localities. The attitudinal change must recognize that each community is knowledgeable in various fields, including history, linguistics, economics, social knowledge, politics, climate, biological entities of plants, crops, weeds, pests, domestic and wild animals, fish and insects etc., medicine, taxonomic systems, time, skills, artefacts, religion and a host of others. In all these fields, each agricultural community has developed knowledge encompassing theory, concepts, interrelationships, factual and attributive information to a high degree of accuracy (Atte, 1989). If treated as equal partner, the rural insider is likely to complement the efforts of the outsider, making agricultural development projects sustainable.

There are five steps to participatory agricultural development.

*A) Participatory agricultural development needs assessment*

This is the first step in agricultural development intervention effort. It is designed to identify and prioritize the agricultural problem(s) facing the people. It could be done by the community, alone or jointly done by the

community and outsiders (government/donor agencies) in a participatory manner. If done by the community and reported to outsiders, there will be need for participatory confirmatory diagnostic survey to make sure the problem is not the idea of one man. The main outcome of this step is the identification of the agricultural problem, which if solved will make the farmers happiest. It is appropriate during the exercise to ask if the farmers will be ready to contribute towards the solving of the priority agricultural development problem.

*B) Participatory planning of agricultural development*

It involves a critical analysis of the possible solution to the identified agricultural problem(s). The steps to be taken, including the roles of the farmers and outsiders and the time frame should be stated. Outsiders must be willing to listen to the suggestions of the farmers who know the locality. Steps for sustainability and flexibility must be put in place.

*C) Participatory implementation of agricultural development project*

It involves mobilization of the materials needed for the projects and projects take off. This step tests the commitment of the community to the agricultural development project. Whatever the community promises to contribute to the agricultural development efforts (time, work, money, cultural support etc.) should be available. The outsiders (donors) also meet their obligations. It involves joint action by the community and outsiders in the execution of the project. The implementation time varies with the scope of the agricultural development project. No matter the duration, it should be possible for the outsider to withdraw and the farmers take over at the end if the agricultural development project is sustainable.

*D) Participatory monitoring of agricultural development projects*

The community and outsider systematically and continuously collect and analyze information about the progress of the agricultural development project over time. There should be agreement over the frequency of meeting between donors and beneficiaries to assess the project. This interactive period is a tool for identifying the strengths and weaknesses of the project. Decisions reached at such meetings could be fed back into the plan especially if there is in-built flexibility in the plan. Participatory monitoring ensures

that the agricultural development stays on course by checking that activities are implemented, measure progress towards the objectives.

*E) Participatory review and evaluation of agricultural development project*

It takes a closer look than is possible through monitoring. It can be carried out to look at different aspect of the agricultural development work. Review and evaluation should be jointly undertaken honestly by insiders and outsiders. It allows the partners to learn from experiences and if they want used the experience to influence others. Failures and successes are equally important.

**Participatory Integrated Agricultural Development: A Case Study of Walalane (Kaolack) Community and Caritas De Kaolack**

Walalane is located about 30km, from Kaolack, a divisional headquarters located some 192km southeast of Dakar, the Senegalese capital. Walalane community development projects is a community initiated success story of participatory approach to agricultural development. The outsider (Donor) is Caritas de Kaolack charity organization and the beneficiary is the Walalane group of villages.

, Before the advent of the intervention, the community, located in the desert threatened Sahel region of Senegal had problem getting water for agricultural and domestic uses; no health facility and no school. Women spent a large chunk of their time searching for water; there was vegetable only during the short raining season and malnutrition was the order for both humans and livestock. Members of the village who are Catholic informed Caritas about their problems (community initiation). Caritas then carried out a participatory diagnostic survey (PRA) to ascertain the claims of the people. The survey revealed that truly, water was the number 1 problem followed by lack of health facilities and that the community was ready to contribute towards solving the problems. That was in 1986.

**Participatory Learning and Action at Work**

A plan of action based on the participatory rural appraisal finding was initiated.

*(1) A vegetable grower cooperative was formed*

To be a member, an individual pays a registration fee of 1500CFA followed by the annual dues. The main objectives of this cooperative is year round

production of vegetables through the use of irrigation. The major project of this group was the construction of a water reservoir. The reservoir which is 17m diameter and 4m deep was designed to collect water during the sort raining season.

In constructing the pond, men did the digging; women evacuated the dug materials while Caritas provided the cement that was subsequently used in constructing an embankment. Water lettuce was planted on the surface of the pond to reduce evaporation. The pond was then linked to the vegetable plots of members only with pipes. Once a member is in good financial standing, he/she can use the water free of charge for irrigating the vegetable gardens.

**Result:** A green valley of vegetables in an apparently dry and sun-scorched environment. There are fresh vegetables more than the community can utilize. The excess is sold to increase the income of members.

*(2) Borehole*

This was designed to provide water for domestic uses and livestock watering. This was another joint project in which the community provided labour and 800,000CFA while Caritas provided equipment, including pumping facilities and laying of pipes to eight nearby villages and livestock water points. Today, there is water for both domestic and livestock uses. However, every user pays a token for the water used. Proceeds from the 'water rate' go into an account, which is used in maintenance of the water system. The project is now entirely managed by the community and Caritas is only called in for technical assistance when needed.

**Result:** Water is available throughout the year.

*(3) Community health centre*

The community health centre is a product of joint action by the villages, Caritas and ARAF (another NGO) in 1998. The community through communal effort built the house with financial support from ARAF. ARAF also trained a woman volunteer from the village in community health service delivery. Initial drugs were supplied by ARAF and the proceeds from the sales is used to procure more medicine and pay the allowances of the staff. This operated like a revolving drug fund scheme.

**Result:** There is improvement in health and decrease in mortality.

*(4) Community cereal bank*

This is a concept designed to enhance the earnings of the community. T building serving as the Cereal Bank was again provided by the joint efforts Caritas and the community. The Cereal Bank allows the procurement a storage of cereals at harvest period when prices are low. These are sold lat when there is scarcity and prices are higher, thereby making profits. It from these profits that members of the community can be granted loans fro the group account. The farm implements of the loan beneficiaries are used collaterals. Again project is now entirely managed by the people.

**Result**: There is improvement in food security in the community. Tea members saw large harvest of millet (their main crop) and some beans.

*(5) School*

With the joint action of the community, Caritas and the government, a sch has just been started in the community. There were only 2 classes as at th time of this investigation.

**Self Reliance**

Walalane is a happy and contended community. Although what they hav seem to be small by town standard; they have so much compared to other village of their size. They are self reliant in vegetable and other crop productions, an livestock husbandry. Both the nutrition and health status have improve considerable. The Walalane community acknowledges this fact and determined to sustain the tempo. The Walalane community has given and take so has Caritas. This is participatory agricultural development at work.

**Efforts at Sustainability**

Caritas has essentially withdrawn from the management of activities Walalane. They are only called upon when technical assistance is neede Efforts of this novel community to sustain what they have included:

1. Willingness to pay for water from their borehole to generate funds. Eve livestock farmers pay for the water the animals drink.
2. The community management teams are volunteers that are not paid b work hard to keep the system going.

3. The health unit survives based on the drug fund-revolving scheme. On occasion, the village chief had to support the drug fund.
4. The loan scheme has continued to generate funds for sustaining the farming and other activities of the community.
5. There is a general increase in the income level, even among women. the women claim such increase income is invested on the family's well being.

**Conclusion**

The objective of development is responsible well-being by and for all. To be effective, the beneficiaries of agricultural development must participate in all the phases of the development process (Agricultural Needs assessment, Planning, Implementation, Monitoring, Review and Evaluation). Most development projects in Africa have been essentially centrally dictated (Top-bottom approach). The result has been generally that of failure and lack of sustainability. There is need for a change of attitude and approach to agricultural development. People's participation (a bottom-up approach) in agricultural development ensures relevance, commitment and sustainability that will ensure food security in Africa. The Walalane experience can be duplicated in many parts of Africa.

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# PROSPECTS OF INLAND FISH FARMING FOR SUSTAINABLE FISH RESOURCE MANAGEMENT AND DEVELOPMENT IN THE CENTRAL REGION OF GHANA

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## Abstract

*The contribution of inland fish farming to sustainable development is greatly underestimated. Inland fish production provides significant contributions to animal protein supplies and employment in many communities in Ghana. Research has shown that fish contribute about 82% of total protein consumption in Ghana. However, the fishing sector is unable to meet this national requirement due to the depleting fish stock in the sea and other major rivers. This has made inland fish farming a realistic option to ensure adequate fish supply for sustainable agriculture and development. The purpose of the study was to identify the prospects of inland fish farming for sustainable development of the fishing sector in the Central Region of Ghana. Based on a case study of the Association of Inland Fish Farmers in the Central Region of Ghana, it was found that high prospect exist for inland fish farming in the Central Region because there are suitable environmental conditions and available market and demand for fresh water fish in the Region. However, there are constraints including lack of labour for pond construction, theft of fish, unavailability of fingerlings (especially catfish), inadequate working capital, high cost of fish feed and lack of technical extension information. Efforts aimed at eliminating the above constraints can contribute to ensure sustainable fish resource management and agricultural development in the Central Region.*

## Introduction

The fishing industry is an important sub-sector to the economy of Ghana. It contributes about 3% to Ghana's GDP and it is most demanded compared to beef, chicken and mutton because it is relatively inexpensive and within the budget of most Ghanaians (Amisah *et al.*, 2008). Not surprisingly, that consumption of fish by an average Ghanaian is estimated to be 20 kg compared to a much lower world average of 13 kg per person (MOFA, 2004).

Despite the high and increasing demand for fish in Ghana, it is unable to meet its requirement for fish products. In 2004, Ghana produced only 68.1 percent of its fish requirement from domestic sources. In 2007, the national fish demand was 913,992 tonnes but the country could supply only 511836 tonnes (Trade zone, 2007), leaving a demand deficit of 402156 tonnes which the government try to resolve through import of fish. It is estimated that Ghana government imports about USD 200 million worth of fish to supplement the local production (Amisah *et al.*, 2008). Evidence for the fisheries industry in Ghana (Fisheries Department, 2000) indicated that about 85% of this local fish production in Ghana comes from the sea. However, this natural fish source (the sea) is found to face several constraints of environmental and economic importance. As such, the government of Ghana and its development partners as well as individuals are getting interested in inland fish farming (aquaculture) to meet the fish deficit and to help address the inherent problems of fish hunting from the wild. Despite this growing importance of fish farming in Ghana, production and supply are still limited and very little is known about the challenges and prospects of aquaculture in Ghana. This latter problem has formed the basis for this research.

**Objective of the Study**

The purpose of the study was to identify the prospects of inland fish farming from the perspective of fish farmers for sustainable development of the fishing sector in the Central Region of Ghana. Specifically, the study meant to determine the key challenges and prospects of the inland fish farming in the Central Region of Ghana.

**Methodology**

The research was conducted between December, 2008 and January, 2009. To gain an in-depth understanding of the prospects of inland fish farming, the study adopted a case study of fish farmers who were members of Inland Fish Farmers Association in the Central Region of Ghana, and who are willing to provide information for the research. Inland fish farmers in the Central Region of Ghana have formed an association to support each other through the sharing of information and as a pressure group to find solutions to their common problems. Membership to this association is however voluntary. The assumption is that those who are part of the Association would have had the chance to discuss among themselves the key issues that affect their enterprises and may be in

position to provide information relating to their individual circumstances as well as those affecting other inland fish farmers for in-depth understanding.

In all thirty members from the Association of Fish Farmers agreed to take part in the study. Multiple sources of data collection were used – interviews (primary source) and observations. An interview schedule with both closed and open ended questions were used for the data collection. Descriptive statistics including means and percentages were used in the analysis of the data. These statistics were only for the purpose of organizing the responses of the respondents for better understanding. The intention is not to generalize the findings to other populations of inland fish farmers in Ghana. However, there is much insight that can be learnt by inland fish farmers from this case study to inform their work.

*Background characteristics of the inland fish farmers*

Out of the thirty individuals interviewed in the study, 29 of them were males. This is not surprising as female's participation in fish farming has mostly been in the area of post harvest activities such as preservation and selling of fresh and processed fish (Ansah, 2008, FAO, 2008). All the key informants were adults. Fish farming is capital intensive and only adults who have build capital or have collateral to go for loan can go into it. The educational level of the fish farmers who participated in the research was generally low – one-third was illiterates. This finding supports the Ghana statistical services report (GSS, 2002), that the educational levels of populations involved in fishing are low, though this may be referring more to those involved in marine fishing. All the farmers participated in the research work practiced fish farming on part-time basis. Twenty six representing 87% of the respondents have been in the fishing business for a year and over and as such, have some experience of the constraints and prospects of the industry with only four been new comers in the industry. Pond is the commonest culture system fish farmers in the Cape Coast Metropolis used. All the fish farmers who participated were into pond culture with sizes ranging from 100 to 990 square metres (Table 1). Pond culture is believed to be easier to construct and manage, and cheaper in terms of cost and fish harvesting when compared to other culture systems such as cages and raceways (FAO, 1994). A relatively larger proportion (36.7%) of the farmers had pond ranging between 700-990$m^2$.

**Table: 1 Pond Size (square meter: $m^2$) of Respondents**

| Pond size ($m^2$) | Frequency | Percentage |
|---|---|---|
| 100-390 | 6 | 20.0 |
| 400-690 | 8 | 26.7 |
| 700-990 | 11 | 36.7 |
| >990 | 5 | 16.7 |
| Total | 30.0 | 100.0 |

Source: survey data, 2009

The study revealed that inland fish farmers in the Cape Coast Metropolis culture tilapia and catfish (Table 2). About 73.3% of the key informants combine tilapia and catfish. The rest were into tilapia production only. Efficient utilization of feed and control of over-population in tilapia were the major reasons the informants assigned to their culturing of tilapia and catfish together. In terms of efficient utilization of feed, the fish farmers made the point that catfish is a benthic organism and tends to feed in deeper parts of the pond compared to tilapia that feed at the upper part. Hence feed that sink to the bottom is efficiently utilized by catfish. They indicated that tilapia is very prolific but the catfish which is a carnivore feeds on the young tilapias to control their population. This later reason is supported by Kaewpaitoon (1992) as one of the management strategies used to control pond overpopulation in tilapia production. However, Pillay (1990) have argued that the extent of this predatory ability of catfish to control populations of tilapia is inconclusive.

**Table 2: Species of fish cultured by Respondents**

| Species of fish | Frequencies | Percentage |
|---|---|---|
| Tilapia only | 8 | 26.70 |
| Catfish and Tilapia | 22 | 73.30 |
| Total | 30.0 | 100.0 |

Source: survey data, 2009

The sources of fingerlings to farmers in the Cape Coast Metropolis are from friends, research stations (Ashaiman breeding station) and private hatcheries (e.g. Kumah Farms at Kumasi). The majority (80%) of the fish farmers in the study get their fingerlings from friends (Table 3). According to the farmers, it is cheaper to obtain the fingerlings from other fish farmers (friends) in terms of

cost of transporting fingerlings as compared to having obtaining it from research station and private hatcheries. The farmers however, acknowledged that fingerlings from research stations and private hatcheries are of better quality in terms of yields than those from their friends.

**Table 3: Source of fingerlings**

| Source of fingerling | Frequency | Percentage |
|---|---|---|
| Friends (other fish farmers) | 24 | 80.0 |
| Research station | 2 | 6.7 |
| Hatcheries | 4 | 13.3 |
| Total | 30.0 | 100.0 |

Source: survey data, 2009

*Major challenges facing Respondents*

The study revealed that inland fish farmers are confronted with six main challenges. These include: lack of labour (100.0%); theft (76.7%); unavailability of catfish fingerling (73.3%); inadequate working capital (53.3%); high cost of fish feed (50%); and lack of extension information (6.7%) in a decreasing order of how widespread the problem is amongst the farmers (Table 4). Lack of labour is the major constraint facing the inland fish farmers. Respondents said human labour needed for pond construction and assistance during harvesting is difficult to get and often expensive. Thus, the farmers often resort to employing mechanical mean involving the use of bulldozers for pond construction, a method which is very expensive for pond construction compared to the manual method which also takes longer time to construct. According to the farmers, it takes between 16 and 25 man-day's depending upon the soil conditions to manually construct a 100 square meter.

Theft by humans is another pertinent constraint that the farmers complained about. Most of the respondents had their fish farms a distance away from human residence and are sometimes encroach by people. Unavailability of fingerlings for stocking especially for catfish, *Clarias gariepinus, is problem facing the fish farmers in the study area. As already discussed, the farmers usually get* their tilapia fingerlings from friends, though they complained that they are of lower quality due to continuous inbreeding compared to those from research stations.

Inadequate working capital for initial start up of fish farm and expansion is another serious problem to the fish farmers in the Cape Coast Metropolis of the Central Region of Ghana. The farmers said they used their personal savings or borrow from the informal sector (e.g. friends, money lenders) to start their fish farms. The advantage of the informal credit is that the provision of the loans is relatively faster, although often more expensive, compared to the banks (Macpherson & Agyenim-Boateng, 1991). Though, the banks are willing to lend money for the construction of fish ponds, the conditions for the loans are strict and more suitable for those already well established in the business. Generally, the estimated market value of the collateral has to be at least equivalent to the amount of funds loaned. This may in part account for the small pond size holdings by most of the farmers and reliance on friends, instead of recommended hatcheries for fingerlings. The few farmers who brought out the issue of extension information indicated that they are provided with extension information that focus more on methods of fish production, but nothing on business management and marketing. They indicated that they have little knowledge as to how to market their products.

**Table 4: Major challenges facing the inland fish farmers**

| Challenges | Frequency* | Percentage* |
|---|---|---|
| Lack of labour | 30.0 | 100.0 |
| Theft | 23.0 | 76.7 |
| Unavailability of catfish fingerling | 22.0 | 73.3 |
| Inadequate working capital | 16.0 | 53.3 |
| High cost of fish feed | 15 | 50.0 |
| Lack of extension information | 2.0 | 6.7 |

Source: survey data, 2009

**Prospects in fish farming**

The results show that there is ready market and high demand for fresh water fish (tilapia and catfish) in the Cape Coast Metropolis of the Central Region of Ghana (Table 5). About 73 % of the fish farmers in the study said there is available market and demand for their fish – they mostly sell to consumers and retailers. Furthermore, most (73.3%) of them made the point that the prices offered for their product are good. At the time of the study, a kilogram of tilapia cost about GH¢ 3.00 in the Cape Coast Metropolis according to the farmers.

**Table 5: Prospects for fish farming in the study area**

| Factors | Frequency | Percentage |
|---|---|---|
| Market availability and Demand | 22.0 | 73.3 |
| Good pricing | 22.0 | 73.3 |

Source: survey data, 2009

When the key informants were asked to described the profitability of the inland fish farming business, all of them said it is profitable except one (Table 6). Slightly more than half (53.3%) of them said it is very profitable. The profitability of the farmers were measured based on their cost of production, consumption level and total revenue after production.

Despite the numerous constraints given by the respondents as issues facing the industry, many (46.7%) of them said the industry is very bright as there is ready market and good price for fresh fish, especially tilapia in Cape Coast and the country as a whole. Additionally, the government and other stakeholders have shown greater interest in the industry by supplying farmers some resources needed for producing fish. Moreover the government is promoting fish farming by giving awards to best fish farmers in the country.

**Table 6: Profitability of fish farming**

| Profitability status | Frequency | Percentage |
|---|---|---|
| Very profitable | 16 | 53.3 |
| Profitable | 7 | 23.3 |
| Moderately profitable | 6 | 20.0 |
| Not profitable | 1 | 3.3 |
| Total | 30.0 | 100.0 |

Source: survey data, 2009

## Conclusions and Recommendations

It could be deduced from the findings that the inland fish farming is male dominated in the study area due to the extent of drudgery involved. Also pond is the commonest culture system used by the respondents. It was also found out that species of fish cultured by the respondents were tilapia (*Oreochromis niloticus*) and cat fish (*Clarias gariepinus*) and they mainly obtained their

fingerlings from friends. The major constraints facing the fish farmers in the study area are high cost of labour, theft, high cost of fish feed, unavailability of catfish fingerlings, inadequate working capital and inadequate extension information. The study however revealed that the sector is very profitable and the future is very bright due to availability of land and water for inland fish farming, and market and good price for fish.

To ensure maximum contribution of the fishing sector to sustainable development, stakeholders such as Aquaculture Development Committee (ADC), NGOs, Department of Fisheries, Chiefs, District and Metropolitan Chief Executives Banks and other research institutions should adopt a multi-disciplinary approach to overcome the challenges facing the inland fish farming in the Central Region of Ghana.

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# SUSTAINABLE FOOD PRODUCTION IN AFRICA: EMERGING ISSUES

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**Abstract**

*Sustainable agricultural development is a must for Africa if the scourge of hunger, poverty and ill-health is to be put away. The highest number of hungry people, people living below the poverty line, people suffering from HIV/AIDS and people displaced or lost as a result of war and or conflicts are higher in Africa than any other region. Annually, over US$20 billion is spent on food importation and yet Africa's food security remains vulnerable. This is because agricultural production is characterized by factors such as low hectrage under cultivation, low input, low output, poor incentives, dependence on uncertain rainfall patterns, small and dispersed domestic market, poor Governmental policies, pests and diseases and many others.*

*While developed countries have proven and continue to demonstrate that science and technology as well as good governance are critical to developmental advances including availability of for the citizenry, most African countries are yet to wake up to these realizations. The paper identifies and discusses some problems hindering agricultural development and food availability, accessibility and affordability in Africa. Strategies for sustainable agricultural development in Africa are also discussed.*

## Introduction

Agriculture is undoubtedly the most important sector in the economies of most non-oil exporting African countries. It constitutes approximately 30% of Africa's Gross Domestic Product (GDP) and contributes about 50% of the total export earnings. In 1990 for instance, agriculture provided on average 32% of Africa's GDP, 66% employment in 1987 and about 20% of its exports (World Bank, 1989, 1992). About 70% of the continent's population depends on the agricultural sector for livelihood, yet production is subsistence in nature with high dependence on rain-fed agriculture. In Sub-Saharan Africa (SSA), 50-75% of the population and labour force are engaged in agriculture for daily sustenance and livelihood.

Africa has a land area of 30.222 million square kilometres (1.67 million square miles) or about 6% of the total earth's surface area. Africa, together with its adjacent islands covers 20.4% of the total land area on earth making it the second largest continent with its territories. As at 2995, there are about 900 million people i.e. 14% of world's population living in Africa, making it the second most populous continent after Asia. The climate is predominantly tropical with three main climatic zones- humid equatorial, dry and humid temperate. It thus has both the natural and human resources to make it sustainable in all respects.

Sustainable agriculture implies farming systems that are capable of maintaining their productivity and usefulness to the society indefinitely. Such systems must be resource-conserving, socially supportive, commercially competitive and environmentally sound (Duesterhaus, 1990). It is an integrated system of plant and animal production practices having a site-specific application that will over the long-term satisfy human food and fibre needs, enhance environmental quality and the natural resource base upon which the agricultural economy depend. It should also enhance the quality of life for farmers and society as a whole. It is a pattern of resource use that aims at meeting human needs while preserving the environment so that these needs can be met not only in the present but also for future generations. Sustainability should therefore be done in such a way that the needs of the present are met without compromising the ability of future generations to meet their own. While these conditions can be and are being met in other parts of the world, the practice is not only foreign to Africa but will be difficult to meet in the foreseeable future due to some prevailing constraining factors.

**The Food Crisis**

Although global food production has reached a stage where sufficient food is produced to meet the needs of every person on earth, the per capita food production and availability has and still remains low in Africa. Indeed, Africa is the only region in the world where food production per person has been declining over the last 40 years. The continent has been relying on the rest of the world for a larger part of her food needs such as rice, wheat, milk, sugar, juice, etc. Indeed presently, about 27% of Africans are undernourished.

The annual per caput production of cereals has fluctuated between 140kg and 175kg during the 1990s which is below the global average of 358 kg (Table 1). Western Europe's per capita food availability stands at about 3500

kcal/day, North Africa 3600 kcal/day while SSA with 2100 kcal/day is the lowest in the world. Low consumption results from non-availability or inability to purchase as between 55% and 60% of the rural people in SSA are absolutely poor, subsisting on less than US$1 per day. More than 200 million people in Africa suffer chronic malnutrition and infant mortality is about 10.3% compared with 0.80% in high income countries. Most urban residents spend more than 80% of their earnings on food leaving very little on human welfare including nutrition, education and public health. In 2000 alone Africa spent $18.7 billion on food importation.

Number of chronically undernourished people in Africa increased from 173 million between 1990 and 1992 to 200 million between 1997 and 1999 with the highest number in SSA. Thirty two out of the World's 48 low income countries are in SSA. The highest incidence of undernourished population (33%) is found in this region compared with Asia (16%) and 10% each in North Africa, Near East Asia, Latin America and the Caribbean (FAO, 2004). Yet Africa has the highest population growth in the World. At a 3.2% growth rate, Africa's population which was about 200 million 30 years ago is projected to increase to 1.3 billion in the next 25 years (Ndiritu, 2009). This, no doubt, will worsen the already fragile food crisis as the present and growing population makes it difficult to maintain adequate food consumption levels.

The high food price situation continues to give rise to concerns about food security of vulnerable populations who spend much to their income on food. FAO (2009), for instance, noted that despite the global drop in the price of international market, the prices of imported rice in Ghana and Niger were still 23% and 35% higher respectively in June 2009 than a year earlier. In Eastern Africa, FAO's findings revealed that an estimated 19.8 million people needed emergency assistance as a result of poor harvests, above average prices, civil wars or a combination of these factors.

From tables 1 and 2, it is not surprising that Sub-Sahara Africa is one region where hunger is both pervasive and increasing. The declining output or stagnation of agriculture in Africa is probably because of one or more of the following:

- More commitment by Government to industrialization,
- Political support of the urban residents,
- Heavy taxation of agricultural exports to fund Government thus lowering incentives for agricultural production,

- Poor incentives to farmers and low investment,
- Continuing dependence on uncertain rainfall,
- Small and dispersed domestic markets,
- Shortage or difficulty in securing arable land,
- Small size of most farms,
- Farmer's frequent lack of organization,
- Lack of rural roads and other infrastructure,
- Neglect of the particular needs of women farmers who provide most of the continent's food,
- Spread of HIV/AIDS,
- Instability and decline of world prices for African agricultural exports,
- Limited access to costly agricultural inputs,
- Limited technological base,
- Poor moisture availability and lack of irrigation system,
- Pests and diseases,
- Poor Government agricultural policies,
- Privatization and Structural Adjustment Programme,
- Low profitability of agricultural products resulting in lower production. As reported by World Bank (1986), producer prices for agricultural exports in many African countries in the 1980s were generally lower than 50% of world prices making production unattractive.

**Emerging Issues in African Agriculture**

According to World Development Report (2008), agriculture in much of Sub-Sahara Africa, is a strong option for spurring growth, overcoming poverty and enhancing food security. Although being a continent endowed with plenty of natural resources, Africa remains the World's poorest and most underdeveloped continent due largely to many negative virtues. They include the following:

*Poor research work*

Basic, applied and adaptive researches that are necessary for critical problems of agriculture are in most cases lacking. Research activities aimed at solving Africa's problems should be encouraged and new areas such as biological control, enhanced nitrogen use efficiency, salt tolerance, high yield, locally adaptive plants and animals, etc, should be emphasized. African leaders should also be more passionate about research as development of any country is usually

anchored on research. Researchers also need renewed dedication to research and embark on meaningful applied research that will result in research outputs that will be used for the overall development of Africa instead of allowing research findings age on the shelves.

*Prevalence of diseases*

The ravaging effects of many diseases prevalent in Africa have made adequate food production and sustainable agriculture near impossible. The scourge of HIV/AIDS is operating at a renewed strength in Africa with Sub-Sahara Africa being more affected than any other region in the world. In 2007 for instance, about 22 million people in SSA are said to be sufferers with about 1.9 million new cases yearly. In some African communities, between 30 and 40% of adults are affected. This is alarming as the number of people to be fed by few healthy workers appears to be on the increase.

*Investment*

Most Africans are small-holder farmers with inability to invest in land improvement, irrigation and fertilizer usage and are quite vulnerable to drought, flooding and political conflict. There is chronic under-investment in farming in Africa as most countries are hamstrung by a lack of investment and financing to take subsistence farming to a larger scale as pertains in other parts of the world.

A country such as Brazil has about 190 heads of cattle giving the nation an export revenue of US$2.5 billion annually, while about one million people in Brazil are engaged in harvesting sugar cane on the fields. In the Indian state of Maharasa, there are 250 sugar factories, 180 in Utar Pradesh each producing 200 tons daily. In Punjab, a state of 24 million people, there are 450,000 tractors out of the total of 4.5 million in India. This number compared with what obtains in Africa shows the seriousness attached to agriculture.

Imposition of export bans to keep prices down as the people struggle to feed themselves is no solution to lack of abundant local food production. There should be increased investment in agricultural practices and boost production especially through irrigation, research and technology to improve yields, supply of fertilizer and provision of good quality seeds. Africa will thus need to substantially increase investments in agriculture and boost investment to improve food production (Table 3).

**Table 3: Required Investments in African Agriculture 2002-2015**

| Activity | US$bn |
|---|---|
| Land and Water Investment | 37 |
| Operations and Maintenance | 32 |
| Rural Infrastructure Investment | 89 |
| Operation and Maintenance | 37 |
| Trade-related Capacities | 3 |
| National Food Security | 6 |
| Regional Food Security | 1 |
| Research and Technology | 5 |
| Humanitarian | 42 |
| **TOTAL** | **251** |

Source: Comprehensive Africa Agricultural Development Programme (2001)

**Land**

Sustainable land and resources are still available to feed the Africa population. Land has remained a major resource for sustainable agricultur whereby the farmers use land principally for subsistence farming, pastoralism plantation establishment, etc. However securing enough land for the poo farming families is a challenge, especially the landless poor who in the rural area account for about 30% of the population. The present land tenure system i most parts of Africa makes acquisition of land difficult, especially for thes resource poor who depend on land.

There is also the need to expand the arable land presently being utilize by bringing new land under cultivation. In Africa, about 874 million hectares c land are deemed suitable for agriculture but 83% of this is subject to seriou limitation such as fragile and poor soil fertility which makes use of adequat chemical fertilizers imperative. Despite the yearly depletion of existing so nutrients, efforts are not made to replace the losses as is the case in other parts c the world. The total fertilizer input in SSA is put at about 9kg/ha compared wit 100kg in South Asia, 135kg in East and South East Asia, 73kg in Latin Americ and 206kg in the industrialized countries (Harsch, 2004).

Currently, only 7% of the arable land is under irrigation in Afric compared with 10% in South America, 29% in East and South East Asia and 41% in South Asia. There is thus need to put more land under irrigation if foo production is to increase.

**Governance**

Governance is essentially about law and order, the use of politics for the promotion of the general well-being of the people, their protection against internal and external dangers and the guaranteeing of the security and life of the citizenry. However, good governance appears lacking in Africa. Lack of transparency and accountability has affected Government major policies including agriculture. With the high level of corruption in governance, it is difficult to sustain agricultural activities as most of the inputs required agriculture for sustainable production are lacking.

With the effluent and ostentatious life styles of our leaders, youths no longer see any dignity in hard labour and the drudgery of farm work in particular. The youths are therefore emboldened to take to vices such as armed robbery, kidnapping, etc, instead of working on the farms. It is not surprising therefore that almost 100% of the rural farmers, the major contributors of national food supply in most African countries, are now the aged. The average age of the African farmer today is about 62 years and can hardly cope with the drudgery of farm labour.

If other continents, countries or people seem to have successfully dealt with the issue of food security, then there is no reason why Africa cannot. As noted by Ogbeh (2008), continents and countries that have had their own share of social and political turbulence have been able to maintain a steady focus largely because of good leadership. India now feeds her population of 1.2 billion and has extra food to export. Vietnam, battered by war as recently as 1975, is now the world's largest exporter of rice and coffee. Thailand, a nation of 63.3 million people, as at the 2003 census, feeds half of Africa with rice and leads in cassava exports. Brazil earns in one year, from agriculture exports, what Nigeria has made from 1958 to 1998, some US$350 billion.

**Insecurity**

Aldous Huxley (1932) observed that every road towards a better society is blocked, sooner or later, by war, by threats of war and preparations for war. This according to him is the truth, the odious and unacceptable truth. Over the last few decades, Africa has spent billions of dollars that could have been committed to sustainable development, including food production for importation of arms and ammunitions, prosecution of war and repairing of devastations left by war. Women, children and adolescents are more on the

receiving end. The prevailing atmosphere has also led to increasing migration and refuge problems in Africa. Sustainable farming and food production is impossible in the prevailing atmosphere of near constant internal conflicts, cross-border conflicts, piracy and militancy; inter tribal and ethnic wars, political tension, famine, etc. prevalent in Africa.

Africa has fought too many wars to end wars and has committed huge resources that could have been used for development into prosecuting wars and purchase of war equipment from food- donating nations. Violence has become one of the newest threats to human existence and good living as it burdens communities and contributes to a wide spectrum of health risk behaviours and consequences. With the strains and injuries placed on societies by violence, food production has become a problem in affected regions, especially as most of the affected are in the age category of 15 to 29, the active energetic group required for food production.

According to WHO's 2002 world report, violence is a significant public health, human rights and human development problem. It added that of those killed by violence, just over half die by their own hand, over 35% because of injuries inflicted by another person and over 11% is as a direct result of war or some other form of collective violence. Conflicts also affect hunger in Africa. In 2001, civil conflict and war affected 16 countries in SSA and even in regions that have achieved a measure of food security, internal conflicts interrupt self-sufficiency. Concerted programmes should therefore be embarked upon to mitigate the effect of violence. One of such is food scarcity, as a hungry nation is an unstable nation and might be difficult to govern.

**Role of Women**

According to Vilsack (2009), women account for as much as 80% of Africa's food production but are limited to accessing land, vital services such as credit and to improved technologies. With the rampaging scourge of AIDS and conflicts that have rendered many women victims, their contribution to food production has diminished. Women therefore must be put at the centre of addressing hunger and poverty in Sub-Saharan Africa.

**Technology**

According to Agricultural Technical Foundation (2007-2008), the use of innovative agricultural technologies is paramount for reviving agricultural

development in Africa and is recognized as a pathway to economic development for the continent. It is therefore important to make available and deliver agricultural technologies for sustainable use by African small holder farmers. Annually, Africa spends about US$20 billion on agricultural products and yet food scarcity and hunger persist. African countries must therefore evolve or strengthen indigenous problem solving techniques and technological generating capacity. Depending on other nations that have developed equipment, machinery, management etc in and for their environments to solve peculiar problems in Africa cannot result in sustainable agriculture.

There is need for intensive and innovative techniques, such as irrigation, for food production as yields from irrigated crops are three times higher than rain-fed crops and yet about 93% of agriculture in Africa is dependent on erratic rainfall. Also, new varieties of high yielding, and pest and disease resistant crops and animals that are also early maturing and adaptable to the harsh climatic conditions of Africa have to be developed. New and cheaper agricultural inputs and management strategies are also required. There is also need for improved access to animal health remedies, safe pesticides and other inputs and training in agro-forestry and other skills.

**Ecological Hazards**

Access to food for majority of people in Africa remains unreliable because of the impact of climate and extreme weather conditions and natural disasters. Africa might not be a significant contributor to climate warming and the resulting effects, but the problems of erratic rains, ocean surge, coastal erosion, land erosion, flooding and desertification are being felt in Africa and these are affecting agriculture and other activities. In eastern Africa, Ethiopia, Kenya and Somalia have suffered from prolonged drought while other countries have suffered from flooding, desertification and erosion problems. Climate change is thus becoming a major challenge to African agriculture. In 2001 alone, almost two million Africans received emergency rations from World Food Programme. There is need for coping with changing climates and conditions as Africa will have much to lose as the earth gets warmer. There is therefore need to invest in supplying drought resistant seeds, better irrigation equipment and techniques, new kinds of seeds that can withstand higher temperatures and less water, etc. instead of depending on how and when to cut the carbon-dioxide and air borne pollutants that are blamed on global warming.

## Conclusion

Certainly Africa's food production remains vulnerable and there is need to find sustainable solutions to hunger and poverty. Adequate food production and provision will be a mirage unless the productivity culture is embraced. Indeed improved productivity will have to be taken very seriously and accepted if food security, sustainable agriculture and vision 2020 are to be realized. Africa can graduate from being a beggar and donor-dependent continent to a food basket of the world. Africa has the potential to meet her food demand if advantage is taken of our rich assets especially the favourable climate, expanse of land and the high percent of the populace who are involved in agriculture.

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# SECTION TWO

# ARTS

# GENDER AND THE ENVIRONMENT IN YORUBA RELIGION: A FOCUS ON WATER BODIES

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**Abstract**

*Africans most often than not ascribe femininity to nature because they recognize the ability of nature to reproduce and regenerate. The ability to bring to existence that which was formerly non-existent involves a level of mystery and compels awe and respect.*

*Elements of nature are construed as feminine and worship is directed at them in one way or another to ensure that the sustenance offered by these elements to human beings continues. The earth is perceived as female among some ethnic groups in Africa. This is especially true of communities where agriculture constitute the main source of livelihood. Ritual prescriptions and taboos are put in place to avoid any form of contamination but if such should occur, prescriptions to remedy the situation are readily available. Water is conceived as being imbued with therapeutic qualities in Africa. Water bodies are also seen as females. Water bodies are usually seen as the abode of goddess (es) in Africa. The African belief in the intrinsic qualities of water reinforces this belief. Such water bodies include streams, rivers, springs, and waterfalls.*

*Waterfalls may be regarded as one of the wonders of the natural world and a spiritual reservoir. Like other water bodies, waterfalls are conceived as females among the Yoruba and seen as being imbued with healing, prosperity and fecundity properties. My aim in this paper is to analyze the Yoruba gender construct as concerns the environment and specifically water bodies in Yorubaland. Attention will also be given to the role of Yoruba women in the preservation of the environment. Methodology for the work includes phenomenological and historical analysis while utilizing research tools like interviews, participant observation and the use of relevant literature.*

## Introduction

The Yoruba occupy the South-western part of Nigeria. The people number about 10 (Ten) million in population (www.uiowa.edu/africart assessed on 22/07/08). The Yoruba trace their origin to a common progenitor named

Oduduwa and to Ile-Ife as the place weof creation by Olodumare, the Supreme Being. The people recognize a Supreme Being (who is without gender), and a host of divinities (male and female), who administer cosmic principles to ensure harmony between the seen and unseen forces. Practices within Yoruba religion include sacrifices, offerings, prayers, songs and invocations. Belief in spirits, the ancestors and mysterious powers, also constitute components of Yoruba religion. A prime place is accorded ritual in Yoruba religion, for it is the venue for contact and interaction between the living, the dead, and the yet unborn. The Yoruba perceive death as a transition rather than an end. At death, the individual is translated into the abode of the ancestors and remains an unseen but viable member of the family. The Egungun (maskers) appear at funerals and other festive occasions to re-enforce this position. According to a Yoruba oral narrative, God, Olodumare, lowered a chain down at Ile-Ife and Oduduwa, the ancestor of the people descended to earth on this chain. The Yoruba worldview is rooted in holistic harmony; hence the principle of relatedness is the sine qua non of the people's social and religious reality.

Historically, the Yoruba were farmers, growing cocoa and yam as cash crops. In addition, the people also engaged in hunting, dyeing, art and crafts. Politically, power and authority is decentralized rather than vested in a singular centralized body. Each town/village is headed by a king (Oba), whose position is usually acquired through inheritance. Also, each king (Oba) is perceived as a direct descendant of the founding King (Oba) in each town/village. The king is usually assisted by a council of chiefs (male and female) and by other groups in the administration of the community. The Yoruba possess a rich cultural heritage as explicated in the people's songs, oral narratives (proverbs, stories and riddles), dances, festivals, pottery, weaving, beadwork and metal works. The contemporary Yoruba society is highly urbanized, westernized and industrialized. Christianity and Islam are presently the predominant religions among the Yoruba in Nigeria. Worthy of mention however is the rejuvenation of Yoruba religion within and outside Nigeria in the contemporary experience.

Theoretically, the Yoruba worldview promotes notions of "duality", binary categorization and complementary roles. Interdependency, mutuality and the need to maintain balance are espoused in human relation with nature. However, these prescribed principles in Yoruba ethos do not translate into static and immutable structures. Rather, these principles are attenuated by fluidity and dynamic negotiations at multi-layered levels. Hence absolutism is a strange phenomenon among the Yoruba (Olajubu, 2003). These principles reflect in the

observation that Yoruba social identities were and remain fundamentally relational, changing and situational. Also, these principles may be discerned in Yoruba gender relations, power structure and in relation with the ecosystem.

My aim in this paper is to interrogate the Yoruba ecosystem and gender construction. I intend to focus on a water bodies as examples of Yoruba modalities for environmental sustainability and ritual enactment. The link between waters and the female in Yoruba religious perception would be examined.

**Gender and Environment among the Yoruba**

Indigenous religions display remarkable intimacies with the ecosystem, which is often believed to be the source of sacred revelation. Indigenous religions maintain intimacy with the natural world because nature is perceived as a symbol, a cipher of something beyond itself (Sullivan, 1987). For indigenous religions to conceive of animal, plant, human and mineral bodies as separated by consciousness or personality is a category error. Moreover, everything was possessed of personality only differing in form. In addition, sustenance of nature is embedded in ritual and practices of indigenous religions hence care for the earth is woven into the people's governing systems, ethics and ethos. Resource extraction in many forms continues to pose serious challenges to the maintenance of this intimacy between indigenous religions and the ecosystem. A clear reflection of this challenge is the confrontation that often occurs between indigenous religions and the government of the state in which such a religion is practiced. The right of the government to harness nature for the well being of people in the state often beclouds the spiritual sensitivities attached to such natural elements (Olademo, 2008). This stance continues to engage the attention of civil right societies, environmental advocates and the indigenous religions worldwide. Again, nature is oftentimes the point of connection between practitioners of indigenous religions and their ancestors. Thus, landmarks in nature often constitute reservoirs of memories which are essential to the construction of identities of and by many indigenous peoples. This is true of adherents of indigenous religions as individuals and as collective groupings. The above observations hold true for the Yoruba who subscribe to the notion that nature is intertwined with human survival. Worthy of mention is the medicinal knowledge and utilization of herbs and roots for holistic healing by adherents of indigenous religions, which has been aptly described as "traditional

environmental knowledge" (<www.environment .harvard.edu> assessed on 12/04/09). Trends in medical research and practices show an increased preference and appreciation for the medicine and medical practice of indigenous peoples even among people of other faiths (Olajubu, 2005).

Moreover, some indigenous religions ascribe gender and anthropomorphic features to some elements of nature e.g. rivers, mountains, streams and water bodies (Olademo, 2009). Such delineation of gender is usually informed by the conviction that these natural elements are imbued with spiritual entities. Certain benefits coded in myths and stories are offered to explain the relevance of such spiritual entities. Prominent among these are cosmological myths and migration stories.

Gender classifications in nature by indigenous religions are oftentimes fluid and flexible. For example, whereas females are credited with the ability to bear children and males with the ability to fight wars, a female spiritual entity may be presented as being in charge of war and a male spiritual entity as providing children for the barren. For example, the Yoruba arch-divinity Obatala is (a god) credited with the ability to provide women (who drink the water in his shrine) the ability to bear children, whereas Oya, (goddess) is in charge of the wind (and whirlwind). In the Yoruba perception of the world, nature is interlocked with the supernatural and humans are dependent on both. The Supreme Being-Olodumare delegates power to the divinities that represent supreme authority in different areas of human endeavour e.g. war, morality, fecundity and healing. Some of these gods or goddesses manifest in natural phenomenon, hence there are river goddess, goddesses who reside in waterfalls, grooves and streams, gods in mountains and in thunder, to mention a few. Gender classification is therefore in reality among the Yoruba. Oftentimes, the designated gender of these spiritual deities prescribes rituals, taboos, characteristics and favourite foods ascribed to such deities. Deities in Yoruba religion include gods – Ogun (iron) Sango (thunder) Obatala (fecundity and healing) Orunmila (wisdom and custodian of Ifa) and goddesses – Oya (wind), Osun (fertility and prosperity), Oba (fertility) and Yemoja (fertility and industry). Gender classification among the Yoruba consequently exhibit a strong link to the people's cosmological myth which posits that Olodumare designated deities and humans as male and female with specific portfolio for each or them. Again, the notion of the interconnectedness between humans and nature is linked to Yoruba cosmological myth. In both situations noted above, a certain amount of fluidity and dynamism may be noted (Olajubu, 2003).

**Water and Waterfall in Yorubaland**

Water is first a significant element of the universal order. Water is essential to the life of plants, animals and humans alike and may be described as the life-bearing force, which is often bound up with divine powers. Water, in all religious traditions – from the most ancient to the most contemporary, in indigenous and the world famous religions – has been noted to transcend its scientific explanations. Most disciplines such as theology, cultural anthropology and history of religions conceive of water as a sacred element and a symbol of cosmic harmony. Its primordial existence is entrenched in most religious mythologies as it affects nature and human life.

The Yoruba interact with water in different ways, but essentially as a natural element which no one can do without; hence the Yoruba say *omi l'buwe, omi l'abumu, enikan ki b'omi s'ota*. In addition, water is symbolized in a variety of contexts among the Yoruba: mythical, mystical, natural and metaphorical. The mythical aspects of water may be perceived in Yoruba cosmological accounts where water preceded everything else. Mystically, water is seen as the habitation of spiritual entities especially goddesses, at the same time, water as a natural element satisfies human domestic needs. Metaphorically, the liquid contents of some plants and fruits such as coconuts and oranges are employed for ritual and medicinal purposes. To the Yoruba therefore, water is a basic element on which all life depends. No life could survive without water as is apparent in a popular recitation of the Yoruba.

| | |
|---|---|
| A se gbere w' aye | The one who comes to the world |
| Omi lo maa gbaa | Will be received by water |
| Arinrin gbere lo s'ode orun | The one who slowly goes back to heaven |
| Omi lo maa gba | Will be received by water |
| Omi l'abuwe | It is water we bath with |
| Omi l'abu mu | It is water that we drink |
| Enikan kii b'omi s'ota | No one makes enmity with water |

Source: *Interview with Chief Mrs. Adedoyin Faniyi, a priestess of Osun Osogbo on 24/03/09*

The Yoruba value water because of its social as well as ritual use. It is employed for domestic purposes and is a symbol in ritual activities. The intrinsic and utilitarian values of water are thus fused in the Yoruba experience.

Waterfalls constitute one of the manifestations of water bodies in human living experiences and may be found in many communities worldwide. Waterfalls are also known as cataracts and are usually formed by a sudden unsupported drop in a stream. It is formed when the stream course is interrupted as when a stream passes over a layer of hard rock to an area of softer and therefore more easily eroded rock. This causes the flow of water to drop vertically or nearly so. Waterfalls of small height or lesser steepness are called cascades. Normally as a stream grows older, the waterfall, by undercutting and the erosion of the waterfall edge, moves upstream and loses height until it eventually becomes a series of rapids and finally disappears. In contrast to this explanation for the origin of waterfalls, the Yoruba proffer a combination of the mythical, mystical and natural explanations for the existence and relevance of a waterfall. Consequently, the Yoruba perception of waterfalls is a product of the robust appreciation of water among the people. For instance, migration stories in some communities are interlocked with the discovery and appreciation of water bodies. In other words, a people's memories and identity constructions may be profoundly influenced by water bodies. Host communities to waterfalls also proffer explanations for the existence and relevance of waterfalls in their territory. Examples of water bodies in Yorubaland include Ikogosi waters (Ekiti state), the Erin-Ijesa waterfalls (Osun state) and Owu falls (Kwara State). For the purpose of this paper, I will examine the Erin-Ijesa waterfall and the Ikogosi warm springs.

**Erin-Ijesa Waterfall**

Waterfalls are often linked with the migration stories and identity construction of host communities and the Erin-Ijesa waterfall is no exception. Moreover, the Erin-Ijesa waterfall is a paradigm for gender and power relation in the community. I visited the waterfall twice between December 2004 and February 2009 and the waterfall was an awesome sight to behold. Two migration/origin narratives were supplied by resource persons in the town (Interview with Pa Jeremiah Fatoki, aged 77 at his residence in Erin-Ijesa on 20th December 2004). One, is the narrative which submits that the people of Erin-Ijesa first settled at a place called Igbo-Oja but had to leave the site due to lack of water. The people needed water for agricultural and ritual purposes mainly. The group migrated onward but after some time a hunter left the entourage to hunt for game on a hill and there he found the waterfall. The hunter immediately abandoned the hunting expedition and came down the hill to report his findings.

In reporting his find, he referred to the waterfall as *olumirin* meaning "another god". His reaction to the waterfall was a consequence of the awe-inspiring effect of the sight on him. The king ordered that his entourage should proceed to the waterfall and on sighting it decided the people were to settle there. The waterfall guaranteed food security and defense from potential enemies to the people of Erin-Ijesa. The waterfall also became the focus of ritual activities in the community. The second migration/origin narrative states that the founder of Erin-Ijesa was Akinla, a descendant of Oduduwa. It was said that at the death of Oduduwa, there was a misunderstanding among the children as to who should inherit the "Iro"-a very important traditional god. There was great jealousy among the children and none was prepared to concede to any of the others. Worship was usually accorded the Iro every year with much celebration and festivity as the god was said to be in charge of prosperity in the community. Akinla was a princess and heiress of Oduduwa. As the controversy on the Iro continued, Akinla quietly took the Iro and with some followers and her siblings migrated to the present site of Erin-Ijesa. Because the migration from Ile-Ife to Erin-Ijesa lasted sixteen days, the prefix "Erin" which was derived from *Erindinlogun* meaning "sixteen" was added to Ijesa to arrive at the name of the community till date. The choice of the site of settlement by Akinla and her entourage was informed by two main reasons. One, the hilltop landscape of the site provided a safe haven for hiding in case of enemy attack and two; the waterfall provided a source of steady supply of water in the community. Akinla is said to have discovered the waterfall personally before ordering the people to settle there. The discovery of the Erin-Ijesa waterfall has been dated around 1140 A. D (Interview with Pa Fatoki).

As envisaged by the Erin-Ijesa people, the waterfall continues to fulfill domestic, agricultural and ritual purposes. In addition the waterfall has become a crucial component of the identity construction of the Erin-Ijesa community and of individual indigenes as well. Also, commercial concern on tourism has added an international dimension to the influence of the Erin-Ijesa waterfall in Nigeria. For instance, the Osun State government has commissioned a relaxation center at the site of the waterfall.

When the waterfall was discovered, the people offered mythical and mystical explanations for its existence. These explanations were significantly influenced by the philosophy guiding the Yoruba worldview on water as a primordial universal element. The waterfall was perceived as the abode of a goddess who bestows prosperity, fertility and health to the people. Ritual

prescriptions were put in place to ensure and sustain the right spiritual atmosphere to guarantee blessings from the goddess. These included sacrifices, offerings, songs, dances and invocations. These practices could occur at both the individual and communal levels. Hence, individuals could approach the goddess for success in business or gifts of children without recourse to any group. Nonetheless, annual celebrations that involved the entire community were mandatory to express gratitude to the goddess and seek for fresh favours. A priest officiated and served as the intermediary between the people and the goddess. Though this deity was female she had a male cultic functionary.

Erin-Ijesa waterfall is currently the sole source of pipe borne water for the community; consequently, the people enjoy steady supply of clean water in all seasons. However, the Erin-Ijesa community no longer views the waterfall as the abode of any goddess, neither is any ritual enacted for the goddess anymore. The annual festival remains but as a cultural event rather than a religious occasion. The utilitarian benefits of the waterfall are now emphasized and continuously developed.

**Ikogosi Warm Springs**

The Ikogosi warm spring comprises of warm and cold springs flowing side by side but each retaining its temperatures. Many narratives are given to explicate the origin of the Ikogosi Warm Springs. A very popular one submits that the warm and cold springs were actually two wives in a polygamous family. The senor wife was hot tempered while the junior wife was cool tempered. Their family experienced constant quarrels and tension which after sometime reached a climax with the mighty clash between them. It was on this occasion that the hot-tempered senior wife transformed into the warm spring whereas the cool-tempered junior wife became the cold spring. It is further submitted that the husband became the hills surrounding the spring (Interview with Mr. Muraino Ahmed, aged 62, an elder of the town). It is not common to touch two springs running along each other yet each maintains a different thermal identity. The springs are objects of worship by the people because of the Yoruba conviction of the intrinsic quality of water, which include fertility and healing qualities.

The people believe that the water from these springs is imbued with healing qualities, especially ailments like guinea worm and pains in the bone. In addition, residents of surrounding villages use the spring water for their battery instead of the bottled battery water. Furthermore, the Ikogosi Water Spring is equipped with some facilities to encourage patronage. Examples are the VIP state chalets, a conference hall, a restaurant and a swimming pool. The springs

have also been selected as one of the pilot eco-tourism projects in Nigeria; the others are located in Delta and Cross River states (www.nigeriaonline.org).

**Water Bodies and Yoruba Gender Construct**

Narratives on the discovery and relevance of the Erin-Ijesa waterfall emphasis' the importance of water as a source of life affirming experiences, which includes agriculture and health. The Yoruba ethos on water is reinforced by the people's conviction that water is a potent symbol of fecundity. This conviction is manifested in Yoruba classification of water bodies as abode of goddesses. The first migration narrative on the discovery of this waterfall emphasis' that fertility was one of the considerations that convinced the Erin-Ijesa people to settle in the present location of the town. Fertility is an attribute of the female principle manifesting either as procreation or harvest of agricultural products among African peoples. Indeed the concept of fertility among the Yoruba could be described as portraying all-round abundance for individual or a community's lived experience. These will include procreation, bumper harvest of crops, prosperity, progress in business, good health and good luck. Such an understating would be described as one with "Ori rere." The second migration story is of special interest as it concerns gender stratification among the Yoruba. A princess leads a delegation from Ile-Ife to discover the Erin-Ijesa waterfall. Invariably, leadership roles were not taboo for women in traditional Yoruba community though fertility was one of the factors that convinced Akinla that the people should settle at the surroundings of the waterfall.

**Water Bodies, Yoruba Female Principles and Sustainable Development**

The worship of water bodies by the Yoruba results in preservation and sustenance of the environment. Thus, the Yoruba effort at sustainability is closely knitted with religious and ethical obligations. The Yoruba conceive of the environment as sacred and consequently approach it with respect, love and harmony. Plants, trees, water bodies and animals, have names, attributes, cognomen and special features in Yoruba philosophy. Nature is approached and tapped into at specific times and with specific methodology. In addition, social structures like taboo and non-verbal language are in place when dealing with nature in Yorubaland. Hunters for instance would not kill an animal under certain condition; neither would medicine-persons cut certain plants at some times of the day.

The Yoruba gender construct regard the female principle as *Iya, abo, or obinrin* i.e. mother, female or woman, representing coolness, mellowness and softness (Olademo, 2009). Also, the Yoruba woman is at the forefront of the entrenchment of religious and ethical provisions in the community. Women have been identified as the sustaining factor in Yoruba religion (Olajubu, 2003). The domestic plane constitutes the primary base for ethical learning and is a domain for the women folk. Further, provisions of nature can best be protected with the right education for women on the preservation of the environment. Education is the most potent tool to improve the way people treat nature. Examples of these are trees (fire wood) and rivers, streams and springs (water for domestic use), which could be utilized correctly with appropriate education. Thus pollution, natural disasters, and environmental degradation are renounced in many genres of Yoruba religion, especially the Ifa Corpus, examples are found in the Ejiogbe chapter of Ifa (Interview with Chief Adedoyin Faniyi 11/09/09).

**Conclusion**

In this paper, an attempt was made to examine gender and the environment from the perspective of Yoruba religion. The implications of this perspective for sustainable development were also highlighted. From the preceding discourse, it is evident that the Yoruba female principle occupies a significant place in any consideration of the sustenance of the environment. Education was recommended as the potent tool to facilitate correct attitudes to the preservation of the environment. Examples of religious injunctions were given from the Ifa Corpus among the Yoruba.

In sum, it may be asserted that the enterprise of sustainable development would need to reckon with women and their salient contributions if it is to be successful among the Yoruba. Furthermore, it is also clear from the discussion that religion provides ethical and religious obligations that ensure that the environment is kept clean and not abused.

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**Some relevant verses of the Ejiogbe chapter of Ifa to Environmental sustainability.**

| | |
|---|---|
| Odundun a b'ewe peke peke | odundun with fresh leaves |
| A difa fun 'gbo | did divination for the bush |
| Igbo sunkun p'oun o leti | who was weeping that it had no ear |
| Teteregun a b'irin ese poriki poriki | the thorn plant walks with heavy steps |
| A difa f'oke | did divination for the hill/mountain |
| T'insunkun p'ohun o lese | who was weeping that it had no base |
| E wo eti adete, e wo odundun | observe the ears of the deaf and odundun |
| Ogbogba ni won se | they are equal |
| A difa f'odo | did divination for the river/stream |
| Ti nsunkun p'oun o l'oju pon | who was weeping that it had no fetching spot |

# HISTORICISM AND POLITICAL DIALECTICS IN OSOFISAN'S *NKRUMAH NI...AFRICA-NI* AND ROTIMI'S *OVONRAMWEN NOGBAISI*

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**Abstract**

*History is a major source of dramatic exposition among African playwrights. Most critics of historically based dramatic texts have the tendency to assess these texts as mere documentation of the past rather than find dialectical means of exploring culture to advance a futuristic political course. This paper assesses history as a mere tool for playwrights to dialectically espouse on contemporary political issues. The paper adopts "inflection device", which is a process of transmuting historical events to forecast political reforms. Osofisan's Nkrumah-ni...Africa-ni and Rotimi's Ovonramwen Nogbaisi are used to explicate the playwrights political visions. The two have divergent ways of handling history. While Osofisan inverts the elitist/recorded version of the historical events surrounding Nkrumah's fall to accentuate the suppressed populist version, Rotimi depends much on the popularized version of the dethronement of the Oba of Benin and the collapse of the Kingdom, which belongs to a coterie.*

## Introduction

Playwrights in Africa have explored historical antecedents by way of adoption or adaptation for different artistic purposes and variance. The objective of each playwright determines the variance in his reference, selection or presentation of historical antecedents, which in turn is the by-product of commitment. Commitment is a Siamese twin to African literature; hence every playwright is committed to his society in a way. It is in this regard that Osofisan (2001) has observed that:

> ...in Africa debate between pure aestheticism and socio-political commitment is largely mute. Such is the force of history on our environment that those of us who come into or shrine of art, either as Acolytes predetermine space. The dominant and seductive tradition is of an art fully entrenched within the survival rituals of the community, consciously and ideologically catalytic (p. 87).

Invariably, the type of commitment a writer has inspires his handling of history and determines his choice of historical antecedents. For instance Soyinka's *The Strong Breed* is a piece aimed at straightening the misconceived notion of offering oneself as "sacrifice" for communal survival and interests as barbaric. He may not necessarily wish to justify human sacrifice but may just attempt to explain the rationale behind the traditional practice vis-à-vis the universal concept of martyrdom. This stand is reiterated in *Death and the King's Horseman.* The same historical antecedent, adopted by Soyinka in *The strong Breed*, is adapted by Osofisan in *No More the Wasted Breed* with a divergence. The latter's emphasis is to query the use of the poor as carriers of the communal burden instead of applying an open ended system of everybody standing an equal chance of a burden bearer.

This paper attempts a comparative analysis of Osofisan's *Nkruma-ni... Africa-ni* and Rotimi's *Ovonramwen Nobgaisi,* in order to establish the approaches of the two playwrights to historical antecedents in Africa. The choice of the two texts is informed by the political nature of the plays and the turbulence that characterizes events in the plays on the one hand and the disposition of the key actors, Nkrumah and Ovonramwen to hold onto power, in spite of the repercussions on their people on the other hand. The writers' handling of the historical incidents is also worthy of note as their approaches are preemptive of their types of commitment.

The paper adopts the Fabulous theatre's 'inferential device' to analyze the writer's concept of the past and its implication on the present and the future (Abubakar, 2006, p. 159-160). This framework is an aesthetic process characterized by inverting the substance, structure and nature of a historical experience with the aim of transmutation. It has a base in the African folktale aesthetics, where the artist is not only inventive in his display of skills but is availed the freedom to update, restructure and reinvent the story to avoid boredom, present new insights, and ensure relevance, (Finnegan, 1976). The transmission and interpretation of historical events in pre-industrial African societies were the responsibilities of the aged in each household, but the wider range coverage is the reserve of the artists, who were referred to as translators, communicators and the interpreters before the art of speech, (Osofisan, 2001). The infection device has five purposes:

(i) identify the existence of two historical versions, the elitist and the suppressed version of the poor,

(ii) de-mystify the powers of and mysteries about the elite,
(iii) encourage the value of upholding social justice which characterizes Africa's power system,
(iv) ensure equity and peace through justice,
(v) use materials in the past as veritable tools for a better future.

**Inflection Device in Osofisan's *Nkrumah-ni...Africa-ni***

In *Nkrumah-ni ... Africa-ni,* an attempt is made to review the history of a political giant in Africa, Ghana's first President, Kwame Nkrumah. In the play, Osofisan provides an alternative to the esteemed and highly philosophical view of the elite about Nkrumah as a political theorist and a leader of the first independent African nation. Historians base their judgment on his struggle to attain unity for politically and economically independent African nations under Pan African Movement (Nwechue, 1991). Viewing Osofisan's approach inflectionally one observes that he juxtaposes the profile of the highly ideological Nkrumah with the real perception and comprehension of his policies by the masses, for which he claimed to have worked. The play reveals a great disparity in the ideals of Nkrumah and the lives of Ghanaians whose hope in the dividends of self-rule had been heightened. Obviously while revolutionary leaders in other African countries savoured the utopian world built in the speeches of Nkrumah, the opposition at home portrayed him as arrogant. The masses were confused by the contradictions in his promises of a prosperous Ghana and self-reliant Africa, on the one hand, and the poverty inflicted by his politico-economic policies on the other hand.

To accentuate the masses' true feelings about the self-acclaimed hero, Osofisan creates in the Jesters opposing voices to those of Nkrumah's accomplices, Sekou Toure and Cabral. The jesters intercept the discussions of the key actors in the re-enacted history of Nkrumah. The masks (won by the jesters) emphasize the facelessness of Nkrumah's regime and its inability to identify the desires of the mammoth crowd that waits endlessly for the manifestation of his promises into concrete actions. The jesters sing:

> *... the whispers gain ascendancy now over the speech, and over the anthem, as a ragged mob, all masked, comes in onto the speakers' platform on the opposite side of the stage, with placards, drums and other make –shift instruments. They are the JESTERS. They take position singing:*

- Nkrumah, how art thou fallen!
You who exalted yourself above God-
- Nkrumah, how art thou fallen!
You the false friend of the poor-
- Nkrumah, how art thou fallen!
Who taxed the poor to build mansions-
- Nkrumah, how art thou fallen!
Who threw the innocent into dungeons-
- Nkrumah, how art thou fallen!...
(Osofisan, 1994).

Nkrumah's self-estimation, the views of his comrades/admirers and political adversaries, dominates historical accounts on Nkrumah's stewardship. The masses' reactions are hardly projected except for reports of demonstrations by a few people in support of the military. The general feeling of dissatisfaction with Nkrumah's regime, that grew with his anti-people policies, were only viewed from the vantage points of foreign and internal opposition groups and not from the perspective of the people at the receiving end. The distance between Nkrumah and the masses, resulting in the lack of accurate feedback from the masses, was the bane of his government. Also available historical analyses fell short of adequate information about the common people's perception of their leader.

This overt or covert omission gives Nkrumah the dual personages of an African hero (outside Ghana) and a villain (among Ghanaian masses). His misreading of this class of people's reactions to his policies made him nurse the hope of coming back to power. It was this wrong assessment that informed the endless hope for a massive revolt against the military junta, which kept him optimistic in his days in exile. However, it was the assessment of the people that was important because the military junta had capitalized on this general opinion to oust him. It is ironical that the people, on whose behalf Nkrumah stepped on the toes of the chiefs and the intellectual (Nwechue, 1991), did not support his vision; this was because the vision was marred by rhetorics and impracticable economic policies that worsened the economic conditions of the ordinary citizens.

The economic woes suffered by the poor, under Nkrumah, are projected through the Jesters. Their intermittent intrusion into the sequence of events in the re-enacted story of Nkrumah in *Nkrumah-ni... Africa-ni* gives vent to the poor

who are originally not represented in the story. The Jesters interject the pla with pungent comments, which amplify the predicaments of the masses unde the dreamy President. These provide an alternative to Nkrumah's wron judgment on public opinion about his regime; it also gives a divergent view to h admirers' high rating of his political philosophy and approach to leadershi More so, through the comments, the weaknesses of Nkrumah, as someone wh easily yielded to flattery and abhorred criticism, (Nwechue, 1991), ar exemplified.

> Nkrumah: Yes! History has given us no choice. For, in an African country, the accumulation of large capital by individuals is impossible by honest means. Thus only the government is able to raise the money for the kind of funds you require for development project. That's why we African countries have no choice but to take to the socialist model...
>
> Jester: But suppose you are wrong? Suppose it requires the fire of that individual greed to spark off the development of a country? Suppose it is true that people only work at their maximum energy and competence, when they see the possibility of personal gain?
>
> Nkrumah: That is a cynical view of humanity... so now if you' II please excuse me-
>
> Jester: (*insisting*) what are you willing to bet that you're wrong, sir? That it won't be long before you're sent packing again from the castle in Accra.
>
> Nkrumah: (*furious*)-I'll not answer such a question! (*Standing*). I'm sorry, but I won't continue this interview... (Osofisan, 1994).

The above quotation leaves one in doubt as to whether Osofisan speaks through the Jester or not. Nkrumah's lack of confidence in the people he rules, a projected in the play, and his outright condemnation of Africans as dishonest are indications of the yawning gap between Nkrumah and the masses. His rhetorica expositions lack the desired practicality that will translate into prosperity an

comfort for the common people. Osofisan's emphasis on a contextualized dialectics, which Nkrumah is far from attaining, is projected in the playwright's evaluation of Nkrumah. He is much more engrossed in his dream of uniting Africa while the domestic economic stand was still feeble. In addition, many African countries were still battling with political independence. The move to adopt a similar coercive union in Africa as in the case of the defunct Union of Soviet Socialist Republic (Bilocerkowycz, 1990) by Nkrumah failed because he did not carefully study his people and their needs. He had little knowledge of the people he ruled: their priorities, hopes, fears and perception of good governance.

Osofisan's down-to-earth portrayal of the relationship between Nkrumah and the Ghanaians shows hostility and stern opposition to a saviour turned into a villain. The people's reactions reveal a rejection of misplaced economic policies and a leader, who is ignorant of his constituency. Even with Nkrumah's death, the people still remain resolute about their expression of disappointment, contrary to the general expectation of mourning in Ghana. Osofisan dedicates a whole scene to this reaction, in order to drive home the point that the sense of disillusionment is so intense that not even at Nkrumah's death did the Ghanaians spare him and his unpopular regime.

> Nyamikeh: You're Ghanaians, aren't you?
> Jester: What's that got to do with anything?
> Nyamikeh: Oh you come here and jeer and laugh because you say Nkrumah made life hard for the common people... But what did you do when the new messiahs sold off the public companies....
> Jester: A regime does not become good, simply because its Successor proves to be worse. (Osofisan, 1994).

Nkrumah's failure as a leader had nothing to do with his vision but his approach to its attainment. People were ignorant about his policies because the policies were not based on the economic realities in the country. The contradictions that existed between his policies and the Ghanaian superstructure actually led to the failure of Nkrumah's vision and the collapse of his regime. This fact is established by the perception of the jesters. While the oppositions' reactions (local and foreign) are politically motivated, the masses denounce a regime that dashes their economic aspirations and threatens social stability. To the political class, it is a matter of power-shift for which the opposition stands. To the common people, however it is another battle for

survival after the patriotic struggle to oust the colonizers. It is made mor difficult because of the personality involved (the independence hero); yet th spirit of collective survival overrides other sentiments.

The outspoken disposition of the masses in the play is another aspect tha projects Osofisan's adoption of the oral performance formula of free intrusio into the sequence of a story in order to pass comments that show consent o disagreement. The Jesters are not part of the Nkrumah play, as planned by hi loyalists. They are the "integrated" audience, a concept that describes the involvement of the theatre audience as different from "integral" or "textual audience in a performance. Osofisan's handling of Nkrumah's history as a Ghanaian leader is completely different from the elitist version that sidelines the masses' view about the celebrated hero. The grand design to 'mask' the masses in the unfolding drama of Nkrumah's self-assessment and his disciples condemnation of the forces that oust their mentor from office is foiled through the freedom provided to the jesters (to interject). The masses assessment (and Osofisan's too) of the Nkrumah reign and the statesman's vision of economic growth are ironical. This contradiction characterizes the idealist concept of revolution. Though Nkrumah's mistakes are genuine, they are not excusable. The stereotype universal doctrines adopted by pseudo-revolutionists in Africa fail to take cognizance of the context in which it will operate.

**Inflection Device in Rotimi's Ovonramwen Nogbaisi**

The historical account of the fall of the Benin Empire began before the reign of Oba Ovonramwen but it reaches the climax during his time. Both external and internal forces were responsible for this. The intertwine interest of trade by the British and the clamour for political freedom by the colonies under the Benin empire put Ovonramwen under pressure. This tension is compounded by division in the Oba's council. The fall of Ovonramwen and Benin according to historians was essentially a result of betrayal by the feuding forces in the empire Omolewa (1986) writes:

> The Itshekiri also assisted the British against their arch enemy, Oba Ovonramwen of Benin. A contemporary report stated that after the Benin expedition 'the Itshekiri chiefs returned to their homes to tell the good news of the fall of Benin City which they had seen with their own eyes'

In the same vein, Rotimi, in *Ovonramwen Nogbaisi*, emphasizes the effect of the intra wrangling between the powers within and without the empire and the inability of Ovonramwen to manage the crises. The Oba's stubborn nature gives rise to divisions among the chiefs while his highhandedness is evidently one of the main reasons for the growing rebellion in the empire. Ovonramwen, like Nkrumah, may have a vision for his people but the realization of this is hampered by his crude method and refusal to yield to the voices of wisdom around him. His insistence on not signing a trade treaty to protect the goods produced in his territory is plausible but his extortion of money from the traders as tax is paradoxical. As an autocratic leader, Ovonramwen treats issues concerning the state as if they were personal. He is blurred by his ego to pre-empt the consequences of facing numerous oppositions at a time. He is portrayed to lack the diplomacy and strategy to manage crises.

> Ovonramwen: What have you decided?
> Ijekiri Traders: We are still begging Your Highness to deal lightly with our people.
> Ovonramwen: I deal lightly with men no more. Indeed, harshly now have I learned that if like soap you try to make men clean, like soap you will dwindle in the act....If you want the ban on trade removed, your Chiefs must meet my terms. Ijekiriland is still of the Benin Empire. In matters of trade, you listen to me and not the whiteman....Besides your people must pay due cost for the losses in trade which your greed has caused Benin these past months (Rotimi, 1974).

Rotimi also creates a jester possibly to represent the masses. However the lone voice nature of the court jester and the fact that he is more conversant with the court politics and seems to be more concerned with the Oba's welfare take off the expected sting in his comments, if compared to the jesters in Osofisan's *Nkrumah-ni... Africa-ni.* Uzazakpo, the jester represents the voice of wisdom in the palace. In the traditional setting, the court poets and jesters serve as the link between the palace and the people. They express the feelings of the common people and sound the note of caution where necessary. Thus the role of Uzazakpo in the court of Ovonramwen is not different though the desired impact might not have been felt, which confirms Ovonramwem as a heady person. On one of the occasions, the jester comments

> Uzazakpo: Bold one, that is not the way to go about it. (*Ovonramwen disregards him*).... In my madness, I served Oba Adolo, your father. That same madness has helped me keep my body in this palace as jester under your full moon. If you will listen to me and my madness, I will tell you frankly that the way you talked to the chiefs was not the right way. (Rotimi, 1974).

The yawning gap between the masses and the palace is depicted in how Ovonremwan relates with his subjects. The lord/servant relationship in the palace extends beyond the common people to the chiefs who find it extremely challenging to express their views on issues concerning the state. The authoritarian nature of the Oba isolates him during the troubled period because the Chiefs were wary of giving honest advice.

> Ologbosere: The Oba is testing us! Take my word, brothers. The python, seeking assurance of adulthood measures his length with the palm tree. We are the palm tree. The Oba, the python. He is only testing the height of our loyalty to the empire, my brothers. When our own Chiefs murdered his personal adviser, ...did the Oba himself not reply the murderers with the ruthlessness of swift vengeance? We did nothing. In shock, we found company in silence, and the Oba thought we meant ill towards him(Rotimi, 1974).

The interplay of power in the palace and the external crises see the Oba's reign preoccupied with antics by the personality involved rather than pay attention to state matters. The invasion of Benin during Ague festival (Rotimi 1974), through the assistance rendered to the invaders by subjects of the territory is the climax of the desecration of the land which began with the Oba's headiness and lack of consideration for his people's welfare. The dethronement of Ovonramwen will definitely be accepted with great ovation in spite of the fact that foreigners have come to take over. The jester, however, remains loyal to the end and this justifies our initial claim that the continuous caution sounded by him may be born out of this rather than any amplification of the masses pains or feelings.

Thus the historical version in Rotimi's *Ovonramwen Nogbaisi* is not farfetched from the Eurocentric version that will want to justify the

dethronement of the Oba by the British. Considering the power regulatory system in most African traditions it would ordinarily be difficult for a king, without external backing, to wield so much power as Ovonremwan, especially among powerful Chiefs, without stern opposition. And for the Chiefs to have taken laws into their hands, they would be sure of the masses support, which is not reflected at all. In situations like this, the masses will react no matter how mild. Therefore the alignment of the whites with the masses to invade Benin is so sudden and this leaves a vacuum. It is also noteworthy that the effect of Ovonramwen's rule is hardly portrayed except for the swift appearance and disappearance of the Itshekiri traders. The determination of affairs solely in the palace depicts the Benin people as robots; this idea is engendered by the cautious disposition of the Chiefs. They always ascertain the stand of Ovonramwen before giving their opinion about an issue as important as that of the security of the land. It seems like a deliberate move by Rotimi to give a dog a bad name in order to hang it.

The Benin massacre is also presented as if the incursion into the land at a prohibited period is not an affront, most especially with boxes which contents are unknown. The voice of wisdom sounding caution to Ovonramwen comes rather too late because the earlier decisions of the Oba have stirred enough trouble for him to now back out. The Oba is sandwiched between the tradition and the destructive power of the white men. The desecration of the land during the Ague festival invites the wrath of the gods and resisting the white man is another serious problem which makes the fall of Ovonramwem inevitable. The tragic picture painted in the play is enhanced by the capture of the Oba and the despiteful way he is treated. This could have been born out of the strict adherence of the playwright to historical events rather than transmuting them to fit into the present situation of the reader/audience or be futuristic. The pessimistic note which ends the play is the result of lack of inversion, which presents an already predictable terrain reminiscent of the tragic ends of such cultural clash. The apologetic manner in which the playwright portrays the Oba's opposition to the whites' exploitative designs leaves little to be desired in spite of the latter's effort to at least protect the trade interest in his territory. Rotimi either by omission or commission plays down the daring attitude of Consul-General Philips whose decision to enter Benin lacks the backing of his masters and contravenes the Benin custom. This outright disrespect for the law and the inhuman manner with which materialism are pursued constitute the major friction in the territory. The colonialist desperate moves to exploit no

doubt, amplify the existing rivalry in the domain. The highhandedness of the Oba on the weaker groups can be seen as a reaction to the apparent disloyalty, which is linkable to the activities of the white people in the territory. Rotimi's 'extreme' loyalty to the elitist version of the Benin crises drowns the voices of the masses, as if they were not actors in the conflict. One can not dispute the literary ingenuity of the playwright in structuring and ensuring aesthetic quality but he has definitely deviated from the art of storytelling indigenous to Africa.

Considering the goal set out to achieve in the 'inferential device', the playwright fails to de-mystify the colonial power and ensure social justice as entrenched in the African tradition. The play text only maintains the status-quo without recourse to contemporary or futuristic motives. This reactionary disposition deprives the text of the quality of dynamism which characterize the art of a story teller in Africa, who constantly mediates the transmitted version through transmutation (by updating and restructuring to attain contemporary goals). The relevance of a story as an art is not in its strict adherence to facts but in its import on the audience. The consideration for the audience takes a primary place in a live performance where reactions are instant. Thus to project a hopeless situation that characterize a historical event calls for empathy from the audience, which is remote to African aesthetics.

## Conclusion

The paper assessed the adoption or adaptation of historical events as handled by Osofisan and Rotimi in *Nkrumah-ni Africa-ni and Ovonramwen Nogbaisi* respectively. Each playwright's processing of history is found to be divergent. While Osofisan adapts the Ghanaian experience with Nkrumah to show his commitment to a mass driven change, Rotimi adopts the history of Ovonramwen's fall as Oba of Benin and the British take-over to paint the gloomy picture of pain and subjugation of the helpless poor. This conclusion is drawn via the use of "inflection device", which perceives historical materials in a work of art as a veritable tool for futuristic postulations rather than a duplication of the recorded/elitist version of such materials. This stand is strengthened by the African traditional aesthetic that conceives a performance of a tale as a product of exigencies of the time of performance rather than faithfulness to the popularized version. Thus different versions of the same story are told to different audience, depending on the aspect of the story relevant to the time and the given audience. While Rotimi can be described as moralistic, Osofisan is focused on inspiring the weak. Both are committed to enlightening their readers but with diverse goals in mind.

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# TOWARDS A PRAGMA-INTEGRATIVE APPROACH TO THE TEACHING OF 'USE OF ENGLISH' IN NIGERIA: A CASE FOR HUMAN DEVELOPMENT

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## Abstract

*Different language teaching methods have evolved over the years with a view to enhancing communicative competence especially in English. But despite the merits of these methods, there has been a noticeable decline in the linguistic competence of Nigerian students in recent years, especially at the University level. The introduction of the Communication Skills Project (COMSKIP) and the emphasis on the Use of English programme for all fresh undergraduates seem not to have succeeded in addressing the situation. One major reason for this trend is the lack of appropriate methodology in English language pedagogy. This paper makes a case for the adoption of the pragma-integrative approach for English language teaching in Nigeria. This method fuses the merits of the existing teaching methods with the application of ICT. Beyond literacy, it is argued, functional computeracy, which the pragma-integrative approach engenders, is crucial to the enhancement of Nigerians' communicative competence in English and the promotion of human development imperative that accrues from functional communication in a global medium.*

## Introduction

Of the thousands of languages (estimated between four thousand and five thousand) in the world, English is the most prominent, the most important, and indeed, the world's most widely used language (Obi-Okoye 2002, p. 46). The emergence of English as the bride of the world is predicated on a number of factors which are political, social, commercial, religious, technological and educational in nature. Education, which Good (cited in Lawal 2004, p. 34) defines as "the art of making available to each generation the organized knowledge of the past, the process by which the tradition and culture of a society are passed on from one generation to another, from the old ones to the young ones," certainly plays a crucial role in the globalisation of English. The English language is so pervasive that the continued survival of Nigeria as a nation depends on it as the sole language of vertical integration, national unity and nationism/ nationalism (Adedimeji, 2004).

The quest for improved communicative competence in Use of English in Nigeria, especially at the higher education level, had led to the emergence of the Communicative Skills Project (COMSKIP/COMSKIPTECH) for universities, polytechnics and colleges of education in the 1980s. Indeed, English for Specific Purposes (ESP), the programme under which COMSKIP operates, evolved in Europe in the 1960s to address the immediate communicative needs of students of English as a Second Language (ESL) (Oluikpe, 1993, p. 4; Adedimeji, 1999, p. 16). In the university system especially COMSKIP or ESP programme consists of the Use of English courses which are implemented on freshmen for two semesters.

But despite the lofty goals of ESP/COMSKIP or Use of English regarding the enhancement of communicative competence and its features as a "goal-oriented" (Ajileye, 2007, p. 135) and "learner-centred" (Babatunde, 2001, p. 67) programme, concerns have been expressed on students' receding communicative competence and their concomitant poor performance in English language generally and Use of English courses specifically. Scholars like Olajide (1991; 2003) Enuesike (1993), Joshua (2000), Odebunmi (2001), among others have decried students' poor performance in the Use of English in Nigerian universities. Ihebuzor (1991, p. 12) especially notes that despite the "very prominent and special role the ESL plays in the Nigerian tertiary institutions, most Nigerian undergraduates have problems contending with the language at all linguistic levels." Though there are several factors attributable to the noted 'poor performance' among the triad of teacher, material and learner, this paper is intended to address the teacher-component, which constitutes the core in the triangle of the Use of English programme.

As fine feathers make fine birds, it is observed that when teachers fine-tune themselves and their methods, good results will be achieved in English Language Teaching (ELT). In other words, we contend that teachers also have problems and that they contribute their quota to the noticeable diminishing returns in students' Use of English. This paper thus argues for a pragma-integrative approach which embraces the deployment of many methods as required and deemed appropriate for any aspect of language study. The approach also includes the application of Internet and Computer Technology (ICT), involving the Computer-Assisted Language Instruction (CALI) and Computer-Assisted Language Learning (CALL), considered necessary for the 'Use of English' teaching in the 21st century in which rapid changes are manifest in all strata of life. The focus of the paper is on the Use of English teachers

mastering their art (as a major component of ESP) so that ELT would "create the right atmosphere and provide the right motivation for learning to take place" (Jimoh, 2004, p. 6). The mastery of language is ultimately viewed as a decisive step towards the development of the enormous human capital that Nigeria has, which will galvanise the country to greater heights of development.

**Teaching and Language Teaching**

Teaching is the process by which trained individuals transmit education to individuals or groups. It is a dynamic activity that is associated with a medley of responsibilities, which according to Daramola (1994, p. 2) include imparting appropriate knowledge so as to prepare individuals to acquire skills necessary for certain careers; developing individuals to cultivate the habit of good human relationship; creating awareness so as to bring about national consciousness and goals; and developing individuals to appreciate the benefits derivable from adequate health-care. To Jimoh (2004, p. 4), to teach is to show how to do something, to give lessons to a student or a group of students, to hold classes, to provide with knowledge and insight. The aim of teaching, Jimoh (2004, p. 7) maintains further, is to "equip students to learn how to learn and to teach them how to think". In essence, the goal of teaching is learning.

From the primordial times, teaching had been found as a veritable means of attaining sustainable human development as well as a process of transmitting skills and social values to the members of every society. Teachers are the piston in any educational system; they are the builders and developers without whose role the society literally collapses. A society without teachers only exists on a fetid foundation and it is bound to be wiped into oblivion. Life itself is said to be the best teacher because teaching is an integral part of life, be it formal or informal.

Teaching methods have thus emerged over the years to achieve functional learning. The most common of these methods are the lecture method, the discussion method, the demonstration method, the laboratory use method, and questioning techniques. Others include field trip method, project method and question mapping techniques used especially in tertiary institutions (Daramola, 2004, p. 48).

Language teaching, on the other hand, especially in a non-native context like Nigeria, is by far one of the most complex and the most arduous tasks for teachers to undertake. It is an applied linguistic phenomenon, or the application of linguistic knowledge to some object (Corder, 1973, p. 10). In other words, language teaching is a component of applied linguistics, which concerns the

application of the principles, insights and findings from pure linguistics (i.e. descriptive and theoretical linguistics) to solve language-related problems in the areas of education, commerce, science and other fields of human endeavour (Ayodabo, 2007, p. 96). Teaching a language is largely a multi-dimensional and interdisciplinary activity which includes organisational dimension, technological dimension, psychological dimension, sociological dimension, pedagogical dimension and indeed, linguistic dimension (Obi-Okoye, 2001, p. 47-48). A language teacher is therefore inexorably expected to be well-organised, technologically trendy, psychologically stable, sociologically oriented, pedagogically savvy and linguistically competent.

As language plays "a unique role in capturing the breadth of human thought and endeavour" (Crystal, 1997, p. 1), language teaching can be said to be the cornerstone of education. This is because the knowledge of language is fundamental to the grasp of all learning, indeed "the most powerful tool of learning" (Adegoke, 1979, p. 15). A lot is often expected of language teachers, especially in the case of English. They are supposed to be "conversant with the different modern techniques of teaching English for effectiveness" and are expected to deploy those techniques to achieving the set goals and objectives of ESP or EST (Azikiwe, 1998, p. 60).

**Good Teachers and Teaching: Qualities and Requirements**

Due to the importance of teachers, especially those of language, Brumfit (cited in Azikiwe, 1998) says they "should be terrifyingly perfect". He provides seven qualities that language teachers must have. These are:

1. They should be professionally trained and well-informed.
2. Their approach to teaching should be founded on principles, but they should not be dogmatic.
3. They should be constantly trying to improve themselves and update their knowledge in the subject.
4. They should be humble without being weak, firm without being autocratic.
5. They should like their students, but if they do not, it should be disguised so that the students and others will not know.
6. They should know in very clear terms why their students are learning English.
7. They should be convinced within themselves about their beliefs on the nature of language teaching and learning.

On his part, Morrison (cited in Azikiwe, 1998) identifies the qualities that a good language teacher must have, as being a good model of speech; being thoroughly conversant with modern English usage; being aware of potential areas of difficulty of the learners; being familiar with a variety of approaches and methods for teaching; being able to modify and supplement instructional materials; being familiar and keeping abreast with current knowledge in the theories of teaching and learning language; and having sufficient knowledge of the culture of the speakers of the language (p. 61).

Richard Leblanc of York University, who won a Seymous Schulich Award for Teaching Excellence, has also provided "the top ten requirements" of "good teaching" all of which are deemed insightful and instructive. Internalising Professor Leblanc's submission is considered an urgent desideratum for every ELT practitioner and ESP professional. Though relatively long, his submission is fully 'downloaded' because of their merit and vitality which include its breezy and refreshing style:

> One. Good teaching is as much about passion as it is about reason. It's about not only motivating students to learn, but teaching them how to learn, and doing so in a manner that is relevant, meaningful and memorable. It's about caring for your craft, having a passion for it and conveying that passion to everyone, most importantly your students.
>
> Two. Good teaching is about substance and treating students as consumers of knowledge. It's about doing your best to keep on top of your field, reading sources, inside and outside of your areas of expertise, and being at the leading edge as often as possible. But knowledge is not confined to scholarly journals. Good teaching is also about bridging the gap between theory and practice. It's about learning the ivory tower and immersing oneself in the field, talking to, consulting with, and assisting practitioners, and liaisoning with their communities.
>
> Three. Good teaching is about listening, questioning, being responsive, and remembering that each student and class is different. It's about eliciting responses and developing the oral

communication skills of the quiet students. It's about pushing students to excel at the same time, it's about being human, respecting others, and being professional at all times.

Four. Good teaching is about not always having a fixed agenda and being rigid, but being flexible, fluid, experimenting, and having the confidence to react and adjust to changing circumstances. It's about getting 10 percent of what you wanted to do in a class done and still feeling good. It's about deviating from the course syllabus or lecture schedule easily when there is more and better learning elsewhere. Good teaching is about the creative balance between being an authoritarian dictator on the one hand and a pushover on the other.

Five. Good teaching is also about style. Should good teaching be entertaining? You bet! Does this mean that it lacks in substance? Not a chance! Effective teaching is not about being locked with both hands glued to a podium or having your eyes fixated on a slide projector while you drone on. Good teachers work the room and every student in it. They realize that they are the conductors and the class is the orchestra. All students play different instruments and at varying proficiencies.

Six. This is very important... good teaching is about humour. It's about being self-deprecating and not taking yourself too seriously. It's often about making innocuous jokes, mostly at your own expense, so that the ice breaks and students learn in a more relaxed atmosphere where you, like them, are human with your own share of faults and shortcomings.

Seven. Good teaching is about caring, nurturing and developing minds and talents. It's about devoting time, often invisible to every student. It's also about the thankless hours of grading, designing or redesigning courses, and preparing materials to still further enhance instruction.

Eight. Good teaching is supported by strong and visionary leadership, and very tangible institutional support resources, personnel, and funds. Good teaching is continually

reinforced by an overreaching vision that transcends the entire organization – from full professors to part-time instructors – and is reflected in what is said, but more importantly by what is done.

Nine. Good teaching is about mentoring between senior and junior faculty, teamwork, and being recognized and promoted by one's peers. Effective teaching needs to be remediated through training and development programmes.

Ten. At the end of the day, good teaching is about having fun, experiencing pleasure and intrinsic rewards... like locking eyes with a student in the back row and seeing the synapses and neurons connecting, thoughts being formed, the person becoming better, and a smile cracking across a face as learning all of a sudden happens.

Good teachers practice their craft not for the money or because they have to, but because they truly enjoy it and because they want to. Good teachers couldn't imagine doing anything else. (Shabani and Okebukola, 2001).

When 'Use of English' teachers, especially make the above checklist inform their teaching delivery, there is no doubt that the fortunes of English language teaching in Nigeria will change for better. For when Omodiagbe (1992) bemoans the falling standards and crisis in English usage in Nigeria and lists the contributing problems, the top on the list borders on "a lack of qualified teachers" (i.e. good teachers).

**Language Teaching Methods**

Methods are a set of teaching procedures to be followed in presenting lectures or lessons. Different ELT methods have been advanced and all of them have their merits and demerits – since a single method cannot be used in the teaching of all aspects of a language.

Components of methods are selection (every aspect of language cannot be taught at the same time), gradation (materials are graded as a teacher may not be able to teach all that he has selected, thus one comes before the other) presentation (this has to do with the effective way of making the students to

understand and retain knowledge easily) repetition (drills and practices are crucial in language teaching) and evaluation (the means by which teachers obtain feed-back on the success of teaching-learning process) (Azikiwe, 1998, p. 68-69).

Language teaching methods are varied and related. They include: the Grammar-Translation Method, the Direct Method, the Reading Method, the Audio-lingual Method, the Communicative Method, the Total Physical Response, the Silent Way, the Community Language Learning, the Whole Language, the Multiple Intelligence, the Lexical Approach and Competency-Based Language Teaching. Current communicative approaches are Communicative Language Teaching, the Natural Approach, Cooperative Language Learning, Functional-Notional Approach, Strategopedia, Full-Frontal Communicativity (Azikiwe, 1998). Only a brief discussion of all these will be allowed in the scope of the present paper. Highlights of the methods are thus briefly presented as follows: The Grammar-Translation Approach is historically connected to the teaching of Greek and Latin. Learners are taught in their mother tongue with little attention given to the target language itself. Vocabulary is taught by identifying words and explaining them while grammar provides rules for words combination.

The Direct Method is developed as a reaction to the Grammar Translation Method. It is an attempt to teach the target language directly. There is no translation and there is no mother tongue used. Conversations and dialogue in the target language are presented with actions and pictures. The grammar and culture associated with the target language are inductively taught.

The Reading Approach emphasises reading ability in the target language and the current/historical knowledge of the native speakers. Vocabulary is controlled to forestall boredom and only the aspects of grammar pertinent to reading comprehension and fluency are taught. Translation features here as a way of making the given passage easily accessible to the learners. High premium is placed on reading within and outside the classroom while pronunciation (or skills of oracy) is given marginal attention.

The Audio-lingual method adopts the principles and procedures of the Direct Method. It is also a reaction to the Reading Approach which de-emphasises speaking skills. The method is fostered on mimicry and memorisation of selected phrases as they are pronounced, which results in lop-sided listening. This method makes an abundant use of language laboratories, tapes and visual aids. The learners are drilled to achieve native-like control of English/target language. The skills of oracy (listening and speaking) and literacy (reading and writing) are sequentially introduced.

The Total Physical Response Method, otherwise known as 'The Comprehension Approach', emphasises listening skills. It combines information and skills through the use of the kinaesthetic sensory system. It arose from the observation of a child's language acquisition developed substantially by listening to people for some time before uttering a word. The teacher gives commands, for instance, and also performs the action.

Like Total Physical Response, the Total Function Response adopts listening to learning. It is a subsidiary of Communicative Language Teaching and it emphasises functions rather than forms. In the Silent Way method, the basic principle is that teaching should be subordinate to learning. The approach is to allow learners to think by passing to them the responsibility for the descriptions of objects shown to them or actions performed.

Community Language Learning adopts counselling techniques to the teaching of target language. The learner is construed as a client and the aim of the language Counsellor is to communicate empathy for the client's state of mind and aid him linguistically. For suggestopedia, it is based on a modern understanding of how human brain works and how learning is effectively achieved. Suggestopedia is a blend of suggestion and pedagogy by its proponent, Georgi Lozanor. It is used to refer to accelerated learning approaches.

While Whole Language Method concerns the incorporation of wide engagement with language, which includes literary study, process writing, authentic content and learner collaboration, the Lexical Approach concentrates on developing learners' proficiency with lexis or words and their combinations, assuming that language learning is essentially hinged on the ability to understand and produce lexical choices.

Multiple Intelligence Approach is an adaptation of the Multiple Intelligence view of human talents and the application of such to teaching. Competency-Based Instruction is a learner-focused development and delivery of curriculum, the idea of which is rooted in the idea that students' competence is achieved only in practice and assessment.

The Communicative Method has been found to be very useful and it has many approaches. Some of the approaches in this method are Communicative Language Teaching Approach (the adoption of computer network in teaching, or Computer-Assisted Language Learning, which is a component of our pragma-integrative Approach), Natural Approach (delaying speech production until students' listening comprehension is developed, just as it occurs in first language

acquisition), Cooperative Language Learning (which emphasises quantitative and verbal knowledge based on competition and an individualistic goal structure), Content-based Teaching Approach (concerned with the idea that language learning is a by-product of focus on meaning, that content topics to support language learning should be chosen to best match learners' needs and interests).

Other Communicative Method approaches are the Task-Based Approach (an approach to syllabus design that entails, in all its forms, a more flexible approach in which "content and tasks are developed in tandem" to achieve learning). The Functional-National Approach (emphasises breaking down the global concept of language into units of analysis on the basis of the appropriate communicative contexts). Strategopedia (thematises "learning to learn" in an instructional focus on language learning strategies, which include memory tricks, thinking, planning and self-monitoring) and Full-Frontal Communicativity (provides instructional focus on the non-linguistic aspects of communication, including rhythm, speed, pitch, intonation, tone, facial expression, posture, etc. based on the premise that the linguistic part of communication, which language teaching still largely restricts itself to, is insufficient).

**Towards a Pragmatic-Integrative Approach to the 'Use of English' Teaching**

Wilkins (1978) observes that "language teaching has always been subject to change" (209) and change is said to be natural, "change is not new; change is important" (Friedman, 2005, p. 20). The quest to bring about the necessary change in the 'Use of English' programme so that it fully achieves what it is aimed at achieving informs the pragma-integrative approach within the broad Communicative Method of language teaching.

By pragma-integrative, we mean that language teaching should be essentially pragmatic, with pragmatics meaning 'action' or 'performance'. "This performance requires that the teacher does not limit himself to "chalking and talking" upon the learners' (Adedimeji, 2008, p. 106) and by integrative, we agree that no method or "no methodologist has the whole answer." This approach is justified by its constituting the second and the fourth slogans of the 'ten new slogans' advanced by Professor Clifford H. Prator of the University of California, Los Angeles, where the teaching of ESL is a major academic concern. The "Ten New Slogans" are, as cited in Ubahakwe and Obi (1979, p. 12):

1. Teaching is more of an art than a science.
2. No methodologist has the whole answer.
3. Try to avoid the pendulum syndrome.
4. Place a high value on practical experimentation without doctrinaire allegiance.
5. Look to various relevant disciplines for insights.
6. View objectives as an overriding consideration.
7. Regard all tested techniques as resources.
8. Attach as much importance to what your students say as to how they say it.
9. Let your greatest concern be the needs and motivation of your students.
10. Remember that what is new is not necessarily better.

Apart from performance, the pragmatic component of the approach appertains to the use of signs which contextually are objects, slides, pictures, maps, charts, etc since pragmatics is essentially the study of the relationship between signs and their users (Taylor, 1988, p. 514) as well as others. It also involves that teaching should be dynamic, interactive, stimulating and not just a mere occupational chore that one has to do to earn a salary or avoid a query.

More importantly, the four Gricean maxims have serious implications for the effective teaching of the 'Use of English'. H. P. Grice, a philosopher of language and a foremost theorist of pragmatics, had observed that participants in language use should maintain four maxims of conversation, which are otherwise known as the "Cooperative Principle" which he summaries as "make your contribution such as is required, at the stage at which it occurs, by the accepted purpose of the talk in which you are engaged (Grice, 1975, p. 47).

Though Grice was not talking of teaching when formulating his maxims, he was only discussing speech acts. His maxims are nonetheless relevant to the teaching and learning situation, as observed by Ihebuzor (1991, p. 14). The maxims are those of quantity, quality relation and manner, explained and elaborated by Mey (2000, p. 72). The maxim of Quantity states that you should say only as much as the learners need to comprehend. An appropriate quantity of information is needed for comprehension to occur. As language is characteristically complex, the role of the teacher is to simplify its understanding through the provision of the adequate body of knowledge, explanation, analysis illustration, exemplification, so that the goal of teaching would be achieved Under no circumstance should a language teacher say less than the required quantity needed for comprehension to occur.

The maxim of Quality requires that you say what you know to be true. Teaching a language is negotiating meaning and a language teacher should teach what is right and correct. There are many "teacher-induced errors", constituting objects of study to error analysts, which could have been avoided by a teacher doing his home-work well before appearing to pontificate before the students. Observing this maxim requires that teachers are competent in the English language they are teaching so that they would not be tempted to flout the maxim through what they do not know or providing answers to questions they are not able to answer correctly in the class.

The third maxim of Relation appertains to saying what is relevant to the issue at hand. There is always a disconnect between a language teacher and the class when the teacher digresses to irrelevant details and analogies. Some 'Use of English' classes can be so boring and uninspiring as a result of the irrelevance of the teachers' submissions. Rather than use the classroom as a forum of narrating travel experiences, condemning government policies and criticising the increasing external debt, so long as such does not have any relevance to the topic under discussion, the teacher should make his teaching relevant to the learners needs and the curriculum requirement.

The fourth maxim of Manner requires that you say what you need to say clearly and unambiguously. In this wise, teaching should be logical and clear so as not to create confusion in the learners. Some of the features that flout the maxim of manner are egocentricity, the use of strange and difficult vocabulary, which detracts from learning or "retreating into obscurity in the hope that incomprehensibility will be equated with wisdom" (Brown, 1978, p. 42).

The teaching of 'Use of English' should also be integrative in the sense of combining the salient methods as each method has its merits. It also involves the deployment of technology to ELT and the promotion of Computer-Assisted Language Learning (CALL) and Computer-Assisted Language Instruction (CALI), where the teacher serves as a guide. This includes exposing students to Information and Communication Technology (ICT), especially the Internet; with the vast opportunities it offers, seeking and conveying information. There is no doubt that an eclectic approach that uses the right method for the right subject area would be more result-oriented than a single method for all areas of language study.

The idea of integrative Use of English teaching also engenders the integration of the five skills essential to effective communication. These five skills, as identified by Berlo (1960) are speaking, writing, listening, reading and

reasoning. The teaching of the Use of English should be geared towards the development of these skills, which are inter-connected. "The encoding skills relate to speaking and writing while the decoding skills relate to listening and reading. The ability of an individual to encode and decode enables him/her to reason" (Akinyemi, 1991, p. 4). In other words, reasoning skills automatically develop from the mastery of the encoding and decoding skills or the skills of literacy and the skills of oracy.

To achieve the goal of teaching the 'Use of English', a language teacher should devote considerable time to the teaching and cultivating of students' communication skills altogether. Testing should also involve all the skills so that the students are considerably proficient in the four main skills of language. A standard test like the Test of English as a Foreign Language (TOEFL) for some years now has focused on testing all the skills of language through which the four skills are tested with the reasoning. When Francis Bacon said that "reading maketh a full man, conference a ready man and writing an exact man," with conference involving the activation of listening and speaking skills, he foregrounded the significance of effective communication. In the Information Age, developing effective communication and linguistic competence in a language like English is developing the human resources and teaching effective communication is developing the nation.

## Concluding Remarks

Human beings constitute the purposive agents that bring about development. The abundance of capital, land and materials without the human agent that would coordinate and transform the factors of production to practical utility is futile. According to Awolowo (1976), "man is the sole creative and purposive dynamic in nature: everything else by comparison is in a state of inertia." This is why human capital is the most important resource of any country and Nigeria has abundant human resource base, being the most populous country in Africa. But this resource has not been fully utilised as a result of a number of factors among which education is prominent. One powerful way of converting this human capital base to development is by educating Nigerians and enhancing their skills. In the Information Age and era of globalisation, communicative competence is fundamental to the development of human resources and effective teaching and learning of English will go a long way in addressing some of the educational challenges facing Nigeria.

While noting that the problems associated with the Use of English pedagogy in Nigeria is varied and multi-dimensional, this paper has posited that a sure way of addressing the situation and achieving a better result lies in the effective teaching of the course. It suggests that a pragma-integrative, or pragmatic as well as integrative approach which emphasises a performance-based ESL pedagogy, adopts flexible, eclectic methodology and involves the appropriate use of ICT will be ideal in achieving good results. It is believed that when language teaching is effectively done and Nigerians are developed in the five communication skills of listening, reading, speaking, writing and reasoning, the human development level of the people will be enhanced and through that, other components of development will be added. But when linguistic competence with its subsuming language education is relegated, the thought process becomes impaired. In that situation, if it lingers, the nation can only be taking a step forward and four steps backwards as a result of the defective thought process, a consequence of poor communicative incompetence.

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# LITERATURE AND THE QUEST FOR PROVISION OF POTABLE WATER IN RURAL COMMUNITIES – A STUDY OF WOTA NA WOTA EXPERIMENT

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**Abstract**

*Wota Na Wota is a development oriented drama. It is a water project experiment commissioned by Engr. Harry Leonhard Van Putten, the Technical Adviser OEP/JDP/Water programme, Enugu. In January 13th, 2003, under the sponsorship of Misereor Germany, the Technical Adviser of OEP/JDP water programme office, Enugu, requested the author to create a water-conflict resolution drama, a water-driven drama that will support OEP/JDP's water installation projects in the Eastern part of Nigeria. The author's main challenge, thus, was to conceptualize a story line that will not only facilitate the water projects of OEP/JDP in the East, but one that will equally educate the masses on the importance of water, peace and sanitation to human development. Professor Chike Aniakor, an Art Critic was later co-opted to join in both the research and in the scripting of this drama. Wota Na Wota is the product of our joint effort.*

**Brief Summary of *Wota Na Wota***

*Wota Na Wota* is a drama on water conflict, with theme, motif and subject matter of water. The dramatization we have in this play concerns a conflict arising from the sighting of a water complex by a donor agency, OEP/JDP water programme. The conflict is between two communities; Ebenato and Ebenano. The issues are:

(1) The sighting of the water complex at Ebenano without the approval of the relevant authorities in that community.
(2) The selection of workers who are by faith Catholics from Ebenato predominantly.

It is understandable that the people of Ebenano are angry and want the water project stopped. When a conflict ensues, the need for resolution follows. Paradoxically, water installation is the cause of this crisis; yet, provision of sufficient water for all is a natural agency for restoration of peace and progress.

To salvage the conflict between the two communities and create the atmosphere for the water installation to be completed, a Community Relations Manager with a high degree of public relations, risk and crisis management expertise is needed. Ikechukwu Ifedi, the protagonist of the play, is recruited by Engineer Harmen, the master hydrologist, to do the job. He is recommended by Rev. Fr Ignatius, the representative of the Catholic Bishop of the Diocese of the Niger in the water organisation.

Ikechukwu sets about his task with a good sense of professional experience and managerial skills, and as a result of his timely intervention, the crisis comes to an end, and the Ebenano//Ebenato Multimillion Naira Water Complex was completed and commissioned, with the support and consensus of all the beneficiaries. As both propaganda and educational drama, the play dramatises the conflict and resolves it in an amicable manner (see stream Four and Five of *Wota Na Wota*). In exploring the use of human reason to solve social problems, this drama assures us that in spite of post modernism, human reason is still the best available tool for ameliorating the human condition. Above all, *Wota Na Wota* is a tribute to OEP/JDP water programme office, Enugu, that has seen, in a drama, a veritable instrument for mass mobilisation in support of its determination to provide water to the poor and the less privileged.

**A Brief Survey of the Socio-Economic Background of Rural Nigeria**

The Nigerian government development agenda is urban oriented. Almost all the rural communities in Nigeria lack the basic amenities that are essential for human survival and progress. United Nations statistical report, as cited by E.A. Ezeani (1995), shows that:

> most of the facilities that make life worth living in Nigeria are concentrated in the urban areas. Lagos, for example, which has about 10 percent of Nigeria's population, consume 56 percent of the telephone services, 46 percent of generated electricity and accounted for 30 percent of registered automobile in Nigeria. Also, 46 percent of Nigeria's industrial output emanated from Lagos (p. 55).

With this picture in mind, one can easily imagine the living condition of the majority of Nigerian population in rural communities. Eric Eboh's study of the state of rural Nigeria also helps to throw more light on the actual situation of the Nigerian majority in rural areas. According to Eboh (1995),

> The challenge of sustainable development in rural Nigeria is real. Critical problems to be addressed by programmes and projects include wide spread poverty, illiteracy and human misery. Like in other developing countries, rural areas of Nigeria lag behind urban areas in human development terms. Access to education, health and safe drinking water is less and, in some cases, non-existent in many rural areas. According to the human development statistics provided by the world resources institute's 1992-93 report, Nigerian population with access to safe drinking water between 1980 – 1988 average over 60 percent and below 30 percent in urban and rural areas respectively (p. 6-7).

Even more than a decade after these findings, these figures have not changed as such. It is in consideration of these facts and the increasing bad condition of rural dwellers resulting from government's obtuseness to the plight of the majority, that non-governmental organizations like OEP/JDP water programme agency and others have opted to come to the aid of these disadvantaged Nigerians.

*Wota Na Wota*, therefore, was conceptualized as a strategy towards finding solution to community conflict which is a major obstacle on the path to provision of potable water.

### *Wota Na Wota* as a tool for rural development

David Kerr provides for us the basic definition that can guide our critical evaluation and appreciation of this kind of literature. According to Kerr (1995), theatre or drama for development is those theatrical or dramatic productions that:

> are geared towards the ideology of modernization. They are usually issue oriented ... and directly or indirectly embarks on problem solving campaign, its methodology stresses the identification of disparate problem. (p. 15)

*Wota Na Wota* which focuses on the problem of water scarcity and water resource - related conflicts is proffered here as an instrument of education and enlightenment. Education is the basis for the creation of awareness and character formation or re-formation. According to Ogbo Ugwuanyi (2006):

> It is as an instrument of education that art serves as a relevant agent of the human development. This is because of the supremacy of education which is the basis for knowledge... (p. 399)

Today in most parts of the world, government/policy makers are adopting a multi-disciplinary approach to the planning and execution of development programmes. Water projects, for example, are not handled by hydrologists and water Engineers alone, but government and non governmental organizations in Nigeria are yet to adopt this interdisciplinary mode of operation. Dan Izevbaye's Study has attempted to trace the cause of this anomaly. As revealed by Izevbaye (2006)

> We tend to associate the concept of development with disciplines like the Social Sciences, Planning, and Sciences and Technology. I ask my self why this is so in the light of the universally accepted view that it is through the arts that we get the most intimate feel and the most profound understanding of a culture, and yet, it is to the social sciences and to sciences and technology that we turn for development matters. I believe that the answer is two fold. First, we need to distinguish economic development – which properly belongs to the social sciences, and technological development which belongs to the domain of the science and technology from the development of people (which belongs to the arts or the humanities). (p. 15)

In other words, inability to distinguish between one aspect of development from the other is our main problem, coupled with the fact that human development may not easily be equated in tangible forms.

*Wota Na Wota* is a human development oriented drama, conceptualized for the resolution of water ignited conflicts. Its functionality as a tool for conflict resolution and for the actualization of the rural dwellers quest for potable water is most ensured if it is realized as a performance on stage. When used as an additional strategy for enhancing rural development, the relative success made by NGO's and Local Government Authorities can be greatly enhanced, complimented and sustained. This medium according to Mbajorgu (2005):

> ... has the advantage of using the provision of vicarious experience to deliver an empathic understanding and knowledge ... empathy on its own has a way of instilling a deep felt awareness of a phenomenon ... Drama is also the most single and effective medium for theatricalizing human problem, experience and situation as an illusion. It cuts across different fronts of audience mix and at a level of bi – and multilingualism, functioning within and beyond language in both graphic, spatial and emotional terms. (p. 315)

The position of this paper, however, is contrary to the view that drama has a direct-automatic solution to human problems such as scarcity of water or water resource-related conflict. We are fully aware that the dramatization of water-related conflicts and water scarcity will not directly bring and end to such problems, yet, drama is highly essential and indispensable because it is the most appropriate tool for creating awareness and re-directing the mind-set of policy makers and the masses on such issues.

As an instrument of advocacy and propaganda, it compels us to consider the challenges of water use that exist in our communities, thus, stimulating us to psychologically re-programme our minds towards seeking lasting solutions to our problems. In this way, drama is more effective than any other medium of mass education for development.

**The rationale for a Water Conflict Drama**

Nigeria is not just a multi-ethnic nation. It is equally multi-cultural and multi-religious in nature, with over three hundred spoken languages.

In Nigeria today, the rising rate of inter-ethnic and inter – communal conflicts is alarming. Violence, crime and ethnic distrust have become part of our life style, and has eaten into the fabric of our rural communities. Elections both at the national and the rural levels are rippled with tuggery, violence, blood shed and endless disputes. The continued increase in resource - related conflicts in the Niger delta regions has resulted in the introduction of conflict resolution courses in the curriculum of tertiary education in Nigeria.

This growing rate of disputes and communal clashes in both urban and rural areas, has prevented many rural and urban communities from enjoying the goodwill of international Non-Governmental Organizations and Donor Agencies. A study by CC Ukaegbu and CC Agunwanba (1995) shows that:

> Very often in Nigerian rural communities, conflicts lead to huge losses in time, human and material resources. There are certain cases in which some communities have engaged in conflict for one decade or more and every other social objective is trivialized and placed secondary. Hence, popular participation in development efforts is jeopardized. (p. 45)

Wota Na Wota was born out of the quest to find solutions to the problem of conflict and water scarcity in our rural areas and since water is central to human development, it is symbolically employed in this play as a metaphor for Nigeria's resource - related conflict as well.

***Wota Na Wota* as a dramatization of the principle of popular participation**

At another level, *Wota Na Wota* teaches us that beneficiaries must actively influence the different stages and processes of any development project by rightly integrating the villagers into the constituted project organising committee, Ikechukwu was able to unite the effort of the people with that of JDP water organisation (see stream four, page 31 of *Wota na Wota*).

Their initial failure to integrate the villagers at the beginning is a common error that is epidemic among NGO's and development initiators. As gathered from Igbokwe and Ajala (1995):

> Engineers, agronomists, policy makers and other technicians involved in rural development projects. Often are concerned with getting a technically sound design, and assume that beneficiaries will respond naturally. Consulting beneficiaries at all stages is thus, seen as unnecessary interruption of the project circle which may lead to delays and other unwanted demands. (p. 243)

As recommended in the play, development initiators and agents can not succeed without integrating a professionally sound Community Relations Partner into their management team. The dialogue between Harmen and Ikechukwu in Stream Two of *Wota Na Wota* highlights the role of the Community Relations Manager in rural development processes.

It also reveals Harmen's sound understanding of the place of the C.R.M in the water project.

**Harmen:**

Fine. The C.R.M is in a sense, our contact person. He can build or destroy, depending on how he is able or not able to mediate between us and the rural communities. In other words, his ability to maintain a healthy relationship with the local communities will determine the degree of success in our water installation projects. He must understand the communities, and must be interested in issues relating to water preservation and conservation.

**Ikechukwu:**

... he must be in close contact with the villagers.

**Harmen:**

Exactly! And by so doing, he will understand the ways of the people, the lines of local authorities, the trend of local politics and the traditions of the people so as to avoid conflict (p. 4).

The completion of the water complex in the play would not have been possible if Ikechukwu's actions and utterances did not inaugurate an atmosphere of mutual understanding and cordial relationship. It is Ikechukwu's efforts and initiatives in this direction that guaranteed the popular acceptance and the massive support/participation of the two communities in the completion of the water complex. By guaranteeing that the project is designed for the benefit of every one, he was able to mobilize their commitment.

***Wota Na Wota* as a lesson on the leadership crisis in Nigeria**

Ikechukwu the protagonist in *Wota Na Wota* is a personification of the leadership qualities that is needed to make things work in our oil rich nation.

He is young, energetic, mentally and physically sound, highly educated, competitive and non tribalistic. Ikechukwu is appropriately positioned and equipped with the right skills. He is loved and admired by all because of his positive mind set, integrity quotient and his sense of value that makes things work. Without his leadership qualities, it could have been impossible to accomplish the task of delivering potable water to the Ebenano/Ebenato villages.

Dele Olojede's concept of leadership will help us appreciate the contributions of Ikechukwu as an exemplary Community Relations Manager.

According to Olojede (2008),

> When we refer to leadership, we speak not merely about politicians; we talk about all those who have been selected by one process or the other to occupy positions of influence, responsibility and privilege at any level. (p. 17)

Ikechukwu who has been called upon to lead an organization out of a difficult crisis is an ideal exemplification of the qualities desired among Nigerian elite. As show in the play, he proved suited to the task that his organization has assigned him, unlike his predecessor Nicholas who symbolizes the fundamental elite problem in Nigeria. As a typical Nigerian elite, Nicholas, in the description of Dele Olojede (2008) is:

> An elite who rather than being self-sacrificing and animated by a sense of the public good, has created a kind of locust culture. The Swarm alights on a cornfield, ravages it, then heads for the next field. (p. 17)

The character of Nicholas is the character that has left Nigeria where it is today. The chronic leadership disease in Nigeria today is traceable to such negative qualities in our so called leaders.

Again, through an ironical model of dramatization, we are made to realize that the Nigerian leader, despite his lack of interest in providing water for rural communities is not really ignorant of the essentiality of water to rural and national development. His Excellency's speech during the commissioning of the Multi-millions Naira Water Complex by JDP water organization is an artful illustration of this:

**His Excellency:**

> I am highly elated and glad to be here as a special guest of honour. As you all know, we are here to celebrate water and to celebrate water is to celebrate life. Water is life and life is water. As far as life is concerned, water is more precious than diamond and gold, because water is a vital component of all living things and a crucial aspect of any material produced by living organisms.

In the same vein, the ending part of His Excellency's long speech revealed that Nigerian Government Officials understand the centrality of water to human health and sanitation:

**His Excellency:**

> ... you all know that most of our health problems are water-related.
>
> It is in recognition of the seriousness of such infections that the centre page of the latest United Nations Magazine featured all the developing nations that are seriously afflicted by water-borne diseases. In one of the paragraphs of that article we are made to understand that "patients suffering from water-borne diseases occupy more than half of the world's hospital beds". Of course, we should, not be surprised to hear that the highest percentages of the victims of such infections are found in Africa.

The irony is that it is the same government that is educating the villagers on the importance of water to health that deliberately omitted provision of water in its list of crucial development agenda. This is sortly highlighted by Ikechukwu's comment on page 12 & 13 of *Wota Na Wota*:

**Ikechukwu:**

> They hardly consider the interest of the common man. They don't even think that adequate water supply should be part of their major policy thrust... They will probably wake up when every one is dead. Soon our people will have no other choice than to drink their urine.

**Conclusion**

In conclusion it is important to mention that in addition to the failure of government, the Nigerian literary, community has also failed to conscientise our leaders or create awareness on the need for water provision, preservation and conservation. There are few significant Nigerian plays focusing on the essentiality and centrality of water to human existence and development. Nnolim (2009) in reaction to this Lacuna had this to say:

> Literature on water may seem strange to us who live on land. But our most celebrated world literatures are set in water environments, reminding us that life is in the main, a sea journey with its turbulence of storms, perils and dangers. I have in mind

> Homer's *The Odyssey* the Anonymous British *Beowulf*, Samuel Coleridge's Celebrated *Rhyme of the Ancient Mariner* and more recently Thor Hayerdal's *The Kontiki Expedition* (p. 12).

Beyond these examples of literary classics on water, the Nigerian writer needs to explore even the geographical importance of water. Water as we well know, is the great compass which connects nations. As emphasized in the introduction to *Water Testaments*, literary artiste can not help to create the desired new world water Ethics if they don't begin to reflect on the magical and spiritual characteristics of water as well as its. Symbolism, power, mystery and its significant to the consolidation and maintenance of law and order. Only literature and theatre can provide the images and the metaphoric premises that can enable us to transcend our ordinary ways of dealing with this indispensable natural resource.

Masaru Emoto, (2005) also reminds us that:

> It is our individual responsibility to learn all we can about water, the most precious resource on our planet, and to help shift the consciousness through our thoughts, through our words ... we drink water without paying much attention to it. We know that water is important to maintain our life, but because of its familiarity, very rarely do we consciously appreciate it. (p. XII)

This paper has thus, shown that drama can be used to advocate for the provision of water and to resolve communal conflicts. It has also revealed that drama can serve as a formidable tool for evaluating the relationship between water, development, governance, and the maintenance of law and order.

The implication of the dramatic events in the play is that without water scarcity, there would have been no water politics, and without the intrigues and politics surrounding the water installation project, there would have been no conflict. It is therefore, in our interest to ensure that the challenges resulting from our water situation can be transformed into an avenue for unity instead of that of dispute. According to Cristina L'Homme, (1998):

> depending on how you treat it, water can be an angel or the devil, an agent of conflict or co-operation, its anger or anger resulting from its conflict has caused humanity so much, on the other hand, its kindness has sustained, revitalized and unified humanity. (p. 6)

The position of this paper, therefore, is that it is as theatre that *Wota Na Wota* can achieve its developmental objective of capturing the imagination of Government Officials and the commitment of decision makers. It is also in its performance context that it can truly encourage the rural dwellers to explore the processes of improving their condition of life.

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# A STUDY OF SOME FACTORS CONTENDING WITH SUSTAINABLE DEVELOPMENT IN NIGERIA: A MUSLIM PERSPECTIVE

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## Abstract

*For long, the angels were busy praising Allah and celebrating His Holy names with little or no attention to studying and utilizing the natural phenomena put in place by Allah. He (Allah) thus decided to create a vicegerent who would discover, appreciate and utilize the natural phenomena and resources for his benefit and others. He therefore deemed it fit to teach Adam, the first man, the inner nature and qualities of all things. References to the natural phenomena and resources in the Qur'an are indication that man still needs divine guidance to develop and sustain these resources. It is on this note that this paper shall discuss the Islamic framework of sustainable development as enshrined in the Qur'an and hadith and how these were put into practice by the early Muslims. The factors that hinder sustainable development from the perspective of Islam shall equally be discussed. The paper shall assist in providing a locus for understanding the Islamic ethical values for sustainable development, while some recommendations shall be made for effective results.*

## Introduction

Most of the definitions given to the concept 'development' see it as a process of change in the social structure, attitude, institution and general acceleration of economic growth through reduction of inequality and poverty. Going through the multifarious definitions of the concept, Mohammed (2002) identifies three important facts on it, namely:

i. increasing the availability and widening the distribution of basic life sustenance such as food, shelter and protection;
ii. raising the level of living in addition to higher income, provision of jobs, better education and greater attention to cultural and humanitarian values; all of which serve to enhance material well-being, but also to generate greater individual and national self esteem, and;

iii. expanding the range of economic and social choice to individuals and nations by freeing them from servitude and dependence (p.5).

From the above, some indices of development which are no doubt prerequisites to sustainable development are identified. According to Adedeji (1997), the level of human development could be measured by the Human Development Index (HDI) whose components are health, education and income. To Aliyu (1999), the Gross Domestic Product (GDP) which is the total output of the economy, is a major determinant of development. Other indices of development identified by Mohammed (2002) include: improved standard of living in terms of availability of decent accommodation, improved nutritional standards, qualitative health care and educational services to the majority; life expectancy which is mainly influenced by the standard of living, availability of health services, literacy level and income of the people. On this basis, the level of development of some continents has been compared. For instance, the average life expectancy in the sub-Saharan Africa is 52 years compared to 73 years in Europe, 76 years in the US and 65 years in Asia. Others include the level of poverty, level of employment opportunity and literacy level. Studies have however shown that many African countries are living below the poverty line, while the economy of most of them encourages rationalization and retrenchment of workers and so increases the rate of unemployment which no doubt is a threat to sustainable development. In short, most African countries should be talking of how to develop themselves before talking of sustaining the development, or else they sustain underdevelopment.

The concept of sustainable development is said to have become prominent in the 20th century when in 1980, the 'World Conservation Strategy' was published by the World Conservation Union. The term became more pronounced and received greater attention in the report of the Bruntland Commission which the United Nations General Assembly assigned to propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond (Sulaiman, 2002, p. 46). The comprehensiveness of the report entails the definition of the term sustainable development, its nature, scope, objectives and approaches among others. The bottom-line of the concept is the efforts at improving the socio-economic and ecological status and at exploiting and processing the environment or natural resources for the purpose of improving the quality of human life in such a way that the needs of the future generations are not jeopardised.

It is interesting to note that some approaches have been adopted to ensure sustainable development all over the world. These approaches centre on the belief in the active involvement of people in the exercise as well as having clear knowledge of environmental constraints. The means to attaining such development therefore include community participation, non-governmental organizations (NGOs), community based organizations (CBOs), capacity building, women empowerment and population control.

It is however observed that the ultimate aim of the concept of sustainable development is to ensure promotion of human well-being through material acquisition and rise in income and wealth. Although, economic growth is a vital component of development, it should not be seen as an end in itself but a means to an end. That the comfort of the terrestrial life is given adequate attention in the secular concept of sustainable development at the expense of the celestial comfort is confirmed by the Qur'an when it reads:

> The love of desires (that come) from women, and of offspring, and heaped-up hoards of gold and silver and well-bred branded horses and cattle and tilth, made to seem fair to mankind. This is the provision of the life of this world, while is He with whom is good resort (Q3:14).

A vital aspect of development which has not been given the desired attention and which of course is the brain-box of other forms of development is spiritual development which though unquantifiable, is a source of mental peace and happiness and so cannot be ignored. Although spiritual matters seem non-economic in nature, the Qur'an categorises it an important aspect of life which should be developed by mankind for him to attain perpetual felicity in this world and in the hereafter (Q61:11; 3:134). It is on the basis of this that this paper shall discuss the concept of sustainable development through the lenses of Islam.

**Spiritual Development in the Realm of other spheres of Development**

The question of development has become enigmatic in view of the divergent perspectives with which people perceive it, as well as the multifarious approaches to its attainment. Very often, people understand it in purely materialistic terms believing that the availability of physical infrastructure and amenities is a major sign of national development. Others see the technological advancement of the nation as a pointer to its development. In the same vein, adoption of a particular system of government, especially democratic system of

governance is seen as a mark of development, while some express it from economic perspective.

If all these are things to go by as marks of national development, one then seems concerned of the terrible experience suffered by the so-called developed nations. The lamentation and disenchantment of many informed and concerned individuals about the state of affairs of these nations is a good indication that their level of development is found wanting. Or what can one say about the level of their social degeneration – abuse of drugs, power, authority and wealth, increased murder and crime, insecurity of lives and properties through production and acquisition of destructive weapons and self- abasement through suicide and euthanasia. The legitimization of unnatural acts like homosexuality, sadomasochism and sodomy by some of these developed nations equally confirms our reservation for their development. The level of corruption and abuses of human rights, coupled with discrimination based on race, colour, sex and religion equally adds to this tragedy of development. In the political realm, many of these countries are yet to record corruption-free and conflict-free elections.

It has been observed that the envisioned sustainable development might be difficult to achieve as long as spirituality and religiosity are downplayed in the process of development. This is because religion has a vital role to play in any viable development. While highlighting the wrong notion prevalent among some people on religion and development, Bashorun M.K.O. Abiola (1988) says:

> The first of such notions is that development is about matter and substance whilst religion is about the spirit and values, and that as a result, religion and national development are poles apart. This notion is very naïve because development is as much about value and ethos as it is about matter and substance. Indeed, a society that ranks poorly in the former dimensions can hardly be regarded as developed even if it ranks very highly in the latter dimensions (p.18).[1]

The summary of this is that a pseudo development could only be attained in an atmosphere where religion is not accorded its right place in the sphere of development. Such a development could only lead to chaos and crises as a result

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Being a keynote address delivered by Bashorun M.K.O. Abiola at a Conference on the Place of Religion in National Development organised by the Department of Religions, University of Ilorin on Tuesday September 29, 1987. See I.A. B. Balogun (et al) (eds), (1998). *The Place of Religion in the Development of Nigeria*; Department of Religions, University of Ilorin.

of the godlessness of the people in such a nation. To drive home this assertion one can attribute the discovery of crude oil in Nigeria as well as the refinery companies there as an element of development. However, this blessing has been misused by some who used the opportunity to enrich themselves; the corporate existence of the country is equally being threatened by various agitations protests and demonstration by the oil producing communities who considered themselves being cheated in the sharing formula of the proceeds from the resources. To add to this, more than one thousand souls were said to have lost during a pipeline inferno which erupted in Jesse, Delta State, as a result of the unpatriotic attitude of some people in the area vandalising the pipeline.

The point we are trying to make is that all-round development needs to be ensured before one can boast of a viable development. Spiritual development is thus the soul of other spheres of development. In its absence, the atomic energy which is supposed to be used by a Godly scientist to treat cancer and to improve the quality of crops would become a destructive mass killing instrument like atomic bombs and the like in the hand of a godless scientist and this is inimical to sustainable development.

**The Qur'anic Concept of Sustainable Development**

Ever before the creation of Adam, the first man, the angels had been created by Allah. The natural phenomena and resources had also been put in place prior human creation. The discovery of these phenomena and resources gave Adam upper hand over the angels who only concentrated on praising and celebrating their Creator. The transgression of man through the influence of Satan eventually led him out of the 'Garden' where he was initially sojourning, for contravening Allah's instruction. However, to ensure the development of man to his fullest capacity, Allah promised to continue sending His Divine Guidance so that he could work within the context of Allah's injunction. This promise is epitomised in the sending of the Qur'an to mankind through Prophet Muhammad the seal of all prophets.

The Qur'an identifies some resources that are crucial to human primary, secondary and tertiary development activities. Some of these resources mentioned in the Qur'an are

i. Energy resources.

These comprise the following:

a. solar energy under which sun plays a significant role as source of various forms of energy.(25:61).

b. Wood fuel for human domestic usage and other endeavours (36:80)
c. Wind which helps in the running of the ecosystem and other earth complex systems (21: 81).
d. Beasts of burden which help in carrying loads and as well in hunting and other security services. (16: 7-8).

ii. Land Resources: These comprise:
a. Landscape which facilitates human settlements and other development installations like roads, industry, tourism and other agricultural activities for basic human development projects (21:31).
b. Agricultural land uses which are useful for various types of agriculture – rainfall, irrigation, horticulture, plantation, animal husbandry and other forms agriculture (80:24-32).

iii. Water resources: These comprise:
a. Domestic water used for drinking and other household materials (16:10).
b. Sea water which provides tender meat and, as well serves as means of transportation (16:14).

iv. Mineral resources (57:25; 3:14).

v. Biotic resources. These include animals on land, water, micro and macro ones which supply foods, raw materials, healings and services and other invaluable resources to mankind. (16:5; 16:66; 16:69).

vi. Non Economic resources: These are resources that provide aesthetic values for mankind (16:6; 16:16; 5:4).

Dogarawa (2002, p. 88-91) has broadly classified resources into four, namely: common, definite, acquirable and possessive resources. To him, common resources are resources that are common to all nations, people and tribes which no one prevents anybody from using. Such resources are air, sunlight, moonlight, rain, weather, wild animals, forest, and time among others. Definite resources as the name implies, have terminal feature hence the need for speedy, effective and efficient utilization. Examples of these are lifespan, target, completion and strategy. Acquirable resources are acquired to change from one status to the other. Examples are skills, experience, and orientation. Possessive resources are obtained through exchange by customary rights and other legal forms of ownership and which can be used, neglected, sold or transferred by way

of gift or control. Money, assets, technology, territory and independence are examples of possessive resources. These resources put together are ingredients of development which sustainability depends mostly on their effective utilization and which under-utilization and misuse could be a great loss and catastrophic. Islam thus enjoins that one should strive to improve his economic status and should guard against misery and poverty resulting from laziness and indolence. The Qur'an says:

> Those who die in privation and misery and answer the angel's inquiry regarding them, with pleas of oppression, of weakness and impotence, are told: Was not the earth wide enough for you to run away from that predicament? Surely, their abode is Hell, the terrible plight (Q4: 97).

From the above, one can conclude that man has been provided and endowed with all resources meant for his development for him to effectively attain the intended divine vicegerency. This informs Nadvi (1966, p. 20) to conclude that man has to satisfy the following conditions for him to attain his position as vicegerent on earth: complete knowledge of all natural phenomena and of the laws under which they work; control his animal nature and practise the lofty code of morality which brings him nearer to the Supreme Being. The ability of human beings to harness these resources and to conquer the environment for their betterment in line with their values, customs and traditions determines their level of development.

Islam strikes a balance between spiritual and economic life of the people by encouraging Muslims to actively involve themselves in series of lawful trade, commerce and vocation, and at the same time engage in acts of religious activities and that none should disturb the other (Q73: 20; 62: 9). In fact, a trustworthy trader is seen as performing active religious duty and so would be made to rise up with the prophets, the righteous and the martyrs on the Day of Resurrection (Doi, 1984).

The Qur'an and the Sunnah are embodiment of moral values crucial to sustainable development. Of such values are honesty, truthfulness, fairness, humility, tolerance, diligence, punctuality, conscientiousness, respect for parents, teachers and the elderly, obedience, sympathy and care for the poor, the handicapped and the downtrodden and concern for the rights and obligations of others. These moral values if strictly observed and adhered to, will no doubt facilitate peaceful co-existence and curb hatred and rancour which militate

against development. A means of sustainable development is cited in a Qur'anic parable of a group of farmers who possessed a high yielding farm and worked hard on it. By the time of harvesting the crops in the farm, they did not put Allah's will in their thought and so decided to refuse the poor and the underprivileged from entering the farm to have their shares in the proceeds of the farm. The Qur'an informs that the farm was rendered barren and bleak while the owners were asleep; and when they got to the farm the second day, they found it devastating that they could not believe their eyes and so exclaimed "surely, we have lost our way!" Two lessons that are derivable from this parable are mentioned by Sulaiman (2000) thus:

> The first lesson is that whatever we do as human beings – individuals and nations – we must recognise the fact that we are all within the absolute control of Allah. He alone and no other power can grant success or cause failure. As such, we should seek His guidance that he has already given, and His succour, which He always gives to the pious and the just in the dispensation of our affairs.... The second lesson to be drawn from the story is that the protection of the common man, the enhancement of his well being, the preservation of his dignity, constitutes one of the bases of stability of any country (p.21).

It is on the basis of the above that we shall consider the obstacles to sustainable development in the light of Islam.

**Factors Hampering Sustainable Development and Islamic Alternatives**

**(i). Injustice**

In an atmosphere of injustice, no meaningful development could be ensured. Rather, rancour, misery and destruction become the order of the day. Cases of vandalization of pipelines, militancy, and incessant kidnapping in the Niger-Delta region of Nigeria are clear evidences of the aftermath of feeling of injustice on the people from whose Nigeria's 'goose' is tapped but whose interests are not protected. No doubt, the Prophet describes injustice as absolute darkness on the Day of Judgement (Sahih Muslim, vol. 4, p. 1996, p. 56). The influence of injustice on sustainable development is aptly described by Chapra (2008) when he writes:

> The darkness (of injustice) in the Hereafter is nothing but a reflection of darkness created by us in this world through injustice *(zulm)*. This darkness can frustrate all efforts to realize peace, sustainable development and social solidarity and lead ultimately to discontent, tension, conflict and decline. ...*Zulm* (injustice) is a comprehensive Islamic term referring to all forms of inequality, injustice, exploitation, oppression and wrongdoing, whereby one person hurts others, deprives them of their rights, and does not fulfil his/her obligations towards them (p.24).

Islam has put in place some measures to guard against injustice in the society. Some of these are discussed below:

***Prohibition of Riba***

A confirmation of the fact that nothing hampers sustainable development faster than injustice could be understood in the Islamic prohibition of *riba* (usury). The injustice inherent in *riba* is succinctly identified by Imam al-Razi in his *Tafsir*. In the first instance, taking *riba* amounts to appropriation of another person's property. Secondly, it discourages working to earn money. This is so because the capital owners will prefer to continue loaning out for him to get more profit rather than risking his money in trade or industry. This consequently leads to unemployment. Thirdly, permitting the taking of interest discourages people from act of benevolence as enjoined by Islam. This is because if interest is made permissible, the needy person will be required to pay back more on loans and this weakens his feelings of goodwill and friendliness toward the lender. Finally, it allows the wealthy ones to become wealthier and the borrower poorer. This is because interest is a deliberate exploitation of the less privileged ones by the wealthy persons. Nejatullah Siddiqi (2002) equally sees *zulm* in interest, as at times, the borrower may lose and yet interest based lending will compel him to repay both the principal and the interest. On the other hand, the borrower may have more than expected profits, yet the lender gets only the stipulated rate of interest which is usually a very small part of the actual profits. A transaction of this nature, no doubt, involves gambling which is declared unlawful in Islam (Q5: 90-91). Irreconcilable animosity and illegal slipping out of wealth from those who worked for it and their consequent reduction to penury are some of the side effects of such a transaction and these are inimical to sustainable development (Suhufi, 1985).

***Prohibition of Gambling***

A transaction which can negatively affect the social and psychological development of man is gambling. Suhufi (1985:82), for instance, has this to say on the evil of gambling:

> One of the other great evils of gambling which is very important from the social and psychological point of view is the enmity which it creates between the persons concerned. Gambling arouses the feeling of pessimism and vengeance in the individuals, severs friendship, love and sincerity and prepares the ground for revenge and awakens the instinct of wrath.

He further cited a newspaper caption where a gambler attacked his rival with knife and killed him for collecting a large sum of money from him and was not prepared to play again. He (Suhufi) therefore concluded:

> It is evident that when the wealth and savings of one of the two parties are poured into the pocket of the other and the winner takes possession of that wealth with a victorious smile, the seed of enmity is sown in the heart of the loser and eventually this enmity makes its inauspicious signs appear on a favourable and proper occasion (p.83).

The above confirms the Qur'anic verse which warns against gambling thus:

> Satan wants to induce hostility and hatred among you through wine and gambling and to prevent you from remembering Allah and prayers (Q5:91).

From the above, gambling is obviously against the spirit of justice for it amounts to unjustly taking what one has not earned or lose on a mere chance. An environment which harbours this practice cannot boast of sustainable development.

**(ii). Excessive Greed for Material Wealth and Under-utilization of Resources**

It needs to be stressed that resources are meant for man to explore, develop and utilize effectively for his well-being in this world and as well in the hereafter. Under-utilization and over-utilization of these resources may however be a bane to sustainable development. To avoid these two extremes, the Qur'an rules

against niggardliness and the evil of wastefulness of wealth in the following verses:

> And let not those, who are niggardly in spending that which God has granted them out of His grace, think that it is good for them. Nay, it is evil for them. They shall have a collar on their niggardliness on their necks on the Day of judgement.
> And squander not (your wealth) wastefully. Surely, the squanderers are devil's brothers. And the devil is ever ungrateful to his Lord (Q17: 26-27).

A moderate course between niggardliness and wastefulness is therefore maintained by Islam. This is confirmed by the Qur'anic verse which states:

> And make not thy hand to be shackled on thy neck, nor stretch it forth to the utmost (limit) of its stretching forth lest thou sit down blamed, stripped off (Q.17:29).

Sustainable development according to the Brundtland Report quoted in Reid (1995, p. xv) is a development that "meets the need of the present without compromising the ability of future generations to meet their needs." From this definition, it could be ascertained that the idea of getting loans could jeopardise the development of future generations as they (the future generations) would have to pay what they did not owe. It has to be noted that the purpose of taking loans by individuals and corporate bodies is to ease and solve certain immediate financial predicaments. However this has turned to be additional burden in view of the high rate of interest on such loans and inexhaustible human wants. Fasipe (1990, p. 7) who studied the Nigeria external debt between 1981 and 1988 discovered that the debt which was N2,331.2 million in 1981, grew to N8,819.4 million and N10,577.7 million in 1982 and 1983 respectively. This skyrocketed to N42,229.5 million, N86, 550 million and N146,410.0 million in 1986, 1987 and 1988 respectively. The table below shows the Nigeria's external debt outstanding between 1991 and 1996 (in USS Million)

| Creditor Category | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|
| Multilateral | 4,016 | 4,518 | 3,694.7 | 4,402.3 | 4,411 | 4,665 |
| Paris Club | 17,793 | 16,454.7 | 18,160.5 | 18,334.3 | 21,669.6 | 19,091 |
| London Club | 5,988 | 2,120 | 2,055.8 | 2,057.8 | 2,045 | 2,043 |
| Promissory notes | 4,479 | 3,246 | 3,159.9 | 3,178.2 | 3,148 | 2.140 |
| Others | 1,454 | 1,226.1 | 1,647.3 | 1,456.3 | 1,311.2 | 121 |
| TOTAL | 33,730 | 27,564.8 | 28,718.2 | 26,428.9 | 32,584.8 | 28,060 |

Sources: *Central Bank of Nigeria and Federal Ministry of Finance (cited by Kani, S.M. (2002, p. 79).*

Coupled with the above is the escalating rate of debt servicing requirement, which grew much faster than the foreign liabilities. Between 1977 and 1984, the interest and principal payments of 123 developing countries rose from $40 to $121 thousand million, while the interest shock hit these countries even harder than their declining capacity to service their debt (Korner, et al: 1986). With particular reference to Nigeria, Soludo (2003) confirmed that the contractual debt service obligation for Nigeria was around US $3.7 billion per annum in 2001. In the same vein, Chapra, (1998, p. 602) goes further to assert that as at 1989, the total debt of low and middle income developing countries was around US$1,200 billion, whereas it was less than US $600 billion in 1980.

**(iii). Visionless and Corrupt Leadership**

The relegation of justice to the lowest ebb is manifested in the political set up of many countries. Various forms of manipulations and malpractices are the major characteristics of the political scene; and these are reasons why the political realm is considered a dirty game hosting hooliganism, thuggery and all forms of vices. The more crooked the path that leads to power, the more determined are people to fell huge trees of morality to give them access to that path. One should not expect much from a leader who smuggled himself to an office through dubious means to perform creditably well in such office. In another situation, one is optimistic that mismanagement of resources is largely due to bad leadership who is out to squander public funds instead of embarking on projects that have direct bearing to human development. Examples abound in Nigeria where many past governors, ministers and administrators are now facing trial of siphoning public funds.

The short-sightedness of Nigerian leaders in the past made them to consider the abundant resources with which the nation is endowed too much to be maintained and so decided to forgo some at the expense of others. This is appropriately put by Omotoye (1987) when he observed:

> ...in the 1960s "palm products, cocoa, groundnuts, rubber, cotton, timber, tin etc" competed favourably with one another, in securing a big chunk of foreign exchange earnings for Nigeria, they were relegated to the background once the oil started booming owing to 1973 oil embargo. Oil, a wasteful asset, soon emerged as Nigeria's major foreign exchange earner. The fact of Nigeria being mostly agrarian economy was lost on the leaders and they also put the cart before the horse by pursuing urbanisation before industrialisation (p.17).

Proper management of the nation resources is one of the big tasks before the nation's leaders. A leader who does not understand the potentials of his subjects and cannot tap the resources with which the nation is endowed would be made answerable to the impoverished status of his subjects.

Islam enjoins proper accountability of people in power. This was adequately demonstrated by 'Umar ibn al-Khattab during his tenure as a caliph. Any appointed official in his administration must, as a matter of policy, declare his assets both before and after his tenure of office. 'Umar was conscious of accountability to the extent that he would not use public fund for his own personal benefit. It was said that he kept two lamps, one bought and maintained with the public money and the other bought with his personal money. He would not lit the public lamp for his personal work.

**(iv). Insecurity of lives and property**

No iota of development could take place in an atmosphere of rancour, disunity and insecurity. The work of development embarked upon so many years back could be disrupted and destroyed by a day mishap. Virile men who could work for the country could loose their lives in any battle and this could hamper the development of any country. It is sad to note that Nigeria has witnessed many crises which had claimed many lives and property. For example, the Kafanchan riot of March 1987, in addition to some mosques and churches that were burnt, about twenty-five people were said to have been killed and several others hospitalised. In the same vein, Imam (2004) recorded the enormous casualty of

the Maitatsine uprising of Bullum-Kuttu of 26th – 29th October 1982, the Jimeta Maitatsine crisis of 26th February -5th March 1984 and the Gombe Maitatsine disturbance of 26th – 28th April 1985. According to him, not less than four hundred lives were lost in the Bullum-Kuttu uprising; one thousand and four lives were lost and five thousand, nine hundred and thirteen families displaced in the Jimeta crisis; and over one hundred lives were lost in the Gombe disturbance. All these crises led to destruction and looting of properties worth millions of naira. One cannot therefore doubt the fact that these incidences have adverse effects on the socio-economic development of the country. Apart from the fact that foreign investors would be scared from coming to the country, no meaningful development could also take place in atmosphere of crises.

The Qur'an in many of its verses traces the genesis of mankind to a single soul. Though the world might be segmented into divisions based on colour, race, religion, tribe and sex, humanity as a whole is seen Qur'anically as a single entity which emanated from a single soul (Q4:1; 49:13). The variations in language, colour, and tribe are only meant for recognition and not for discrimination. For meaningful development to take place therefore, mankind should see itself as one entity and so share its posterity and adversity together. Once this is understood, all forms of discrimination will be jettisoned, while individuals will deal justly and equitably with one another in the society.

### (v) Dichotomy between *Mu'amalat* and *'Ibadah*

Islam is being looked down upon as a religion which does not encourage economic development because of its mysticism and fatalism which impede individual initiative, ventures and risks, all which are the cornerstone of economic development. Al-buraey (1990) cites Lewis to have said:

> Even some of the old, high religious ideals have been condemned as hostile to development. Such for example is asceticism, which tends to reduce and limit human needs instead of satisfying them, and thus discourages effort: the virtue of renunciation leads too easily to the vice of indolence. Similarly, the great importance attached to virtue of charity – in the sense of alms-giving – in the traditional Islamic scale of values has been criticized, in that it gives an accepted – even an honourable place to the beggar in society, and thus discredits and discourages honest toil. The charge that the Islamic religion is innately hostile to economic development is difficult to sustain (p.172).

The above statement reflects the non-recognition of some scholars of the stand of Islam of the wholesome manner in which the religion looks at issues. While the capitalists rate an economic system based on its generation of profit, the Marxists stress on the productive and distributive processes of the economic system. Islam, on the other hand, frowns at compartmentalization of secular and sacred and so stresses the moralization and spiritualization of these same processes (Al-Buraey, 1990). The holistic manner with which Islam sees issues transformed the hitherto backward city of Madinah to a leading nation of the world in every sphere of life by the time the Prophet and his companions introduced the economic doctrines of Islam to the city. Islam does not uphold asceticism which despises wealth and riches and so condemns indulgence in pleasures of material life. It rather encourages spiritual and material development and so high-rates a God fearing man who engages in economic activity for the purpose of meeting the needs of his family than a person who depends on others for his sustenance while he secludes himself in a mosque praying.

During the tenure of Umar the second caliph, a man was seen seriously concentrating on *nafilat* and *dhikr* in a mosque from morning till evening. Upon his request on who provided him with food and drinks, he was told that it was his brother. 'Umar remarked that the brother had more reward than the one staying in the mosque. In essence, man's spiritual development should not in any way hamper his socio-economic development. Little doubt that the Qur'an enjoins Muslims to disperse in the earth seeking sustenance immediately after the weekly Friday prayer (Q62:10).

Apart from this, the discovery of the mysteries of creation as enunciated in the Qur'an is seen as part of *'ibadah*. The reading of the Holy Qur'an from page to page may not attract celestial reward as much as the one who sweats to search and discover the secret of the cosmos as well as the hidden treasures which Allah has created for man to explore for his benefit. This actualizes the principle of *khilafah* as entrenched in the Qur'an and the *Sunnah*. As Allah's vicegerent on earth, he is expected to "develop it, bring civilization to it, overcome the obstacles it presents, response to its challenges, and create the conditions for a more secure life' (Khalil, 1991). Thus, any effort made in this direction is nothing but a serious *'ibadah*. Stressing the need for the Muslims to acquire adequate scientific knowledge for the discovery of the nature and law of the world as a prerequisite for Muslims to function as Allah's vicegerents, Khalil, (1991) declares:

> Muslims cannot carry out their functions as vicegerents, or obtains guarantees and assistance to enable them to achieve their objectives of perpetual progress unless they use scientific research method and methodologies to discover the laws of the world, nature and the cosmic system. Only then can they "plug in" to their reserves of energy and achieve a greater harmony between themselves and their environment. Without this, the principle of Khilafah is no more than a theory or a dogma in a vacuum (p.3).

The point we are trying to make is that the Almighty Allah has provided for man all his needs. What is left for him is to explore these resources for his optimum use. This explains why Al-Ghazali frowns at some Muslims who engaged themselves in *adhkar* shouting profusely the name of Allah. He likens this to the ungrateful attitude of a group of people whose master provided them with all their basic needs, but who instead of making proper use of these amenities, converged to demonstrate their support to their master by shouting his name thinking that such a step would be satisfied to him (Al-Ghazali, 1402AH).

**(vi). Faulty Education**

As no meaningful development could be attained without knowledge, the first task of Allah was to teach –educate Adam and this served as a prerequisite for him to identify the nature of all things. In the same vein, Prophet Muhammad was not initially asked to start preaching or worshipping. Rather, he was asked to read. His acclaimed 'unletteredness' was therefore limited to the early days of his mission. The task of seeking knowledge was rigorously pursued by the early Muslims to the extent that distance, religion and language were no barrier to its acquisition. With time they developed themselves to the level of world recognition. The accelerated rate of Muslims' contribution to knowledge as a whole was however hampered by some socio-political factors. They, thus loss the battle to the West, who later spread it to the rest world after secularising it.

The inherited system of education which demarcates religious and secular subjects is no doubt a bane to sustainable development. Instead of producing candidates who can effectively perform in all aspects of life, it has dichotomised its products to perform either religiously or secularly. Apart from

this, the system is said to have produced scholars who do not understand the nation's problem and so not capable of solving them. Lamenting on the incapability of our educational system to solve the nation's problems, Sulaiman (2000) writes:

> Yet our educational system prevents us from focussing our attention on ourselves which will have otherwise enabled us to develop our own experience and build our own world in accordance with our history, beliefs, culture and intellectual tradition. Hence our world collapses before our eyes because we have denied its existence, while the lamp we have borrowed from Europe fails to provide the light we truly need.
>
> .....Our universities have continued to deny our existence and to produce for these nations, politicians who are dishonest, businessmen who believe that exploitation is a legitimate means of enrichment and scholars who are mere agents of falsehood (Pp.18-19).

As one does not opt for traditional Islamic schools as a model for true Islamic education, which of course, has its own shortcomings in its curricula and organization, one does not as well solicit for the western system of education which does not give room for revealed knowledge or spiritual development. An integration of the two would surely provide the much needed development in the nation.

**Some Institutional set-up for Sustainable Development**

***(i) Zakkat***

In order to allow for circulation of wealth and discourage concentration of wealth in the hands of few individuals, Islam enjoins the well-to-do and affluent ones to assist the less privileged ones by deducting certain percentage of their wealth to those in need and for other beneficial purposes. It is demanded that 2 ½ % of the total amount of one's savings be given out as *zakkat* to the poor and the needy. *Zakkat* is considered therefore, as a social insurance fund against unforeseeable calamities that can lead to unexpected and sudden poverty. Such catastrophes as diseases, inferno, flood, bankruptcy and death, which might lead to abject poverty, are taken care of by *zakkat*. Describing the function of *zakkat* in alleviating poverty, El-Gousi (1982) writes:

> It is an insurance fund to which the wealthy make contributions. If you are rich today, you contribute to this fund; the needy and the poor benefit from this fund; if you or your children are rendered poor tomorrow by the vicissitudes of the world, you or your children will also benefit from it... Even when one is on a journey and becomes penniless through theft, sickness and some other reasons, this fund will meet all one's need (p.90).

It is understood that Islam demonstrates modesty on the amount to be paid as *zakkat*. The amount is so moderate that it is convenient for any serious qualified man to pay easily. This would avert the insensitivity of the individual to collective responsibility; the widespread tax avoidance and tax evasion are largely caused by exorbitant neck-broken levies and taxes charged by the government.

One unique characteristic of *zakkat* is that it is levied not on the income of its payers, but on accumulated net worth which is in one's possession for up to a year. This implies that any wealth that is left idle would be penalized through the annual *zakkat* payment. In order to guard against this, the wealth owner has the option of investing his wealth more so that the invested amount is *zakkat*-free. A leaf can be borrowed here by various governments, to shift their taxes from the income of the payers to the accumulated wealth from such income. This would discourage hoarding and encourage investment. Payers of such taxes will thus prefer to invest their wealth on other lucrative businesses and this will in turn create job opportunity for others and cumulatively produce more people who will be eligible to pay *zakkat* as their status will rise from receivers to payers.

In essence, if the principle of *zakkat* is allowed to operate, and such depositors realize that rather than expecting interest on their money, their money that is left idle would be penalized through the annual *zakkat* deduction, they would prefer the option of investing rather than saving, and this would be beneficial to them and the entire society. Hooliganism and thuggery which characterize the political scene of developing countries, the high rate of insecurity of life and property, the manifestation of social crises, tribal strife, free trafficking and peddling of drugs, are all resultant effects of youth unemployment, which could be ameliorated through investment. Thus, all efforts at controlling societal crime and other acts of indiscipline in the society will for long remain a mirage if creation of appropriate job opportunities is taken with levity.

### *(ii) Waqf*

Technically, *waqf* signifies the dedication of a property or giving a property away in charity for the purpose of giving the proceeds from such for charitable objects, or rather making its income available for specified beneficiaries. The social-economic significance of *waqf* as an institution had been acknowledged right from the time of the Prophet. The Prophet was said to have directed a *waqf* created by Abu Talhah and part of the income from it was spent on his poor relatives. 'Umar was equally said to have created a *waqf* in accordance with the directives of the Prophet, the income from which both the poor and his rich relatives benefited. In the same vein, 'Uthman ibn Affan bought a well and made it a trust property for the charitable use of all and sundry in order to relieve Muslims of the difficulties imposed by the Jews who banned Muslims from drawing water from their wells. It became a matter of public concern in the second century of *hijrah*. The Umayyad caliphate entrusted large *awqaf* established during the period to *Qadis*. A *Diwan* called *Diwan al-Nazr fil-Mazalim* (Bureau for the inspection of grievances/Public Complaints Bureau) was established not only for the purpose of looking at the miscarriage of justice, but to supervise the *waqf* property and ensure its administration. During the Abbasid caliphate, the supervision of *awqaf* was exclusively in the hand of the *Qadis*.

The institution of *waqf* has being a strong weapon for development and growth of colleges and learning among Muslims. It could therefore be used to cater for the needs of students in form of scholarship awards and grants which would in turn facilitate students' devotion to serious pursuance of knowledge. It could also be used for the provision and improvement of social amenities in the society. Doi (1984, p. 341) has observed that a number of schools, colleges, hospitals, orphanages, mosque-buildings and scholarship funds are run through *waqf* properties in most parts of the Muslim world.

### *(iii) Hisbah*

The institution of *hisbah* was firstly established and maintained by the Prophet to ensure public moral order and socio-economic justice. He himself was reported to have personally undertaken *hisbah* patrols around the market to ascertain compliance with Islamic ethics of business transactions. At an occasion, he detected that a trader displayed dried wheat while the moist one was kept underneath. He then queried the trader for not putting the moist on top of the stock so that people could see it. He therefore warned him saying: "he who

defrauds us is not of us." Many *ahadith* confirmed that he forbade any business deal that involved injustice, cheating and exploitation. The Prophet, apart from being the first *muhtasib,* also appointed some staff to investigate market affairs. This was equally practised by the Rightly-Guided caliphs especially 'Umar ibn al-Khattab who himself used to go to market to ensure compliance with Islamic injunction.

The *Siraj al-Ikhwan* of Shaykh 'Uthman ibn Fodio contains his ideals of *hisbah.* In order to ensure just business transaction in the Islamic Sokoto Caliphate, the *Amir* suggested that the property of those who defraud and cheat to get rich should be confiscated and considered as revenue. He equally saddled the Emirs with the responsibility of supervising and regulating the measures and scales used in the market. He is reported to have written in the *Siraj al-Ikhwan* that:

> The ruler should try to curtail shady dealings and blameworthy characters of the marketers. He should check cheat like tampering with measures, reducing or increasing weights, or allurement tantamount to lies like ornamented copper meant to be sold for silver or deliberate mingling of gold with dust, inflating prices of meat by means of blowing air into it, mixing water with milk, or forcing people to buy the items they are not satisfied with or their price. (Dogon-Daji, 2003, p. 33-34)

In line with the above, Shaykh Abdullah ibn Fodio also postulated the regulation of the market through a market inspector who would be dealing with issues related to fraud, dishonesty, cheating and other un-Islamic business transactions; inspects weights and measures to ensure uniformity of standard; prevents the sales of items forbidden by the *Shari'ah;* prevents harmful monopolies; ensures flow of goods to the market; guards against all forms of *riba* or unjust enrichment in commercial transactions and discourages unwarranted price rises without imposing artificial prices of his own.

**Conclusion**

The above discussion so far has identified the unique perspective of Islam on sustainable development as against the secular perspective. Islam is seen approaching issues holistically by considering the spiritual development in the perspectives of other aspects of life. The Islamic preaching against some factors which can hinder sustainable development were equally identified and

discussed. As long as these issues are not given the desired attention, one doubts the viability of sustainable development in Africa. Finally, some institutions put in place by Islam to ensure effective sustainable development were also highlighted. As vicegerent of Allah on earth and with the human and natural endowments of the world, one is optimistic that there is no reason why a nation should remain undeveloped or underdeveloped, as Allah has given it all the instruments required to change its situation for better. Allah will not come to change the condition of a nation until such a nation has decided to take its fate in its hand and so decides to take positive measures to ensure its positive and desired development. The guide as to how to go about the development is contained in the Qur'an. It is therefore our recommendation that Africa and Nigeria in particular should borrow a leaf from Islamic ethical values of justice, accountability, probity and moderation; and avoids such vices as injustice, excessive expenditure, and under-utilization of resources and finally adopts an education system which will take care of the body and soul of its citizens for all-round development to be attained.

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# POPULORUM PROGRESSIO VERSUS ENVIRONMENTAL DEGRADATION: A RE-EXAMINATION OF THE AGRARIAN REVOLUTION IN THE GHANAIAN FOREST BELT

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**Abstract**

*Employing the multi disciplinary approach, this paper uses Hardin's 'Competitive Exclusive Principle' to show how the socio-economic development of forest peoples adversely impacted upon biodiversity in the forest region of Ghana. We posit that human history is replete with the struggle of mankind to conquer the environment, including real and imagined adversaries. Thus the nineteenth and twentieth centuries witnessed an extensive intrusion of human beings into the natural habitat of plants and animals for the purposes of commercial agriculture. This inevitably pitched the human population against the flora and fauna, particularly the forest elephant (Loxodonta africana cyclotis). Incursions into the forest therefore culminated in a struggle for survival between the human population on one side and the flora and fauna on the other. Again, this paper argues that by the 1970's commercial agriculture as a tool for socio-economic development had succeeded in reducing drastically the extent of forest cover and the population of plant and animal species.*

## Introduction

Development is multi-dimensional and often involves what is termed the 'common good'. This good is thought to be oriented towards the progress of persons, thus *populorum progressio*. In the pursuit of authentic human progress, there are interrelated elements which include, respect for the fundamental and inalienable rights of persons, as well as the social and environmental well-being, and politico-economic development of humanity as a group. Authentic development is therefore not limited to mere economic and infrastructural growth, but extends to include human and environmental well-being. This broad definition of development of course led to the ideas and principles of sustainable

development adopted since the late 1970's and early 1980's. In the 1970s, the United Nations coined the phrase 'sustainable development' because of the recognition that the 'champagne and caviar' lifestyle does not translate into development, neither does development mean ownership of expensive four wheel drive vehicles or skyscrapers. If development is for the common good, then such an advance must target today's people and tomorrow's. That is why there can be no development without ecological concern.

A close examination of the history of Ghana has exposed us to the fact that the forest belt of Ghana did not only witness the emergence of most of the powerful kingdom and empires in the country, but also saw diverse socio-economic development during the pre-colonial, colonial and post-colonial eras. In this paper, we are going to show how human migration and population growth, and the high demand of land for socio-economic activities, particularly, commercial or plantation agriculture had caused environmental degradation in the form of flora and fauna impoverishment in the forest belt of Ghana. Employing the multi-disciplinary approach, this paper uses Hardin's 'Competitive Exclusive Principle' to show how the socio -economic development of forest peoples adversely impacted upon biodiversity in the forest region of Ghana.

An on -going scientific debate revolving around Hardin's theory of *the Competitive Exclusive Principle* (Hardin, 1960, p. 1291-97), which Barbier *et al* refer to as 'the competition for land argument' (Barbier *et al*, 1990, p. 14) and Sugg and Kreuter (1994) call the 'theory of competitive exclusion' (p. 22-3) posits that where the demands of two species are sufficiently similar, competition between them will lead to the extinction of one (Hardin, 1960, op cit). In fact, this theory perfectly explains how socio-economic activities or development have over the years contributed to the impoverishment of biodiversity in the forest belt of Ghana. Dickson avers that during pre -colonial times, Ghana had a large stretch of wilderness comprising high forest and savannah vegetation relieved in only a few places by clearing for settlements and farms. And everywhere in the country, there was abundant game in the forest (Dickson, 1969, p. 57).

However, migration, human population growth and agricultural activities had decisively led not only to the decline of the plentiful game, but also the destruction and contraction of the forest cover which served as the habitat of the game. Historically, the Akan people occupied the forest belt of Ghana. Anquandah, an archaeologist, suggests that remnants of the Neolithic people and

some migrants possibly evolved into the Akan in the area around Bono, Adanse and Assin between 500 BC and AD1000. They developed the Akan language and the political and social institutions associated with the Akan (Anquandah, 1982, p. 53). But Adu Boahen relying on oral tradition observes that the provenance of the Akan–speaking peoples was the confluence of the Pra and Offin rivers to the north of Kusa Hills, in the Adanse and Amansie districts (Adu Boahen, 1975, p. 5-6).

**Features of the Tropical Rainforest**

The population of the Akan in this geographical environment at this stage was very small or sparse. This was because by nature, the tropical rainforest and for that matter swamp forest, have dense vegetation and are very humid, which promoted the growth of huge and tall trees with huge buttresses growing up some feet above the base. These features of the forest hampered dense human settlement (Mabogunje, 1971, p. 3).

Besides, the damp and dense nature of the forest environment stimulated breeding of mosquitoes and tsetse flies which caused malaria and sleeping sickness respectively. Therefore, there were high morbidity and mortality rates which kept the population very low. Additionally, there was difficulty in clearing the humid and dense vegetation for agricultural purposes. This coupled with the delay in the introduction of iron technology, discourage agricultural settlement. This is borne out by the Akan tradition recorded by Rattray that there was an 'era when game, fish, wild herbs, berries and roots were the sole food of the people' (Rattray, 1923, p. 218).

Nonetheless, with the passage of time, the Akan peoples who were living in clusters of small independent villages either through population growth or political pressure, coupled with the opportunity offered by trade, diffused in waves into other places in the forest zone. These places were either completely uninhabited or had small pre–existing human population and were thus conquered and absorbed by the invading or migrating Akan. The Fante, Assin and Ahanta moved southwards towards the coast, the Akyem and Kwawu migrated eastwards, Bono and Asante northwards, and the Gyaman and Sehwi westwards (Amenumey, 2008, p.17).

It was after these waves of migration that the various Akan polities like Akwamu, Denkyira, Akyem and Asante emerged. Tradition relates that the Oyoko family which established the Asante migrated from Asante Manso to Kwaman where they established the nucleus of the Asante nation, after

conquering all the states in Kwaman except Domaa who resisted them. Bu through series of wars, the Asante forced the Domaa (a splinter group of th Akwamu), who had by the seventeenth century settled in Suntreso in the vicinit of Kwaman, into Abampredease or Bomaa, Abesim, Chiraa, Wam Pamu an Gyaman (Ampem, 2002, p. 6) in the deep forest near the Ghana –Ivory Coas border to populate the area (Manu, 2005).

Further, the Asante expansionist policy in the second decade of th eighteenth century led to the annexation of Ahafo forest, which the Asant wrested from the Aowin between 1719 and 1722 during the Abirimoro war. The Asante systematically over the years populated that territory by setting up twenty–eight colonies. Kumasi Wing Chiefs settled their subjects, servants and war captives in these colonies to perform various duties, prominent among them was hunting (Kwarteng, 2002, p. 59-66). From that time until the twilight of the nineteenth century, hunting remained the single most important occupation not only in Ahafo but also in the entire forest belt.

But despite the prevalence of hunting during this period, the flora and fauna could not be said to be at risk or endangered at all. The reason being that, apart from metropolitan Asante, much of the forest region remained thinly populated in most places as large expanse of the land remained virgin or uncultivated. Cash crop or plantation agriculture was unknown to the Akan who practised only subsistence agriculture. The situation however, changed after 1896 when Tetteh Quarshie introduced cocoa into the country.

**The Cocoa Industry, Population Increase and the Degradation of the Forest**

Prior to the introduction of the cocoa industry in Ghana and its adoption by the pioneer cocoa farmers, the forest belt did not appear to face any threat of degradation because there was no pressure on land for cultivation. Thus large expanse of the forest remained virgin and undisturbed, and devoid of human settlement or population. However, the introduction of cash crop agriculture generated high demand of land for the cultivation of the new cash crop by individuals who adopted it. From about 1892 onwards, individual Akuapem, Krobo, Shai, Ga and other Ghanaian farmers from the south migrated to the forest belt to purchase forestlands (*kwaeɛ*) for the cultivation of cocoa farms (Hill, 1997, p. 1).

These migrant farmers from the south were followed by others from the north who entered into share cropping contracts with the landholding chiefs in

areas such as Akyem, Asante, Sehwi, Dormaa and Ahafo. With the participation of migrant farmers in the cocoa industry and the subsequent reinvestment of their profits in farm acquisition within the forest zone, the cocoa frontier swiftly moved throughout the high forest, from New Juaben and Akyem Abuakwa, by 1900, reaching the Amansie district of Asante in 1905, and later to the Bono-Ahafo areas and the Western Region, until no new frontier districts remained. During the 1920s, there was an influx of long distance migrant labourers from the French colonies of Togo Dahomey and Upper Volta (Burkina Faso), as well as Niger and Mali. The 'foreign' migrant labourers were attracted to Ghana because of attractive remuneration (Amanor, 2006). The rise of migrant labour into the cocoa belt coupled with migrations of the forest peoples themselves resulted in human population explosion in the forest belt. By the 1930s, large acres of forestlands in the Western Province of Asante (later Brong Ahafo Region) had been put under cocoa cultivation, (Dickson, 1969, p.306) leading to an agricultural revolution in the Gold Coast.

What did the acquisition of such large-scale forest land for agriculture mean? This meant two things. First, it implied that cocoa farmers and the wildlife species (plants and animals) were now seriously in competition for space. And since the farmers were in an advantageous position, they succeeded in putting large tracts of forestlands under cultivation. Secondly, the acquisition of such forest land for commercial agriculture meant that part of the large expanse of the forestlands in Ahafo, Twifo Hemang, Denkyira, Adanse, Wassa, Sehwi, Dormaa, Sunyani, Asante and other places, which had hitherto been uncultivated, were now cleared to make way for the cultivation of cocoa.

This inevitably impacted negatively on biodiversity as the forest became fragmented. Most of the flora (tree and plant species) was felled to make way for the cocoa farms. By the same token, the range of most of the fauna did not only become fragmented, but also shrank. The habitat of the animals was limited largely to Government constituted forest reserves, while unreserved forestlands were lost to agriculture. The habitat loss made most of the animal species vulnerable to human predators, particularly, the pioneer farmers who either trapped or shot them for food because they relied heavily on some of these animals for their food protein supply (Manu, 2005). One of the wildlife species which was greatly affected by the expansionist policies of cocoa farmers was the African elephant (Loxodonta Africana).

Sugg and Kreuter in their contribution to the debate on the 'Competitive Exclusive Principle' note that since the advent of sedentary agriculture, land put

under cultivation contributed to critical habitat loss to the elephant (Sugg & Kreuter, 1994, 23). The forest belt of Ghana used to harbour large elephant populations in the past, but due to subsistence and commercial agriculture, the range of the elephant has been fragmented (IUCN Report, 2002, p. 205), and this has caused a considerable decline in elephant numbers. In Ghana, the Goaso Complex (Ahafo) is now considered by wildlife experts as the largest elephant range (IUCN Report 2002, p. 205); however, historical evidence shows that it is a pale reflection of what it used to be. This is due to the fact that the elephant range has been fragmented by the agrarian revolution that engulfed the forest belt in the nineteenth and twentieth centuries.

Faced with the imminent loss of its habitat to agriculture, the elephant reacted violently by killing farmers as well as destroying farms and settlements. The competition between the elephant on the one hand and the cocoa farmers on the other, introduced a third party, the government. As an interventionist policy, the government introduced a Game Control Unit initially based at Damongo but later transferred to Goaso in the Ahafo area where the human-elephant competition was acute. For several years, the Game Control Unit operating from Goaso embarked on game control operations throughout the forest region, killing elephants that were found destroying cocoa farms or food crops, and even at times chased them into the forest reserves and killed them. The systematic killing of these elephants during game control duties immensely contributed to the decline of Ghana's elephant population.

Between 1972 when the Game and Wildlife office was opened at Goaso and 1989 when Ghana ratified the Convention on International Trade in Endangered Species' (CITES) Appendix I listing of the African elephant (which made the Department of Game and Wildlife place a moratorium on the killing of prowling elephants during control exercises), several hundreds if not thousands of elephants were killed by Game Scouts throughout the country. In the ensuing years, there appeared to be a widespread belief among villagers that a visit by the elephant control team to an area led inevitably to the killing of elephants with the meat being sold to defray part of the cost of the operation. Thus inhabitants of Hwiehwiegu in the Dormaa District openly encouraged the control team to kill an elephant so that they could get meat to eat. For example, one Owusu Anane, who did not even have a farm at Kwame Puah village, falsely reported that elephants had invaded his farm (Wild Division file GoGw/2/vol.1, 1976).

## Conclusion

In the interest of sustainable development, we have to re-think land use and agriculture in Ghana so as to save some forest lands for the use of future generations. The promotion of commercial agriculture is a major cause of deforestation and the concomitant habitat loss resulting in the decline of wildlife population in Ghana. Given that most existing plantations are ageing, and that new plantations are most likely to be set up in forest areas, this threat is likely to expand in the future. Consequently, the replacement of diverse ecosystems by large-scale cocoa farms has impacted negatively on plants and animals, especially the forest elephant. This demands the pursuit of real, and not imagined, sustainable development in so-called developing and under-developing nations, and provides compelling reasons to build on bio-cultural diversity through the principle of endogenous development or development from within. In the final analysis, the call today in Africa and elsewhere, is to concentrate on not making culture the missing link in development planning. This is to say that we must not lose sight of the veracity in the saying that "when the last tree dies the last man dies."

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# THEATRE AS A MECHANISM FOR THE PREVENTION AND MANAGEMENT OF HAZARD AND DISASTER FOR SUSTAINABLE DEVELOPMENT IN AFRICA

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## Abstract

Most of the environmental hazards and disasters occurring in our societies today are due to carelessness and ignorance occasioned largely by lack of proper enlightenment and careless disposition to environmental issues.

This paper identifies that in a developing society like Africa, dependency on technological innovation for its development is inevitable. For that reason constant occurrences of hazard and disaster can not be averted. However, it is possible to manage the situation to the advantage of man so that the rate of its occurrence would be reduced to the barest minimum. This can be brought about by our inherent management approach. In this wise, the role of theatre in providing this managerial outlet from the approach of Theatre for Development (TfD) stands out. This paper will attempt to identify some of these hazards and disasters and analyse how theatre can be a tool for the amelioration of the phenomenon. The concepts that will be advanced will provide better understanding of this phenomenon.

The paper concludes by recommending theatre as a mechanism and panacea for keeping hazards and disasters at bay from our vicinity.

## Introduction

The incessant occurrences of hazards and disasters in Africa have caused leaders and citizens alike some high degree of worry. Lots of mechanisms have been put in place to combat the phenomenon. The happenings, which occur in two dimensions are prominent in; natural disasters and the man-made ones. The natural occurrences are visible in earthquakes, floods, volcanoes, hurricanes, tornadoes, storms, droughts, snow, hail and lightning. The man-made ones, which are majorly due to man's careless disposition to the issue of his environment are observable in; deforestation, lack of attention to town planning programmes, poor attitude to waste disposal, construction of structures on water ways, incessant bush burning, lack of respect for road signs and excessive

speeding on our roads etc. Those ones that occurred through natural means have posed more problems. This is due to the fact that they are occurrences that are said to be beyond human control. They are classified as nature outbursts that are catastrophic and more often than not they occur without warning. Adding to the reel of environmental problems are technological inventions, which are genuinely aimed at bringing comfort and improvement to mankind, but have caused us more harm than good. As a developing nation though, our dependency on technology for sustainability cannot but be on a high side, but the complexities which it carries are the source of worry. As these worries occasioned by negative environmental occurrences posed by natural disaster, technological inventions mount by day, one is more alarmed that combating the man-made hazards and disasters posed greater complexities than the ones that occurred naturally or through technological inventions. It is at these cross-roads that we opined that the complexities brought about by technological inventions, natural occurrences and man-made disasters and hazards could be ameliorated using theatre approach. This paper therefore, recommends a mechanism that we hope is potent to prevent and manage the occurrences of these various hazards and disasters for sustainable development in Africa.

In approaching this work, we have segmented it into six compartments, with a view to providing a sequential understanding of what the work is all about. The introduction is preceded by an examination of conceptual framework and an historical preview of steps taken so far by various governments and non-governmental organisations to combat hazards and disasters that have been ravaging Africa. The paper also examines some technological inventions and its effect on our environment. Finally, it examines Theatre for Development (TfD) approach as a mechanism for preventing and managing hazards and disasters for sustainable development in Africa. It concludes by making some recommendations.

**Theoretical Framework**

It becomes imperative to illuminate on some concepts that we shall come across in this paper, they form our theoretical framework and are therefore germane to our understanding their relationship in this work. The concepts are: hazard, disaster, theatre, prevention and development.

*Hazard*: can be described as anything that caries the potential emblem of danger. It cuts across all live endeavours; occupational, health, social, recreational, environmental, etc. while *Disaster* as described in Encarta

Dictionaries 2009: "as an event that causes serious loss, destruction, hardship, unhappiness or death." Disaster, which manifest in injuries and death, property damage, earthquakes, volcanic eruption, hurricanes, tornadoes, tidal waves etc. often occur in a sudden form. Disasters may either be natural (caused by disequilibrium in nature) or man-made (caused by man careless disposition to the issue of his environment).

*Theatre* is a concept that carries a two dimensional definitions. It is defined by Etherton (1982) from the angle of a play house; where audience seat to enjoy performances, "a building for live dramatic performances." Secondly, he also defined it as "the circumstances of a live dramatic performance." (Etherton 1982) For the purpose of this discourse, we will adopt the latter and enumerate its potency as a tool for management and prevention of hazard and disaster. *Theatre for development* (TFD) on the other hand as described by Okwori (2004), is: "one of a range of participatory method through which development issue can be communicated." (Okwori 2004: 17) TfD as an approach share the same attributes with the under-listed theatre practices: 'People's Theatre', 'Popular Theatre', 'Theatre for Conscientisation', 'Theatre for the Oppressed', 'Theatre for Change ', Theatre for Integrated Rural Development' etc. All the above enumerated theatre styles are theatrical approaches devoted to community concerns. Yankah (2006) quoting Prentki (1998: 247) captured the meaning of TfD. He described it as a mechanism:

> Used in the service of development aims: a tool available to development agencies which pursue the goals of self-development and an improved quality of life of all people whose material conditions leave them vulnerable to hostile and predatory forces, both natural and human. In other words, it is an instrument in the struggle to help such people become subjects, and cease to be objects of their own histories. (Yankah 2006:42)

From the above definition it is obvious that theatre for development is people-oriented; it is a means by which people in a given area congregate to make significant contributions to their existence, using communal participatory method. This paper will further elucidate on this theatre approach.

*Prevention*: is defined in the Encarta dictionary as: "action that stops something from happening: "an action or actions taken to stop somebody from doing something or stop something from happening" We see it therefore, as a process of distancing from imminent terrible occurrences, an approach

masterminded to ward off an impending evil. *Development* as it were is the manifestation of growth, increase, changes, progress or advancement. Development more often than not is a positive phenomenon, noticeable in physical, such as in structural transformation like; buildings, roads, infrastructural facilities, etc and the intangibles, as manifested in values; political social, economic and social values. Development is the yardstick for measuring the rate of growth in a given society.

**Occurrence of Hazards and Disasters- A Historical Outline of Combative Efforts**

Earlier in this work we tried to enumerate different ways by which hazards and disasters find it ways into our environment. This segment will not bother to go again in that direction; rather we shall examine several notable combative efforts made by Governments in various Nations in Africa at putting the occurrences of hazards and disasters in permanent check. Some of the measure were seen in the establishment of agencies in different countries within the African sub-region, such as National Disaster Agency, Meteorological and Disaster Management agencies, National Emergency Management Agencies, Indigenous Knowledge Research Team, United Nations Environmental Programme (UNEP), Ecological and Disaster Management Agency, Environmental and Social Impact Agency, Fire Services, Road Safety Corps, Police Services, Red Cross Society etc. Some of the agencies were assigned to specific hazard prevention and management process. Like Fire Service, managing fire disasters, ecological agencies managing flood and other environmental problems Road safety Corps preventing and managing occurrence of road accidents etc. These obviously were aimed at allowing specialists to handle specific disaster. Many Non-governmental Organisations like United Nations Development Programme (UNDP) (1965), United States Agency for International Development,(USAID) (1961) United Nations Children Fund (UNICEF) (1946), to mention just a few also show great concern by providing assistance in form of financial aid, technical and expertise aid to Africa. Astonishingly, each day that passed, there were mounting reports of new occurrence of hazards and disasters in a more alarming magnitude. This is to say that most of the preventive and management mechanisms have not achieved the intended purpose. Relentless efforts of various governments in Africa at checkmating the situation have proved ineffective. A look into our environment shows that hazards and disasters still lingers in spite of all efforts made by

various governments within the African sub-region. The inability to combat the problem in Africa has continued to stand in the way of African development and its sustainability. Although hazards and disasters are not limited to Africa alone, developed nations also suffer one kind of natural disasters or the other. We have had reports of disasters in the following places: The Biloxi Mississippi hurricane in 1998, Eastern India cyclone in 1999, Southern and Midwestern United States tornadoes in 2001, Southern South Korea typhoon in 2003, South Eastern United States hurricane, Katrina in 2005, to mention just a few. The only difference is that they were able to manage their own leaving minimal effect. These developed countries did not show complacency, rather, they continue to invent disaster forecasting mechanisms while also embarking on aggressive enlightenment and awareness campaign. For instance, in 1991 the volcanic eruption of Mount Pinatubo in Philippines, had its attendant effect reduced because Philippines government yielded the warning handed to them by a team of Geologists from United States of America to evacuate their citizens from their habitation. (Encarta 2009) Yielding the warning saved the lives of thousands who would have died as a result of the volcanic eruption in the area. This was a disaster, which its effect was reduced due to obedience. These kinds of measures and discipline are what is lacking in Africa. There is no doubt that all the environmental hazards and disasters enumerated above are inimical to growth and sustainable development in any society where they manifest. It is at this point that we felt that if we must confront the problem headlong, there is the need to revisit our approaches. One would wonder why the responsibility for the prevention and management of hazards and disasters fell squally on government. It is because the occurrences of the phenomenon are of high magnitude, only government can afford the resources to prevent and manage it. We noted that the burdens of providing all conveniences for citizen are too weighty on government. It is against this backdrop that we are recommending the use of theatre as an alternative mechanism for the prevention and management of hazards and disasters in Africa for sustainable development. This paper will therefore, elucidate on this suggested mechanism, Theatre for Development(TfD) approach, which has been tested and found to be a potent and an effective approach and mechanism for orientating citizen on the prevention and management of hazards and disasters, which may have defiled other methods.

**What is Hazard?**

Here, hazard shall be holistically examined. It will be a slight build up on the earlier segment where we tried to illuminate on its definition. Hazards are occurrences that pose danger to man's life. They are occurrences that are present in almost all human endeavours and have been identified to manifest in diverse forms. They include: industrial hazards, agricultural hazards, health hazards, household hazards, social hazards and hazards that occur due to technology. We shall enumerate and explain how they occur later.

**What is Disaster?**

Disasters are sudden occurrences that cause great damage; including loss of life and or great destruction to property. Disasters have been identified to occur through natural means and through human intervention and they are inimical to sustainable development. Disasters are not synonymous to Africa alone; they are phenomena that occur worldwide. However, those ones that are common to Africa are those we want to attempt suggestion for their prevention in this paper. They are: flood disasters, fire disasters, collapse buildings, (in Nigeria, Lagos and Abuja from 2008-2009), bridges, tunnels and mines draught, famine, plague, epidemic, etc. It is not as if the occurrences of these phenomena are new to us.

**Manifestation of Hazards and Disasters**

Disasters and hazards are two intertwined phenomena that we found no area of difference in their features. They both carry danger and are sudden occurrences. Therefore we will treat them as same. They occur as enumerated below:

1) Industrial waste hazards: Many hazards and disaster that occurs in our environment have been as a result of industrial wastes. They include; air pollution, water pollution and soil pollution. Air pollution especially has accounted for death caused by cancer while water and soil pollution have resulted inaccessibility to clean and hygienic drinkable water and inability to be engaged in farming. A typical example is situation in Niger-Delta, Nigeria where there have been protracted unrests and protests against different kinds of pollutions from industrial wastes.
2) Agricultural waste hazards: as good as agriculture is to man existence, because it provides food for our consumptions. The hazards that

confront our environment as a result of wastes from pesticides and herbicides used to keep pests away from the crops and herbicides used to eradicate weeds are enormous. Soluble nitrates are also part of the agricultural wastes, these dissolve in ground water (wells and boreholes), and causing health problems.

3) Wastes from Hospitals, which include; discarded used medical materials that have been contaminated with blood, outdated/ expired drugs discarded and radioactive isotopes has also been identified as another outlet through which our environment are exposed to hazard.
4) Household wastes also have the potentiality to pose hazards to our environment. Batteries that we use and thrown away carelessly contains toxic, toxic from paints and asbestos particles from renovated old homes when inhaled could cause lung diseases or even cancer.

Another in the categories of hazards and disasters occurrences are those that are caused by technological inventions. Technological inventions are no doubt catalyst for man comfortable living, but through the same means they brought comfort to man, they also bring hazards and disasters. Technology was described in Encarta (2009): "as creation of new devices, objects, ideas, or procedure useful in accomplishing human objectives." (Encarta 2009) These creations, Besel (2009) identified that they manifest in "communication, aviation and astronautics." The under-listed are these technological manifestations:

- Telecommunication technology, which brought about the manufacturing of cell phones (GSM), walkie-talkie etc, provides convenience in communication and embarking on journeys, which in itself is hazardous.
- Automobiles and aircrafts, which aids our movement from one place to another.
- Dam construction for generating hydroelectricity, water supply for human consumption and farm irrigation also fall in line with technological invention.
- Bombs, Chemical weapons, grenades, guns and ammunitions for defence against war and attack from enemies.
- Manufacturing of industrial machine to aid large production of goods.

Hoagland (1932-) captured man's quest for development using technological invention. He also tried to paint the danger associated with their use, when he described the inventions as 'risky activity.' He says: "Man is different from animals in that he speculates a high risk activity." (Hoagland 1932) These activities are the technology we invented for our comfort and security but which more often than not place disaster on our doorsteps. As we invent more and more in these various areas of technology, we are dragged into destruction by those things we invented for our comfort. Sagan observed that:

> We've arranged a civilization in which most crucial elements profoundly depend on science and technology. We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces. (Sagan, 2009)

Arp (2009) also brought us to the nakedness of the danger inherent in man's technological inventions. He said:

> Soon silence will have passed into legend. Man has turned his back on silence. Day after day he invents machines and devices that increase noise and distract humanity from the essence of life, contemplation, meditation...tooting, howling, screeching, booming, crashing, whistling, grinding, and trilling bolster his ego. His anxiety subsides. His inhuman void spreads monstrously like gray vegetation. (Arp 2009)

**Effects of Technology on Man's Life and its Environment**

It will be recalled that we presented technology as a strong catalyst in our developmental processes in Africa as a developing continent, the attendant negative effects, which are highlighted below are the worrisome aspect of the invention.

The radiation effect emitting from Mobile phones and their service stations, which is causing health hazard is one. The very many motor accidents that occur as result of the indiscriminate use of mobile phones by motor drivers on motion are another. There are many automobile accidents, plane crashes, from inventions in automobile technology. Dams overflowing their banks;

thereby causing floods that have sacked quite a number of citizens from their homes are some of the negative effect of technology. A case in point was contained in the Nigerian Tribune of Thursday, 20 August 2009, where it was reported that: "about 68 families were rendered homeless as a result of flood in the Duste-Kura area of Niger state, Nigeria." (Nigerian Tribune 20 august 2009: 1) Aside from flood from our dams, there are records of people who died through electric shock from the hydro electricity power generated from our dams. The invention of bombs, chemical weapons, grenades, guns and other war equipment being used to fight wars that are in most cases not necessary and uncalled for is another example. All industrial machines that we use to aid production in our factories constitute industrial hazards to factory workers, operators of the machines and people living within and around the vicinity of the industrial location. These and many more are the problems that technological inventions have caused us in our environment. Considering the good and the bad effects of technological inventions, we are presented with the fact that technological innovations are a double edge sword that we must contend with. However, as we invent these technologies, we should be thinking of a way out before their attendant negative effects start to rear its head. This thinking elicited the discourse in this paper.

**Efforts of Governments, Non-governmental Organisations and their Agencies**

Government in Africa deserved some commendation haven put various mechanisms in place to ward off hazards and disasters from our environment. The antecedents of their efforts manifest in:

i) The establishment of relevant agencies, which various governments has embarked upon attested to genuine efforts at putting the problem in check.

ii) Acquisition of instruments and equipment for monitoring and prevention of disasters before they occur.

As earlier observed, efforts made so far by government, year in year out are commendable, but it looks as if it is the same style that no longer produced the expected result. We realized that in solving the riddles of life, including solving environmental problems, one single straight jacket approach will be insufficient to arrest the situation. It is against this backdrop that we are proposing the use of theatre as a mechanism for resolving problems of

environmental hazards and disasters in Africa. One fact remained incontrovertible that no matter how terrible any problem is, it prevention is not impossible given the right management approach. Theatre in this case seems to stand out as an ameliorative preventive tool. In the subsequent section of this paper, we want to highlight the role that theatre plays in ameliorating societal problems, using the Theatre for Development (TfD) approach and recommend it as a mechanism for prevention and management of hazard and disaster for sustainable development in Africa.

**What is Theatre?**

In the preceding section of this paper, we had attempted defining Theatre; as a circumstance of live performance. In this segment we intend to enumerate the importance of theatre and how it could be used as a mechanism for prevention and management of hazards and disasters. Theatre, from time immemorial and over the year has been acknowledged as a sacrosanct instrument mirroring the ways of life of the people of Africa. Ogundeji (2000), describe theatre as that tool which: "articulate the spiritual, social, economic, political and psychological needs and fear of a people through performance." (Ogundeji 2000:2) Theatre enactment therefore, reminds people of what is expected of them when they are derailing from the norms and the ethics that bind them together. The misconception that trailed theatre not being regarded as a noble profession gave way a couple of years back. Theatre practitioners, especially ladies who were hitherto described as: "loose", 'immoral and lacking in decency" (Owusu 1992:26), were no longer described so. Rather the profession and practitioners are now treated with respect and dignity, haven seen the multi-dimensional potency of the art.

**Theatre and its Effects on Development**

Theatre has been known to be a tool for entertainment. It has been known too for being a medium used to educate the society. It is also a medium used to communicate ideas, values and ethics connected with prevention and management of problematic issues. Theatre also provides effective methods for charging and appealing to human minds, using entertainment. (We have seen situations where people have wept in the theatre, haven been emotionally stirred.) Theatre have provided forum for discussions, interactions and cross-fertilisation of ideas. Theatre has also been used as medium of enlightenment and forum for creating awareness. It is an instrument for effecting social change.

It will be observed that with all the characteristics listed above, theatre has grown beyond just being a mere vehicle for the satisfaction of entertainment wants to a didactic instrument from which the society stand to benefit. Theatre soon grew in leaps and bounds to have branches. One of such branches is Theatre for Development (TfD).

**What is Theatre for Development (TfD)?**

Theatre for Development (TfD) is a theatre style that we have identified as a branch in theatre, employed for solving community problems. We will also try to provide answer to why it has been suggested as a mechanism for the prevention and management of hazards and disasters for sustainable development in Africa. The contents, context, notion and methodology of this style of theatre shall be explored in this paper.

Theatre for Development has been described by Abah (1996:247) cited in the works of Yankah (2006) as:

> People's theatre, addressing their own problems in their own language, using their own idioms and their own terms. The ordinary people are the subjects, and in practice, the ones in control. That is they decide the agenda and participate in making the drama on those chosen issues. (Yankah 2006:42)

Mavrocordatos also observed that mechanism, which preaches that "a community can participate in the development of a strategy, of a path to overcome its hardships." (Mavrocordatos 2008:1) is Theatre for Development (TfD). Thus, Theatre for Development explores mostly communication as its tool for the realization of its objectives. We like to emphasise here that when there is robust communication doubt outlets is removed. Mda (1993) advanced that TfD:

> ...has the potential for being a democratic medium, in which the audiences may play an active role in medium programming, and therefore in producing and distributing messages. It is not centralized like the technological media and is capable of integrating indigenous and popular system of communication that already exists in the rural areas. (Mda 1993:2)

The first impediment to growth is the absence of a good communication channel. When channels of communication are blocked, no amount of mechanism geared toward solving any problem will ever be productive.

Communication therefore is a good antidote to resolving p roblems, solving environmental problems for sustainable development inclusive. TfD according to Okwori (2004) is described as:

> one of a range of participatory methods through which development issues can be communicated. It uses all denominators of community theatre (language, artistic forms of expression, codes and symbols and above all stake holders are participants), but it is more interested in process...in addressing issues of development. (Okwori Ed. 2004:17) (emphasis mine)

**Prevention and Management Functions of Theatre for Development (TfD)**

Kofoworola, a theatre scholar of long standing, at one of this presenter's interaction with him spoke eloquently on the potency of TfD. Some of the experiences we drew from him shall form part of our submissions. We also observed in the course of our research that Theatre for Development (TfD) has been employed to resolve many knotty communal problems in many countries in all parts of Africa and beyond. Kerr (1999) reported how TfD was used in 1999, in Lusaka, Zambia to provide avenue for the marriage between two sects of activists; adult educators and social workers on one side and University based artists on the other who has for long engaged in protracted status conflict. TfD approach was used to resolve the crisis (Banham et al, 1999, p. 79).

In Oluwole in Nigeria, Ewu (1999) reported how TfD was used to stop the archaic traditional practice of Female Genital Mutilation (FGM) that was rampart in the area (Banham et al. 1,999, p. 89).

In Ketepe, a community in Oyo state, Nigeria, TfD was the mechanism used to resolve a protracted misunderstanding that had pitched the women against the Village head. The TfD team that went to the community were able to fraternise the two aggrieved parties and peace returned to the community.

Augusto Boal and Paulo Freire in Brazil have inspired International Aid Agencies and Theatre practitioners to help create awareness among the people on the understanding of issues, such as AIDS, gender and development (Encarta, 2009.)

Given the above enumerated antecedents of TfD, and considering the fact that among others it has the following under-listed advantages:

That it uses people to resolve their own problems

That it communicate in the code that the people understands, haven agreed on such codes.

a. That it is nearer to the people, so it permeates interpersonal relationship.
b. That preparation, feedback and evaluation is the product of TfD
c. That it promotes actor-spectator transaction.

**Theatre for Development (TfD) Methodological Approach**

Having been familiarized with the operational approaches of TfD, We enumerate below its operational methodologies, which are being recommended to bring about the prevention and management of hazards and disasters for sustainable development in Africa that we have long quest for.

Theatre for Development (TfD) relied on the under-listed operational tools highlighted below for effective performances: TfD team, (who will be the facilitators) members of the targeted project community, language, music, dances folklore and the cultural value of the people of the project community. All the above highlighted instruments are what TfD will explore to get the people committed to the project. Thereafter, it begins to act as enumerated below.

The first operational methodology in commencing the process of prevention and management of hazards and disasters is in the creation of linkage with the project (affected) communities (hazard and disaster prone areas) with a view to discussing project modalities and logistics. Prevention of hazards and disasters therefore, require that a linkage should be established with people living in the areas that are hazard and disaster prone with a view to discussing all necessary project modalities.

The TfD team will proceed by paying visit to the targeted community's head and elders with a view to obtaining permission, especially when the area involved are in a rural setting. At the forum, mode of operation and management approach with the community will be agreed upon. This is because TfD is a practical exercise which requires participation and cooperation of all members of the project community. This can only be achieved when continuous dialogue is established.

Then channels of communication, cultural factors and tradition that may impede the smooth operation of the project will be identified with a view to ironing them out with the community. Establishing a robust communication channel will permeate understanding and fertile ground for a rewarding rapport.

Homestead approach in the community research, essentially is, involving the people in the process of solving the problems that confront them. The use of TfD approach will create an enlightenment forum, a reminder process and initiating a sense of direction for the people to follow.

Presentation of all data collected will be laid bare at the community open forum for discussion and agreement. The people of the community will be afforded the opportunity to know why they are often confronted with environmental problems while they will jointly phantom a way forward.

The performative approach that TfD will use abounds in the presentation of relevant story that would analyse the problems identified. Analysing problems using stories is a good way of sustaining awareness.

In order for the targeted project to be committed to solving their environmental problems, TfD will use the approach of theatre by the people. This is a system where community members are casted to act out the story with less expert interference. Through that approach, the targeted community will appreciate their problems.

Performance and post-performance appraisal, which is one of the operational methodologies of TfD sustains the peoples commitment.

Follow up action which TfD adopt ensures that all that were agreed on in solving identified problems were fully implemented.

**Recommendations**

We realized that carelessness is the bane of most of the disasters and hazards confronting us. Therefore we need to be constantly enlightened and reminded of individuals and communal obligation and responsibilities to the issue of his environment. Hence, we have put to bare the potency of the TfD's approach, which is basically an enlightenment instrument. This will help in ameliorating occurrences of hazards and disasters in our society. As a follow up, government should show favourable disposition to the newly suggested approach, using theatre mechanism to confront occurrence of hazards and disasters headlong in our environment. The mechanism of theatre should be used to constantly charge and remind people about the danger inherent in citizen's lackadaisical attitudes to issues of environment, using TfD approach. In addition:

- TfD's approach, as a mechanism for crisis prevention and management should be given more vitality, by establishing more TfD teams in various countries in Africa.

- Government should enliven National, States, Regional Arts Councils and National Cultural Centres or as the case may be, to be more active in enlightenment service to humanity, rather than reduce them to mere praise singers to political leaders at political functions and ceremonies.
- More Cultural Centres should be established by government and empowered to carry out enlightenment and mass mobilisation programmes.

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**Interview**

This presenter during an interview drew experience from Kofoworola Ziky, a theatre scholar and a researcher who had employed TfD to resolve some communal issues.

# TWO ANIMAL TRICKSTERS IN THE ARABIC FABLES OF TWO AFRICAN WRITERS: SHAWQI AND OGUNBIYI

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## Abstract

The paper focuses on the Fox in Shawqi's fables in verse and the Tortoise in Ogunbiyi's Arabic rendering of Yoruba fables in prose. The objective of the study is to compare the two tricksters as portrayed in the fables and bring out the utilitarian and artistic values of the portrait of the two characters.

The seven purposively selected short poems by Ahmad Shawqi (1868-1932), an Egyptian literary figure, are given in full texts and translation. On the other hand, Ogunbiyi's ten fables in prose are summarized in English for space economy. This is followed by an analysis of the similarities and differences between the two characters, owing, perhaps, to the peculiarities of the animals and the cultural backgrounds of the two sets of fables. The two writers' styles are also discussed briefly.

In writing the paper, we have relied mainly on the two fable-writers' texts and other supporting sources. In addition, we have drawn from our own modest research on Afenmai culture of Edo State of Nigeria to support this study.

The paper throws a challenge to folk-lore scholars in Africa to intensify their researches into folktales, proverbs and African philosophy to bring out more of the wisdom and, perhaps, the folly of the African mind as part of global philosophy. Perhaps, other continents would notice and comprehend some of the similarities and differences between them and the various African communities. That act of cultural reciprocity is, in our opinion, the essence of genuine globalization.

## Introduction

To begin with, we define the key terms in this paper – fable, fox and tortoise. It is hoped that defining the terms would help the reader to understand more the import of this study.

***Fable***

A fable is a short narrative tale told for the express intention to entertain and teach a moral (Eaton, 1934). It may either be in prose or verse. Its characters are usually animals which are personified and behave as human beings would do. Sometimes the device of humanization is extended to inanimate objects such as stones, trees, winds, cause, streams and houses (Fletcher et al, 1977). In some cases, human beings are presented as animals, and this is characteristic of the purely literary fable as distinct from the rather simple type of fables one observes amongst the communities in which the sophisticated literary fable is yet to develop (Cuddon, 1977 and Steinberg, 1973).

A fable resembles the ordinary folk tale which is a short narrative meant to interest the reader or listener. On the other hand, the fable is different from the folk tale in that it is a moral – a rule of behaviour – that is often woven into a story. It is entertaining as well as didactic (Fletcher *et al*, 1977). Owing to the embodiment of a moral in the plot of the fable, an explicit statement of the lesson to be learnt from it is not often given. (We shall see in 2.0 how Shawqi handled this in his fables on the Fox).

One often observes fables woven round morals that have already been known in the community in form of tersely expressed proverbs; thus in the fables, the proverbs are expanded in an artistic and didactic story-telling manner. Examples of this can be found in fable nos. 1, 5, 6, 7, 8, 9, 10, 11 and 19 of Oseni, 1999. In corroboration of such fables, Fletcher et al (1977) say, "Many of these moral tag lives have taken on the status of proverbs because they so clearly express commonly held social attitudes" (p. 133).

We are aware of two other forms akin to the simple fable. They are the beast epic or bestiary and the fabliau which are beyond the scope of our discourse here. (For details on them see Fletchers et al, (1977, p. 135) and Kermode et al (1973).

***Fox***

The ordinary dictionary definition of the fox is "an animal akin to the dog having upright ears and a long bushy tail; - fem. Vixen" (p. 496). In the *Oxford Advanced Learner's Dictionary* (2006), a clearer definition of the animal is given thus: "a wild animal of the dog family, with reddish-brown fur, a pointed face and a thick heavy tail" (p. 589). The term is used disapproving "of a person who is clever and able to get what they want by influencing and tricking other people" (p. 589).

In Arabic, fox is commonly called *thaʿlab*. Al-Azhari says that the male is *thaʿlab* while the female is *thaʿlabah* or *thuʿalah*. (Ibn Manzur, n.d. I, p. 359)? *Thaʿlab* has other meanings such as "a hole from which rain water gushes out and the tip of a spear" (Ibn Manzur, n.d, p. 359). Shawqi used both *thaʿlab* and *thuʿalah* in his versified fables.

***Tortoise***

Hornby (2006) defines tortoise as "a reptile with a hard round shell, which lives on land and moves very slowly. It can pull its head and legs into its shell". (p. 1562). Similarly, Kirkpatrick (1983) defines it as "any land or freshwater (rarely marine) chelonian (now, in Britain, usually restricted to land forms)" (p. 1364).

In African folktales, the Tortoise is a personification of craftiness, cunning, trouble-making, greed, selfishness and disregard of other people's welfare. This is true of the Yoruba culture which is the background of Isaac Ogunbiyi.

Among the tales that are narrated and chanted as songs by the Yoruba storytellers who are adept in the art are fables about animals in the animal world on the one hand, and of animals in the human world on the other. (For instance, there are fables such as, "Why Tortoise as animals have no orchestra", "The trial of Mr. Tortoise", and "A hunter encounters a tigress" in Omoleye's collection in English of 1977. Similarly, stories such as "Why the vulture has a bald head" and "How the vulture became the king" are found in the sixteen great poems of Ifa Oracle by which Yoruba diviners foretell coming events (Abimbola, 1975, p. 261-90, 208-234 and 73-104). In these fables, the didactic element is clear. Hence, Omoleye stated in his preface that Yoruba tales are meant to instill respect for elders in the youth and also teach them how to conform to the laws of the land (Omoleye, 1977).

**Ahmad Shawqi's Fables on the Fox**

Ahmad Shawqi is one of the best known Arabic poets of the Modern Era. He was a neo-classicist poet who employed the traditional sixteen meter to compose poems on diverse topics such as panegyrics, elegies, scenic descriptions, satires, love, religious tolerance, Islamic institutions and nationalism (Badawi, 1975; Oseni, 1983).

He was born in Cairo in 1868 of parents who had ancestry of diverse origins such as Arab, Caucasian, Greek and Tarfiqish. He had some affinity with the Royal Khedival House. He had a good elementary and secondary education in Egypt with a heavy stamp of traditional Arab and Islamic culture. As a youth, he had interest in poetry and worked hard to cultivate it with outstanding profundity.

For his higher education, the Khedive of Egypt, Jawfiq sent him to France to study law and literature but his interest was more in literature. While in France he encountered other literatures and benefited from them.

On his return to Egypt, he served in the Khedival court and composed poems immensely; eulogizing the Khedive and occasionally criticizing British policy in Egypt. When the First World War broke out in 1914, he was exiled to Spain on account of his anti-British proclivities on the basis of his loyalty to the Khedive 'Abbas Hilmi who was on a visit to Turkey and was not allowed to return home by the British. It should be noted Turkey was in support of Germany during the war.

After the War in 1918, Shawqi was allowed to return to Egypt. His stay in Spain enabled him to study extensively the past Arab culture in the Iberian

Peninsula and he regarded his stay there academically rewarding and culturally enriching. His profile continued to rise in the realm of poetic virtuosity.

Shawqi has to his credit a voluminous *diwan* (collection of poems) in four volumes. It is entitled *al-Shawqiyyat*. He also has prose works on the ancient history of Egypt, miscellaneous essays, and at least six poetic plays. (Badawi, 1975; Bidmos, 1980; Omotoso, 1968; and Al-Fakhuri, n.d.). On account of his exalted position as an Arab poet, he is popularly known as Amir al-Shu'ara (King of Poets). As a matter of fact, he was given the title at an elaborate celebration in Cairo in 1927. He died in 1932 (Oseni, 1987).

In the fourth volume of al-Shawqiyyat, there are 54 fables in verse. He used animal and bird characters such as the Fox, the Lion, the Elephant, the Cock, the Hoopoe, the Weasel, the Hare, the Monkey, the Wolf, the Ass and the Camel. Our interest in these fables is focused on the Fox which features in 10 of the fables. These are Fables numbers 12, 13, 21, 33, 35, 46, 48, 49, 53 and 54. Of these, we give below the best seven in English translation. (For the Arabic originals, see the Appendix). In the remaining three the Fox features marginally.

Ahmad Shawqi was motivated to produce his fables in verse by his exposure to Arabic fables and tales early in his life. These include the fables in

*Kalilah wa Dimnah, Alf Laylay wa Layla* (Arabian Nights stories) and al-Jahiz's *Kitabu 'l-hayawan* (Book of Animals). Secondly, European fables such as those of Aesop and La Fontaine with which he was familiar in France influenced him too. In fact, there are many similarities between his fables and the Arabic and European fables referred to. Thirdly, the Islamic environment in which the poet lived also influenced him regarding the way he fashioned many of his 54 fables (Oseni, 1981).

**1. 13th Fable: The Lion, the Fox and the Calf**

The Lion looked at a fat bull
Which lived in a secure bush nearby.
The king's soul loved its meat;
That is how expensive things attract souls.
He said to the Fox, "O you crafty fellow,
Your beloved head or that gazelle!"
The latter prayed for luck and long life
And set out for the great task.
He got to the bush at nightfall
And saw the bull and greeted him,
Saying: 'O Master, the Vizier,
Your leniency and profound goodness!
The wolf has been pushed by envy to kill me
And had calumniated me before the Lion, our master
And I've hauled myself at your exalted honour
Which had never ceased to be our good intercessor",
The deceived one wept over the nasty one's condition
And moved nearer for more explanation,
He said; "O fellow of gratifying qualities, aren't you aware
That our master, father of elephants, had died,
And the king opined that in a big head (like yours)
Are wisdom and copious intelligence,
And regarded you as the best to be made a vizier
And a pillar to store the king's affairs.
They have counted you among the forefathers
Like Abis and the idol of the Jews
For your installation, a throne has been set
On the right hand of the noble, exalted king

15 Birds and wild animals have got ready for that,
Awaiting the exalted leader yonder.
If you take charge of the affairs
And all the friendly atmosphere and joy go to you,
Please, prove me innocent before the king of age.
And ask him to grant me pardon and security.
Sufficient for you is my being an obedient servant;
I serve my benefactor with all my strength".
The bull then sharpened his horns and said,
"From today on, you're my unnameable protégé
20 Go and show me the way to the Lio
Someone close to me can't be miserable before him",
The two friends at once set out into the desert:
This one to death and the other to life.
Yonder, the Lion swallowed the Vizier
And offered the Fox a little of it.
(The Fox) began to laugh at the rashness of bulls
And raced on the track of pride, boasting
"The Fox with a small head has been saved,
Having been ransomed by the big-headed fellow".
(Shawqi, 1956, p. iv:110-111).

**2. The 21st Fable: The Fox and the Cock**

One day the Fox appeared
In the garment of a preacher
And walked on earth, guiding (people)
And insulting the deceivers.
He said, "Praise be to Allah,
The God of the Universe,
O servants of God, do repent
For He is the Refuge of penitent fellows,
5 And leave birds alone
For real life is that of the ascetics.
Ask the Cock to call
To morning prayer among us"
The messenger came to the Cock
From the devotees' leader.

He presented the request to him,
Seeking that he should conform.
The Cock replied, "Excuse me,
You who are the most lost of all guides,
10 Tell the Fox that on the authority
Of my pious forefathers –
The crown-wearers among whom
Some entered the accursed belly –
They have spoken and the best
Word is the sages' word:
"Mistaken is anyone who ever
Thinks that the Fox is religious!"
(Shawqi, 1956, p. iv:122).

### 3. The 33rd Fable: The Fox in the Ark

The Fox strolled in the ark
And knew the fat Cock and Fowl.
He said that his character had changed
And all he had previously been is gone.
This is because of the calamities which occurred
On account of God's anger against foxes.
He swore and swore to the cocks
To wipe off any doubt that could remain
5 And added that if they disembarked,
They'd all observe pleasant things in him
It was said, "When they left the Ark,
He walked with the fat cocks and hens
Until when they got half-way
And no companion remained with them'
He asserted, "People say that I'm irreligious;
No wonder then if my oath is broken
We are but shrewd ones; we work
In times of adversity for prosperity
10 Anyone you fear his faithlessness
Companionship in the Ark would save you (from him).
(Shawqi, 1956, p. iv:135)

**4. The 35th Fable: The Fox and the Hare in the Ark**

Fox once came to God's prophet
And said, "My master, I am a sinner.
My record has been darkened by sins
And if I can get an intercessor I'll repent.
Beg my God to grant me His grand pardon
To a penitent one who's humbly come to Him.
Even though I have led a bad life,
And done evil, I I've also done good
One day, a Hare came to me
Playing merrily in my house,
And there was no one watching,
And I left him in spite of that.
By not preying on him, I desisted from meanness
And no harm came to him from my hand!"
In that session was the Hare
Listening to all that the Fox revealed,
Who said after the latter had ended his claim,
"That was abstinence indeed, O nasty one,
When you were between death and life
Because of the flatulence you had in the desert"
(Shawqi, 1956, p. iv:137)

**5. The 46th Fable: The Camel and the Fox**

On a certain road there was a Camel
Whose master made him bear the unbearable
He said, "What a misfortune and ill-luck!
If this continues for long, I'll not live long,
The mounts have not carried the like of my load,
I think that my master wants to kill me!
Then the Fox approached him from the front,
For he had heard some of his words
He said, "Take it easy, brother of loads,
O powerful one among the camels.
You're better than your brother in condition,
For I'm more stressed at heart than you.
I feel as if a thousand cocks are before me,

Questioning me about their spilled blood;
As if behind me are a million hares
Which pull my tail when I wake up.
Many a mother, whom I have come to her abode
And afflicted her by killing her chickens, weeps
And her crying wakes me up from sleep
And I open my eyes, hearing her complaint,.
You've now known better, O exhibitor of loads;
Be patient and tell the community of camels,
"That which stresses the back is no burden;
Real burden is what bothers the mind
(Shawqi, 1956,p. iv:150).

**6. The 48th Fable: The Self-Conceited Fox**

The Fox heard the villagers
Calling a deceiver, 'O you fox',
And he said, "Truly, this is an object
Of pride which is not given or asked for.
Whose more shrewd than I?
I've become a parable among the peoples.
Paying them a visit won't cause any harm
To show them of my grotesque mien
5 Perhaps, they'd honour me with a decoration
In a ceremony to be attended by the Cock or Hare"
He went to the people and greeted them
And he then rose among them to speak.
The visitor was held by the ear
And given to the dog to play with!
Never you trust in a cunning fellow,
For the Fox can be self-conscious
(Shawqi, 1956, p. iv:15).

**7. The 53rd Fable: The Fox, the Hare and the Cock**

It's a wonderful story that when the Hare
Saw the Cock insulting the Fox
While safely (relaxing) on the wall,
Rendered triumphant by position, not by ability,
He thought that the sly fellow had become

A laughing-stock out of weakness.
The Hare began to curse him like the Cock
As many times as the number of rash ones on earth
5 The Fox, in reaction, carried away the weak Hare"'
As his brother, the Wolf, carries away a sheep,
And said, "In your spilled blood I have
Consolation for my missing the Cock".
Then the Cock turned to the victim and said
The word of the eloquent sage:
"Many of us can't be benefited by the tongue;
Of the people some are made to speak by their position".
(Shawqi, 1956, p. iv: 157).

**Isaac Ogunbiyi's Fables on Tortoise**

Isaac Adejoju Ogunbiyi is a major scholar of Arabic in Nigeria. Born in 1941 at Ilaro, Ogun State of South-Western Nigeria, he had his first contact with Arabic at the University of Ibadan in 1964 as a young man from a Christian family. He studied it and graduated in 1968 with First Class Honours and then proceeded to the University of London where he obtained his Ph.D. in Arabic in 1972. He also has a Postgraduate Diploma in Teaching Arabic to Foreign Learners (TAFL) obtained from King Saud University, Riyadh, Saudi Arabia in 1980. He has been teaching in the Universities at Ife, Ibadan, Ojo-Lagos and Anyigba in Nigeria since 1968. He has been a research fellow in Germany and the U.K. in recognition of his contribution to Arabic education in Nigeria, the Federal Government awarded him National Honours – Officer of the Order of the Niger (O.O.N) in October 2000 (Oseni, 2002 and Onibon, 2003). He wrote a collection of fables on the Tortoise in Arabic in 1975 (Ogunbiyi, 1975). The stories are basically Yoruba fables narrated in Arabic by the author. There is no evidence that he translated them into Arabic from anybody's collection.

Expectedly, the collector's resourcefulness and creativity would be evident. If a number of scholars are asked to write fables from a particular language (their mother tongue) in another language, they are not likely to carry out the assignment in the same way. Their works would vary in style, details and artistry. This is why we should look into Ogunbiyi's fables as his on the basis of his own creativity, though using materials which belong to the Yoruba culture and also partly shared by other African traditions.

The 10 fables are summarized as follows:

**1. Al-ghaylam wal-Khinzir (The Tortoise and the Pig)**

The Tortoise was indebted to the Pig and was unable to pay. The Pig came to his house for the money and the Tortoise tricked him by lying upside down and asking his wife to be grinding grains on his flat belly. When the Pig came and did not meet the Tortoise, he angrily picked the grinding stone and threw it away – not knowing that it was his debtor. The Tortoise hurried back and asked for his grinding stone in which he kept the money he wanted to pay. The Pig became sober and searched on end for 'the stone'. Up till this day, the Pig continues to search the bush for it. That is how the Tortoise escaped payment of his debt (Ogunbiyi, 1975).

**2. Al-Ghaylam wa Zawjatuhu al-acqir (The Tortoise and his barren wife)**

The tortoise had a wife who was barren for a long time. One day he took her to a traditional doctor for treatment. She was given a potion prepared in soup and fish. Out of greed, the Tortoise drank the soup and ate the fish. The result was that his stomach began to swell – for he was pregnant! He hurried to the doctor's house for help but the latter refused to assist him (Ogunbiyi, 1975).

**3. Yaghlibu al-ghaylam 'ala al-fil (The Tortoise subdues the Elephant)**

The king of a town was seriously ill and the heart of the Elephant was needed for the preparation of the medicine for him. The Tortoise volunteered to go into the forest to bring the Elephant to the town. A pit was dug and mats were spread on it in form of a throne. The Tortoise went to the forest and told the Elephant that the king of the town had died and that the unanimous decision was to make him, the Elephant, the new king. He put the request in form of a song and the Elephant, having been convinced, danced to the town and fell into the pit dug for him. He was killed instantly and the heart was extracted and used (Ogunbiyi, 1975, p. 9-12).

**4. Al-ghaylam yatma cu fi ma'izati zawjatihi (The Tortoise craves for his wife's goat)**

The Tortoise once pretended to be sick and asked his wife to visit a traditional doctor (who happened to be himself) somewhere far away, instructing her to take a long way to the doctor's house. He himself took a short route and pretended to be the doctor. The prescription for his ailment was that he ate a whole goat alone. When his wife left, he got home first. He was told what

'the doctor' said and he lamented that it was very unfair for him to eat the goat alone but his wife assured him that his health mattered most to her. He ate the whole goat all alone (Ogunbiyi, 1975, p. 13-15).

**5. Al-ghaylam yatazarwwaju ,i-bint al-malik (The Tortoise Marries the King's Daughter)**

The king of a certain community announced that he would marry his daughter to a strong, tough and courageous man who could drink boiling water. None but the Tortoise offered to carry out the feat. A day was fixed for the act and people gathered. The tortoise carried the pot of boiling water and sang a long song that he would perform the feat. The crowd was carried away by the sweet song until the heat was drastically reduced. He then drank the water and won the hand of the princess and married her. (Ogunbiyi, 1975, p. 16-19).

**6. Al-girdu yarfudu an yaqula "Amin" li-du'a'i l ghaylam (The Monkey refuses to say 'Amen' to the Tortoise's Prayer)**

The Tortoise once prayed against calumny and frame up while in the company of the Monkey and the latter refused to say 'Amen'. To prove a point the trouble-making Tortoise framed up the Monkey by telling the Lion that the Monkey's excreta was like honeyed cakes. He even bought such cakes and gave them to the Lion to eat. The latter searched for the Monkey, grabbed him and ordered him to defecate. The latter did not and the Lion squeezed his stomach and forced faeces out of him and tasted them and they were not. The Lion squeezed him more violently and faeces mixed with blood came out and the taste was anything but sweet. The lion was disappointed and left the Monkey when the latter fainted. When the Tortoise met the Monkey thereafter, he repeated his prayer against any malicious frame up and did not complete the prayer before the Monkey said "Amin, Amin, Am" which he repeats till this day (Ogunbiyi, 1975, p. 20-21).

**7. Al-ghaylam yajma'u 'ulumi n-nas fi qur'ah (The Tortoise gathers all human knowledge in a gourd)**

The Tortoise wanted to have monopoly of knowledge and gathered all human knowledge in a gourd and wanted to climb a palm tree and put the gourd on top of it. He proudly regarded himself as a sage but could not climb the tree with the gourd tied to his belly. The Hare, who was his friend, and was passing by when he saw the Tortoise struggling to carry out his 'feat.' The Hare told him that

if he were not a big fool, he would have known that the right thing to do was to tie the gourd to his back. The Tortoise was frustrated, having discovered his folly. (Ogunbiyi, 1975, p. 22-23).

**8. Al-ghaylam yaslubu haql a'-qird (The Tortoise snatches the Monkey's farm)**

The Monkey had a farm to which he went by climbing trees and jumping from one to another. He did not see the necessity of constructing a road to it. When the Tortoise realized this, he hired labourers to help him construct a path to the farm and then claimed the farm. The matter was taken to the king's court and the Tortoise won on the strength of his evidence and the labourers' statement, whom he called as his witnesses (Ogunbiyi, 1975, p.2).

| S/NO. | TOPIC | CONTENT | ETHICAL OBJECTIVE |
|---|---|---|---|
| 1. | The Lion, the Fox and the Calf | The Fox lures a young, fat gazelle into the hands of the Lion to save his own head. | Beware of the wiles of the sweet-talking fellows who may be foxes in human garments. |
| 2. | The Fox and the Cock | The abortive attempt of the Fox who puts on a preacher's garb to entice the Cock. The Cock understands his plan and is saved. | Beware of tigers in sheep's clothing. |
| 3. | The Fox in the Ark | The Fox cunningly simulates friendship with the Cock and Fowl in Noah's Ark and later devours them when they were safely on land. | Beware of the promises of a known enemy. |
| 4. | The Fox and the Hare in the Ark | The Fox makes a false repentance before Noah that he would never devour a Hare and the latter exposes the Fox's hypocrisy. | Beware of the promises of a known enemy and be critical of all his presentations. |
| 5. | The Camel and the Fox | The Camel complains of the heavy load he is compelled to carry and the heavy Fox tells him that the psycholo gical burden of his killing and devouring birds and animals was more stressful to him. | Psychological problems can be more serious than physical ones. |
| 6. | The self-conceited Fox | The Fox praises himself for being cunning and goes to town to show off and to watch out for its prey. He mistook his notoriety for fame and was handed over to the dog "to play with". | A deceiver sometimes over-reaches himself and gets into trouble. |
| 7. | The Fox, the Hare and the Cock. | A Cock on top of a wall confidently insults the F ox and a Hare on the ground boldly insults the Fox too. The Hare gets devoured by the Fox instantly. | Look before you leap. |

## 9. Al-ghyalam wal-kalb athna' a'l-qaht (The Tortoise and the Dog during a drought)

There was famine in a community as a result of drought. The Tortoise and his family suffered a great deal. He even lost two of his children as a result of hunger. He met the Dog who was not so affected because he stole one yam every day from someone's farm. The Dog suggested to the Tortoise to go to that farm and do the same. Out of greed, the Tortoise went to the farm and took five big

yams and the load weighed down heavily on him and the farm-owner caught him. He was taken to the king's court and sentenced to jail (Ogunbiyi1975, p. 26-28).

**10. Al-ghaylam yasbiqu 'l-arnab (The Tortoise beats the Hare in a race)**

There was a racing competition between the Tortoise and the Hare. (There are two versions of the story in the book.) The first one states that the Tortoise put one of the children at each of the seven milestones. The hare was expectedly very fast but was astonished to meet the Tortoise in his front at each milestone, not knowing that he was meeting his opponent's children. That is how the Tortoise won.

The second version of the story states that the Hare slept off at the sixth milestone and was then overtaken by the slow Tortoise who eventually won. The Hare was frustrated and committed suicide by drowning (Ogunbiyi 1975, p. 29-31).

**A Comparative Analysis**

*A Summary of the Topics, Contents and Ethical Objectives*

To recap the fables of the Fox and the Tortoise, we give a tabular summary of the topics, contents and ethical objectives of the fables.

***The Fox***
***The Tortoise***

| S/NO. | TOPIC | CONTENT | ETHICAL OBJECTIVE |
|---|---|---|---|
| 1. | The Tortoise and the Pig | The Tortoise was an un-repentant debtor and was bent on deceiving and frustrating his creditor, the Pig. | Beware of the wiles of cunning people. Be vigilant always. |
| 2. | The Tortoise and his barren wife. | Out of greed the Tortoise drank the medicinal soup meant to cure his wife of barrenness. He became 'pregnant' and sought a solution for that in vain. | Greedy people end up in perdition. |

| | | | |
|---|---|---|---|
| 3. | The Tortoise subdues the elephant. | The Tortoise succeeded in luring the Elephant to the town where he was killed and his heart used in preparing the medicine to cure the king of his disease. The Elephant was given the impression that by the tortoise he would be made king. | Beware of the eloquence of the cunning one. |
| 4. | The Tortoise crave s for his wife's goat | The greedy Tortoise devised a trick to consume his wife's goat alone. He pretended to be very sick and got a traditional doctor (himself) to prescribe the remedy – the consumption of a goat. His gullible and faithful wife complied. | Greed is meanness. We should beware of the wiles of greedy people. |
| 5. | The Tortoise marries the king's daughter. | The Tortoise succeeds in marrying a princess after drinking hot water. It was supposed to be boiling water but he sang a long song to deceive the people who did not notice that the water had become a bit cool. | The folly of the masses' gullibility. |
| 6. | The Monkey refuses to say 'Amen' to the Tortoise's prayer | The Tortoise frame up the Monkey for not saying 'Amen' to his prayer and latter suffered greatly in the hands of the Lion. | One should learn to be reasonable and avoid defamation of character and a frame -up. Explanation of why the Monkey constantly says 'Amin, Amin'. |
| 7. | The Tortoise gathers all human knowledge in a gourd | The Tortoise want ed to have monopoly of knowledge and he gathered all human knowledge in a gourd and attempted vain to climb a palm tree on which he wanted to hang it. But he ignorantly tied the gourd to his belly instead of his back and the Hare rebuked him for his stupi dity. The Tortoise was frustrated in the end. | The futility of claiming to know too much. Learned scholars must be humble and ready to learn always. |

| | | | |
|---|---|---|---|
| 8. | The Tortoise snatches the Monkey's farm | The Monkey tilled his land as a farmer and was there on top of trees rather than make a path to the farm. The Tortoise makes a good road to the farm with the assistance of labourers whom he employed for the job. A dispute arose and the judge decided in the 'Tortoise's favour. | 1. We must do things the right way.<br>2. Due to human limitations, justice is sometimes misplaced. |
| 9. | The Tortoise and the Dog during famine | There was a severe famine and the Dog stole one yam everyday from someone's farm. He advised the Tortoise to do the same thing when h e realized the Tortoise's lamentable condition. But the latter greedily carried five yams at a time and was weighed down. He was caught by the farm -owner and taken to court. He ended up in jail. | The unsavoury consequence of greed. |
| 10. | The Tortoise beat s the Hare in a race | The slow Tortoise defea ted the fast Hare in a race through a trick. | We should be extra -vigilant in dealing with crafty fellows. |

**Similarities between the Fox and the Tortoise in the Fables**

1. Ahmad Shawqi's fables are on the Fox, the famed trickster in Arabic fables while Ogunbiyi's fables are on another animal known for its craftiness in Yoruba culture, the Tortoise.
2. In Shawqi's fable on the Lion, the Fox and the Calf, the Fox lures the gazelle to death in the hands of the Lion. Similarly, the Tortoise in Fable No. 3, lured the Elephant to death with the promise that he would be crowned as a king.
3. In the fable on the Fox and the Cock, the former failed to accomplish his mission of killing and devouring the Cock. In the same vein, the Tortoise failed in his attempt to carry five yams at a time and his confidence in his 'super intelligence got him into trouble. In addition, the Tortoise's greed which led him to drink the delicious soupy potion prepared for his barren wife failed him as he became 'pregnant' instead of his wife. The Tortoise also failed in his bid to hoard knowledge in a gourd.

4. As trickster, the Fox had his way in fables numbers 3 and 7 while the Tortoise had his way in Fables Nos. 1, 3, 4, 5, 6, 8 and 10.
5. The Fox in fable 6 subjected himself to danger by thinking that he was very popular in the human community and had to pay a visit. Similarly, the Tortoise, out of greed, subjected himself to danger by drinking the soup potion prepared by Babalawo (traditional doctor) for his barren wife.
6. As in the tradition of fable-writing, the two sets of fables are didactic and entertaining. The lessons of each are easily comprehended.
7. The writers of the two sets of fables are competent and have styles that are of high standard. They both wrote good grammar and styled their works with appropriate rhetorical devices cherished in Arabic literary works. They also used Islamic terms spontaneously and aptly. (See Oseni, 2002, p. 28 and Oseni forthcoming).

**Differences between the two animal tricksters**

Shawqi's Fox and Ogunbiyi's Tortoise have a number of differences. These are as follows:

1. While the Fables on the Fox are in the traditional Arabic verse, the fables on the Tortoise are in Arabic prose,
2. The audience in the Fables on the Tortoise in fables Nos. 5 and 8 is too gullible to be convincing.
3. The Tortoise's wife in Fable 4 is too simplistic, gullible and submissive. There is nothing like a wife in the fables on the Fox.
4. In Fable 5, the Fox confesses that he was burdened by his past atrocities which he said were more stressful than physical burden borne by the Camel. There is no such confession in Ogunbiyi's fables on the Tortoise.
5. Fable 1 on the Tortoise explains why the Pig searches the bush near the house up till today. Fable also points to why the Monkey says "Amin, Amin, Am, Am..." up till today. Conversely, we do not have anything similar to that in Shawqi's fables on the Fox.
6. Fable 7 on the Tortoise seems to contain a scathing criticism of such intellectuals who arrogate to themselves the monopoly of knowledge and wisdom. Although Shawqi's fables on the Fox also contain social criticism, there is none like the one of the Tortoise.

7. Whereas the fables on the Fox were written by an Egyptian Arab, the ones on the Tortoise were written by a non-Arab who studied and mastered Arabic as an academic subject.

## Conclusion

In the foregoing, we have attempted a critical study of fables written in Arabic on the Fox and the Tortoise respectively by two African writers, Ahmad Shawqi (1868-1932) and Isaac Ogunbiyi of Nigeria (1941 to date). Shawqi's seven versified fables in verse depict various aspects of the character of the cunning Fox. Similarly, Ogunbiyi's ten fables on the Tortoise which he put together in Arabic from his Yoruba cultural background were summarized and studied. Moreover the ethical objectives of the fables, the similarities and differences between the two sets were also looked into. It is hoped that this expose would encourage more scholars to intensify the study of African fables among the various ethnic groups to enrich world scholarship on folktales and the philosophy embedded in them.

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# SECTION THREE

# EDUCATION

# ACADEMIC INTEGRITY AND SUSTAINABLE EDUCATIONAL DEVELOPMENT: IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT IN AFRICA

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**Abstract**

*Academic integrity, in this paper, refers to commitment to the values of honesty, fairness, transparency and accountability on the part of all stakeholders in all matters relating to sustainable educational development in Africa. Deriving from the assumption that sustainable educational development is central to sustainable national development, the thesis sponsored in the paper is that educational policies responsive to national challenges, powered by locally derived resources and driven by intellectually competent and honest nationals must be pursued to engender sustainable educational development. Specifically, a panoramic view of the state of development in Africa relative to other continents is presented; the concepts of academic integrity and sustainable educational development as well as the meeting point are discussed; and the potential of sustainable educational development in fostering sustainable national development is articulated. In addition, the paper proffers pragmatic suggestions for effecting sustainable national development to facilitate Africa's quest for actualizing the Millennium Development Goals.*

## Introduction

It is generally agreed that national development entails valuable and positive changes in the living standards of the people. However, clear-cut indicators of development are yet to be agreed upon in literature. In relation to Africa, for instance, James (2002) identified poverty alleviation, environmental protection, access to education and appropriate technology as central to development; while the United Nations Development Programme (2008) conceptualized life expectancy, adult literacy rate, school enrolment, per capital income and social security as critical indices of development. In the context of this paper, the indicators of development comprise economic advancement (access to qualitative education, high employment rate and high standard of living); good governance (political stability, endorsement of democratic ideals

and gender mainstreaming); and psycho-social security (access to efficient basic human needs & justice, safety of lives & properties and protection of human rights) in African countries.

**Developmental Status of Africa**

Africa is the second largest continent, after Asia, in the world. With 2007 population estimate of 939,166,800, the continent accommodates about one-eighth of the world's population. It contains an enormous wealth of mineral resources, rich vegetation and diverse wild life. Historically, the continent, which archaeological evidence indicates has been inhabited by humans for some four million years, is recognized as the birthplace of mankind and the cradle of civilization (Encyclopaedia Britannica, 2009). Besides, the continent is geologically stable and enjoys full access to development models in other continents of the world through information technology.

In spite of such glowing statistics, researchers are unanimous in their conviction that most African countries, to date, lag behind in development regardless of the indicators adopted. Except for South Africa, the continent ranks the least developed economically; characterized by high level of illiteracy; low achievements in Science and Technology; and general absence of good governance (James, 2002). In addition, hardly does a day go by without reports in the media of large scale poverty, maternal and infant mortality, unemployment, youth restiveness, crime, collapsed buildings, ethnic conflicts, sharp practices, political unrest, or threats to lives and properties in different parts of Africa. The People's Daily Online (2006), for instance, reported that "out of the world's 500 million starving population, 200 million live on the African continent and one African child dies from malaria every 30 seconds". Similarly, James (2002) called attention to many editorials which described Africa as "a place that does not matter in global affairs" on account of its developmental lag. These assessments were empirically supported by the 2008 Human Development Report (HDR) in Africa. In the report, scores of 177 countries around the world were rated on three major dimensions of development: life expectancy, access to education and standard of living. From their scores, Algeria, the African country with the highest Human Development Index (HDI) in 2005, ranked 104th position with a score of 0.733 in the world; while Ghana and Nigeria occupied the 135th and 158th positions respectively. Besides, as many as 22 of the 45 African countries rated in 2005 scored below 0.5 (the lowest positive value). Similarly,

when compared with other nations in Asia and Europe, the Human Development Index (2006) showed that Africa generally lagged behind in development ratings. Table 1 shows the HDI of some African countries relative to other countries around the world on life expectancy, adult literacy rate, school enrolment and per capital income in 2006.

**Table 1: Some African countries' Human Development Index and Underlying Indicators in 2006**

| HDI value | Life expectancy at birth (years) | Adult literacy rate (% ages 15 and above) | Combined primary, secondary and tertiary gross enrolment ratio (%) | GDP per capita (PPPUS$) |
|---|---|---|---|---|
| Iceland (0.968)<br>142. Ghana (0.533)<br>152. Tanzania (United Republic of) (0.503)<br>153. Senegal (0.502)<br>154. Nigeria (0.499)<br>156. Uganda (0.493)<br>179. Sierra Leone (0.329) | 1. Japan (82.4)<br>139. Ghana (59.4)<br>166. Côte d'Ivoire (47.7)<br>168. Nigeria (46.6)<br>169. Congo (Democratic Republic of the) (46.1)<br>170. Guinea-Bissau (46.0)<br>179. Swaziland (40.2) | 1. Georgia (100.0)<br>109. Tanzania (United Republic of) (72.0)<br>111. Nigeria (71.0)<br>112. Malawi (70.9)<br>113. Madagascar (70.7)<br>120. Ghana (64.2)<br>147. Mali (22.9) | 1. Australia (114.2)<br>149. Tanzania (United Republic of) (54.3)<br>150. Ghana (52.9)<br>151. Nigeria (52.5)<br>152. Benin (52.4)<br>153. Rwanda (52.2)<br>179. Djibouti (25.5) | 1. Luxembourg (77,089)<br>137. Mauritania (1,890)<br>138. Sudan (1,887)<br>139. Nigeria (1,852)<br>141. Côte d'Ivoire (1,632)<br>152. Ghana (1,247)<br>178. Congo (Democratic Republic of the) 281) |

Source: United Nations Development Programme (2008)

As shown in Table 1, no African country ranked among the first 100 countries in the world on any of the indicators of development. Also, although Ghana ranked higher (152nd) than Nigeria (154th) on the absolute HDI and on life expectancy, she lagged behind Nigeria on adult literacy rate and per capita income, while both countries were generally comparable on gross school enrolment. A graphic indication of the low developmental status of African countries is presented in the 2008 HDI Report in which 179 countries were categorized into three: High, Medium and Low Human Development (Table 2).

As shown in the Table, four (8.3%) of the 48 African countries rated in 2008 were categorized as High on HDI; 19 (39.6%) as Medium; while the rest 28 (58.3%) countries were rated Low. While Ghana, with a ranking of 142, was categorized as Medium, Nigeria topped the Low group with a ranking of 154

(United Nations, Development Programme, (2008). Importantly, more than other regions in Africa, more of the West African countries ranked low in development status in 2008.

It is however important to emphasize that the ratings in both tables must be interpreted with caution because they do not seem to present the whole picture of the development status of the countries. Two major observations in this regard are in order. Firstly, the ratings were based only on proportions (expressed in percentage) and failed to take into account the absolute population of each nation whereas on issues of development, every member of a nation should count (Lawal, 2005). In relation to literacy level in 2006 for instance, Nigeria ranked 111th with 71% literacy level while Ghana ranked 120th with 64.2% literacy level. The truth, however, is that Ghana (with population < 20milllion) actually ranks higher than Nigeria (with population >120million) on this variable when the absolute number of people without access to education in each country is taken into account.

**Table 2: Human Development Indices: 2008 - HDI rankings of African Countries**

| High Human Development | Medium Human Development | Low Human Development |
|---|---|---|
| 52. Libya | 100. Algeria | 154. Nigeria |
| 55. Saudi Arabia | 107. Gabon | 155. Lesotho |
| 57. Trinidad and Tobago | 115. Equatorial Guinea | 156. Uganda |
| 74. Mauritius | 116. Egypt | 157. Angola |
| | 118. Cape Verde | 159. Togo |
| | 125. South Africa | 160. Gambia |
| | 126. Botswana | 161. Benin |
| | 127. Morocco | 162. Malawi |
| | 128. São Tomé and Principe | 163. Zambia |
| | 129. Namibia | 164. Eritrea |
| | 130. Congo | 165. Rwanda |
| | 142. Ghana | 166. Côte d'Ivoire |
| | 143. Madagascar | 167. Guinea |
| | 144. Kenya | 168. Mali |
| | 146. Sudan | 169. Ethiopia |
| | 150. Cameroon | 170. Chad |
| | 151. Djibouti | 171. Guinea Bissau |
| | 152. Tanzania | 172. Burundi |
| | 153. Senegal | 173. Burkina Faso |
| | | 174. Niger |
| | | 175. Mozambique |
| | | 176. Liberia |
| | | 177. Congo Dem. Rep. |
| | | 178.Central African Rep. |
| | | 179.Sierra Leone |

Source: Human Development Report (2008)

Secondly, based on the fact that development comprises intellectual, affective and psychomotor dimensions, the absence of affective indices of development in the report not only makes it non-comprehensive, but also culture-laden. For instance, it would have been informative to also rate countries on quality of family life, which, in development studies, is a major determinant of quality of national development. In this regard, rating nations also on such issues as single parenting, same sex marriage, divorce rate, murder and suicide rates (on which most African countries obviously fare better than many other regions of the world) would have been informative. Therefore, while not

contesting the fact that African countries generally have a lot of work to do to foster sustainable development in their societies, it must also be appreciated that comprehensive indices of development and ratings based on absolute numbers, rather than proportions, would be required for objective reports.

**Responses to Developmental Lag in Africa**

Many scholars have attempted advancing plausible explanations for the prevailing developmental lag in Africa. For instance, the Human Development Report (2008) implicated economic recession and massive effect of HIV/AIDS on life expectancy as the principal reasons for the developmental stagnation of Africa. Widespread corruption, particularly fraud, was highlighted as the principal cause in the Crimes of Persuasion Website; while Ottawa (2009), opined that erosion of African culture was majorly to blame for the economic stagnation of the continent

Various solution strategies have also been proffered to reverse the apparent developmental lag. For instance, Nwaka (2003) reasoned that national development can be achieved through collaboration of social scientists with policy-makers and practitioners; Dike (2009) argued that technical education is the key to national development; while the American President Obama, in Accra, Ghana on July 12, 2009 underscored the importance of African traditional values and institutions in moving the continent forward.

In response, appreciable efforts are being made in many African countries to combat the problem. For instance, The People's Daily Online of October 13, 2006 reported appreciable advancement in the area of information technology resulting in about 47 African countries having access to the internet in 2006 compared to the mere 5 with such facility some ten years earlier. The same source also reported that African leaders have suggested that every country should put one percent of its Gross Domestic Product (GDP) into its scientific and technological development. Particularly in Nigeria, a lot of initiatives towards redressing existing developmental lag have been put in place including the implementation of Universal Basic Education policy (which provides for nine years free and compulsory basic education) , public-private partnerships in provision of education at all levels, poverty alleviation programmes, massive immunization campaigns and adherence to rule of law. Apart from these, in the bid to curtail corruption and tardiness in service delivery in Nigeria, initiatives including Due Process, Economic and Financial Crimes

Commission (EFCC), Independent Corrupt Practices Commission (ICPC), International Standard Organization (ISO), Service Compact with all Nigerians (SERVICOM) and 'Rebranding' campaign, are put in place by the Government.

No doubt, such responses may be profitable but it should be worrisome that in spite of the efforts, the fact of generally low developmental status of most African countries persists. What plausible explanation could then be provided for this state of affairs? To this author's mind, the current initiatives are apparently ineffective because they tend to target the symptoms rather than the root of the problem whereas, as observed by the (World Bank, 2000), a holistic approach must be evolved to reverse the current developmental lag in Africa.

It is argued in this paper that the principal bane of sustainable development in Africa is the absence of sustainable educational development which fosters production of quality personnel for driving development initiatives in any nation. The reason is simple; education remains the only means of building human capital and tertiary education is at the forefront of the enterprise (Abdullahi, 2008). This paper therefore takes a cursory look at the concept of academic integrity and its role in engendering sustainable educational development in tertiary institutions in Africa. It also articulates the relationship between sustainable educational development and sustainable national development, and proffers pragmatic initiatives for entrenching sustainable educational development with a view to fostering sustainable development in Africa. The significance of the paper lies in its focus on academic integrity as a critical, yet rarely explored, psychological prism for engendering sustainable educational development and consequently, sustainable national development.

**The Concept and Principles of Academic Integrity**

The Encarta Dictionary defines integrity as "the quality of possessing and steadfastly adhering to high moral principles or professional standards". Consequently, academic integrity has to do with maintaining high professional standards in all educational issues. The Centre for Academic Integrity (CAI) succinctly describes it as being honest, responsible, trust- worthy, transparent and accountable in all matters relating to the education enterprise. (Centre for Academic Integrity, 2003.)

Though basically value-laden, academic integrity also has cognitive and behavioural dimensions (Olasehinde-Williams, 2005). It is behaviour typically endorsed with full perceptual awareness and involves taking actions, often

requiring making choices between conflicting personal and interests. In general, individuals of high academic integrity tend to manifest overriding concerns for corporate over personal interests in their work and relational behaviours. In the context of this paper, then, academic integrity refers to endorsement of, and adherence to, honesty, responsibility and accountability by all stakeholders in all issues relating to the goals of higher education in Africa.

Institutions with potential to foster sustainable educational development must endorse and implement academic integrity policy. Members of such institutions (particularly administration, academic staff and students) must consciously cultivate and uphold the fundamental values of academic integrity in all academic and relational matters. Fostering academic integrity involves curricular initiatives; identification of compliance indicators; and application of appropriate reward and discipline system to reinforce compliance and deal with infringements of academic integrity regulations respectively. Full adherence to such academic integrity policy is critical to achieving sustainable educational development.

**Academic Integrity and Sustainable Educational Development**

Education, in the context of this paper, is not just the ability to read, write and count. Rather, it involves the training of the whole person, in head, hand and heart. The focus then is on tertiary education that empowers recipients to gain knowledge, develop skills and also build character. The University of Ilorin, Nigeria aptly captures this in its motto "Probitas Doctrina" i.e. "In Character and Learning". The placing of character before learning in the Motto is instructive and supports the thesis of this paper that character (integrity) is the heart of knowledge. This comprehensive goal of true education is what educational psychologists, including Jean Piaget and Jerome Brunner as well as evaluators of learning outcomes like Bloom and his associates, classified as cognitive, affective and psychomotor learning domains; and it is what the Nigerian National Policy captures as the goal of tertiary institution i.e. 'Production of highly skilled manpower with culturally appropriate values' (Federal Republic of Nigeria, 1977).

The ability to develop and sustain such true education and make it responsive to the present needs of African nations (rather than the needs of the West or East) on incremental and cumulative basis without compromising the ability of future generations to meet their own needs is what sustainable

educational development, which is of interest to this discourse, is all about (Obanya, 2005 and Lawal, 2005). To this author's mind, nations that endorse academic integrity stand in good stead to evolve and achieve such sustainable educational development which is central to sustainable national development. Figure 1 presents the conceptual frame work for understanding these relationships.

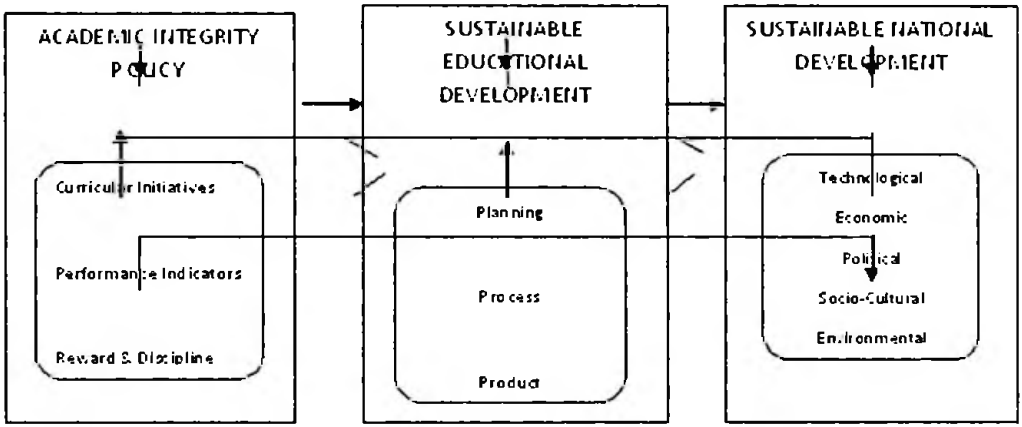


**Figure 1: Relationships among academic integrity, educational development and national development**

As shown in Figure 1, two stages: institution of academic integrity and achievement of sustainable educational development are critical to sustainable national development. The arrows in the Figure indicate that when tertiary institutions endorse and uphold academic integrity in the development of their curricular initiatives, in performance of shared responsibilities and obligations as well as in utilization of reward and discipline system, sustainable education develops (in terms of planning, process and product quality ); which ultimately facilitates sustainable national development (in terms of technological, economic, political, socio-cultural and environmental development). The broken arrows indicate the determinants of each stage as boxed; while the feedback arrows suggest that achievement of sustainable national development further reinforces endorsement of academic integrity and development of sustainable education plan, process and product in a vicious cycle.

However, sustainable educational development never occurs by accident. Rather, it is the product of conscious planning and processing rooted in the 3P Model of Curriculum Evaluation (Lawal, 1995, 2005). To start with, when academic integrity is upheld in the course of sustainable educational development, educational policies derive from honest needs-based, rather than from politically motivated, national philosophies and goals (Abdullahi, 2005; Olasehinde-Williams, 2007); enabling environment for actualizing the policies derive from domestic resources (in terms of capital, human and infrastructural resources), rather than being foreign donor-driven; relevant and culturally appropriate curriculum initiatives, locating worthy knowledge, values and skills are developed; possible contributions of alternative knowledge streams to development are explored (Western, Semi-formal and Traditional); honest and objectively verifiable achievement bench marks, (using bottom-up rather than top-bottom approach) are evolved (Obanya,2008 ; Lawal, 2005); transparent monitoring and evaluation procedure are responsibly utilized; while reward and discipline system are transparently applied.

A second major component of sustainable educational development is the processing (acting out) of the planned educational policies and curriculum initiatives. In line with the social-cognitive theory, implementation of educational initiatives comprise intellectual and psychological dimensions (Bandura, 1986; Mischel, 1968 & Rotter, 1966); and one psychological determinant of the nature and quality of stakeholders' involvement in processing educational initiatives is academic integrity because it is essentially valuative (Olasehinde-Williams, 2007). Consistent with the thesis of this paper therefore, endorsement of academic integrity will ensure provision of enabling environment and critical leadership by institutional administration, student admission based, principally, on merit; and judicious application of reward and discipline. Similarly, it ensures that academic staff prepare for, and attend to, their lectures honestly and conscientiously, conduct and report researches honestly, model and uphold the values of honesty, fairness, respect and accountability in all matters relating to teaching, evaluation and general relationships; while it ensures that student attend to lectures, research, examinations and interpersonal relationships with high degree of responsibility and honesty.

The implication of holistic education initiatives (driven by competent professionals in an appropriately enabling environment) on the quality of products of tertiary institutions cannot be over emphasized. Products of such

educational system will not only be empowered to improve their minds, gain knowledge and develop skills that will assist them in their life's work, they will also build character through enculturation of the fundamental values of academic integrity. The contributions of such individuals into initiating, driving and sustaining national development will impact positively on every facet of national development for as summarized Obanya (2008:26) "Quality inputs with quality processes would likely produce quality outcomes."

**Achieving Sustainable National Development**

To achieve sustainable national development, national policies must derive from painstaking needs assessment, requiring honest responses to critical questions. For example, in pursuit of technological developmental issues in a country like Nigeria, policy makers would require honest responses to include: whether the focus of development should be on nuclear energy (NTA News, 20/09/09) while still grabbling with the challenge of generation of mere 5000mega watts of electricity by the end of 2009. Whether the vision 20-2020 (i.e. making Nigeria become one of the twenty world economy by the year 2020) is achievable with a weak industrial sector in which the principal economic resources, including petroleum, are still being exported raw and imported processed nine years to the due date (Lawal, 2008). Whether massification of education should be preferred to qualitative education (given the current level of dependency on foreign heads, hands and hearts to drive technological projects). Whether tuition in tertiary institutions should be free when funding of education remains grossly inadequate and infrastructural facilities are either dilapidated or inadequate. The extent to which developmental initiatives should be powered by external funds given donor agencies' tendency to impose 'international best practices' (Obanya, 2008: 34) and perpetrate external debt repayment. What concrete forms of policies will respond to boosting employment, employability, service delivery, life expectancy, economic wealth, sense of nationalism, self worth, personal and national integrity in consonance with the provisions of the Millennium Development Goals. To what extent should development initiatives derive from external models? Whether policies outlive successive governments or die with initiators. Whether gender should be mainstreamed or discountenanced in development policies. Whether development policies should follow the top-down or bottom-up approach. To what extent should education for sustainable development be mainstreamed into all sectors such as agriculture, health, industrialization, and construction? Whether reward and

discipline system should be mainstreamed into public life behaviours and work culture. The list of plausible questions is endless but that honest responses to such inquiry can provide critical insight into appropriate policy development hardly be contested.

African nations will do well to copy the successful models from nations like India, Malaysia, Japan and China to achieve sustainable national development. Japan, for instance, emerged from a most crippling World War II effect to evolve a strong scientific and technological base (Abdullahi, 2008). India insisted on local technological initiatives powered by domestic resources to emerge a technologically viable country now well sought-after especially in medical technology. For instance, India only recently launched the first flying eye hospital going round the world to treat patients (NTA News 21/09/09). Malaysia moved from an impoverished underdeveloped status to become an economically and technologically viable nation; while China moved from a low development status to a highly sought after technologically advanced nation (to date, high proportions of products in African markets are made in China). One thing all these nations have in common is the ability to consciously and honestly factor critical national issues as raised above into their educational development initiatives (Abdullahi, 2008; Lawal, 2005).

**The Way Forward**

As articulated in this paper, commitment to sustainable educational development is central to reversing the slow pace of development in Africa. The following suggestions for fostering sustainable educational development with potential for accelerating sustainable national development are made.

1. Firstly, to demonstrate commitment to the values of academic integrity, every tertiary institution in Africa should institute and implement academic integrity policy. To this end, tertiary institutions, particularly in the West Africa Sub Region, should collaborate in evolving academic integrity policies on their campuses, and generally work together towards the same goal. The Centre for Academic Integrity (CAI), a consortium of higher institutions with academic integrity policy, in the United States of America and some other parts of the world, presents a good model in this respect.
2. Personal and national integrity must be built into work culture, public life and governance in African nations. People in leadership positions must model the value of integrity in their service delivery; while distinct

reward and discipline system must be evolved and transparently applied to reinforce compliance or punish infringements of the values of integrity respectively.

3. Beyond rhetoric, African countries must take practical steps to evolve and implement holistic educational policies responsive to their unique challenges , (with input from all stakeholders to ensure ownership and sustainability); invest significantly in educational resources and infrastructures (particularly training, recruitment, remuneration and retention of good quality academics); and provide generally conducive environment in terms of good governance and security of life and properties to facilitate the processing of educational initiatives.
4. To liberate them from perpetual control of Western nations, African nations must desist from further reliance on foreign aids (no matter how 'juicy or soft'), recondition Africans' taste and values by drastically restricting importation of foreign goods and services, values and technologies; and instead facilitate local production, and development of sense of personal and national worth.

**Summary and Conclusion**

In the context of this paper, academic integrity refers to manifesting honesty, transparency and accountability by all stakeholders in all matters relating to tertiary education in Africa. Developing educational policies capable of bringing about changes in knowledge, skills and values responsive to each country's unique economic, technological, political, socio-cultural and environmental challenges; and driven essentially by locally–sourced human and capital resources tend to guarantee sustainable educational development. Since education provides the platform for producing manpower for driving development initiatives in any nation, putting students on the right path from tertiary institutions is apparently the surest way to achieve sustainable national development required for attainment of the MDGs (of which many African countries are signatories), by 2015.

In conclusion, rather than merely spending on education, African nations must be committed to genuinely investing in sustainable educational development (Ogunyemi, 2005; Obanya, 2008) targeting identification of needs-based, culturally appropriate and holistic educational policies; powered by local capital and human resources ; and provided in enabling environment to drive

national development initiatives. Succinctly put, sustainable educational development facilitated by academic integrity have in-built mechanisms for getting African nations out of the woods of their current low development ratings relative to other continents (McKeown, 2002; Lawal, 2008). This probably informed the call by the Rio Earth Summit of 1992 to all nations to develop and implement an education for sustainable development strategy by 2002 ; and the United Nations' 2002 declaration of a Decade of Education for Sustainable Development, (ESD) ,2005-2014 (Ogunyemi, 2005).

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# GENDER AS A DETERMINANT OF INDIVIDUAL LIFESTYLE FOR SUSTAINABLE DEVELOPMENT IN AFRICA

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**Abstract**

*The study examined the relationship between gender and individual choice of lifestyle factors. The lifestyle factors of smoking, alcohol consumption, sedentary lifestyle, nutritional habit and sexual behaviour constitute the dependent variables, while gender (male and female) constitute the independent variables. Ex-post facto research design of 2x 5 non-experimental factorial sub-designs was used. The design afforded the researchers opportunity to juxtapose the two independent variables in order to study their relationship on the dependent variables. Cluster random sampling technique was used to select samples for the study. A total of 1350 randomly selected samples were used for the study. A questionnaire, which consists of 45 items on the practice of lifestyle factors, developed by the researchers and pilot tested was used for the study, using Goffman split-half model, a reliability analysis scale of 0.918r was obtained. Data collected were statistically analysed using descriptive and inferential statistics of student t-test. The results indicated that gender does not influence or determine respondents smoking habit, alcoholic lifestyle, nutritional habit and unsafe sexual practices of the people of Kaduna State. It was also found that significant differences exist in male and female drug habit and physical in-activities (sedentary lifestyle) in Kaduna State. The authors recommended that public health education should be intensified to improve people's awareness of the consequences of unhealthy lifestyle, with the aim of encouraging them to make right decisions or choices among others.*

## Introduction

Lifestyles are patterns of behavioural choices made from the alternative that are available to people according to their socio-economic circumstances and to the ease with which they are able to choose certain ones over others (Shehu, 2005). Lifestyles are the "behaviour of choice" which affect ones fitness and health status. Smoking, diet (food type and habit) and alcohol consumption are particularly important in this context. Each of these variables had at least a weak influence upon both fitness and health status in their own right and can potentially confound assessments based upon either occupation or patterns of leisure activity.

The individual lifestyles constitute what he does and what he fails to do, ranging from smoking, overeating, inactivity, alcoholism, drug abuse and participation in unprotected sexual relationship. The World Health Organisation (WHO, 1993) reported that there is a strong negative relationship between people's mortality rate and lifestyle practices. This has serious negative consequences on the national health status and survival.

Lifestyle factors, such as physical activity, dietary habits, smoking and alcohol intake are related to relative weight gain in both men and women (Seidell & Flegal, 1997; Trembley, 1999; Lissner & Heitman, 1995; Molarius, Seidell, Kuulabma & Dobson, 1997). Molarious, (2003) reported a prevalence of obesity by gender and age group among his study population in Germany (i.e. 12% of men and 14% of women were obese). Also, about one-fifth of the study populations were reported to be physically inactive and physical inactivity was most common among young men (20-33 years) than women. In Nigeria, it is observed especially in the cities, that heavy use of alcohol and drug abuse is very common among men especially young men than women. Dietary attitudes show similar patterns as heavy alcohol use and drug abuse. Men are observed to be generally active than women especially in rural areas of Nigeria. Further differences in health status and lifestyle between men and women have been attributed to gender-specific health and longetivity related behaviours. For example women are more likely than men to describe themselves as non-drinkers and non-smokers, yet are less physically active (Ross and Bird 1994). Women also tend to be more concerned about health matters and to use health care system for treatment compare to men (Verbrugge, 1984; McDonough & Walters, 2001). Gender disparities in health are often linked to differences between men and women in exposure to lifestyle factors.

Gender is one among many other demographic factors of age, religion, socio-economic status, marital status and environmental factor that influence individual choice of lifestyle factors. The individual lifestyle or behaviour can influence his state of health and individual's state of health can influence lifestyle choice. Branch (1985); Breslow and Broslow (1993); Rogers (1995); and Manton, Stallard and Tolley, (1991) were of the opinion that individuals with healthy lifestyle tend to live longer than others and that individuals with unhealthy lifestyle tend to die sooner than others. Healthy lifestyle factors of concern consist of regular exercise, good diet, non-smoking, non-alcohol consumption, safe drug use and avoidance of casual and unprotected sex. Healthy lifestyle helps to prevent weight gain, high blood pressure, stress, early mortality and the spread of HIV/AIDS. On the other hand, unhealthy lifestyles of individuals are those negative health behaviours that had been scientifically proven to be harmful to one's health. They individually or collectively have direct or indirect consequences on the health and well being of individuals. These include poor dietary habits or excessive eating, lack of exercise or sedentary activities, smoking, casual sex and heavy use of alcohol. The implications of unhealthy lifestyle are enormous these includes problems of malnutrition, obesity, liver cirrhosis, cardiac diseases, HIV/AIDS, accidents, untimely deaths and many others.

Life chances and choices are very clearly gendered in all parts of the world; no country treats its women as well as it treats its men. Gender is not just a question of socially acquired female and male roles; it is an organizing principle of social life (Shehu, 2005). In defining gender as a key determinant of health we recognize not only how central the power relationship between men and women is to our daily life and wellbeing – but that it can be a question of life and death. It is therefore important to examine how gender influences the choice of a particular lifestyle-heavy use of alcohol for example.

Alcoholism as a lifestyle is characterized by excessive use of alcohol to the point of over-dependence or addiction (Asuni, Schoenberg & Swift, 2004, Shehu, 2005). Alcoholism could be differentiated from excessive and heavy social drinking. Excessive drinking goes beyond what is traditional and customary in one's country. Alcoholics are these excessive drinkers whose health or family relationships or work performance are adversely affected by drinking.

In traditional African Communities drinking (alcohol consumption as a lifestyle) occurs not only at home and after work, but also outside the home and at the time of weddings and other special ceremonies. African alcoholics fall into

two main groups. The first are those men and women who have not left the traditional setting. Their drinking was originally in conformity with the custom in their village or community but unlike most of their friends drinking became more and more excessive and thereby set them apart from most of their neighbours even though such men and women with alcoholic problem might not drink the entire year simply because of the unavailability of alcoholic drinks. However, when the alcohol drink is available they may be the ones who would drink without control and perhaps be drunk much of each day. The other type of alcoholic is found among men and women who have moved away from the traditional way of life and lived in cities. Such alcoholics may present symptoms of one of the personality disorders or social uneasiness and inability to tolerate tension, or, less frequently, symptoms of a more psychiatric illness.

On smoking, Andrew, Donna, Stuart and Sandler (2002) observed that the rate of smoking among women now outnumbered the men, thus, cigarette smoking was associated with short and irregular cycles (menstrual cycles). The odds of having irregular cycles were 3.6% among women who smoked more than a pack of cigarette a day compared with non-smokers. This assertion was corroborated by Molarius (2003) when he reported that women were often smokers than men, except among the elderly. Smoking is seriously implicated in heart diseases and account for many deaths from lung cancer to other cancers among women than men (Andrew et al, 2002).

The same parameters apply to the choice of individual choice of other lifestyle factors. This study therefore examined the influence of gender on the choice of lifestyle factors like heavy use of alcohol, nutritional status, smoking, drug habit, lifestyle and unsafe or indiscriminate sexual practices.

**Research Hypotheses**

The following hypotheses were formulated for the study

- Gender of the respondents in Kaduna State does not significantly determine the smoking habit of the people for sustainable development in Africa
- Gender of the respondents in Kaduna State does not significantly determine the alcoholic lifestyle of the people for sustainable development in Africa
- Gender of the respondents in Kaduna State does not significantly determine the sedentary lifestyle of the people for sustainable development in Africa

- Gender of the respondents in Kaduna State does not significantly determine the nutritional habit of the people for sustainable development in Africa
- Gender of the respondents in Kaduna State does not significantly determine the drug habit of the people for sustainable development in Africa
- Gender of the respondents in Kaduna State does not significantly determine the sexual behaviour of the people for sustainable development in Africa

**Methodology**

Ex-post facto research design of 2 x 5 non-experimental factorial sub-designs was used. Thus, the lifestyle factors of smoking, alcohol consumption, sedentary lifestyle, nutritional habit, drug habit and sexual behaviour constitute the dependent variables, while gender (male and female) constitute the independent variables. The population for this study consist of all individuals aged 16 years and above living in both rural and urban areas of Kaduna State, Nigeria as at the time of this study. A total of 1350 samples were randomly selected from six rural and six urban areas selected from the three constitutional recognized senatorial districts of Kaduna State, Nigeria using cluster random sampling technique. A self structured and developed questionnaire tagged "Questionnaire on Relationship between Gender and Lifestyles of the people of Kaduna State, Nigeria (QRGLKSN). Face and content validity of the research instrument was established by distributing copies of the questionnaire to jurors in the field of health education. The instrument was pilot tested using Goffman split-half reliability model through the statistical package for social science (SPSS) a reliability analysis scale of 0.9181r was obtained. The instrument was administered with the help of research assistants and interpreters who are fluent in various local languages of Hausa, Fulani, Kargo, Daba etc that exists in the state. Inferential statistics of student t-test was used to analyse the six hypotheses generated for the study at 0.05 alpha level of significance.

## Results

**Table 1: Summary of means, standard deviations, standard errors and t-values of differences between individuals' adopted lifestyles and gender of the respondents**

| Lifestyle factors | Gender | No of cases | Means | S.D | S.E | Df | Cal-t-value | Critical value | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Smoking | Male | 1038 | 4.9094 | 3.817 | 0.118 | | | | |
| | Female | 312 | 4.7596 | 4.042 | 0.229 | 1348 | 0.60 | 1.96 | Not sign |
| | Total | 1350 | | | | | | | |
| Alcoholic lifestyle | Male | 1038 | 7.9017 | 6.044 | 0.188 | | | | |
| | Female | 312 | 7.2596 | 5.593 | 0.317 | 1348 | 1.67 | 1.96 | Not sign |
| | Total | 1350 | | | | | | | |
| Sedentary lifestyle | Male | 1038 | 8.0032 | 2.707 | 0.084 | | | | |
| | Female | 312 | 8.6002 | 2.691 | 0.153 | 1348 | 3.43 | 1.96 | Sign |
| | Total | 1350 | | | | | | | |
| Nutritional habit | Male | 1038 | 15.9094 | 4.304 | 0.134 | | | | |
| | Female | 312 | 16.0609 | 4.607 | 0.261 | 1348 | -0.54 | 1.96 | Not sign |
| | Total | 1350 | | | | | | | |
| Drug habit | Male | 1038 | 7.1657 | 5.650 | 0.175 | | | | |
| | Female | 312 | 8.1250 | 5.449 | 0.308 | 1348 | -2.65 | 1.96 | Sign |
| | Total | 1350 | | | | | | | |
| Sexual behaviour | Male | 1038 | 9.4971 | 4.134 | 0.128 | | | | |
| | Female | 312 | 9.7276 | 4.521 | 0.266 | 1348 | -0.84 | 1.96 | Not Sign |
| | Total | 1350 | | | | | | | |

DF = N – 2 = 1350 -2 = 1348; critical value = 1.96; P< 0.05

Table 1 shows that the calculated t-value for smoking habit (0.60), alcoholic lifestyle (1.67), nutritional habit (-0.54) and sexual behaviour (-0.84) of the respondents were less than critical value of 1.96 with a degree of freedom 1348 at 0.05 alpha level of significance. Therefore, the null hypotheses that say there are no significant differences in the adopted lifestyles of smoking, alcoholic lifestyle, nutritional habit and sexual behaviour were upheld. This connotes that significant difference does not exist in the adopted lifestyles (smoking, alcoholic lifestyle, nutritional habit and sexual behaviour) and gender of the respondents in Kaduna State. This implies that gender of the respondents does not influence the respondents smoking habit, alcoholic lifestyle, nutritional habit and sexual behaviour of the people of Kaduna State.

Table 1 also reveals that the calculated t-value for sedentary lifestyle (3.43) and drug habit (-2.65) were greater than the critical value of 1.96 with a degree of freedom 1348 at 0.05 alpha level of significance. Therefore, the null hypotheses that say there are no significant differences in the adopted lifestyles

of sedentary lifestyle and drug habit of the respondents and their gender were rejected. This implies that significant differences exist between the adopted lifestyles (sedentary and drug habit) and the gender of the respondents in Kaduna State.

**Discussion of Findings**

The findings that significant relationship does not exist between gender and the practice of lifestyle factors like smoking, alcoholic lifestyle, nutritional habit and sexual behaviour of the respondents in Kaduna State as presented in table 1 is not in conformity with the submission of Verbrugge (1984), McDonough and Walters, (2001) that gender disparities in health are often linked to differences between men and women in exposure to lifestyle factors. Also, the finding was not in accord with Molarius (2003) who reported a prevalence of obesity by gender and negatively skewed to women among his study population (12% of men and 14% of women were obese) that the rate of smoking among women are now outnumbered men. On gender and alcohol consumption, a visit to southern parts of Kaduna State would clearly testify to the fact that both genders were actively involved in alcohol consumption. However, a slight increase is found among men than women as shown in their arithmetic means in table 1. Also, majority of the respondents (cut across gender) in the study area, agreed that they feed on local foods everyday of the week (papa & akara, tuwo masara, gari, yams, rice, beans and other cereal products). The insignificant difference observed in gender and their sexual behaviour is due to the fact that both genders were actively involved in indiscriminate sexual behaviour.

On smoking, a contradictory report was also found in Andrew, et al (2002) when they observed that the rate of smoking especially from kitchens among women are now outnumbered men, men, thus, cigarette smoking was associated with short and irregular menstrual cycles in women. The reason for this contradictories is not known, it is however, open for further research to find out why significant relationship does not exist between gender and some lifestyle factors like smoking, alcoholic lifestyle, nutritional habit and sexual behaviour.

The finding that gender is significantly related to sedentary lifestyle and drug habit of the respondents, is corroborated by the submission of Molarius (203) who reported a prevalence of obesity due to physical inactivity by gender

and age group among his study population (i.e. 12% of men and 14% of women were obese). About one-fifth of the study populations were reported to be physically inactive, and physical inactivity was most common among young men (25-44 years) than women. Seidell and Flegal, (1997), Lissner and Heitman (1995), Molarius (2003) and Tremblay (1999) observed that physical inactivity, smoking, drug abuse and alcohol intake are related to relative weight gain in both men and women. The finding that gender is related to drug habit among the people of Kaduna State is in agreement with the submission of Folawiyo (1990) who observed especially in Nigeria cities, that heavy use of alcohol and drug abuse are very common among men especially young men than women.

**Conclusion**

Alcoholic lifestyle, nutritional habit, smoking and unsafe sexual behaviour are found not to be significantly related to gender (male and female). A visit to places like Kafancha, Kwoi, Zonkwa, Kagoro, Fadan Kagoma and Gantu in the southern parts of Kaduna Sate and Samaru-Zaria, Kwangila, Mando, Kawo and Buruku in the northern parts of the state would clearly testify that both gender are actively involved in the production and consumption of alcohol (local Burukutu), feed on majorly cereals crops and no clearly distinction as to a particular gender with high rate of smoking. However, it is a fact that anybody that is drunk is bound to sexually misbehave.

Conclusively, young men than women in Kaduna State engages more in sedentary activities like long hours of sitting down at popular local joints to enjoy burukutu "locally made alcohol", petty trading, and others. This appears not to favour the men health wise as women were barred to farming for a more strenuous activities when young men engages in pleasurable activities. The effect of this is a number of health related diseases that like obesity, cancer, cardiac diseases, high blood pressure and untimely deaths that are common in the state.

Also many of those young men were easy weapons for political jobbers and religious fanatics in the state, who readily recruit them for political and religious disturbances that are abound in Kaduna State, Nigeria in recent times.

**Recommendations**

1. Since the lifestyle exhibited by an individual does not spring up in a day, health education of children and youths (especially adolescents) should be intensified in the primary and secondary schools in order to make them appreciate the adverse effects of alcohol, drug abuse, smoking, inactivity and indiscriminate sexual behaviour.
2. Religions and community leaders as well as opinion leaders should be involved in the crusade against unhealthy lifestyles.
3. Public health education should be intensified to improve people's awareness of the consequences of unhealthy lifestyles with the aim of encouraging them to make right decision and choices.
4. The young adolescents men who are mostly found in the habit of excessive drinking, drug abuse, smoking and indiscriminate sexual practices should be positively counselled to modify their behaviours and encourage to adopt healthy lifestyles.

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# FACTORS IN THE RATE OF ACCEPTANCE OF HIV/AIDS VOLUNTARY COUNSELLING AND TESTING (VCT) IN KWARA STATE

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**Abstract**

HIV/AIDS has become a source of concern all over the world. The concern cannot be isolated from the devastating effects of HIV/AIDS on economic, social, political and technological development of any nation plagued by the virus. Nigeria is one of the countries with a high rate of HIV/AIDS prevalence. The current national rate is over 4 percent. Despite this challenge, the patronage of voluntary counselling and testing is still very low. This study therefore examined the factors responsible for the rate of acceptance of voluntary counselling and testing as expressed by youths in Kwara State. A total of 600 youths from the three Senatorial districts in the State were involved in the study. A survey instrument designed by the researchers was used to collect relevant information from the respondents. Among others, the study identified ignorance, poverty, inadequate number of VCT centres, stigma and discrimination as major factors responsible for the low patronage of VCT centres in Kwara State. Gender and religion had no significant influence on the respondents' views while place of residence had significant influence. The implications of the findings to counselling were identified and discussed.

## Introduction

HIV/AIDS is a major source of concern all over the world as it constitutes a major source of death and a threat to national development. The virus has negative impact on economic, social and political development of any nation that has its high rate. Nigeria is one of the countries a relatively high prevalence of people living with HIV/AIDS in Africa. Statistics indicated that as at the end of 2007, an estimated 22 million adults and children in the sub-Saharan Africa were living with HIV. Also, an estimated 1.5 million Africans died from AIDS while 11.6

million African children became orphans as a result of HIV/AIDS. Specifically, as at the end of 2007, Nigeria had 2.6 million people living with HIV/AIDS, 170,000 died of AIDS and 1.2 million were orphaned (AVERT, 2009).

Due to the deadly effect of HIV/AIDS, Nigeria's life expectancy dropped from 53.8 years for women and 52.6 years for men in 1991 to 46 years for women and 47 years for men in 2007. About 80 percent of HIV infections in Nigeria are transmitted through heterosexual activities, 10percent of the new HIV infections are transmitted through blood transfusions while another 10 percent HIV infections are transmitted through mother-to-child transmission and other HIV risk behaviours, such as circumcisions and incision of tribal marks (AVERT, 2009).

In Nigeria, HIV/AIDS is promoted by inadequate sexual health education, inadequate voluntary HIV testing and counselling, unhealthy cultural practices and poor health care system (Alao, 2004). HIV/AIDS is a dangerous virus which destroys the body immunity. It leads to a progressive loss of a specific type of immune cell called T – helper, or $CD_4$, cells. As the Virus grows in the body, it damages or kills the cells and weakens the immune system leaving the infected person vulnerable to various opportunistic infections and other illnesses (Lawal, 2008).

A healthy condition is an essential condition to meaningful contribution to national development. HIV/AIDS is a source of threat to life, thus individuals need to know their HIV status through testing. This is necessary because such a test helps to reduce transmission and involvement in risky sexual behaviours. It also promotes early treatment and adjustment (Oshi, Segun, Oshi, Dimkpa, Korie and Okperi, 2007). HIV AIDS counselling involves educating a client or a group of clients on the control management and prevention of HIV/AIDS. Counselling assists people to make informed decisions, cope better with life challenges, lead positive lives and prevent further transmission of HIV. Voluntary counselling and testing can be defined as a confidential face–to–face interaction between a professional counsellor and a client or a group of clients with a view of assisting the clients to make informed decisions and adjust effectively in life. HIV/AIDS counselling consists of three stages, which are pre-test counselling, post-test counselling and follow up (Yahaya, 2004). HIV/AIDS test involves a scientific analysis of a client's blood in order to determine his/her HIV/AIDS status. Both HIV/AIDS counselling and testing aim at assisting clients/patients to understand themselves, adjust effectively to life challenges and contribute

meaningfully to the development of the society (Alao, 2004). Pignatelli, Simpore, Pietra et al (2006) noted that VCT is a key element in to identify HIV infected persons who could benefit from therapeutic interventions.

**Literature Review**

O'Donnell, Knight, Campbell, Van-Amdel, Zeinick and Rand (2004) carried out a study on factors associated with participation in HIV voluntary counselling and testing among TB patients in a rural south African hospital. A total of 153 consecutive adult TB patients were enrolled in the study. Demographic characteristics, knowledge, attitude and belief regarding HIV/AIDS were measured in order to determine possible associations with the decision to accept or reject VCT. In the study education was found to be the most important predictor of refusal to participate in VCT. The belief that VCT participation led to better health care and that participants had sufficient privacy to make their decisions about VCT were significantly associated with the acceptance of VCT. The study concluded that educated that reaching educated TB patients in rural South Africa with VCT programmes may require different outreach strategies than less educated patients.

Oshi, Ezugwu, Oshi, Dimkpa, Korie and Okperi (2007) investigated the influence of self perception of HIV infection on youths' attitude towards Voluntary Counselling and Testing services in Nigeria. The study, which employed in-depth interviews, indicated that youths with low self perception were not inclined to reduce risky sexual behaviours or to seek HIV/AIDS counselling and testing. Similarly, Okpoto (2009) conducted a study on the attitude of the University of Ilorin undergraduates towards Voluntary HIV/AIDS Counselling and Testing. The study revealed that the students had negative attitude towards VCT and gender, age, religion, course of study and marital status had no significant influence on their attitude. The study recommended that VCT centres should be established to enable people access to the needed services.

Holmes, Preko, Bolds, Baido & Jolly (2008) conducted a study on acceptance of Voluntary Counselling, Testing and Treatment for HIV among pregnant women in Kumashi, Ghana. The result showed that 76% of the women reported no prior HIV counselling and 78% had never undergone for HIV testing. The study also indicated that the majority of the respondents were not accessing the available VCT services. It was also found that education, prior HIV testing and history of Sexually Transmitted Diseases (STDs) influenced respondents' acceptance of VCT.

Pignatelli, Simpore, Pietra et al (2006) investigated the factors predicting uptake of VCT in a real life setting in a mother and child centre in Ouagadougou, Burkina Faso. The sample consisted of all pregnant women receiving ante-natal group health education at St Camilla Medical Centre, Ouagadougou, Burkina Faso. It was found that less than 20% of the sample accepted VCT. The HIV seroprevalence rate was 10.6%, while the uptake rate was independently associated with age, the number of previous pregnancies and the number of previous miscarriages.

**Statement of the problem**

The youth age is characterized by strength and vitality which predispose the young ones a high level involvement in sexual activities and the consequent attendant risk such as unwanted pregnancy, abortion and infection with Sexually Transmitted Diseases. According to Mishra (2005), young people are highly vulnerable to HIV and other STDs. He asserted that in many countries 60 % of all new HIV infections are among the young ones ages15-24years and stressed that the highest rates of STDs are usually found among the youths of ages 20-24 years followed by 15-19 years. It was estimated that in Nigeria 3.1% of people living with HIV and AIDS are between the ages of 15 and 19 years. (UNAIDS, 2008) It is the relevant that the views of youths are sought as regards factors involved in the acceptance of VCT.

Lawal (2008) reported that the level of awareness of HIV/AIDS in Nigeria is still low and thus, the attitude of most Nigerian towards voluntary HIV/AIDS counselling and testing is still negative. For instance, UNAIDS (2008) revealed that in 2006, only 10 percent of HIV-infected women and men were receiving antiretroviral therapy and only 7 percent of pregnant women were receiving the treatment needed to reduce the risk of mother-to-child transmission of HIV. AVERT (2009) also reported that the Nigerian government has set up the National HIV/AIDS Strategic Framework to manage the nation's response from 2005 to 2009. Thus, by 2010 Nigeria aims at providing antiretroviral therapy to 80 percent of adults and children with advanced HIV infection and to 80 percent of HIV – positive pregnant women.

The Nigerian government has displayed good intention and commitment to the reduction and management of HIV/AIDS related problems but the objectives of the government as regards prevention, control and management of the epidemic may be unachievable if Nigerians continue to

display negative attitude to voluntary HIV/AIDS counselling and testing. This is because report indicated that in 2006 only about 10% of HIV infected women and men were receiving antiretroviral therapy and only 7% of HIV infected pregnant women were receiving treatment to reduce the risk of mother-to-child transmission of HIV (The Population Council, 2007). This report is a major source of concern and thus the study was designed to investigate the factors in the rate of acceptance of HIV/AIDS Voluntary Counselling and Testing (VCT).

**Research Questions**

In line with the identified problems, the following research questions were raised:

1. What are the factors affecting the acceptance rate of HIV/AIDS VCT as viewed by youths in Kwara state?
2. Do gender, religion and place of residence influence the youths' views of the factors in the rate of acceptance of HIV/AIDS VCT?

**Research Hypotheses**

1. There is no significant difference in the factors influencing the rate of acceptance of HIV/ AIDS Counselling and Testing as viewed by respondents based on gender.
2. There is no significant difference in the factors influencing the rate of acceptance of HIV/ AIDS Counselling and Testing as viewed by respondents based on religion.
3. There is no significant difference in the factors influencing the rate of acceptance of HIV/ AIDS Counselling and Testing as viewed by respondents based on place of residence.

**Methodology**

The research was conducted using a descriptive survey. This involved the administration of an instrument designed by the researchers titled "Factors in the Rate of Acceptance of HIV/AIDS Voluntary Counselling and Testing Questionnaire". The validity of the instrument was conducted through content validity procedure while its reliability was determined using test re-test procedure. The instrument was found to be valid and reliable. Prior the administration of the instrument to the selected sample, the researchers obtained the lists of registered youth organizations in Kwara State from the

Ministry of Youths and Sports Development and permissions for the administration of the questionnaires were sought from youth leaders. A total of 800 youths participated in the study but only 600 questionnaires were validly completed and consequently analyzed using descriptive and inferential statistics.

## Results

***Socio-demographic Characteristics***: The average age range of the respondents was 18 to 40 years. Sixty five percent of the respondents are males while thirty five percent are females. Also Seventy seven percent of the respondents resided in urban area while twenty three percent resided in rural area. Twenty percent of the respondents obtained primary school certificates; sixty six percent had secondary school certificates while twenty four percent had post secondary school certificates.

***Factors in the rate of acceptance of HIV/AIDS VCT:*** Tables 1-3 present the findings of the study:

**Table 1: Rank order of Respondents' views on Factors in the rate of acceptance of HIV/AIDS VCT**

| S/N | The rate of acceptance of HIV/AIDS VCT is influenced by: | Mean | |
|---|---|---|---|
| 1. | Ignorance | 3.22 | 1st |
| 2. | Fear of being positive | 3.19 | 2nd |
| 3. | Poverty | 2.85 | 3rd |
| 4. | Inadequate number of VCT centres | 2.55 | 4th |
| 5. | Stigmatization | 2.15 | 5th |
| 6. | Discrimination | 1.90 | 6th |
| 7. | Religious belief | 1.63 | 7th |
| 8. | Cultural belief | 1.35 | 8th |
| 9. | Parental pressure | 1.20 | 9th |
| 10. | Inadequate motivation | 1.18 | 10th |

Table 1 indicates that the respondents ranked ignorance, fear of being positive, poverty, inadequate of VCT centres and stigmatization as the main factors in the rate of acceptance of HIV/AIDS VCT

**Table 2: A t-test analysis comparing the views of respondents on factors in the rate of acceptance of VCT based on gender**

| Gender | No. of Respondents | Mean | SD | Df | Cal. t-value | Crit. t-value |
|---|---|---|---|---|---|---|
| Male | 390 | 22.96 | 2.52 | 598 | 0.77 | 1.96 |
| Female | 210 | 22.81 | 2.37 | | | |

Table indicates a critical t-value of 0.77 and a critical t-value of 1.96 at 0.05 alpha level. Since the calculated t-value is higher than the calculated t-value the null hypothesis one is accepted. Thus, there is no significant difference between the two groups of respondents.

**Table 3: A t-test analysis comparing the views of respondents on factors in the rate of acceptance of VCT based on Religion**

| Religion | No. of Respondents | Mean | SD | Df | Cal. t-value | Crit. t-value |
|---|---|---|---|---|---|---|
| Christianity | 234 | 29.68 | 2.55 | 598 | 0.91 | 1.96 |
| Islam | 366 | 29.85 | 2.43 | | | |

Table indicates a critical t-value of 0.91 and a critical t-value of 1.96 at 0.05 alpha level. Since the calculated t-value is higher than the calculated t-value the null hypothesis two is accepted. Thus, there is no significant difference between the two groups of respondents.

**Table 4: A t-test analysis comparing the views of respondents on factors in the rate of acceptance of VCT based on place of Residence**

| Place of Residence | No. of Respondents | Mean | SD | Df | Cal. t-value | Crit. t-value |
|---|---|---|---|---|---|---|
| Urban | 462 | 29.97 | 4.57 | 598 | 3.04* | 1.96 |
| Rural | 138 | 28.54 | 4.16 | | | |

*= Significant at 0.05

Table indicates a critical t-value of 3.04 and a critical t-value of 1.96 at 0.05 alpha level. Since the calculated t-value is less than the critical t-value the null

hypothesis three is rejected. Thus, there is a significant difference between the two groups of respondents.

**Discussion of findings**

The study indicated the main factors in the rate of acceptance of HIV/AIDS as ignorance fear of being positive, poverty inadequate VCT centre and stigmatization. The finding could be due the information available to students as regards the experience of HIV/AIDS patients. In a similar study, Okpoto (2009), found that undergraduates of the University of Ilorin had negative attitude to ignorance and stigmatization.

The study also found no significant difference in the views of respondents as regards the factors in the rate of acceptance of HIV/AIDS VCT based on gender and religion. This finding may be due to the efforts of governments and non-governmental organizations on creating awareness about HIV/AIDS. People irrespective of gender and religion seem to be aware of HIV/AIDS and basic issues that are related to the virus. It was found that respondents' place of residence has significant influence on the respondents' views on the factors in the rate of acceptance of HIV/AIDS VCT. Respondents residing in rural areas had a significantly lower mean, an indication that they viewed the factors differently from those from the urban areas. This finding could be attributed to the opportunity available to the respondents in the urban areas especially access to information through the print and electronic media. Lawal (2008) also found that the knowledge and attitude of his sample was significantly influenced by place of residence.

**Implications of the findings**

The implication of these findings is that Counsellors and health personnel need to collaborate in order to remove obstacle in the acceptance of HIV/AIDS VCT. , there is need to make VCT services available in urban and rural areas with little or no cost. This is essential in order to reduce the spread of the virus, provide treatment to victims of HIV/AIDS.

**Conclusion and Recommendations**

HIV/AIDS require and collaborative efforts in view of its devastating effects. People should be encouraged to seek information about their HIV status and seek intervention when necessary. Governments should therefore establish

more VCT centre in both rural and urban areas. HIV/AIDS counselling and testing should be integrated into counselling and medical curricula.

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Nelson Mandela, the world celebrated anti-racist at 86 years of age mourned his only surviving son who died of AIDS in January 2005, Nigeria Tribune Friday 7th January 2005

According to Mishra (2005) 45 countries with HIV prevalence rates above 2 percent of the worst affected by HIV/AIDS crisis and such countries include of the 45 countries, 36 are in Africa, 7 with prevalence rates of about 20 percent. South Africa, Nigeria, Zimbabwe, Burkina Faso, Benin Republic, Kenya, Tanzania, Cote

# NUTRITIONAL LIFESTYLE OF THE PEOPLE OF KADUNA STATE, NIGERIA: THE NEED FOR EDUCATIONAL INTERVENTION

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**Abstract**

*The study examined the relationship between the nutritional lifestyle of rural and urban people of Kaduna state, Nigeria. The nutritional lifestyle examined includes the difference in proteins, calories, vitamins and minerals consumption by the rural and urban people of Kaduna State, Nigeria. It also examined their attitude towards the consumption of natural and refined food products. Descriptive research design was adopted for the study. The population consisted of all individual age 16 years and above living in both rural and urban areas of Kaduna state, Nigeria as at the time of the study. Stratified and cluster random sampling techniques were used to select samples for the study. A total of 1350 randomly selected samples were used for the study. A structured questionnaire, developed and pilot tested with a reliability analysis scale of 0.92r was used for the study. The data collected were statistically analysed using student t-test. All the hypotheses generated were subjected to statistical analysis. The result showed that significant different exists in the calories, natural and refined food products consumed by rural and urban people of Kaduna state, Nigeria. It also reveals that rural and urban people of Kaduna state, Nigeria are not significantly different in their nutritional lifestyle. The researchers recommends, among others that appropriate health education interventions be put in place in other to promote active living among the people of Kaduna State, Nigeria.*

## Introduction

The major cause of mortality in developed and developing countries of the world are diseases in which nutritional lifestyle plays an important role. The choices of what people eat are determined by various factors such as religions, customs and socio-economic differences. The principal determinant is the environment in which an individual finds himself or herself. Changing these factors in the direction of nutritional lifestyle patterns could postpone the age of onset of permanent mobility, disability, disease occurrences and death and could have a major effect on quality of life (Bush, Miller and Criqui, 1990; Verbrugge and Jette, 1994; Havemam-Nies, Lisette, Amorin and Burema, 2002). As pointed out above, the nutritional lifestyle of an individual is influenced by a variety of external and internal factors based on the complex interactions between the individual and his environment.

Sharma, Cade and Jackson (1996) and Mennen, Mbanya and Cade, (2000) reported that urban lifestyle in Africa is characterized by changes in dietary habits involving an increase in consumption of refined sugars and saturated fat, and a reduction in fibre intake. Majority depends on imported and refined food nutrients with little nutritional values which may have adverse effects on their well being. Moreover, there is reduction in physical activity with urban lifestyles.

Rural population depends on available natural foods like green vegetables, fresh fruits and dairy products in their immediate environment. Although significant amount of refined foods could also be noticeable in the rural areas such as bread, soft drinks and other refined or processed food products. Rural people have a high physical activity related energy expenditure compared to urban subjects (Singh, Prentice and Diaz, 1989, Heini, Schutz and Diaz, 1991). Thus explaining the higher ratio's of obesity, overweight and other food deficiency diseases in the cities.

Nutrition is the entire process in which our bodies absorb and make use of foods; nutrients are those substances in foods that sustain our bodies. Nutrients serve three basic functions; (1) Building and repairing the body tissues; (2) Regulating body processes and (3) Supplying energy. This study therefore group the nutrients we consume around the three (3) basic functions stated above to include; (1) proteins, (2) Vitamins and Minerals and (3) Carbohydrates, fats and oil.

Food choice is an important determinant of people's quality of life. Poor or unbalanced diets as in the case of excessive eating and under nutrition are risk factors for several chronic diseases. Poor food intake reduces the level of

nutrients in the body thereby exposing the patients to nutritional health related problems. For example, a diet characterized by a high proportion of high-fat dairy foods, fatty containing sugars and by a low proportion of vegetables, fruits, cereals and legumes poses an increase risk of nutritional deficiency diseases. The choice of good nutrition is not only important in preventing health problems and promoting active living, but it is a critical part of managing diseases among those who are infected or sick.

**Purpose of the Study**

The study examined the relationship between the nutritional lifestyle of rural and urban people of Kaduna State, Nigeria. It examined the difference in the consumption of proteins, carbohydrates and fats as well as vitamins and minerals salts. The study also examined the differences in the consumption of natural and refined food products among the people of Kaduna state, Nigeria.

**Research Questions**

The following research questions were outlined in an attempt to find solution to the research problem.

1. Do the nutritional lifestyle of urban people of Kaduna State, Nigeria significantly different from their rural counterparts?
2. Is there any significant difference in the consumption of proteins, calories, vitamins and mineral salts among the rural and urban people of Kaduna state, Nigeria?
3. Why does the urban people of Kaduna state, Nigeria prefers refined and imported food products then the rural foods?

**Hypothesis**

The following hypotheses were formulated and tested for the study.

**Main Hypothesis**

There is no significant difference in the nutritional lifestyle of rural and urban people of Kaduna state, Nigeria.

**Sub-Hypotheses**

1. Rural and urban peoples of Kaduna State, Nigeria are not significantly different in their protein consumption.

2. Rural and urban people of Kaduna state, Nigeria are not significantly different in their calories consumption.
3. Rural and urban people of Kaduna State, Nigeria are not significantly different in their vitamins and minerals salts consumption.
4. Rural and Urban people of Kaduna State, Nigeria are not significantly different in their consumption of natural food products.
5. Rural and urban people of Kaduna State, Nigeria are not significantly different in their consumption of refined food products.

**Methodology**

Descriptive research design was adopted for this study. The population consists of all individuals from age 16 years and above living in Kaduna State, Nigeria as at the time of the study. A structured questionnaire, developed and pilot tested with a reliability analysis scale of 0.92r was used for the study. A total of 1350 respondents (rural 450 respondents, urban 900 respondents) were selected using a combination of stratified and cluster random sampling techniques. The researcher with the help of three (3) Research Assistants who are fluent in the various local languages in the state (Hausa, Fulani, Garje, Yoruba, Nupe Ibo, Jaba etc) were actively involved in the administration of questionnaire, samples were drawn from the (6) rural area (Ja'ma, Kwangila, Giwa, Buruku, Kagoro and Kagoma) and six (6) urban areas, (Zaria city, Samaru, Kawo and Mando, Birni Gwari, Kafanch and Kwoi) carefully selected using random sampling techniques across the three (3) senatorial districts of Kaduna state, Nigeria. 75 respondents were randomly selected from each of the rural areas, which 150 respondents were randomly selected from each of the urban areas.

The data that emanated from the study were statistically analyzed using student t-test using statistical package for Social Science (SPSS). These results are presented below.

**Results**

The result presented in Tables 1 and 2 were strictly based on research questions.

**Main Hypothesis**

**Table 1: Means, standard deviation, standard error and t-value of difference between the nutritional lifestyle of rural and urban respondents in Kaduna state, Nigeria.**

| Type of dwelling | No of cases | Means | S.D. | S.E. | D.F | Cal. t-value | Critical value | Remark |
|---|---|---|---|---|---|---|---|---|
| Rural | 450 | 16.2311 | 4.323 | 0.204 | | | | Not sign |
| Urban | 900 | 15.8011 | 4.396 | 0.147 | 1348 | 1.709 | 1.96 | |
| Total | 1350 | | | | | | | |

A careful examination of Table 1 shows that the calculated t-value of 1.70 is less than the critical value of 1.96 at 0.05 alpha level of significance. Therefore, the null hypothesis that says rural and urban people of Kaduna State, Nigeria are not significantly difference in the nutritional lifestyle is accepted. This means that there is no significant difference in the nutritional lifestyle of rural and urban people of the Kaduna State, Nigeria.

**Table 2: Means, standard deviation, standard error and t-value of differences in the consumption of protein, calories, vitamins, natural and refined food products by the rural and urban respondents of Kaduna State, Nigeria.**

| Nutrition | Type of dwelling | No of cases | Means | S.D | S.E | Df | Cal. t-value | Critical Value | Remark |
|---|---|---|---|---|---|---|---|---|---|
| Proteins | Rural | 450 | 15.9094 | 4.303 | 0.134 | | -0.54 | 1.96 | Not |
| | Urban | 900 | 16.0209 | 4.607 | 0.261 | 1348 | | | Sign. |
| | **Total** | **1350** | | | | | | | |
| Calories (carbohydrates, fats and oil | Rural | 450 | 8.6002 | 2.691 | 0.153 | 1348 | 3.43 | 1.96 | Sign. |
| | Urban | 900 | 8.0032 | 2.707 | 0.084 | | | | |
| | **Total** | **1350** | | | | | | | |
| Vitamins and Minerals | Rural | 450 | 9.5971 | 4.134 | 0.128 | 1348 | -0.84 | 1.96 | Not |
| | Urban | 900 | 9.7276 | 4.521 | 0.266 | | | | sign. |
| | **Total** | **1350** | | | | | | | |
| Consumption of Natural food products | Rural | 450 | 10.2622 | 3.887 | 0.183 | 1348 | 4.41 | 1.96 | Sign. |
| | Urban | 900 | 9.1944 | 4.344 | 0.145 | | | | |
| | **Total** | **1350** | | | | | | | |
| Consumption of refined food products | Rural | 450 | 4.7700 | 5.498 | 0.183 | 1348 | S.78 | 1.96 | Sign. |
| | Urban | 900 | 8.6222 | 5.655 | 0.267 | | | | |
| | **Total** | **1350** | | | | | | | |

Df =N –2=1350-2=1348, critical value = 1.96, P<0.05

Table 2 shows that the calculated t-value for proteins (-0.54), and vitamins and mineral salts (-0.84) of the respondents were less than the critical/table value of 1.96 with a degree of freedom 1348 at 0.05 alpha level of significance. Therefore, the null hypotheses that says there are no significant difference in the proteins, vitamins and mineral salts consumption of rural and urban respondents of Kaduna state were upheld. This means that significant differences does not exist in the protein, vitamins and mineral salts consumption by rural and urban respondents of Kaduna State, Nigeria.

The Table also reveals that the calculated t-value for calories (3.43), natural foods (4.41) and refined or processed foods (5.78) were greater than the critical value of 1.96 with a degree of freedom 1348 at 0.05 alpha level of significance. Therefore, the null hypotheses that say rural and urban people of Kaduna state, Nigeria are not significantly different in their consumption of calories, natural and refined food products were rejected. This implies that significant difference exist between rural and urban respondents in their consumption of calories, natural and refined food products.

**Discussion**

The finding that there is no significant difference in the nutritional lifestyle of rural and urban of people of Kaduna state, Nigeria as presented in Table 1 is supported by the findings of Sharma, Cade and Jackson (1996); Shehu (2005) Mennen, Mbanya and Cade, (2000). While Shehu (2005) reported that evidence shows the prevalent of poor nutritional basis in the rural areas resulting in food deficiency diseases like rickets, kwashiorkor, marasmus, scurvy, anaemia, osteoporosis and early mortality especially among the under-five and other vulnerable groups. Sharma, et al (1996); and Mennen et al (2000) submitted that urban lifestyle in developing countries is characterized by poor dietary habit involving an increase in consumption of refined sugars, saturated fats, imported and refined food nutrients with little nutritional values which may have adverse effects on their quality of life. The contradictory in the reports of the authors cited above, lay credence to the finding of this study that there is no significant difference in the nutritional habit of rural and urban people of Kaduna state.

It was also found that rural and urban people of Kaduna state are not significantly different in their proteins, vitamins and mineral salts consumption. On proteins consumption, the respondents in both rural and urban areas of Kaduna state, Nigeria concord that they depends on plant and animal sources of

protein for their daily protein which are readily available in their communities. Examples of protein foods listed by the respondents are soya beans, meat, poultry products, beans, fish (fresh and dry) etc. the average means of 15.9094 (rural) and 16.0209 (urban) which are closely related as presented in Table 2 is a pointer to this direction. On vitamins and mineral salts, while the rural people submitted that they can easily get their daily vitamins requirement from fruits and green vegetables from the neighbourhood farms, the urban respondents believed that fresh fruits and green vegetables are abound in the market at affordable prices. The average means of 9.7276 (urban) and 9.5971 (rural) which are closely related lay by credence to the finding that rural and urban respondents of Kaduna states are not significantly different in their vitamins and mineral salts consumption.

The finding that significant difference exist in the calories consumption of rural and urban respondents of Kaduna state can be understood, an in consonance with the finding of Alemu and Lindtjorn (1995). The researchers reported a reduction in calories and physical activity with urban lifestyle while the rural populations rely on high calories food nutrients to meet daily energy requirement due to intense agricultural activities and manual work or labour as their main occupation, Singh, et al (1989); and Heini, et al (1991) also laid credence to the fact that rural people have a high physical activity related energy expenditure thus required more calories nutrients compared to urban subjects.

Significant differences were also found between the rural and urban people of Kaduna State in their consumption of natural and refined food products. While the rural people depend mainly on natural food products available in their immediate environments, the urban subjects rely on processed, refined and imported food items. This finding was supported by Sharma, et al (1996) and Mennen et al (2000) when they reported that urban lifestyle in Africa is characterized by changes in nutritional habits involving an increase in consumption of refined sugars and saturated fat, and a reduction in fibre intake. They added that, majority of urban subjects depends on imported and refined foods nutrients with little nutritional values which may have adverse effect on their well being.

**Summary of Findings/Conclusion**

(1) Rural and urban people of Kaduna State are not significantly different in their nutritional lifestyle.

(2) Rural and urban people of Kaduna State are not significantly different in their consumption of proteins, vitamins and minerals salts nutrients.

(3) Rural and urban people of Kaduna State are significantly different in their consumption of calories, natural and refined food products.

**Recommendation**

Based on the finding of the study, the following recommendations are made:

- Health educate the people on the choice of food nutrients like protein, carbohydrate, vitamins, mineral, fats and oils in the current proportion would go a long way to influence or determine the nutritional lifestyles of an individual.
- Appropriate health education interventions with prompt monitoring and surveillance activities by health practitioners, teachers, parents or guardians and other categories of health workers be put in place to check cases of early mortality among under five and other vulnerable groups occasioned by poor nutritional habits.
- Appropriate media campaign through the use of posters, television and handbills should be put in place when giving educational instructions.
- Government should encourage people to farm and provide necessary incentives to ensure adequate food security in the country. Storage and processing facilities be provided to ensure the availability and affordability of food items like fruits and green vegetables across the seasons.
- The dietary habits of carbohydrates all days by the rural people and dependence on refined and imported food products by the urban subjects should be discouraged through educational intervention.

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# COUNSELING AND POVERTY ALLEVIATION

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**Abstract**

*Counselling is an enlightened process whereby professional counsellors assist in facilitating growth and development among clients through an exercise of self understanding. Poverty is an age long problem which has characterized the developing nations. The effects of poverty on individuals and the society at large cannot be over stressed. For instance: Poverty leads to ignorance, malnutrition, poor health, begging, and prostitution, child labour, child-trafficking and other social exclusion problems. Poverty is also capable of setting stage for deviance. Counselling as an essential part of education, aims at assisting individuals to actualize their potentials in order to reduce and eradicate poverty, illiteracy, diseases, ignorance, prostitution and other forms of negativity hindering national development. In view of need to equip individuals with the necessary knowledge and skills needed to contribute meaningfully to national development, this paper highlights the usefulness of counselling in alleviating poverty and offers some suggestions on how counselling can be employed to reduce poverty in Nigeria.*

## Introduction

Counselling is an enlightened process whereby professional counsellors assist in facilitating growth and development among clients through an exercise of self understanding. Poverty is defined as "a condition or act of being deficient" (New Thesaurus Dictionary). It can also be referred to as a want, an extreme need, often financial (Idowu, 2003). Ifeoma (2008) stated that poverty is synonymous to abjection, aridity, bankruptcy, barrenness, emptiness, hardship, impoverishment, indigence, impecuniousness, meagreness, penniless, pinch, reduction, starvation, underdevelopment, & scarcity among others.

A nation is poor if a fair proportion of her population lives under poverty condition whereby they lack basic needs such as nutritious food, clothing, clean water, clean environment, health care and easy means of transportation and communication (Katende, 2008). Nigeria Human Development Report (NHDR)

(2001) estimates put the percentage of the poor at between 66 and 70 (Ocholi, 2003). Nigeria Human Development Index (HDI) value at the dawn of the third Millennium and the twenty-first century ranked among the lowest in the world. All the twenty-three countries with lower HDI values have been classified as least developed countries. Nigeria is a major producer and exporter of crude oil and she occupies a top position among the Organisation of Petroleum Exporting Countries (OPEC) but the country is one of the most backward in terms of development among all other OPEC countries.

Katende (2008) identified corruption, lack of capacity to harness available natural resources, over population, inadequate education and employment opportunities, mismanagement of available resources, insufficient natural and human resources and environmental degradation.

The effects of poverty on individuals and the society cannot be overstressed. For instance, poverty leads to malnutrition, poor health, ignorance, illiteracy and can well set stage for deviance among the populace. Also it leads to migration of people from rural to urban areas thereby over stressing the available services. The influx of rural dwellers into urban areas without any productive capabilities is a potential source of increase in the level of poverty and social vices. The consequences of this include high rate of prostitution, robbery, drug peddling and use, general insecurity and disregard for human life.

Poverty is an aged long problem, which has led to the introduction of various alleviation strategies. At independence, in 1960 and for the best part of the 1960s, poverty eradication efforts in Nigeria centred on education, which was seen as the key to economic, technological and intellectual development of the nation, as stipulated in National Policy on Education. Nigeria's First President, Late Nnamdi Azikwe was quoted to have said "show the light, and the people will find the way". Thus, education programmes were implemented alongside agricultural extension services which encouraged increased food production.

However, the oil boom in the 1970s skewed this outlook as rising global oil prices boosted export from N4 billion in 1975 to N26 billion in 1980. By the time oil prices fell, so did the nation's export receipts. Prior to 1960 the federal office of statistics estimated that 15% of Nigerian population was poor but by 1980 the percentage has risen to 28% and by 1985 to 46%. In 1996, poverty incidence in the country was 66% and by 1999 the United Nations human poverty index placed Nigeria among the 25 poorest countries in the world.

Various measures were put in place by successive governments to alleviate poverty, these include Operation Feed the Nation (OFN) by the administration of General Olusegun Obasanjo (1971), Green Revolution by President Sheu Shagari (1979-1983); War Against Indiscipline by General Muhammed Buhari Administration (1983-1985). General Ibrahim Babangida (1985-1993) however introduced a number of poverty alleviation programmes which include People's Bank and Community Banks, (meant to provide loans to prospective Entrepreneurs), Directorate of Food, Roads and Rural Infrastructure (DFFRI), Nigerian Agricultural Land Development Authority (NALDA) and the National Directorate of Employment (NDE). During the reign of Late General Sanni Abacha (1993-1998), the Family Economic Advancement Programme (FEAP) was established to fight the poverty scourge. It must also be recalled that spouses of the Heads of state also joined in the fight against poverty with novel programmes such as Better life for Rural Women and Family Support Programme (FSP) by Mrs. Mariam Babangida and Mrs. Mariam Sani Abacha respectively.

With the advent of the third republic (May, 1999), National Poverty Eradication Programme (NAPEP) was introduced to be a central coordination platform for all anti-poverty efforts from the local government level to the national level. On assumption of office on May 29 2007, President Umar Musa Yar'Adua also unfolded his innovative 7-point Agenda. The aim of the Agenda was to fast-track socio-economic development of Nigeria, He also endorsed vision 2020 which is the projection that by the year 2020, Nigeria should be one of the world's top 20 economies. The visioning process is useful and much needed, but Goldman Sachs (A leading global investment banking, securities and investment management firm ) emphasized that research findings has pointed to a wide range of conditions that are critical to ensure solid growth performance. He noted for instance, that getting the right institutions as well as the right policies are important ingredients for meaningful socio-economic development. He also cited higher education as one of the critical factor for successful economic growth and poverty reduction. It is imperative to note at this juncture that for higher education to produce the needed high level manpower for economic and technological advancement of any nation counselling for self understanding, skill acquisition and potential actualization is required.

Erwin, Guerrero and Gretchen (1999) stressed the need to design educational programmes, which are tools for liberating human beings from poverty, in line with the societal needs. It is obvious that counselling as helping service is needed now more than before as means of:

a. Assisting individuals to access information for enhancing their effectiveness in their field of endeavour.
b. Training individuals to work cooperatively and productively with a wide range of people to set and pursue education and career goals; and to evaluate their achievement in life.
c. Encouraging people to learn from their experiences and accomplishment and new skills capable of facilitating their survival in structured and supportive settings.
d. Facilitating their self understanding, the value of education; apply their skills and knowledge in the classroom, school various work places and community at large as responsible citizens.

Okafor (2008) also noted that higher education has the capacity to assist its possessors to make transitions throughout lives from family to school, from school to school, from school to work and from school to lifelong learning. Adequate education and guidance will also prevent individuals from entering into premature marriage, which reduces the opportunity for upward socio-economic mobility. According to Oniye (2008), premature marriage is a potential source of socio-personal maladjustment and occupational backwardness. It has been observed that individuals who aimed at having higher education would require accurate guidance and counselling to sensitize them on the negative impact of premarital sexual relationship, which may lead to teenage pregnancy. Adegoke (2003) explained that adolescents in institutions of learning require proper guidance in order to avoid mistakes and involvement in deviant behaviours such as drug abuse, prostitution, examination malpractice and robbery

There is also a great interaction between counselling and health; and health is very crucial in poverty alleviation. For instance, accurate health counselling increases the willingness to improve sanitation practices which consequently prevents many diseases. The wider the scope of counselling one acquires, the brighter the opportunities avoiding diseases. Health counselling also encourages an individual to keep his/her body physically fit through having good diet, exercises adequate sleep/rest and personal hygiene (Mustapha, 2005). Counselling also affords individuals the opportunities to develop their capacities to the fullest, if they are able to acquire the knowledge to understand and appreciate their environment and the world and the wisdom to change it, then the prospect is bright.

Counselling plays vital roles in national economy by helping to identify and develop the skills needed for national development. Learners who acquired knowledge, skills, attitudes and values through counselling have been found to be better equipped to contribute meaningfully to the economy (Idowu, 2003). Counselling helps people to develop and use skills which will free them from the shackles of poverty. It is necessary for:

i. Promoting health, because knowledge about diseases, nutrition and hygiene is the best as a preventive strategy rather than curative.
ii. Applying new technologies and the advancement of new knowledge, because it provides the training essential for scientists and other professionals in the area of self understanding and capacity utilization.
iii. Protecting the environment and ensuring sustainable development, since it gives knowledge about the web of life and how to preserve it.
iv. Advancing gender equality, this is because it is capable of creating awareness on the benefits of educating girls and women.
v. Extending democracy and good governance, because accurate education enables citizens and the rulers to know their rights and responsibilities in the true spirit of give and take.
vi. Production of human power for exploration, exploitation and marketing of the nation's human and material resources (Mustapha, 2005).

A lot of challenges have been militating against poverty alleviation in Nigeria in particular and Africa in general. For instance, Blair Commission Report for African (2005) observed that "*an understanding of the cultures of Africa shows that development means putting a greater emphasis on increasing human dignity within a community*". It identified professional skills and leadership as key to achieving development and highlighted the challenges confronting African countries in this regard. According to the report, qualified professionals are essential to all forms of development; for delivery of health, education and other services. Scientifically and technically proficient staff are crucial and essential with skills for:

a. Collecting, analysing and managing data.
b. Debating and developing good policies based on the evidence of what works and what does not.
c. Implementing policies and monitoring how they are put into effect.
d. Identifying opportunities arising from innovation and scientific discoveries.

e. Developing effective policies in areas such as science, trade and resource management.

The report noted that while these skills are particularly needed for high performance and innovation, Africa has been lacking skilled men and women in all these spheres and *fundamental* to this shortage is the loss of much of Africa's pool of skills to the developed world. *"Around 70% of Ghanaian medical officers trained in the 1990s have left and it has been estimated that there are more African Scientists and engineers working in the USA than in the whole of Africa. This shortage starts with higher education, which ought to be the breeding ground for the skilled individuals whom the continent needs".*

The report also has the following to say about the tertiary educational institutions:

> *Many of Africa's higher education institutions are still in a state of crisis. They lack physical infrastructure, such as internet access, libraries, textbooks, equipment, laboratories and classroom space. Demand for higher education is increasing; in 2000 Nigeria had the capacity to accept only 12% of qualified candidates. Hit by these pressures and a lack of funding, the research capacity of Africa's institutes has declined. The capacity that does exist is not being used efficiently, as there is limited collaboration, and human and financial resources are spread thinly.*

The report lamented that the science gap between Africa and the rest of the world is wide and under business-as-usual the gap will continue to grow. The theme of this conference and the collaborative effort of its organizers appears to be a timely response the African way to some of the observations raised in the Blair report. The role of counselling in fast tracking poverty alleviation is made more imperative given the understanding that Africa lacks the requisite manpower in so many facets of the economy, while the few available are noted to be underutilized, poorly remunerated or over-utilized or variously dehumanized leading to the "**Brain Drain Syndrome**".

Okebukola (2009) highlighted the various reasons why Nigerian higher education has not been able to achieve its aims and objectives. He maintained that the state of University education in Nigeria can be described as one of massive explosion in student enrolment; increasing number of prospective new

entrants in the face of inadequate and obsolete infrastructure and equipment; poor library facilities, inadequate academic staff in number and quality; lack of relevance of academic programmes, low level of funding, cultism, examination malpractice and generally therefore low quality graduates as shown by many studies supported by the World Bank and the Needs Assessment Survey of the National Universities Commission (NUC) of Nigeria. This to a great extent is not surprising especially when it is realized that most of the education programmes in this part of the world are provided without due regard for counselling and its guidance component both at the planning and implementation stages. Invariably we now have a situation where those willing to learn and those not so keen find their ways into our public schools creating an army of perpetually overcrowded school/classrooms. Consequently, the human and infrastructural facilities that should have been concentrated on willing populace are often shared among the ever growing army of school population. The world economy is however changing as knowledge supplants physical capital as the source of wealth. This is driven by technology especially information technology and biotechnology. As knowledge becomes more important, so does qualitative and quantitave education improve. The quality of this and its availability to the wider economy is becoming increasingly critical to national competitiveness. These challenges and problems call for a re-think on the part of education policy makers with regards to role of counselling in educational planning, implementation and delivery to ensure that counselling is given the opportunity to play its mandatory role in the society as a veritable tool for poverty alleviation. For example, a glance at the nature of Girl-Child Education would show that in spite of the increase in enrolment at all levels of the educational system, access, participation and retention of girls in schools have been a subject of great concern.

In terms of the indicator of access for the Millennium Development Goals (MDG), it is noteworthy that at least 3.9 million primary school-age children are out of school, of which 71% are girls. The gender disparity in basic education no doubt contributed to the increasing rate of poverty since the females form recognizable proportion of the national populace. A number of factors militate against gender parity in female enrolment, retention and achievement. Prominent among these are socio-cultural practices, misinterpretation of religious tenets, poverty and unfriendly school environment. Other factors include issues of curriculum and curriculum delivery. There have been efforts to put in place a policy environment to tackle these impediments and enhance girls' education. For instance, in Nigeria, the Federal Government has produced a

National Policy on Women which has provisions for women and girl-child education. In the quest to implement the Policy, task forces on the Education for the Girl-Child has been set up at all levels: Federal, State and Local Governments. The Federal Government established Unity Schools for girls. There are 19 co-educational Federal Science Technical Colleges in the country. The Federal Ministry of Education has also established and equipped 275 Women Centres. Each Centre has sewing machines, typewriters, industrial cookers, fridges, deep freezers, and materials for teaching skill in functional/literacy and skill acquisition. The Federal Government also set up the National Commission for Mass Literacy, Adult and Non-Formal Education Commission (NMEC) that mounts literacy programmes for out-of-school girls and women, which was to help them engage in activities that will alleviate poverty. It has devised a strategy for mass literacy known as Participatory Learning and Action (PLA) Programme.

Also in line with its commitment of achieving gender equality in education by 2015 such that both males and females are assured full and equal access to good quality basic education, government is collaborating with all stakeholders to promote programmes and activities towards elimination of gender gaps in education. Notable is the FGN/UNICEF/DFID and Strategy for the Acceleration of Girl's Education in Nigeria (SAGEN). It is noteworthy that in spite of all the afore mentioned efforts on creating level playing ground for both sexes in the field of education, the female gender is still lagging behind educationally, socially, politically and vocationally and this is a recipe for poverty and social exclusion.

**Recommendations**

Based on the above submission it is recommended among other things that counselling should be incorporated into our educational and societal activities. Guidance and counselling programmes should serve as basic tools for poverty eradication and social inclusion. If counselling is to be employed in fast tracking poverty alleviation and social inclusion the following areas need attention:

a. Establishment of Counselling centres and implementation of counselling programme in schools.
b. Entrepreneurial education at all levels.
c. Establishment of a National Quality Assurance System.
d. Improving access to education for the girl-child.

e. Reform specific for the university system.
f. Funding of education generally.

Mentoring, which a method of nurturing the young ones to attain maturity and self independence needs to be adequately emphasized in different organizations. NCCE, NBTE and NUC should encourage institutions to formulate and implement a sustainable mentoring programme in colleges of education, polytechnics and universities starting of course from the primary school level.

Economic development demands improvement in activities that will create jobs and enhance production. As it is the case in the developed countries, emphasis of the Nigerian university delivery system should be on the production of entrepreneurial graduates. The outlook is that all entrants into the system will be worked through a rigorous regime of entrepreneurial studies regardless of the course of study. Hence, all the over 140,000 graduates that will be exiting Nigerian universities from 2010 will be ardent job creators. With a large army of such resource coming out of our universities every year, the pace of growing the economy will quicken. To ensure the full realisation of this dream, special grants for implementing entrepreneurial education in Nigerian universities should be provided by government and other stake holders. The establishment and running of Entrepreneurial Study Centres should be considered as priority by all Nigerian universities. The establishment of such Centres will be a condition for accreditation. In these centres it is recommended that professional counsellors be employed for capacity identification and development of staff and students.

Education is a costly investment hence it is proposed that a minimum of 26% of national budget at each level (federal, state and local) should be allocated to education. It should be cautioned that raising the allocation to education is not the only major concern the available fund should be properly utilized. Nigerian institutions should have professional counsellors at all levels of student involvements such as admissions, orientation, learning and graduation.

## Conclusion

Counselling contributes to individual and national social economic development. It leads to production of high level manpower development needed to man the affairs of the nation, leading to reduction in over reliance on expatriates in the management of the national resources. For higher education in collaboration with counselling to alleviate poverty, such education should expose students to creative and innovative problem solving strategies in science

and technology in order to equip them to find local solutions to local problems. Faculties should encourage practical industrial work periodically to reinforce students' practical base and to firm up industry-academia link. Nigerian institutions should also internalize the values of hard work, thrift, honesty, patience, and tenacity as well as equip their graduates to face challenges of new technology and encourage women participation in education.

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# POVERTY ERADICATION AND SOCIAL INCLUSION: THE PANACEAS TO SUSTAINABLE DEVELOPMENT IN AFRICA

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**Abstract**

*Data showing recent trends in world development suggest that a sixth of world population produce 78 percent of goods and services and receive 78 percent of the world income while three-fifth of the worlds people receive 6 percent of the worlds income (World Bank, 2000). Obviously, the entire Africa continent is rated as third world and countries therein are classified as less developed nations ranking among the 61 poorest countries with per capita income less than $ 2 a day. The basic characteristics of these less developed nations include high population growth rate, low level of urbanization, low life expectancy, high infant and maternal mortality rate, low literacy rates, national expenditure exceeding national income on the national budget leading to huge foreign debts, low Gross Domestic Product (GDP) and low per capita income and a poor balance of trade. All these lead to poverty. This constitutes a major challenge of the present millennium. The nations of the world have responded in a variety of ways to this problem. Millennium Development Goals have been set and a number of poverty reduction strategies put in place to promote sustainable development. However, some of the gains of these strategies are eroded in most countries owing to social conflict, health pandemics like HIV/ AIDS, bird flu and social exclusion of women and the challenged people. This paper is aimed at reviewing the level of national development achieved across nations on the African continent. The thesis of the paper is that to reduce poverty on the African continent, we need to improve education, conduct proper head count to facilitate planning, ensure equitable income distribution, improve health facilities and ensure social inclusion in all social services.*

## Introduction

The African continent is the second largest continent in the world with land coverage of 30,330,000sq km. In 2004 the estimated population was 875,027,307. The continent is richly endowed with abundant natural resources

like gold, diamond, copper, bauxite, manganese, nickel, cobalt, zinc anc petroleum some of which are yet to be fully harnessed for sustainable development. Culturally, the continent has very rich but diverse cultures. The African culture is a rich blend of local tenets, believes, religions, dances, dresses, languages, diets, traditions, festivals, Arts and Sciences. All these have combined to influence the attitude of the people and have sharpened their destinies and national development. More than 3,000 distinct ethnic groups have been classified. The extended family is a basic social unit in Africa.

Several factors have affected sustainable development in Africa. Some of such factors are over population, poor educational development, bad culture, low scientific and technological development, high rate of poverty, social exclusion, social conflicts, mismanagement of National economy and bad governance leading to political instability. Data showing the recent trends in the world development suggests that a sixth of the world population produced 78 percent of goods and services and received 78 per cent of the world's income while three fifth of the world's people received 6 percent of the world's income (World Bank, 2000). Actually, the entire African continent is rated as third world and countries, there in are classified as less developed nations ranking among the 61 poorest countries in the world with per capital income less than $2.0 per day. The basic characteristics of these less developed nations include high population growth rates, low level of urbanization, low life expectancy, high infant and maternal mortality rates, low literacy rates, national expenditure exceeding national income on the national budgets leading to deficits and huge foreign debts, low GDP and per capita income and a poor balance of trade. All these have led to the poverty syndrome on the continent.

No doubt, this situation constitutes a major challenge of the present millennium. The nations of the world have tried to put up a concerted effort to respond to this challenge in a variety of ways. Millennium Development Goals have been set and a numbers of poverty reduction strategies have been put in place to promote sustainable development. However, some of the gains of these strategies are being eroded away in most of the African countries by some social conflicts, Health pandemics, such as HIV/AIDS, Bird flu and even social exclusion of girl child, woman, and the challenged people.

This paper is aimed at reviewing the level of national development attained across nations on the African continent using some socio-economic development indicators with a view to highlighting the impact of poverty eradication an social inclusion on national development and proffering suggestions for ensuring sustainable development on the African continent.

**An assessment of the National Development of Some African Countries Using Socio-Economic Growth Indicators**

For the purpose of this assessment eight countries were sampled based on stratified random sampling with geographical locations of North Africa, West Africa, Central Africa Region and Southern Africa as the strata. Two nations were sampled from each of the regions. Based on this technique the countries sample are Algeria, Botswana, Ethiopia, Ghana, Morocco, Namibia, Nigeria and Uganda. The socio-economic growth indicators used for the assessment of national development include population size, population growth rates, rate of urbanization, life expectancy rate, infant mortality rate, literacy rate, National budgetary balance between income and expenditure, GDP, GDP per capital and GDP by economic sectors.

Table 1. presents the data collected on the socio-economic indicators of national development among selected African nations.

| Socio-economic indicators | ALGERIA | BOTSWANA | GHANA | MOROCCO | NAMIBIA | NIGERIA | UGANDA | ETHIOPIA |
|---|---|---|---|---|---|---|---|---|
| Capital | Algiers | Addis Ababa | Accra | Rabat | Windhoeck | Abuja | Kampala | Gaborone |
| Land Area | 2,381,741 Sq. km | 1,133,380 Sq. km | 238,500 Sq. km | 453,730 Sq. km | 824,269 Sq. km | 923,768 Sq. km | 241,038 Sq. km | 581,730 Sq. km |
| Population | 33,357,089 | 67,851,281 | 20,757,032 | 32,209,101 | 1,954,001 | 120 million | 26,404,543 | 1,561,973 |
| Population growth rate | 1.61% | 1.89% | 1.36% | 1.61% | 1.25% | 2.50% | 2.97% | 0.69% |
| Population density | 14 per sq. km. | 68 per sq. km. | 90 per sq. km | 72 per sq. km | 2.4 per sq. km | 1.51 per sq. km | 132 per sq. km | 2.7 persons per sq. km |
| Urbanization | 58% | 16% | 37% | 59% | 32% | 46% | 15% | 49% Urban |
| Life expectancy | 70.8 years | 40.9 years | 56.3 years | 70.3 years | 40.5 years | 50.5 years | 45.3 years | 30.8 years |
| Infant Mortality rate | 36 per 1000 | 102 per 1000 | 52 per 1000 | 43 per 1000 | 70 per 1000 | 71 per 1000 | 86 per 1000 | 79 per 1000 birth |
| Literacy rate | 71.1% | 43.9% | 75.9% | 52.6% | 84.7% | 69.4% | 70.7% | 80.5 |
| Languages | Arabic French Berber | Amharic Arabic English | English Akan Ewe Mole Ga | Arabic Dorja French | English Afrikaan German | English Hausa Ibo Yoruba | English Swahili Bantu Luganda | English |
| National Budget Income | 19.50 billion | 1.169 million | 1013 million | 80.85 Billion | 1.119 million | 11,400 million | 617 million | 2,178 million |
| Expenditure | 17.31 billion | 1.63million | 1.253 million | 11.47 billion | 1.241 million | 11,722 million | 1,212 million | 1,738 million |
| Religions (Indigenous) | - | 40% | 7% | | - | 10% | | 50% |
| Christians | 1% | 12% | 43% | | 90% | 40% | | 50% |
| Muslims | 99% | 45% | 12% | | 10% | 50% | | - |
| GDP | 56 billion | 6.059million | 6.160 million | 36 billion | 2.904 million | 43,540 million | 5803 million | |
| GDP per capital | 1,740 | 90 | 300 | 1,220 | 1,460 million | 330 | 240 | 3600 |
| GDP by economic sectors | | | | | | | | |
| - Agric. | 10% | 39.9% | 33.8% | 16.1% | 10.6% | 37.4% | 31.6% | 25% |
| - Industry | 52.7% | 12.4% | 24.3% | 30.3% | 31.1% | 28.8% | 22% | 47.6% |
| - Services | 37.3% | 47.6% | 41.9% | 53.6% | 58.3% | 33.8% | 46.4% | 49.9% |
| Imports | Food & Coal | Food, fuel machine | Petroleum, food machines | Food, fuel, machines | Food, petroleum machines | Food, cattle Machines | Food petrol machines | Food, Textile petrol |
| Exports | Petrol<br>Gas, iron | Gold petroleum<br>Agric product | Cocoa gold | Food | Diamond, gold | Petroleum, cocoa | Gold, coffee | Diamond, copper |

**Table 1: Assessment of the growth of selected African countries using socio-economic indicators**

**Sources:** Data gathered from statistical bureaus of individual countries, ww.census.gov, www.who.int; www.unesco.org, www.worldbank.org, various IMP publications.

According to the Table, Algeria with capital at Algiers has a land area of 2,381,741 sq. km and a population of 33,357,089. Algeria's population growth rate is 1.61% and the population density is 14 persons per sq. km. Algeria is 58% urbanized, the life expectancy is about 70.8years on the average while the infant mortality rate is 71.1%. The people of Algeria speak Arabic, French and Berber languages. The National budget of Algeria for 2005 shows the income as 19.50 billion while the expenditure was 17.11 billion. The Gross Domestic Product (GDP) of Algeria in 2005 was 56 billion while the GDP per capital was $1,790. Algeria generates 52.7% of her GDP from industries, 37.3% from services and 10% from Agriculture.

Botswana with capital at Gaborone has a land area of 581,730 sq. km. and a population of 1,561,797. Botswana population growth rate is 0.89% and the population density is 2.7 persons per sq. km. Botswana are 49% urbanized while the life expectancy is 30.8 years. The infant mortality rate is 70 per 1,000 births. Botswana literacy rate is 80.5. The lingua franca is English and a look at the 2005 National Budget of Botswana shows income was 2,174 Million dollars while expenditure was 1,734 million. The GDP of Botswana for 2005 was 5,273 million Dollars while the GDP per capital was 3,080 Dollars. Services contributed 49.9% to the GDP of Botswana while industrial sector contributed 47.6% and Agriculture contributed 2.5%.

Ethiopia with capital at Addis Ababa has a land area of 1,133,380 sq. km. and a population of 67,851.281. The population growth rate is 1.89% while the population density is 61 persons per sq. km. Ethiopia is 16% urbanized. The life expectancy is 40.9 years while the infant mortality rate is 102 per 1,000 births. The literacy rate is 43.9% while the Budget for 2005 showed income was 1,168 million dollars and expenditure was 1,636 million dollars. The Gross domestic Product (GDP) was 6,059 million dollars while the GDP per capital was 90 dollars. Services sector contributed 47.6% to GDP; Agriculture sector contributed 39.9% while industrial sector contributed 12.4. Ethiopians speak English, Arabic and Amharic languages.

Ghana with capital at Accra has a land area of 238,500 sq. km and population of 20,757,032. Ghana population growth rate is 1.36% while the population density is 90 persons per sq. km. Ghana is 37% urbanized and the life

expectancy of the people is 56.3 years while infant mortality rate is 52 per 1,000 births. Ghana's literacy rate is 75.9%. The national budget for 2005 shows income was 1,013 million dollars while expenditure was 1,253 million dollars. The GDP was 6,160 million dollars while the GDP per capital was 300. Services sector contributed 41.9% to GDP while Agriculture sector contributed 33.8% and industrial sector 24.3%. Ghanaians speak English, Akan, Ewe, Mole and Ga languages.

Morocco with capital at Rabat has a land area of 453,730 sq. km. and a population of 32,209,101. The population growth rate is 1.61% while the population density is 72 persons per sq. km. Morocco is 57% urbanized and the life expectancy of the people is 70.3 years. Infant mortality rate in Morocco is 43 per 1,000 births. Morocco's literacy rate is 52.6% while the national budget for 2005 revealed that income was 10.45 billion dollars while expenditure was 11.47 billion dollars. Morocco's GDP was 36 billion dollars while GDP per capital was 1,220 dollars. The services sector contributed 53.6% to GDP while the industrial sector contributed 30.3% and the agricultural sector 16.1%. Moroccans speak Arabic French and Derija languages.

Namibia with capital at Windhoek has a land area of 824,269 sq. km. and a population of 1,954,033. Namibia's population growth rate is 1.25% while the population density is 2.4 people per sq. km. Namibia is 32% urbanized while the life expectancy is put at 40.5 years. The infant mortality rate in Namibia is 70 per 1,000 births. The literacy rate is 84.7% while the national budget for 2005 showed that income was 1,119 million dollars and the expenditure was 1,241 million dollars. The GDP of Namibia was 2,904 million dollar while the GDP per capital was 330 dollars. The GDP of Namibia was 2,904 million dollars while the GDP per capital was 330 dollars. The Agricultural sector contributed 10.6% to the country's GDP while the services sector contributed 53.6% and the industrial sector contributed 31.1%. Namibians speaks English German and Afrikaans.

Nigeria with capital at Abuja spans 923,768 sq. km. of land area and has a population of 120 million. The population growth rate is 2.5% while the population density is 151 persons per sq. km. Nigeria is 46% urbanized while the life expectancy is 50.5 years. The infant mortality rate is 71 per 1,000 births. The literacy rate is 69.4%. The 2005 budget shows income to be 11,408 million dollars while the expenditure was 11,722 million dollars. The GDP of Nigeria in 2005 was 43,540 million dollar while the GDP per capital was $330. The agricultural sector contributed 37.4% to GDP while the services sector

contributed 33.8% and the industrial sector contributed 28.8%. The major languages spoken in Nigeria are English, Hausa, Ibo and Yoruba.

Uganda with capital at Kampala has a land area of 241,038 and a population of 26,404,543. The population growth rate is 2.97%. The population density of Uganda is 132 persons per sq. km. while the rate of urbanization is 15%. The life expectancy of Ugandans is 45.5 years. The infant mortality rate is 86 per 1,000 births. The literacy rate of Uganda was found to be 70.7%. The national budget showed that income in 2005 was 617 million dollars while expenditure was 1,212 million dollars. The GDP of Uganda was 5,803 million while the GDP per capital was found to be 240. The services sector contributed 46.6% to GDP while the industrial sector contributed 22.0% and the agricultural sector contributed 31.6%. The Ugandans speak English, Swahili, Bantu and Luganda languages.

On a general view of the socio-economic development indicators across nations sampled, it was found that the population ranges between 241,038 in Uganda and 120 million in Nigeria while the population growth rates ranged between 0.89% in Botswana and 2.97% in Uganda. Also the population density among the sampled African countries ranged between 2.4 persons per sq. km. in Namibia and 151 persons per sq. km. in Nigeria. The rate of urbanization in the African nations ranged between 15% in Uganda and 58% in Algeria. The life expectancy ranged between 30.8 years in Botswana and 70.8 years in Algeria while the infant mortality rates ranged between 36 per 1,000 births in Algeria and 102 per 1,000 births in Ethiopia. The literacy rate ranged between 43.9% in Ethiopia and 84.7% in Namibia.

A closer view of the national income and expenditure shows that seven out of the eight countries sampled (i.e. Algeria, Ethiopia, Ghana, Morocco, Namibia, Nigeria and Uganda) had their expenditures exceeding their incomes. This implies budgetary deficits and indebtedness. Moreover, a look at the GDP of the nations shows that this ranged between 5.2 million in Botswana and 56 billion in Algeria and the GDP per capital ranged between 240 dollars in Uganda and 3,080 dollars in Botswana. The contribution of Agricultural sector to GDP of the nations sampled ranged between 2.5% in Botswana and 39.9% in Ethiopia. It was further discovered that the contribution of the industrial sector to GDP of sampled nations ranged between 12.4% in Ethiopia and 52.7% in Algeria while the contribution of the services sector to GDP ranged between 33.8% in Nigeria and 58.3% in Namibia.

**Poverty Eradication and Sustainable Development**

A very clear picture of what poverty is cannot be better given than what was presented by King Birendra Bir Bikram(1981) of Nepal at the Least Developed Countries Conference in Paris. He described a poor man as who suffers poor nutrition, vulnerable to diseases, has a short average life span, lives in huts and perpetual squalor, is illiterate, does not get his food regularly, even when he gets a meal he is haunted with the fear of how to get the next meal. The poor man is clad in rags and walks without shoes, lack hygiene and is prone to diseases; he drinks water that is neither safe nor clean. He is either unemployed or underemployed, sometimes overworked but underpaid. He suffers ignominy from birth till death and remains a destitute. If prices go up the quality and quantity of food he can get go down. He cannot afford school fees for his children let alone of buying books. Unfortunately, he is the one that gives birth to the greatest number of children.

Poverty is a social phenomenon with various dimensions. Analytically, poverty could be viewed from two clear perspectives – income poverty, which is the lack of income necessary to satisfy basic needs and Human poverty, which is the lack of human capabilities for example low life expectancy, poor maternal health, illiteracy, poor nutrition poor, poor access to safe drinking water and low perceptions of well-being (UNDP, 2003).

Never before in the history of the world was so much concern generated for the issues and problems of poverty than now. There are several global, regional and national initiatives focused on poverty eradication in Africa and many African nations have pledged their commitment to the implementation of the initiatives. The world summit for social Development was held at Copenhagen, Denmark in 1995 with the issue of poverty eradication on the fore burner and Governments in attendance pledged their commitment to implementing national anti-poverty plans.

Also, the Millennium summit of 2000 resolved to adopt the Millennium Development Goals (MDGs) as a powerful instrument for global partnership to fight for the eradication of poverty. In a similar vein, for the women folks, the Beijing Declaration and plat form for Action resolved to promote gender at poverty eradication. ( UNDP 1990).

No doubt, eradication of poverty is the greatest global challenge facing the world today and it is an indispensable factor for sustainable development in Africa.

At the Regional level, the African Union (A.U.) established New Partnership for African Development (NEPAD) and also demonstrated serious commitment to poverty eradication and acceleration of progress using the MDGs. A joint stand was also taken on this at both the 2005 World Development summit, and at the 2006 Banjul summit. The A.U. also held an extraordinary summit on Employment and poverty alleviation in Ouagadougou, Burkina Faso in 2004 to draw up action plans to enable member states embark more on job creation.

Moreover, at the level of individual nation, there are various initiatives taken by each Government to solve the problem of poverty. For example in Nigeria, the Government's National Poverty Eradication Programme (NAPEP) was established to help eradicate poverty caused by unemployment and lack of technical skills among youths and women. There poverty eradication strategies have assisted most African nations to generate rapid and sustainable growth which in turn provided the resources necessary to improve social services for the attainment of the millennium Development Goals. However, economic growth in Africa fluctuates since the economy of most Africa nations depends more on either agricultural exports or oil. The fluctuation may be induced by changing terms of international trade or weather. Mkandiwire (2009) noted that although Africa recent growth performance has been quite impressive especially when placed in the context of the negative GDP, growth trends in the late 1980s and early 1990s, it is still too low to achieve poverty eradication. However, it had generated some employment growth in some countries as shown on Table 2.

**Table 2 Employment Growth in some African Countries**

| Countries | 1980-1990 | 1990-2000 | 2000 Present | 1980-Present |
|---|---|---|---|---|
| Algeria | -0.66 | -1.03 | 0.09 | -0.53 |
| Ethiopia | -0.51 | 0.30 | -0.01 | -0.07 |
| Ghana | -0.32 | 0.61 | 0.29 | 0.19 |
| Nigeria | -0.71 | - 0.32 | 0.30 | -0.24 |
| Morocco | 0.54 | -0.08 | 0.51 | 0.26 |

Sources:- Mkandiwire, T. (2009). The new poverty agenda in Africa: A social policy perspective, REPOAs' 14th A.K.W.

**Social inclusion and sustainable development in Africa**

Social inclusion is a phenomenon where the concept of human rights is respected in the distribution of and participation in social amenities and services. Social inclusion occurs when social development activities take cognizance of the wide variety of the citizens without any exception. Usually, the negative side is social exclusion. In most African societies, social exclusion is widely noticed in the areas of education, health care delivery, housing, road and transportation as well as employment of labour. The most vulnerable groups in most of these cases are women and children, disabled people, rural dwellers, ethnic minorities and the sick and aged people.

In widening responses to the full diversity of learners, an inclusive education is seen as a strategic approach to overcoming the current exclusion of nearly 113 million children of school age worldwide through Education for All programmes. Social inclusion seeks to address the reality and practicalities involved in moving away from separate provision or discriminative provision for the majority or minority to no provision at all for others. Social inclusive and sustainable development could be achieved in Africa if developmental policy, practice and activities are commonly and rightly associated with the mainstream participation of all the citizenry. Social inclusion is concerned with identifying and overcoming all barriers of effective, continuous and quality participation in social and national development.

There are some instruments such as the united Nations Standard Rules on the Equalization of opportunities, the World Declaration of Education For All and the Salamanca Statement and Framework for Action that highlights the exclusion of disabled people at all levels of Education and society and the formidable obstacles to their social participation. Apart from the disabled persons, there are many other currently excluded groups who suffer social and economic or cultural exclusion. Such groups include girls, women, street and working children, refugees, orphans, language and ethnic minorities and those in region experiencing religious conflicts and civil unrest. In recent time, Africa experienced many of such violent conflicts in Countries like Liberia, Sierra Leone, Corte D'Ivoire, Democratic Republic of Congo, Niger, Chad and Nigeria. This further stresses the need for stronger connections among social development, social inclusion and social security planning (Durosaro, 2009).

**Conclusion and Recommendations**

Africa is a continent where almost half of the 875.0 million people live on less than $ 1 a day and more than 75 per cent of the countries are less than 50 per cent urbanized. No doubt to promote greater development, there is a mountain to climb. It is against these backdrops that this paper seeks to take a sober look at the issues of poverty eradication and social inclusion in Africa as panaceas to sustainable development of the continent. This paper highlights the various strategies that have been put in place to promote poverty eradication at the world, regional and national levels and the problems of social inclusion in order to achieve result. The findings show little progress and new challenges in Africa development.

To promote greater and sustainable development in Africa the following suggestions may need to be considered:

Africa's leaders must realize that national development can be promoted better with social mobilization. Social mobilization can be hampered by poverty. Poverty is determined by a number of political, social and economic factors. For instance, economically poverty depends on the level of economic development, structural change, spontaneous outcomes of the operation of markets and the overall effect on the welfare of the people and other social spending. Poverty reduction is more about ideologies and politicians must provide the necessary social policy frame work to promote it.

Also, Africa leaders need to focus more on building of human infrastructures through education to cater for human resource required to contend with the challenges of modern economy. A host of our laudable social policies and programmes such as community development, rural electrification, rural/Agric credit schemes, adult literacy campaigns, free health schemes and universal Primary Education scheme failed owing to dearth of qualified manpower.

Apart from the need to sustain economic growth through poverty eradication, there is also a need to ensure a level field for all citizens to take part in the growth process. A situation where many people are excluded could deter sustainable development. There must be equity in terms of access to employment opportunities. Productive resources such as, land, financial credit facilities and other basic social services as health, education, water, and sanitation are central to sustainable development in African.

Moreover, for poverty to be eradicated in Africa, there is a need for diversification of economic activities within African economics. In most African countries the major contributor to the Gross Domestic Product is the service sector while the Agricultural and industrial sectors contribute little. The agricultural sector needs to be better developed to contribute more to national production since in most nations it is the largest employer of labour.

There is also a need for Africa nations to collaborate more internationally in trade and regional integration and in the exchange of best practices that could promote poverty eradication and social inclusion in order to ensure sustainable development in Africa.

Social inclusion is a phenomenon where the concept of human rights is respected in the distribution of and participation in social amenities and services. Social inclusion occurs when social development activities take cognizance of the wide variety of the citizens without any exception. Usually, the negative side is social exclusion. In most African societies, social exclusion is widely noticed in the areas of education, health care delivery, housing, road and transportation as well as employment of labour. The most vulnerable groups in most of these cases are women and children, disabled people, rural dwellers, ethnic minorities and the sick and aged people.

In widening responses to the full diversity of learners, an inclusive education is seen as a strategic approach to overcoming the current exclusion of nearly 113 million children of school age worldwide through Education for All programme. Social inclusion seeks to address the reality and practicalities involved in moving away from separate provision or discriminative provision for the majority or minority to no provision at all for others. Social inclusive and sustainable development could be achieve in Africa is developmental policy, practice and activities are commonly and rightly associated with the mainstream participation of all the citizenry. Social inclusion is concerned with identifying and overcoming all barriers of effective, continuous and quality participation in social and national development.

There are some instruments such as the united Nations Standard Rules on the Equalization of opportunities, the World Declaration of Education For All and the Salamanca Statement and Framework for Action that highlights the exclusion of disabled people at all levels of Education and society and the formidable obstacles to their social participation. Apart from the disabled persons, there are many other currently excluded groups who suffer social and

economic or cultural exclusion. Such groups include girls, women, street and working children, refugees, orphans, language and ethnic minorities and those in region experiencing religious conflicts and civil invest. In recent time, Africa experienced many of such violent conflicts in Countries like Liberia, Sierra Leone, Corte D'Ivoire, Democratic Republic of Congo, Niger, Chad and Nigeria. This further stresses the need for stronger connections among social development, social inclusion and social security planning (Durosaro, 2009).

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# SCIENTIFIC LITERACY AND THE AFRICAN WORLDVIEW: IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT OF SCIENCE EDUCATION IN AFRICA

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**Abstract**

*There have been arguments about the relationships between scientific literacy and the African worldview. The purpose of this paper is to examine the concepts of scientific literacy and African worldview and draw implications for sustainable development of science education in Africa. First, I present the definitions of the concepts of scientific literacy and African worldview to reveal their nature and characteristics. Second, I undertake a critical review of literature on the relationships between the two to identify their similarities and differences in form and content to enable me draw implications for sustainable development of science education in the continent. I use the following areas of Science Education to guide the discussion—policy, curriculum development, teaching and learning, teacher education and research. Finally, I conclude the paper with a summary and a set of actionable recommendations that would foster the development of a sustainable scientific culture in Africa without loss of Africanness.*

## Introduction

The science education literature is replete with arguments about the relationships between scientific literacy and the African worldview (Abimbola, 1977; Cobern, 1995, 1996; & Ogunlana, 1976). The purpose of this paper is to examine the concepts of scientific literacy and African worldview and draw implications for sustainable development of science education in Africa. First, I present the definitions of the concepts of scientific literacy and African worldview to reveal their nature and characteristics. Second, I undertake a critical review of literature on the relationships between the two to identify their similarities and differences in form and content, with examples, to enable me draw implications for sustainable development of science education in the continent. I use the following areas of Science Education to guide the discussion—policy, curriculum development, teaching and learning, teacher education and research. Finally, I conclude the paper with a summary and a set of

actionable recommendations that could foster the development of a sustainable scientific culture in Africa without loss of Africanness.

**Scientific Literacy**

We can describe science as a body of knowledge, a way or method of investigating and a way of thinking in the pursuit of an understanding of nature. The scientific body of knowledge is the product of science, which includes the following: concepts, facts, laws, and theories. Concepts and facts form the foundation that enables scientists to construct broad conceptual schemes, i.e., laws and theories. These are used to describe, explain, and predict experimental findings and observations in the simplest and most efficient ways.

The scientific method involves designs of investigations mainly through experiments, observing, classifying, measuring, hypothesizing or predicting, describing, or making conclusions from data, asking insightful questions about nature, and formulating problems.

In addition, science includes the ethics, motives, or attitudes that guide the day-to-day activities of scientists. These are certain beliefs, values, opinions, characterized by curiosity, humility, scepticism, open-mindedness, avoidance of dogmatism or gullibility, and a positive approach to failure, which have become rules of behaviour for scientists to follow in scientific investigations (Abimbola, 2006).

"Literacy" is "knowledge of or competence in a subject or area of activity" (Microsoft Encarta Dictionaries, 2009). Scientific literacy, therefore, is expected to be the possession of the scientific view of the world. According to the National Academy of Sciences (1996) and Wikipedia (2009), the United States National Center for Education Statistics defines scientific literacy as "the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity". It also includes specific types of abilities, such as ability to describe, explain, and predict natural phenomena. The Project 2061 refers to scientific literacy as science literacy (AAAS, 1989). It was intended to mean the possession of an understanding of major concepts, principles, and habits of thinking related to science, mathematics, technology and the interrelationships among them on one hand, and the society, on the other. It is described broadly to include the knowledge of the following content areas:

- The Nature of Science
- The Nature of Mathematics
- The Nature of Technology

- The Physical Setting
- The Living Environment
- The Human Organism
- Human Society
- The Designed World
- The Mathematical World
- Historical Perspectives
- Common Themes
- Habits of Mind

According to Hazen (2002), scientific literacy "is a mix of concepts, history, and philosophy that help you understood the scientific issues of our time" (p.1). Scientific literacy or science literacy, therefore, is an essential educational outcome desirable in a world increasingly shaped and directed by science and technology (Murcia, 2007).

However, the concept of scientific literacy may not be a simple and straightforward one, when it is under-girded by a set of philosophical presuppositions that may be adequate or inadequate, at a particular point in time, which also usually undergo evolution over a period. For instance, in general, the schools of thought in philosophy of science that guided works in science started from classical empiricism (e.g., Bacon, 1620, 1960; Hume, 1962). They then evolved through positivism (e.g., Comte, 1858; Mill, 1843), logical positivism (e.g., Whitehead & Russell, 1910-1913), logical empiricism (e.g., Carnap, 1966; Hempel, 1965; Kemeny & Oppenheim, 1970), Popperism (Popper, 1968) and the new philosophy of science (Brown, 1977; Feyerabend, 1978; Kuhn, 1970; & Lakatos, 1970).

In addition, specifically, the conceptions of the goals of science have varied from verification, through confirmation, falsification, or refutation to problem solving. The conceptions of the scientific method have varied from Aristotle's deductive method, through Bacon's (1620) four-step inductive method, Pearson's (1937) six-step account of the scientific method that included both inductive and deductive methods, Descartes' (1960) four-step deductive method to the problem-solving methods of the new philosophers of science (Brown, 1977; Kuhn, 1970). The problem-solving methods account for both the discovery and the justification phases of the scientific method. Conceptions of how science progresses have also varied from a cumulative view of the

empiricists and logical empiricists to integrated and evolutionary views held by the new philosophers of science. Therefore, a person not sufficiently grounded in science, history, sociology, and philosophy of science may not know what type of science he or she is literate in or how much of it would count for sufficient literacy.

This complex nature of conceptions of science means that scientific literacy, though desirable to possess, may not be easy to understand and possess. For instance, the possession of scientific literacy has several advantages (Hazen, 2002). These include ability to understand day-to-day issues in daily news and government debates; an understanding of how the natural laws of science influence one's life leading to an ability to use science; and knowledge of the intellectual climate of our time. Despite these advantages, citizens in countries reputed for their advanced scientific and technological development, are scored low on indices of scientific literacy.

**An African World View**

According to Abimbola (1977), a worldview is generally considered the body of beliefs, assumptions, and sentiments with which a people confront an organized life. Cobern (1995) defines a worldview as "the set of fundamental nonrational presuppositions on which . . . conceptions of reality are grounded" (p. 7). A people's worldview, therefore, is the set of principles and the attitudes and sentiments that go with it with which they make sense of their natural environment and the day-to-day occurrences, therein. Therefore, a worldview is the lens through which we view experience and its highly structured, complex interacting set of values, expectations, and images of oneself, others, and the world (Azibo, 1983). A worldview therefore is culturally based.

At first, considering the size of Africa and the diversity of its peoples, one may be right to say that there must be various worldviews. However, Idowu (1963) and Turnbull (1976) asserted that with a closer look at the total culture, religious beliefs and practices, there seemed to be a kind of commonality that suggested the possibility of an African worldview. Recent political moves that changed the Organization of African Unity (OAU) to the African Union and the mooted idea to have a United States of Africa, all point in this direction of an African worldview.

An African worldview acknowledges spiritual and material reality. Everything is regarded as being spiritual but appearing materially (Myers, 1988). Therefore, harmony with nature, group orientation (Jackson & Sears,

1992), and interpersonal relationships (Fine, Schwebel & Myers, 1988) are of prime importance and highly valued. Individuals are brought up not to exist alone; but owe their existence to ancestors, (e.g., masqurades) those unborn, the entire community and all of nature. Therefore, the highest value is placed on interpersonal relationship. In addition, Africans highly value a past present experiential and flexible time orientation.

On the other hand, because the future has not been experienced and cannot be controlled, Africans do not place emphasis there. These beliefs manifest in behaviours such as sharing a communal orientation as in farming and building construction; living in harmony with nature, as with food and clothing; demonstrating cooperativeness, as in traditional savings and loan systems, and avoiding competitiveness, control, and confrontation; being flexible about time and using spiritual faith (Myers, 1988) in daily activities.

African worldview used to be regarded as a set of unscientific views or superstitions about culture, religion, customs, and other practices. Some examples include ancestral worship, beliefs about natural phenomena such as flood, lightning, rainbow, fire, etc. The role of Ifa divination in Yorubaland has its predictive scientific content. The role of music and dances in traditional religious worship, whereby, perhaps, due to the effect of resonance, a dancer could reach a stage where he or she could become unconscious; the same effect that a tuning fork could have on a glass cup in the laboratory. The fact is that, however crude and superstitious some of these beliefs may be, they are no more crude than most of the postulations of scientists in the middle ages.

The modern view of science seems more compatible with the African view of nature to the extent that some people now think an African science (Ikponmwosa, 1984), or an idea that there is science in Africa, is possible. For example, Murfin (1992) and Meder (1977) documented many examples of scientific activities in Africa before the coming of the Europeans. May be, if we had been left alone, we would have been able to develop our own indigenous view of science that would equally be acceptable to the rest of the world. According to Murfin (1992), Van Sertima (1984) documented the use of fire over 1,400,000 years ago in Chesowanja, new Lake Baringo in Kenya (p. 293). He claimed that the Yoruba tribe in Nigeria had an exceedingly complex number system based on twenty (p. 15). This number system is still in use today in Nigeria. Furthermore, Van Sertima (1984) claimed that Africans were the first humans to raise crops and to domesticate cattle over 15,000 years ago (p. 20).

Meder (1977) gave an example of Blacksmithing, which people in Uganda had been using ages past before Bessemer developed his own process and got knighted for it!

It is now necessary to attempt a comparison between the two worldviews to see if there are similarities and differences, and if there is any strong need for the mutually exclusive way each of them has been developing.

**Scientific Literacy and African World View**

The received view of the relationship between science and African worldviews is that the two are incompatible. This was the case when the rational, hypothetico-deductive, and experimental methods of science dominated the science scene. This was, looking back now, the basis for Abimbola's (1977) disillusionment with perfect science in the face of deep-rooted African worldview that refused to yield to scientific explanations. With the ascendancy of the new philosophy of science (Abimbola, 1983; Brown, 1977; Kuhn, 1970) and its accommodation of non-logical elements in scientific discourse, it is now possible to consider a new set of relationships between science and African worldview.

Despite the fact that science content may be universal, the context within which it thrives varies, so that it is possible to have different conceptions of the same science content across different parts of the globe. The road, in science education discourse, from superstitious beliefs (Ogunlana, 1976) through misconceptions and alternative conceptions (Abimbola, 1984; Doran, 1972; Driver, 1973; Hewson and Hamlyn, 1983; Kelly, 1955; Okeke, 1976; Soyibo, 1983; Taiwo, 1976) and now to the misunderstood word (L. Ron Hubbard Library, 1992, 2004), has demonstrated that people could be immune to the effects of changing scientific worldviews. This is what Cobern (1995) referred to as "scientifically compatible worldviews" (p. 7).

For example, it is interesting to note that in a study of graduate science teachers' philosophical views of the nature of science, Adeyemi and Abimbola (1993) found that professionally untrained graduate science teachers' views of the nature of science approximated those of the new philosophers of science. The study was based on the views of the logical empiricists and the new philosophers of science. However, those of the trained graduate science teachers approximated those of the logical empiricists. In this case, the findings suggest that professional training inducted the graduate science teachers into the

hypothetico-deductive view of science while they lacked an update on the ascendancy of the new philosophers of science. Thus, their training seemed to have alienated them from current views of the nature of science on the one hand, and, perhaps, their own African view of the world, on the other. On the other hand, it was the views of the new philosophers of science on the nature of science that intuitively made sense to the professionally untrained graduate science teachers. Perhaps, this was because it was compatible with the African view of the world. This, to me, was an unintended outcome of professional training that should not normally be the case.

Another important and relevant example is the work of Hewson and Hamlyn (1983), which showed that students' alternative conceptions about specific content areas of science were not universal. They suggested that the intellectual environment of students played a significant role in their conceptions of specific science content areas, just like the science teachers in the example above. For instance, they showed that Sotho (South Africa) high school students possessed prekinetic and kinetic conceptions of heat rather than the caloric conceptions of heat found among students in Western culture. The kinetic conception of heat is more sophisticated than the caloric one.

In sum, it thus appears that students from a particular culture are not likely to share the same misconceptions about a given science concept with their colleagues from other cultures. Similarly, another group of students from another culture may not necessarily share a scientifically compatible worldview held by students from a particular culture. An extension of this argument is that students from particular cultures can be very naïve in their conceptions of one science content area while being sophisticated in their conceptions of another. Therefore, the Western worldview may not necessarily be compatible or incompatible with the African worldview.

Normally, the two views of the world should not be mutually exclusive because science, according to the new philosophers of science, is a human activity (Brown, 1977; Feyerabend, 1978; Kuhn, 1970; & Lakatos, 1970). People go through all the processes of scientific investigations, on a daily basis, as human beings, albeit, unconsciously, whether or not one is trained in science. The direction this argument is going is that normally, nobody should own scientific literacy as an exclusive preserve. Therefore, Africans should be scientifically literate, too, if science is a human activity. In addition, if science is part of culture, there should be science in Africa and there does not seem to be anything that should prevent Africans from being scientific.

Scientific literacy is a useful attribute to possess, according to researchers cited earlier. However, Hazen & Trefil (1990) revealed that in an informal poll during a commencement, less than 10% of graduating seniors from an excellent university in the U.S. could explain why it is hotter in summer than in winter. In addition, Hazen (1992) found out that half of the seniors in his own University did not understand the difference between an atom and a molecule. Furthermore, Miller (1998) estimated scientifically literate Americans to be (i) fewer than 7% of adults (ii) 22% of college (university) graduates and 26% of those with graduate degrees. So, why are cultures that lay claim to being scientific not scientifically literate? Is scientific literacy an unnecessary requirement for normal human beings? Are the tenets of scientific literacy compatible with human nature?

Expectedly, in some African countries, the situation is worse. Wilmot (2007) reported,

> South Africans consistently score very low in similar (Miller's, 1998) studies. In fact, South African learners are regularly outstripped in science and mathematics by pupils from much poorer African nations. (p. 1)

In a study conducted by Ogunlana (1976), 70% (Male, 20%; Female, 50%) of his sample believed in superstitions while only 9% did not believe in superstitions, perhaps, they were scientifically literate. There is, therefore, a strong need to discuss the implications of the two worldviews in relation to sustainable development of science education in Africa.

**Implications for Sustainable Development of Science Education in Africa**

Africa needs to develop scientifically, especially in this age of science and technology, where science and technology literally dominate all aspects of one's life. However, what type of science is best for Africa? Is it science that alienates its citizens from their cultural milieu or is it science that grows out of their own culture and tradition? The implications of the two worldviews are discussed under the following sub-headings:

- Science education policy;
- Science education curriculum;
- Science teaching and learning;
- Science teacher education; and

- Science education research.

*Science education policy*

Most of the required policies to develop science and technology in Africa are already embedded in their Millennium Development Goals. African countries, therefore, need to work hard to implement their policies and strategies for achieving their Millennium Development Goals in science and technology education, including poverty reduction. Poverty is likely to play a role in the type of views held by people.

To facilitate the implementation of these policies above, there is a need for political will. There is, therefore, an increasing need, more than ever before, for African politicians to become both scientifically literate and sufficiently knowledgeable in their customs and traditions to be able to fashion out appropriate educational policies that have respect for both scientific literacy and African worldview. For example, African countries may wish to adopt Britain's Royal Society scheme of "pairing" politicians with scientists from their constituencies to improve mutual understanding (Dickson, 2007). It may also be necessary to start encouraging more scientists to become politicians (Dickson, 2007). There is also a need for African parliaments to have, at least, a committee on science and technology, if they do not currently have, in a way that they can make themselves function at an international level.

Another innovative approach is the organization of annual national science festivals as done in South Africa (Dickson, 2007) in addition to annual national cultural festivals as is done in Nigeria. These are science education policies, which are culturally responsive (Ladson-Billings, 1995) and could yield important dividends within a short period.

Some African countries are noted for their vibrant press. It is desirable to increase the science and technology contents of African newspapers and other print and electronic media. A good place to start is with government media organizations in a manner that would encourage privately owned media houses to follow suit.

*Science curriculum development*

Constructivism is a by-product of cognitive science, which is the rave in science education research at this time (Abimbola, 1987). Constructivism assumes that logical thinking is an inherently human quality regardless of

culture, and instead focuses attention on the processes of interpretation that lead to understanding. It also assumes that the processes leading up to a scientific discovery is not necessarily usually logical. It is in the process of reconstruction and justification that logic comes in. Constructivism naturally leads to an expectation that students in different cultures will have somewhat different perspectives on science. It is time that science education research started informing curriculum projects that incorporate this point, thus making science curricula authentically sensitive to culture and authentically scientific (Cobern, 1996).

The teaching of General Studies courses such as: Use of English, Citizenship and Nigerian Culture, History and Philosophy of Science, etc. in Nigerian universities is a step in the right direction. There is a need for more Departments of Philosophy in African universities to be able to implement this in their universities. Miller (1998) found that the introduction of the general science courses as a graduation requirement enabled the United States to lead the other major countries in scientific literacy. The Nigerian General Studies curriculum seems to satisfy Ladson-Billings (1995) "culturally responsive science education curriculum" criterion and more.

African countries may also want to adopt the suggestion of Osborne (2002) "of the centrality of language, literacy and argument to science education curriculum" (p. 1.) at the secondary and university levels of education to prepare students to become "critical consumers of science" (p. 1).

Some of the science curriculum projects developed in Africa in the sixties and seventies were well intentioned and should have developed culture-friendly scientific literacy in the students if they had been faithfully implemented. The objectives of the curricula are instructive: For example, the African Primary Science Programme had the following as its objectives:

(a) develop attitudes and values, which in daily practice, assure a quality environment;
(b) develop skills needed to seek and evaluate information;
(c) use experimentation and discovery with a variety of materials to find answers to questions;
(d) develop concepts, which are formulated upon basic scientific knowledge; and
(e) relate the contribution of science to the improvement of life.

The role of the Nigerian Integrated Science Project was aimed at

(a) the unity of all knowledge;
(b) the conceptual unity of the sciences;
(c) a unified process of scientific inquiry; and
(d) an interdisciplinary study.

This is a curriculum introduced into the first three years of secondary education, which emphasizes the fundamental unity of sciences. In addition, it provides basic knowledge of science to all students before they specialize later as arts, social science and science students. All students that pass through this programme are expected to be scientifically literate, even if they do not specialize in science subjects later.

To enable students to be scientifically literate, there is a strong need for a science curriculum that emphasizes the teaching of "less for more" as in the U.S. Project 2061. The science curricula of some African countries may still be patterned after the old science curricula of the sixties in the developed countries that were heavy on content. In Nigeria, most of the secondary school science curricula are heavy on content to bridge the gap between secondary school education and university education with the scrapping of the Higher School Certificate level.

More countries in Africa should begin to incorporate superstitious beliefs prevalent in their countries into their science textbooks, to confront them with appropriate science contents. This is where teachers would discuss them thoroughly to point out to students their value and their demerits (Abimbola, 1984; Cobern, 1995; Okeke, 1976; & Taiwo, 1976). The Science Teachers' Association of Nigeria did this to its STAN Biology, STAN Chemistry, and STAN Physics books meant for the senior secondary school level. The authors are experts in student misconceptions and alternative conceptions in science.

*Science teaching and learning*

African educators in the 21st Century need to reflect on the increasing demands of the knowledge of science and technology to be able to live usefully with minimal stress and how students could have access to this knowledge at all levels of education. Doing this would enable current students to be able to cope even better in their own world, which would be dominated by more science and technology.

Study technology is a new teaching and learning technique that seems to be gaining acceptance by educators. Study technology is a research-based

system of learning how to learn, which includes basic principles and workable methods for application in the field of study (Slaughter, 2006). It is Applied Scholastics International's collective name for its teaching and learning methods. The outcomes of the application of study technology are students who know how to learn, how to apply what they learn and are motivated life long learners. The students taught with this method are expected to have less study troubles.

Teachers who know how to use this method become new teachers, who know how to teach students how to learn, and whose lives can no longer be the same again because, they, too, become lifelong learners and teachers who are capable of learning anything and teaching anything and anybody! It embodies cooperative learning, which is a popular teaching and learning technique in science education and is compatible with African culture. Study technology employs concrete objects in teaching and learning. It also uses good dictionaries to clear misunderstandings during learning to ensure proper understanding. It is largely a mastery learning approach, which ensures complete understanding of materials.

The system of having general studies courses, where specialist lecturers teach science, social science and arts students the same courses, up to ten credits, is a culturally responsive pedagogy (Ladson-Billings, 1995) and scientifically compatible. For example, the Use of English component of the General Studies takes care of English for Specific Purposes.

The teaching of science should now be out of the box as against the old system of overusing the lecture method for teaching science. Teachers should now employ the pedagogy for science, technology, and society in teaching science at all levels so that students can see the relevance of each topic taught to their day-to-day life and living. Hitherto, teachers taught science from textbooks largely adopted from the developed countries and students ended up thinking that science contents are not really part of their lives. Teachers should make students see the interactions between science and technology and their relevance to the society, without any loss of the knowledge of important science and technology concepts. A relevant teacher education programme is likely to achieve this.

*Science teacher education*

Pre-service teacher education programmes should pay attention to the latest research in science education, to introduce students at that level to the latest techniques that would facilitate a responsive science teacher education.

There is a need for continual review of teacher education programmes to be in tune with the latest findings in research in science education. Lecturers should employ more model teaching techniques in training pre-service teachers. In addition, samples of model instructions could be recorded and reviewed with students, before they embark on their own microteaching or peer teaching exercises.

Educators need to use more culturally relevant examples to teach science to trainees. This should also be required of the trainees when on teaching practice. Exposure to courses in science, technology and society could assist in making this method possible.

For a successful implementation of a responsive science teacher education, research results must be taken to practising teachers to assist them in continual professional development. Science educators may achieve an important aspect of their mandates by adopting neighbouring schools for this purpose. It also means that Inspectors of Education in the Inspectorate Divisions in Federal and State Ministries of Education should be empowered to be able to play their traditional role of being extension agents for new knowledge.

*Science education research*

There is a strong need to step up research activities in science education in Africa to assist in inculcating culturally responsive scientific literacy among the citizens. As a first step, there is need to study the level of scientific literacy in African countries on a comparative basis.

More work is needed in the area of constructivism and science education. Science education research should inform curriculum reforms, teaching and learning, and teacher education that incorporate this point, thus making science curricula, teaching and learning and teacher education authentically sensitive to culture.

Study technology research needs to be focused on improving students' scientific literacy level, through instruction. In addition, there is need to determine its effectiveness on students with differing ability levels. For instance, is a student of high ability level, when taught using study technology tools likely to become more scientifically literate than does a student of low ability level? Alternatively, is study technology a useful tool in improving students' scientific literacy, generally?

**Summary and Recommendations**

I have attempted, in this paper, to examine the concepts of scientific literacy and African world and draw implications for sustainable development of science education in Africa. First, I presented the definitions of the concepts of scientific literacy, literacy and African worldview to reveal their meaning, nature and characteristics. Second, I undertook a critical review of literature on the relationships between the two to locate their similarities and differences in form and content, with examples, to enable me draw implications for sustainable science education in the continent. I used the following areas of Science Education to guide the discussion—policy, curriculum development, teaching and learning, teacher education and research. Finally, I concluded the paper with a summary and a set of actionable recommendations that could foster the development of a sustainable scientific culture in Africa without loss of Africanness.

There is no doubt that colonialism has robbed most African countries of their authentic African culture. However, we cannot continue to use this as an excuse for our lack of adequate scientific and technological development. In addition, culture is not static; it changes in form and content. It is time we started emphasizing our areas of strength that we can market to the outside world.

Africa is rich in traditional medicine. Substantial progress has been made in this area but more standardization is required. More government support is also required. For example, since 1976, the Nigerian Government has approved that such practitioners could use "Dr." before their names (Abimbola, 1977). If the Chinese acupuncture procedure could be eventually accepted in the developed countries, African traditional medicine could also be eventually accepted, if we adopt a dogged approach.

There is need for African countries to step up their cultural as well as their scientific tourism (Miller, 1998; & Wilmot, 2007) to improve scientific literacy that is compatible with African culture and display Africa's scientific capabilities to the world. More cultural contacts are also to be encouraged in the spirit of, for example, ECOWAS and African Union.

African countries need to share best practices in science curriculum development, teaching and learning methods, teacher education and research. If we faithfully implement all these suggestions, we may be on the road to the scientific and technological development of the continent in this 21st Century, through a sustainable development of science education.

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# SECTION FOUR

# INFORMATION AND COMMUNICATION TECHNOLOGY

# GENDER DIFFERENCES IN COMPUTER ACCESS AND LITERACY - AMONG AGRICULTURAL STUDENTS AT UNIVERSITY OF CAPE COAST IN GHANA

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**Abstract**

*Computer and its related technologies have become a standard and an enabling tool in almost every career worldwide. Therefore the issue of computer access and literacy have become important for higher education and institutions which churns out graduates for the world of work. The Information Communication Technology (ICT) policy of University of Cape Coast, Ghana is to ensure that all graduates acquire proficiency in ICT. ICT literacy and access are components of agricultural curriculum.*

*The paper presents findings of a study that determined gender differences in computer access and literacy among agricultural students at University of Cape Coast in Ghana. Survey design involving the use of questionnaire was used to collect data for the study. A cluster random sampling procedure was used to sample 144 respondents out the population of 585 undergraduate students in the School of Agriculture. The study concluded that there are gender differences in computer access and literacy among agricultural undergraduates at the University of Cape Coast. The study recommends compulsory ICT proficiency course and a scheme to acquire Personal Computers for students to bridge the computer access and literacy gap.*

**Introduction**

Computer technologies are changing the face of education throughout the world and have the potential of providing more effective teaching and learning tools, serve as the medium to transmit content and encourage more immediate, relevant and authentic learning (Porter, 1997; Hawkins, 2003). Robertson (2002) has argued that computer technology will lead the transformation of education and may be the most important tool to occupy the central position in education once occupied by books. Effective application of

computer technologies in education requires computer literacy and access. Computer literacy and access are important to agricultural education because almost all facets of agriculture use computers.

The School of Agriculture, University of Cape Coast has recognised that the application of Information Communication Technology (ICT) in the field of education, homes and work places has increased over the years. Computing is therefore an important component of the curriculum for agricultural students enrolled at the University. Equal computer access and literacy are provided to all students since they are expected to be computer literate to keep up with the current information society and needs of work.

Computing is perceived by many as belonging to the male domain. The need to assess students' ability to use computers is a central tenet of education and research (Selwyn, 1997). Gender which is a significant factor in predicting an individual's potential interest and involvement in computing has not been explored at University of Cape Coast.

**Purpose of Paper**

The paper presents the results of a study that sought to find out the level of computer access and literacy of agricultural students, so as to provide the critical mass of information required for future improvement of curriculum design and planning. Specifically the study sought to:

1. Examine gender differences in Computer access among agricultural students of UCC in terms of:
   a. Ownership
   b. Location of Use
   c. Frequency of use
2. Determine gender differences of computer literacy among agricultural students of UCC in term of their ability to:
   a. perform computer operating environment tasks
   b. send e-mailing tasks
   c. perform world wide web tasks
   d. do presentation tasks
   e. perform word processing tasks and
   f. knowledge on software cate gories

**Literature Review**

Computer literacy is the knowledge and ability to use the computer and its related technologies efficiently. Computer literacy includes the understanding of computer characteristics, capabilities, applications, as well as the ability to use these knowledge in a skilful manner that is productive and suitable to an individual's roles in a society (Simonson, Maurer, Montag-Torardi, & Whitaker, 1987).

Computer access is the ability of an individual to reach and easily obtain computer for use. It is associated with the amount of time spent working with computers (Orpen & Ferguson, 1991), ownership (Brock, Thomsen and Kohl, 1992) and higher levels of literacy (Gattiker and Hlavka, 1992).

Gender is the roles socially assigned by being female or male, girl or boy, woman or man (Zanden, 1990) and learned behaviours expected from members of each sex from the society (Andersen and Taylor, 2004). Many studies have concluded that gender differences affect access and literacy in computing. Males are more likely to use computer than women when equal access is provided (Becker and Sterling, 1987 and Arch & Cummins, 1989). There are differences in the level of confidence in the application of computer skills, interest and perception of the benefits of computers among boys and girls in elementary and secondary schools. The fewer girls than boys have access to computers at school and boys are more self-confident about their potential with computers and perform better than girls in computing tests. (Lancaster, 2007),

According to Volman & van Eck (2001) females tend to be less interested in computers, have less positive views about the value of computing, and report more computer anxiety and less confidence in their computer abilities. Consequently, girls are often less computer literate than boys (Schaumburg 2001). A number of environmental and social factors such as early exposure to computers, frequency of computer use, parental and peer support for ICT learning which contribute to computer literacy tend to favour boys (Cassidy & Eachus, 2002; van Braak; Vekiri & Chronaki, 2008). Traditionally, girls tend use computer less in their spare time and have more negative attitude towards them (Barnert and Arbinger 1996, Brosnan 1998, Metz-Goeckel et al. 1991, Okebukola 1993, Shashaani 1994). Males dominated computer ownership (Culley, 1986) and are perceived to have higher knowledge about computer functions and disk operating system use (Geissler & Horidge, 1993). Males on average spend more hours per week with computers than females. Gender difference in computer

literacy was found to diminish with increased computer experience (years and weekly usage) (Smith & Necessary, 1996).

**Method and Data Sources**

The study used the survey design in the form of questionnaire to collect data from the respondents. A panel of experts ensured the content validity of the research instrument. The study targeted all undergraduate students enrolled in the B.Sc. Agriculture programme at the School of Agriculture, University of Cape Coast. The School of Agriculture is one of the seven Faculties of the University of Cape Coast, Ghana. The school has five departments namely Department of agricultural Economics and Extension, Department of soil science, Department of Agricultural Engineering, Department of Animal Science and Department of Crop Science. Other support units include research and teaching farm, and technology village. The school currently runs postgraduate and undergraduate programmes leading to award of degrees in B.Sc. Agriculture, B.Sc. Agricultural Extension, and B.Sc. Animal Health.

The student population in the School numbered 585 in 2008/2009 academic when the study was conducted. A cluster sampling procedure based on the levels was used to select the level 200 class out of the four levels in the School of Agriculture. The level 200 constituted the sample size of 200 out of which 144 respondents returned their questionnaires. The response rate of 72% was deemed adequate for the study.

The SPSS (version 16, 2007) was used to generate statistics to describe the data. The perceived level of literacy were measured on a Likert-type scale ranging from 1 to 3 where 1= poor, 2= good, and 3= excellent. **Croncbach's Alpha of 0.8 on scales was deemed consistent for the study.** Frequencies and percentages were used to describe access in terms of computer ownership, location and frequency of use of computers. Means, standard deviation and t-test were used to establish the difference in computer literacy.

**Results and Discussion**

*Gender differences in computer access*

The study revealed that less than one-third (29.1%) of the respondents own personal computers. Of those who owned PCs, 30 (69.8%) were males while 13 (30.2%) were females (Table 1). This indicates that more male respondents

have computers than females. This confirms Gunn (2003) study that concluded that women are still less likely than the men to own a computer.

**Table 1: Computer Ownership**

| Ownership | Male | Female | Total |
|---|---|---|---|
| Yes | 30 | 13 | 43 |
| No | 62 | 39 | 101 |
| Total | 92 | 52 | 144 |

*Location and Frequency of Access to the Computer*

Table 2 shows that results of the location and frequency of use of computers by students on University of Cape Coast campus. Generally computer access to all students was quite high in all locations except at the departmental laboratory. Computer access is low at the departmental computer laboratories since most access is allowed for postgraduates only. Undergraduates can access computers at both ICT Centre and Socket Works-a private Internet cafe that authorities of UCC have give laboratory for their operation.

The percentage for access were 89.1%, 47.9 %, 68.8%, 56.9%, 75.7% and 67.4% respective for access at residence, department laboratory, ICT Centre, Socket works, private Cafes and friend's residence. Of the respondents who used computers daily, every other day, weekly, monthly or occasionally, more males had access than females. The percentage for total access is shown Table 2.

**Table 2: Location and Frequency of use of Computers**

| Location | Gender | Frequency of Access to Computer | | | | | | Total Access |
|---|---|---|---|---|---|---|---|---|
| | | None | Daily | Every other day | weekly | Monthly | Occasionally | |
| Residence | | | | | | | | |
| | Male | 16 | 37 | 12 | 9 | 8 | 10 | 92 |
| | Female | 10 | 18 | 6 | 2 | 1 | 15 | 52 |
| Total | | 26 | 55 | 18 | 11 | 9 | 25 | 144 |
| | Male | 49 | 2 | 1 | 9 | 6 | 25 | 92 |
| Departmental Laboratories | Female | 26 | 3 | 3 | 1 | 1 | 18 | 52 |
| Total | | 75 | 5 | 4 | 10 | 7 | 43 | 144 |
| | Male | 26 | 2 | 1 | 23 | 5 | 35 | 92 |
| ICT Centre | Female | 19 | 3 | 2 | 4 | 0 | 24 | 52 |
| Total | | 45 | 5 | 3 | 27 | 5 | 59 | 144 |
| | Male | 37 | 2 | 2 | 10 | 3 | 38 | 92 |
| Socket Works | Female | 25 | 5 | 3 | 3 | 1 | 15 | 52 |
| Total | | 62 | 7 | 5 | 13 | 4 | 53 | 144 |
| | Male | 20 | 3 | 10 | 22 | 7 | 30 | 92 |
| Other Private Cafes | Female | 15 | 5 | 4 | 7 | 0 | 21 | 52 |
| Total | | 35 | 8 | 14 | 29 | 7 | 51 | 144 |
| | Male | 28 | 7 | 9 | 14 | 3 | 31 | 92 |
| Friends' Residence | Female | 19 | 5 | 4 | 5 | 1 | 18 | 52 |
| Total | | 47 | 12 | 13 | 19 | 4 | 49 | 144 |

*Gender Differences in Computer Literacy*

Respondents' ability to use some computer applications including word processing, spreadsheet, presentation software, internet browsing (sending an email, sending and retrieving an attachment), and general operating environment were tested to determine their computer literacy level. Respondents rated their perceived knowledge and level of confidence on Likert type scale from range 1= Poor, 2= Good, 3=Excellent. The ability of respondents to perform computer operating environment tasks is presented in Table 3.

Table 3: Mean, standard deviation and t-values of respondents' ability to perform tasks related to computer operating environment

| Tasks | Gender | N | Mean | Std. | T-value | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Creating and opening a simple text document | Male | 92 | 2.54 | 0.72 | 5.62 | 0 |
| | Female | 52 | 1.71 | 1.05 | | |
| Saving a document in a new file and in an existing file. | Male | 92 | 2.68 | 0.66 | 3.65 | 0.000 |
| | Female | 52 | 2.19 | 0.95 | | |
| Closing a document | Male | 92 | 2.60 | 0.81 | 4.90 | 0 |
| | Female | 52 | 1.85 | 1.00 | | |
| Printing a document from a list file option. | Male | 92 | 2.52 | 0.82 | 4.92 | 0 |
| | Female | 52 | 1.77 | 0.98 | | |
| Using the print preview option before printing | Male | 92 | 2.42 | 0.84 | 5.20 | 0. |
| | Female | 52 | 1.63 | 0.93 | | . |
| Retrieving an existing document, edit and save in new file. | Male | 92 | 2.52 | 0.83 | 4.91 | 0 |
| | Female | 52 | 1.75 | 1.03 | | . |
| Using RENAME to change the name of a file. | Male | 92 | 2.33 | 0.94 | 3.42 | 0.001 |
| | Female | 52 | 1.75 | 1.03 | | |
| Accessing and using the HELP function | Male | 92 | 2.08 | 0.87 | 2.98 | 0.003 |
| | Female | 52 | 1.62 | 0.93 | | |
| Installing and using a new software programme without much help. | Male | 92 | 2.00 | 0.85 | 4.13 | 0 |
| | Female | 52 | 1.40 | 0.80 | | |

Means were computed on a scale that ranges from 1-3, where 1=Poor, 2=Good, 3=Excellent

With regards to their abilities in performing tasks involving manipulation of documents (operating environment), both male and female respondents rated their competencies to be good or excellent (means raged from 1.65 to 2.68). The only exception is the installing and using a new software programme without much help that females perceive their competency to be poor (mean=1.4, s.d= 0.799). Therefore is the need for users to acquire competency in this area. In the past, software installation was done either by the Computer Professionals or experienced end-users but with more and more software becoming user-

friendly and intuitive, this is likely to change in the nearest future. In all cases there were significant differences between the ratings for males and females. Males rated themselves higher than their female counterparts indicating gender differences with regards performing computer operating environment tasks.

With respect to the ability to work with email and browsing (Tables 4), both males and females rating were good. This could be due to the fact that these are mostly used tasks performed on the internet. However, male ratings were higher than their female counterparts.

**Table 4: Mean, standard deviation and t-values of respondents' ability to perform Internet task**

| Tasks | Gender | N | Mean | Std. | T-value | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Composing and sending an E-mail message | Male | 92 | 2.18 | 0.838 | 3.362 | 0.001 |
| | Female | 52 | 1.67 | 0.944 | | |
| Sending and receiving E-mail message with attachment | Male | 92 | 2.05 | 0.894 | 2.155 | 0.033 |
| | Female | 52 | 1.71 | 0.957 | | |
| Utilizing E-mail, news groups or other web browser applications to obtain information on a selected topic. | Male | 92 | 2.01 | 0.92 | 2.213 | 0.028 |
| | Female | 52 | 1.65 | 0.947 | | |
| Accessing a specific Web page (URL) and search the Web using a variety of tools. | Male | 92 | 2.08 | 0.855 | 3.034 | 0.003 |
| | Female | 52 | 1.62 | 0.911 | | |
| Accessing, Utilize, and research resources through the World Wide Web | Male | 92 | 2.17 | 0.779 | 3.681 | 0 |
| | Female | 52 | 1.63 | 0.95 | | |

Means were computed on a scale that ranges from 1-3, where 1=Poor, 2=Good, 3=excellent

Males rated themselves higher (mean= 2.04) in terms of creating and using a simple presentation documents than females (Table 5). However, both rated their abilities to add animation to presentation to be poor.

**Table 5: Mean, standard deviation and t-values of respondents' ability Presentation tasks**

| Tasks | Gender | N | Mean | Std. | T-value | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Creating and using a simple presentation | Male | 92 | 2.04 | .84 | 3.58 | .000 |
| | Female | 52 | 1.48 | 1.02 | | |
| Creating animation | Male | 92 | 1.24 | .54 | 2.06 | .041 |
| | Female | 52 | 1.04 | .59 | | |

Means were computed on a scale that ranges from 1-3, where 1=Poor, 2=Good, 3=excellent

Table 6 highlights the fact that both males and females rated themselves to be good in their abilities to perform basic word processing tasks. This may be due to the fact that word processing is the first software application package to be learnt and the most used for it typing assignments, emails, chatting and the like. Still the ratings of male respondents were significantly different from than female respondents.

**Table 6: Mean, standard deviation and t-values of respondents' ability to perform Word Processing tasks**

| Task | Gender | N | Mean | Std | T-value | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Setting and changing left, right, top and bottom margins; | Male | 92 | 2.25 | 0.89 | 3 | 0.003 |
| | Female | 52 | 1.77 | 1.00 | | . |
| Underlining, boldfacing, and italicizing text as it is being typed; | Male | 92 | 2.3 | 0.94 | 2.4 | 0.017 |
| | Female | 52 | 1.9 | 1.00 | | . |
| Using a blockage function; | Male | 92 | 2.27 | 0.89 | 3.5 | 0.001 |
| | Female | 52 | 1.71 | 1.00 | | |
| Moving and copying text to other parts of a document | Male | 92 | 2.47 | 0.82 | 4.2 | 0 |
| | Female | 52 | 1.83 | 0.99 | | |
| Deleting text from a document | Male | 92 | 2.42 | 0.80 | 3.8 | 0 |
| | Female | 52 | 1.85 | 1.00 | | |
| Using SPELL CHECK and correct errors in the document | Male | 92 | 2.22 | 0.88 | 2.6 | 0.01 |
| | Female | 52 | 1.81 | 0.97 | | |
| Selecting and altering font style and size | Male | 92 | 2.3 | 0.80 | 4 | 0 |
| | Female | 52 | 1.69 | 1.04 | | |
| Saving a block of text as a separate document | Male | 92 | 2.28 | 0.88 | 4 | 0 |
| | Female | 52 | 1.65 | 0.97 | | |
| Reformatting margins, spacing justification and tabs within documents | Male | 92 | 2.11 | 0.81 | 3.5 | 0.001 |
| | Female | 52 | 1.6 | 0.89 | | |
| Creating a simple table | Male | 92 | 2.11 | 0.83 | 2.3 | 0.024 |
| | Female | 52 | 1.77 | 0.90 | | |
| Copying tables to a separate document | Male | 92 | 2.09 | 0.82 | 3.9 | 0 |
| | Female | 52 | 1.5 | 0.96 | | |

Means were computed on a scale that ranges from 1-3, where 1=Poor, 2=Good, 3=excellent

In Table 7, general capabilities of other application packages such as Spreadsheet, Database Management Systems, Graphic programmes, and On-line bibliographic databases are presented. Both males and females considered their competencies with the use of the above mentioned software packages to be poor. With exception of Database Management Systems, there was no significant difference in gender capabilities.

**Table 7: Mean, standard deviation and t-values of respondents' Knowledge other software categories**

| Computer Software Categories | Gender | N | Mean | Std | T-value | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Spreadsheet | Male | 92 | 1.23 | .52 | 1.74 | .085 |
| | Female | 52 | 1.08 | .48 | | |
| Database Management Systems | Male | 92 | 1.32 | .55 | 2.43 | .017 |
| | Female | 52 | 1.08 | .59 | | |
| Graphic programmes | Male | 92 | 1.35 | .56 | 1.73 | .086 |
| | Female | 52 | 1.17 | .62 | | |
| On-line bibliographic databases | Male | 92 | 1.24 | .52 | 1.57 | .119 |
| | Female | 52 | 1.10 | .53 | | |

Means were computed on a scale that ranges from 1-3, where 1=Poor, 2=Good, 3=excellent

**Table 8: Mean, standard deviation and t-values of the overall Computer Literacy of respondents**

| ICT literacy | Gender | N | Mean | Std | T-value | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| Overall | Male | 92 | 1.58 | .29 | 4.46 | .000 |
| | Female | 52 | 1.30 | .47 | | |

Means were computed on a scale that ranges from 1-3, where 1=Poor, 2=Good, 3=excellent

Table 8 presents the overall computer literacy of respondents. This estimated from the composite mean of all the Computer software categories namely the word processing, spreadsheet, presentation software, internet browsing, and general operating environment. The results indicate that there is a significant

gender differences in computer literacy. While the overall male student competency was good, that of the female was poor. This may be due to the fact that more male than female owned computers and again spend more time with the computer than female. This is in agreement with Gattiker and Hlavka (1992) who indicated that access to a computer is known to be associated with higher levels of computer literacy.

**Conclusions and Recommendations**

The study has shown that there are gender differences in computer access and literacy levels among undergraduate agricultural students of the University of Cape Coast. The differences are evident in computer ownership, ability to perform specific tasks on productivity software application packages, and the number of hours spent on computers. The study concludes that there exist significant differences in computer access and literacy level among agricultural students. Male respondents are more computer literate than female respondents. This has implication for all undergraduate Agricultural students at University of Cape Coast. As a way of rectifying the gender gap in computer access and literacy, the study recommends the following:

a) The computer proficiency course for first year students should be made as a compulsory or core course for all first year students.

b) The female students of UCC especially those studying MEd (ICT), BSc Computer Science, BEd Computer Science and BSc Information Technology should be encouraged to form a club whose purpose is to train other female students to become computer literates. It has been established that peer tutoring demonstrates effectiveness in facilitating progress in the general education curriculum (Cohen, Kulik & Kulik, 1982).

c) There are 250 and 150 PCs at ICT Centre and Socket Works respectively for a student population of 18,000 making PCs density in the UCC is very low. Therefore more avenues for computing should be provided.

d) Students had more access to computers in their halls than any other locations surveyed. In this regard, a scheme should be established by the university's authorities or the Student Representative Council (SRC) whereby students acquire PCs on high-purchase. If possible with special concession given to female students since few owned PCs. Also, the Ghana Government decision of one laptop to a child should be extended to students in the Tertiary institutions since they will join the working

world very soon where computer literacy is a must requirement is most places. When these are done it may go a long way to increase students' access to computers.

e) Since practice makes perfect, assignment should be submitted in electronic form and occasionally students should be required to make presentation with PowerPoint.

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# THE USE OF THE INTERNET AMONG AGRICULTURAL STUDENTS AT UNIVERSITY OF CAPE COAST IN GHANA

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**Abstract**

We are living in the age where the Internet is one of the most important tools for accessing information and knowledge to improve the welfare of humankind. All graduates from universities are expected to become internet proficient in order to participate in the Information and Knowledge Age. Therefore, Internet literacy is important to agricultural education because almost all facets of agriculture use computers. This study analyzed the use of the Internet among Agricultural Students at University of Cape Coast in Ghana in 2008/2009 academic year. A total of 200 students were randomly selected and surveyed using a content-validated questionnaire and group discussion. Descriptive statistics were used to analyse the data. The major finding was that the level of knowledge of students on the Internet was low. However, most students have the e-mail addresses and have received training on Internet from private firms outside the University. Occasionally, students used the private cafes in the University to access the Internet. The study recommends among others that hands-on practical approach should be adopted to enhance teaching and learning of ICTs. Moreover, students should be linked to the main University-wide wireless network to enhance access.

## Introduction

In the era of application of Information and Communication Technologies (ICTs) in all facets of life, the Internet, one of the ICT facilities stands tall. The internet is basically a communication system for distributing and exchanging information through computers scattered across the world. It can be described as a huge information-rich global system of networks that allow different computers located in any part of the globe to communicate directly with others.

The Internet is changing the face of education in the World. Indeed, it is a gateway to the world of learning and strongly linked to education. The very existence of the Internet evolved from the sharing of research findings among scientists and scholars and to providing access to libraries, schools, and universities worldwide. The Internet is the source of interesting reference material and valuable resources such as books and journals. Through the use of the Internet, students can have access to large volumes of information irrespective of their geographical location. Furthermore, the Internet allows more people to receive alternate education and teaching methods through virtual classrooms and long-distance education (Uimonen, 2005).

The real challenge of the Information Age is not producing information or storing information, but rather getting people to use the information (Patton, 1985). Educational systems, therefore, have a great deal to offer in pointing the way to increasing the use of knowledge and information in the future through the Internet. The University of Cape Coast has been linked to the Internet and continued to improve its ICT infrastructure. The study of ICT is a prerequisite for all agricultural students in the University. With these new developments, it is assumed that students should be able to access current information on agriculture through the Internet. Agricultural students will need the Internet in future to support the development of agricultural producers; community development; research and education; small and medium enterprises development; and media networks (Richardson, 1996).

To determine what kinds of Internet education were appropriate and necessary for agricultural students, it is useful to first understand how students use the Internet. The data collected were to provide insights into revising and improving teaching for this population. The extent to which students in agriculture use the Internet in Ghana was not known prior to this study. Analysing the use of Internet by agricultural students can improve the teaching and learning, policy formulation and human resource development for the benefit of agriculture in Ghana.

**Purpose of the Study**

The University of Cape Coast in Ghana expects all its graduates to be ICT literate to be effective in their future chosen careers. This study was conducted to analyse the use of the Internet by agricultural students. The specific objectives were to:

1. examine sources of Internet training among agricultural students;
2. determine the Level of knowledge of agricultural students of Internet;
3. assess the major reasons of Internet use by agricultural students and
4. discuss students perceived problems associated with the use of Internet.

**Literature Review**

Organizations and individuals store information on the Internet for use by people. The Internet provides world-wide connectivity, tools and services to acquire information. The basic services on the Internet include e-mail, WWW, Telnet, and News (USENET). According to Laudon, Trauer and Laudon (1996), *the* WWW resources provide access to multimedia data, search engines, meta-search engines, information gateways, and Resource Discovery Network (RDN) which is a free service for resources used in learning, teaching and the research community. The e-mail is the electronic equivalent of postal mail which allows people to type a letter on computer keyboard and send it along over the Internet. Arguably, the e-mail is the most widely used Internet tool that supports networking among professionals in different geographical locations.

A list server/mail server is a discussion group created on the Internet to share ideas and knowledge on a subject. A message sent to a list is copied and then forwarded by e-mail to every person who subscribes to the list, thereby providing an excellent resource for distributing information to a group with a shared interest. The discussion group on the Internet allows users to follow issues of interest while the File Transfer Protocol (FTP) and the Telnet facilities allow users to access information at remote locations. The Newsgroups servers (for example USENET) provide access to thousands of participants to discuss research, business, and news, science and technology topics. It provides users the opportunity to obtain useful and free advice from experts.

Using information in decision-making is the key issue of the information age. The academics have made significant breakthrough in their activities with the opportunity provided by the Internet which has made it possible for them to obtain current information as well as communicate with others at an affordable price. According to Spiess (2000) the major uses of the Internet by agricultural teachers in California were for agricultural research, referencing, increasing awareness on current and global events, and downloading educational programmes. Agricultural teacher educators have found the Internet useful in sending or receiving e-mail. Approximately 80% of the group logged on to the

Internet five times per week, and almost 70% log on for at least one hour per day (Workman, 1996). Peckham and Iverson (2000) have concluded that agricultural educators in Georgia are positive toward Internet and are interested in using the Internet in their classroom. However, they differed significantly only in perceived knowledge level, school policy, equipment availability, training and computer literacy.

In spite of the benefits of the Internet, its use among even the Faculty is still very low in Ghanaian universities due to lack of access to the Internet, low literacy rate hence the need for training, the frequent power outages and slowness of the system (Adika, 2003). Challenges to the use ICT for agricultural development in Ghana includes the need for ICT training opportunities, provision of adequate infrastructure, financial resources and technical backstopping (Annor-Frempong, Kwarteng, Agunga, & Zinnah, 2006). The personal concerns of teachers, if not addressed, would cause them not to learn new technology until their concerns are addressed (Thompson & Connors, 1998).

**Methods and Data Sources**

The research employed both quantitative and qualitative research techniques to collect data. A structured content-validated survey questionnaire was used to collect quantitative data from 200 student respondents made up of 84.5% males and 15.5% females. The respondents were level 200 students randomly selected out of the four levels in the School of Agriculture at University of Cape Coast. A panel of ICT experts at University of Cape Coast, who were familiar with the Internet use ensured the content validity of the questionnaire.

The qualitative research technique adopted involved the use of group discussion with the class to identify the problems associated with Internet usage by students. Firstly, volunteers in class were asked to mention the problems. A consensus was reached with the class as to the prevalence of the problem. The nature of the problem was then discussed. The researchers facilitated the discussion and recorded the major ideas expressed by students. Additional information was sought from a secondary data sources such as annual reports, journals, books, conference proceedings, theses and dissertations related to agricultural training needs.

## Findings and Discussion

*Sources of Internet training and rate of usage among Agricultural students*

Students were asked to indicate from where they received training on Internet. The findings shown in Table 1 indicate that 36.5% had received Internet education prior to their education in University either at the High School, Polytechnic or Teacher Training College. This low access to Internet education at the pre-university education level is not surprising as many computers in pre-university schools are not connected to the Internet. A national survey in Ghana in 2000 confirmed that although a number of Ghanaian schools especially the secondary schools have computers with about 79% of the schools having computers, only 16% of the schools use their computers to access the Internet (Dzidonu, 2000).

**Table 1: Source of Internet Training**

| Source | *Frequency | Valid Percent |
|---|---|---|
| Pre-university studies (High Schools, Polytechnic and Training College) | 73 | 36.5 |
| Self taught | 68 | 34.0 |
| Private Centre outside the University | 27 | 13.5 |
| Official Course at University | 12 | 6 |
| Private Course at University | 4 | 2 |

Source: Field data, 2008. *Multiple responses

About 34% of the respondents claimed to have studied Internet on their own. Few had studied Internet at the University either by taking part in the official proficiency course (6%), and privately at training schools within (2%) or close (13.5%) to the University.

Table 2 presents the results on rate of the Internet use among respondents. With the exception of few (9.3%) respondents who indicated they have never used the Internet, most of them (58.8%) occasionally used it. They normally visit the Internet cafe occasionally and are assisted by attendants to search for information. More respondents used the Internet weekly (17.5%) than monthly (7.7%) and daily (6.7%). The low use of the Internet daily could be attributed to inadequate access and non-availability at times where students have free periods to use the Internet. As discussed under problems, the few places on campus where students could have access do not operate 24 hours a day.

**Table 2: Rate of use Internet**

| Rate of use | *Frequency | Valid Percent |
|---|---|---|
| Occasionally | 114 | 58.8 |
| Weekly | 34 | 17.5 |
| Monthly | 15 | 7.7 |
| Never | 18 | 9.3 |
| Daily | 13 | 6.7 |
| Total | 194 | 100 |

Source: Field data, 2008. *Multiple responses

*The level of knowledge of Agricultural students on Internet*

Effective search for information on the Internet starts with good knowledge on aspects of the Internet. Students were asked questions to identify their level of knowledge on aspects of the Internet. Majority of the respondents (87.5%) knew the homepage and were able to describe it correctly (Table 3). Every website on the internet has a homepage. This is generally the first page you see when you visit a Website. Knowledge of the homepage will assist students to obtain information about the organisation and links to other web pages in that website and in other websites. The respondents were able to indicate that homepage one can find audio and video files, links to other web pages, text and graphics.

**Table 3: Level of Respondents' Knowledge on Internet**

| Knowledge Area | Frequency | Valid Percent |
|---|---|---|
| Homepage | 175 | 87.5 |
| Web address structure | 143 | 71.5 |
| Search Engines/browsers | 59 | 29.5 |
| E-mail Address | 55 | 27.5 |
| Use of Uniform Resource Locator | 32 | 16.0 |

Source: Field data, 2008.

The level of knowledge of respondents on web address structure was quite high. Majority of the respondents (71.5%) could describe correctly the structure of the web address and naming the three parts which are made up the protocol indicator, the domain name, and the file name. Less than a third of the respondents had knowledge on search engines (29.5%), e-mail (27.5%), and Uniform Resource Locator (URL) (16.0%). A search engine provides a user interface that helps browsers to explore web pages on the Internet easily. The URL is a unique address of the webpage.

The main use of Internet among the respondents was to interact with friends (Table 4). More than half (55%) of the respondents indicated so. Other uses include sending and receiving files (35%). Less than a third indicted they used the Internet to subscribe to academic materials. Few respondents specified that had used the Internet to subscribe non academic materials (4.5%), participated in discussions (7.0%) and chatting (12.5%).

**Table 4: Reasons for Use of Internet**

| Use of Internet | *Frequency | Valid Percent |
|---|---|---|
| Interact with friends | 110 | 55.0 |
| Send and receive files | 70 | 35.0 |
| Subscribe academic materials | 56 | 28.0 |
| Chatting | 25 | 12.5 |
| Participate in discussions | 14 | 7.0 |
| Subscribe to non-academic materials | 9 | 4.5 |

Source: Field data, 2008. *Multiple responses

**Problems Associated with Use of Internet**

*Inadequate Internet Infrastructure and Access*

Inadequate access was mentioned as a major problem to the use of the Internet. The inadequate infrastructure on-campus posed challenges to many students who wanted to use the Internet. Students were of the view that many computers available were not connected to the Internet. Moreover, the few computers with internet connectivity were available in the Computer Laboratory which was opened to students only when they have lectures. The ICT Centre was closed after normal working hours and the number of computers was enough for many students, who wanted to browse at a time. The Internet innovation requires a cluster of related technologies and means of connection such as the existing network of telephone cables, fibre-optic cable or wireless in the telephone network or modem density. These were unfortunately, not adequate to cater for all students.

*Cost of Internet*

According the students the issue of cost restricts their use of the Internet. Individuals were unable to cover cost of Internet services especially at the private Internet cafes in view of their low income. Eikhamenor (2002) has

iterated that financial commitment to regular surfing is a problem in countries where the wage level is low in comparison to the telecommunications costs and connection charges of the Internet services providers. The cost becomes a problem when some scientific and technical journals demand charge for access and downloading. Most students do not have credit cards to pay for such charges.

*Slowness in assessing data on the Internet*

The students identified and emphasised the slowness of the Internet as major problem associated with the non-use of the Internet. The slowness did not only waste the time of students, but also added to the cost of accessing information from the Internet. Some of the students even perceived the slowness as deliberate since the longer the time spent in accessing information meant they are charged more by the Internet Service Providers. They also complained the periods they are willing to use the Internet coincides with the peak periods where accessing information took a lot of time. This calls for increase in bandwidth of ISPs on campus to improve on the speed of Internet access.

*Inadequate local content on the Internet*

**Inadequate local content on information on agriculture was mentioned as a constraint to the use of the Internet. The agricultural students** felt most of the information on the Internet were foreign-based and not relevant when they require information on Ghana for assignments. They preferred more local content in agriculture and related subjects. Nag (2002) concluded that if the contents of Internet are useful and appropriate people would acquire the basic skills to make use of them.

*Lack of Internet-based assignments*

Some students were of the view that they will use the Internet if they were provided with assignments that would require them to use the Net. This provides a challenge to university Teachers to encourage students to use the Internet as a learning tool to provide alternate technique for teaching. Uimonen (2005) highlighted the use of the Internet as alternate education and teaching method to improve teaching and learning.

*Low knowledge on tools to enhance information search*

Respondents indicated that they had basic computer competence, but they will prefer to know more about the Internet than they did. Students said that

they will need more training on effective use of the Internet tools to search for information.

**Conclusions, Implications and Recommendations**

This study was conducted to identify the uses of the Internet, constraints and challenges faced by agricultural students in that regard. It was aimed at addressing the teaching and learning, policy formulation and human resource development in Ghana.

First, it was concluded that agricultural students learn how to use the Internet prior to admission into the University, and this they did on their own although on the low scale. This implies that Internet education and training need to be strengthened at the pre-university education level to ensure that students become abreast with the Internet before they are admitted into the tertiary system. The Ministry of Education needs to draw programmes and monitor it delivery at non-academic IT Education institutions. Again, the Government should consider offering tax incentives for ISPs who provide discount packages to enhance connectivity to Senior High Schools.

The second conclusion was that the rate of usage of Internet is low as few agricultural students use the Internet once daily, weekly, or monthly. The use of the Internet is dependent on availability of infrastructure and access. The inadequate access to the Internet on Campus seems to have resulted in low usage. According to Thompson and Connors (1998), the personal concerns of users if not addressed, would ignore learning new technology until they are addressed. Therefore there is the need for UCC to revamp its Internet infrastructure to enhance access.

The third conclusion of the study was that students' knowledge on the Internet is not complete. Students had fairly adequate knowledge on homepage and web address. However, they recorded low knowledge on Search Engines and Uniform Resource Locator (URL). It is therefore recommended that the ICT literacy course for first year students should adopt hands-on practical training approach to enhance teaching and learning of Internet.

Furthermore, the study concludes that the main use of Internet among the respondents was to interact with friends. Students did not subscribe to academic materials, participate in discussions or chat on the Internet. To enhance high academic achievement, students will need to use the internet to subscribe academic materials. For example, the Resource Discovery Network (RDN) provides a free service for resources for learning, teaching and the research community (Laudon, Trauer, & Laudon, 1996).

Since the study observed that most students do not have internet. The current policy of giving internet access to only academic staff and senior administrator should be expanded to include students. When this is done students would be given login accounts to access the Campus-wide Wi-Fi.

The Government should establish an initiative that will subsidizes internet connectivity for Education institutions in Ghana since it is very expensive. As at 2009, UCC pays $ 12,000.00 per month for 4 mbps duplex internet connectivity. This intiatiative should be similar in nature as the National Grid for Learning (NGfL), a UK government initiative aimed at connecting all schools to the Internet by 2002. NGfL had increased computing technology and Internet availability astronomically since the mid-1980s.( Hennessy & Dunham, 2001)

Furthermore, the University will need to develop regulation and guidelines with the private firms that have established Internet café in the halls of residence and others facilities close to the university. The guidelines could address the problem of cost and slowness of Internet services.

The study recommends capacity building for the Faculty on Internet use. Adika (2003) had earlier reported the low Internet usage among the Faculty in Ghanaian Universities. The capacity building can address the problem of inadequate local content on the internet since the faculty could develop and put more local information in their respective areas of specialization on the Internet. There should be the creation of databases and establishment of websites by Lecturers and online services to make the latest information available to students and obtaining their feedback.

The online services will facilitate the interaction between Lecturers and Students on the Internet where students will respond to lecturers on queries and specialised subjects ICT services. This will also provide up-to-date information, supplied to students as early as possible, about subjects such as course outlines, questions and answers.

Finally, the curriculum for ICT should include effective searching of information on the Internet.

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# CHALLENGES OF MANAGING INDIGENOUS KNOWLEDGE IN AN AFRICAN SETTING

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**Abstract**

*Indigenous knowledge is critical to the African culture and development. It manifests in agriculture, health, environment, etc. Unfortunately, its application in development is very limited because it is scattered, dispersed, unorganized, and reside mainly in the memories of the non-literate population sector of the society. Because indigenous knowledge is orally transmitted and predominantly tacit, it is difficult to capture, document and ascribe intellectual property rights to any single individual. These pose a lot of challenges to the use of indigenous knowledge in Africa. Some of the challenges include capture, documentation, organization, dissemination and archiving. The paper proffers solutions based on the application of information communications technologies (ICT) through digital capturing and archiving. The ultimate aim of applying ICT to IK is to provide a database of indigenous knowledge so that peoples living in developing countries, especially in Africa, can reap the benefits of indigenous knowledge.*

## Introduction

According to Gorjestani (1998), indigenous knowledge is defined "as the basis for community level decision making in areas pertaining to food security, human and animal health, education, natural resource management and other vital economic and social activities." Jain (2008) describes indigenous knowledge as being synonymous with cultural knowledge, environmental knowledge, community knowledge, local knowledge, traditional knowledge, farmer's or pastoralist knowledge, folk knowledge, traditional wisdom, traditional science, people's knowledge" UNESCO, Most and- Nuffic-CIRAN (2002) on best practices on indigenous knowledge provided a comprehensive description of indigenous knowledge as "the local knowledge that is unique to a given culture or society. It is a basis for local level decision making in agriculture healthcare, food preparation, education, natural resource management, and a host of other activities in rural communities".

From the definition and descriptions of indigenous knowledge (IK) above, IK is a cultural issue and generally peculiar to rural communities. Since rural inhabitants constitute the greater majority of every African nation, it is important for policy makers, planners and researchers to put a lot of emphasis on IK. This is because most decisions taken at the rural communities' level are mainly based on IK. However because of the tacit nature of IK, it is difficult to capture, document, organize, disseminate and archive. This is why documentation of IK should be the focus of policy makers, planners and researchers in Africa. But it is not straight forward. How can researchers and information professionals unlock indigenous knowledge from where it is locked away in the memories of elders in the communities, who are largely illiterate? This is the major poser to researchers and documentalists. Most of our day-to-day activities focus on health care, food security, conflict resolution and environment, etc, where instant decisions are required, either at rural or urban areas, there is therefore a need to integrate both IK and modern knowledge so as to make a well-informed decision. While modern knowledge is well documented and therefore constitutes explicit knowledge, unfortunately, IK is not. It is scattered, dispersed, unorganized, and reside mainly in the memories of the non-literate population sector of the society. IK is orally transmitted and predominantly tacit. This paper is divided into four sections. Apart from introduction, the other sections include: IK Documentation initiatives. This section aims to discuss the various initiatives made at documenting IK, both at global and national levels; IK Documentation strategies. This section attempts to describe the strategies for capturing, documenting and archiving IK and also presents the challenges; The last section proffers solutions to the documentation of IK in African countries.

**Indigenous Knowledge Documentation Initiatives**

Policy makers, researchers, planners, etc, have recognized the need to document IK. Many global initiatives have been put in place. International organizations and non-governmental organizations (NGO) are in the forefront of these initiatives. Jain (2008) has provided comprehensive descriptions of global and African IK initiatives. There are the Centre for International Research and Advisory Networks (CIRAN), UNESCO'S Management of Social Transformations (UNESCO-MOST) and UNESCO'S Local Indigenous Knowledge System (UNESCO-LINKS). MOST has been involved in the documentation of best practices on

indigenous knowledge through its database. CIRAN is involved in the documentation of IK by maintaining a website of IK. In co-operation with UNESCO, it maintains a database of best practices on indigenous knowledge. The International Institute for Sustainable Development (IISD), an NGO initiated a project entitled "Indigenous Knowledge and Innovation." The World Bank has also been supporting many organizations that are involved in IK documentation.

Apart from international organizations' involvement in the documentation of IK, there have been some initiatives from Africa as well. Ethiopia, South Africa, Tanzania, Ghana and Nigeria are the foremost countries in Africa in the documentation of IK. Several institutions exist in Ethiopia that are concerned with the documentation of IK. For example, the Ethiopia's Information Communications Technology for Development (ICTAD) promotes the dissemination and sharing of local knowledge. It assists the Government of Ethiopia in developing standards for computer based scripts for some major Ethiopian languages in IK related activities such as health and agriculture. Another initiative in Ethiopia is the Conservation and Sustainable Use of Medicinal Plants project in Ethiopia. The project supports the conservation, management and sustainable utilization of medicinal plants for human and livestock health care.

South Africa, through its National Research Foundation (NRF), publishes *Indigenous Knowledge Systems Newsletter*. NRF sponsors research activities in IK in South Africa, by promoting the role of IK in nation building and developing research capacity in IK in South Africa (NRF, n.d.). The North West University in South Africa has provided for the training and capacity building in IK in its curriculum. It is termed *IKS learning, research and Community programmes*. The main objectives of these programmes are to promote IK and sensitize students to the realities of indigenous knowledge systems. Many other South African universities are also involved in the documentation of IK such as the University of KwaZulu-Natal and the University of Johannesburg.

The Tanzania Development Gateway has a number of databases on indigenous knowledge in Tanzania. Many institutions that produce different databases on IK are co-ordinated by the Tanzania Development Gateway. It maintains databases on indigenous technologies, traditional healers, medicinal plants and indigenous plants.

The Centre for Indigenous knowledge Systems (CEFIKS) based in Ghana was established in 2000 to record, preserve and disseminate information about

indigenous knowledge systems; serving as a clearing house of indigenous knowledge systems in Ghana; and supporting and advocating the use of indigenous knowledge systems in the socio-economic development and the region of West Africa. The centre publishes *Indigenous Knowledge and Development Monitor.*

In Nigeria, the African Resource Centre for Indigenous Knowledge (ARCIK) based at the Nigerian Institute of Social and Economic Research (NISER), Ibadan, Nigeria is concerned with the documentation of IK in Africa. It captures IK on social, economic, political, cultural and technological lives of African societies. The University of Ibadan has been making efforts to document IK through its Department of Library, Archival and Information Studies. Students as part of their training, are expected to collect, document ad preserve oral IK (Mabawonku, 2002). Unfortunately, the IK collected is not widely disseminated. The tapes could only be found in the department.

**Indigenous Knowledge Documentation Strategies**

From the previous section, it is evident that only few countries in Africa are involved in the documentation of IK. The whole of Africa has to be involved in the documentation of IK given its importance in the development of the continent. The aim of this section is to discuss the strategy for documenting IK, challenges and how many more countries in Africa could be involved in the documentation of IK.

As already stated, the documentation of IK is difficult because it is a tacit knowledge. It resides in the memories of people and among largely illiterate people, so the process is obviously tasking. What are the issues involved in the documentation of IK? The whole process of IK documentation is to make it widely available and accessible, hence the need to document but given its nature, certain steps have to be taken. The process of documentation of IK involves the following: capture, organization, dissemination and archiving. Since documentation is IT driven, the section will also discuss how ICT can accelerate the process of documentation of IK.

**Capture of Indigenous Knowledge**

According to Jain (2008) "oral method is the most important information gathering and sharing method in IK". Oral method includes storytelling, folklore, proverbs, festivals, dances, cultural rituals and demonstrations. Some of the capturing methods include audio and video-recording, translation /transcription and interviews.

In order to capture IK it is important to interact with those that have the knowledge of the past in their memories and how the knowledge has been passed from generation to generation. This will involve interviewing the chiefs, elders, herbalists, etc, of the community. Also, agricultural practices that have evolved over the years would have to be demonstrated for it to be captured. Such interviews and interactions must be recorded both in audio and video. Apart from interviewing elders, festivals, cultural rituals, storytelling, would have to be audio recorded and videotaped. Since the interview will be in local dialect /language, the tapes produced would have to be transcribed into the official language of each nation, English, French or Arabic depending on the official language of the country. After the transcription/translation it would be word-processed using Microsoft Word. This is a commonly available soft ware. Alternatively, it can be captured directly by using digital camera. The knowledge would be available both in electronic and hard copies. It should be emphasized that there are a lot of challenges. The most prominent being the secrecy that is associated with most of the festivals and cultural rituals that are performed in the rural areas. Thus, interviewing and interaction with elders, chiefs and herbalists have to be holistic and well co-ordinated. Government officials at local level need to be involved in convincing the stakeholders in the rural areas on the importance of documenting IK. Mabawonku (2002) listed some of the challenges involved in capturing IK as follows: several traditional rites are prevented from being discussed, women are prohibited from hearing or seeing some of the rites, suspicion of the 'outsider," information is held in top secret passed only to offspring sand apprentices and validating the information collected.

It is important that each piece of IK documented must be corroborated by making it available to other elders in the community to ensure the veracity of it.

**Organization of IK**

Even when IK has been documented, it is still scattered and until it is organized, it would not be readily available. Thus researchers, experts and information professionals have to ensure that IK is organized. This will involve creating a metadata containing various key words that can be used in describing the IK captured and providing brief description and how it can be located. Metadata is access system tool. It describes the structure of the content data. According to Groff and Jones (2003), metadata is the key component to allowing effective information retrieval. By describing the essential aspects of a text, such

as author, language, subject, publication, popularity rating, and revision dates. Metadata improves the precision of searching. The metadata can be stored directly within the document, that is, the full texts. Experts, researchers and information professionals have to agree on a thesaurus to be used to describe each piece of IK collected. This may be the in the form of a catalogue or an index. The description will include keywords ascribed to the IK, provider of the IK, location of the IK, date when it was created, etc. The catalogue would be available in both hard copy and electronic copy. In addition, databases of related types of IK would be built up using one of the Microsoft suites, MS-Access. This is very suitable in building up databases as one can easily access related pieces of IK on a particular topic. In organizing IK, the major problem, however, is to whom to ascribe the intellectual property. Since indigenous knowledge belongs to the whole community, it cannot be assigned to any individual, whether the interviewee or interviewer. This is one area that there is yet to be a consensus on how to ascribe intellectual property.

**Dissemination**

No matter how organized IK is, if it is not disseminated widely, it would not be accessible, as many researchers, experts and policy makers will not know of the existence of such documents. Many organizations have adopted the publication of newsletters which will be circulated as widely as possible. Another method is to integrate IK databases with existing online databases based on the various disciplines. Aggregators would be expected to integrate IK with other formats of information in an online environment.

A common method is also to provide abstracts of IK on the website of the organization responsible for the documentation of IK. A discussion group on IK can also be maintained for various disciplines through which experts can provide opinions on IK.

**Archiving**

Given the fact that documentation of IK is a laborious and costly activity it is important that whatever that is documented needs to be preserved for generations yet unborn. This is why it is necessary to digitally preserve IK. According to Digital Preservation Coalition (DPC) (2002), digital archiving is referred to as the process of creating backup as an ongoing maintenance activity" It is important to ensure that there is no technological obsolescence as upgrading of operating systems and programming languages might make IK inaccessible.

Another challenge in digital preservation is the deterioration of digital media. Thus, a policy must be put in place that will ensure continuous migration from one technology to another as new one emerges. Zulu (2008) has listed the International Federation of Library Associations and Affiliated Institutions (IFLA) and UNESCO, as major organizations that are concerned with digital preservation. These organizations have issued guidelines for digital preservation. South Africa has been a major player in digital preservation in Africa, through its Digital Imaging Project of South Africa (DISA). The main objective of the organization is to use digital technologies to ensure that scholars access South African materials.

**Conclusions and Recommendations**

This paper has highlighted the importance of IK in Africa and the need to document and preserve IK for generations yet unborn. While many initiatives have been taken on the documentation of IK in Africa, there is no doubt that only few countries in Africa have appreciated the importance of documenting IK. Yet IK abounds in many countries in Africa but they are locked away in the memories of elders. In particular, herbalists tend to restrict IK to members of their immediate families, who because of modern knowledge are barely interested in indigenous knowledge, thus, when these herbalists pass on, the knowledge is lost forever. In order to avoid this unpleasant situation it is important to document IK. Strategies for documenting and preserving IK have been provided in this paper. This paper recommends that many more countries in Africa should be involved in the documentation of IK.

IK has to be made a continental issue if success will be achieved in this regard. Fortunately some of the objectives of the African Ministerial Council on Science and Technology (AMCOST) are to promote linkage between formal research and development institutions and holders of indigenous knowledge and technologies, increase intra-African sharing and application of indigenous knowledge and technologies to solve specific problems; and improve the continent's capacity to protect indigenous knowledge and technologies from piracy and related misappropriation (AMCOST, 2006). Thus, each nation has to be sensitized on the need to promote and document IK. Within each nation there must be a co-ordinating body that is responsible for the promotion and documentation of IK. Such a body should encourage learned societies, universities, research institutions and non –governmental organizations to capture and document IK in their disciplines, sectors and other areas of interests.

Each organization involved in the documentation of IK should make it available to the national coordinating body, which shall be responsible nationally and internationally for the dissemination and archiving of IK. Each national coordinating body must maintain databases of IK in relevant fields. Also, a website of abstracts of IK must be maintained by the national coordinating body, which must be regularly updated. The full texts of IK must be maintained and preserved by the coordinating body. ICT is an important factor in the documentation of IK and efforts must be made to ensure that all experts and researchers in IK have relevant IT skills so that they can benefit from IK. In addition, hardware/software and other necessary ICT facilities including digital camera must be subsidized by each government so as to make these facilities widely available. This is the path to sustainable development in Africa.

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# THE WEB AS A MEDIUM FOR COMMUNICATING RESEARCH WORKS FROM AFRICAN UNIVERSITIES: CASE STUDY OF A NIGERIAN UNIVERSITY

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**Abstract**

*Research publications from Universities in Africa are not easily obtainable. The point is made in this paper that the world-wide-web (the web) provides an efficient means of communicating research works from Africa to the outside world. This paper seeks to determine the extent to which such works are made available on the web and if they are visible by using a typical Nigerian university as a case study. The number of research works owned by the academic staff sampled is compared with the corresponding number found at the website of the university. Research works found on the website are evaluated for web visibility. The findings lead to recommendations that would ensure that research findings from Africa are effectively communicated using the web and areas for further research are highlighted.*

## Introduction

Hitherto, the challenge for researchers in many African institutions had been access to timely and relevant publications both from within their immediate regions and the world at large. The 1990's witnessed an upsurge in efforts to solve this problem. One of such was the collaboration between African, American, Canadian and British Universities in 1992, to create the African Educational Research Network (AERN) with the aim of coordinating efforts to support research capacity building in African universities and to increase access of the Northern universities to the information resources dealing with educational development in Africa (Ploghoft, 1995). In Nigeria, the National Documentation and Information Centre for Sciences and Technology (NADICEST) Project was founded in 1985 and one of its tasks was to create an

inventory of Science and Technology Information (STI) resources in Nigerian libraries (Ike, 1992). At this time, Ike (1992:2) had expressed the fear that "research scholars working in such information isolation may be engaged on wasteful duplicated research programmes". Though this statement was made in the context of access to research information that is outside the researcher's immediate locality, the same is true for access by both local and international researchers to research output generated from within Africa.

This paper outlines the problem of communicating research works from Africa to the world at large and presents the web as an effective medium for doing this. The case study undertaken to explore the extent to which research works at a typical Nigerian university are being communicated using this medium is presented, and recommendations necessary for fast-tracking the communication process are made.

**Problem of Communicating Research Works from Africa**

Due to availability of well managed centralized electronic databases, computerized cataloguing, online indexing, and the Internet, researches from the more advanced countries are better able to communicate their research findings. However, the Association of African Universities (AAU) notes that "African research results are rarely indexed in major international databases" and that "the inability to learn about and access African material is frustrating to students and scholars both on the continent and overseas" (The DATAD Initiative). When literature reviews are being done, there is a paucity of cases or data from within Africa that can be cited. Requests for information on research outputs from Africa by researchers on the international scene (Mejabi, 1995) are difficult to meet because most of the reports are in the traditional printed form in library shelves.

Some disadvantages of not communicating the research works from Africa include:

- Duplication of research work and consequent waste of scarce resources.
- Ease of plagiarism
- Incomplete literature reviews
- Promotion of the notion that there is very little research of note being done in Africa
- Low ratings on citation evaluations.

As part of its contribution towards bridging this gap, the AAU, since 2000, has coordinated the Database of African Theses and Dissertations (DATAD) programme. The objective being to improve the management and access to African scholarly work by focusing on the indexing, abstracting and distribution of theses and dissertations completed in African universities. One of the programme's long term objectives is to provide visibility and improve accessibility to the work of African scholars both within and outside the continent. Access to the full content of DATAD is available only by subscription and maintenance is a challenge going by the "call for consultancy ... concerning the new development of DATAD" which was posted on the AAU website in June 2008, as well as keeping the registration page for access to the database through the AAU website accessible 24/7. Over the years, a have compilation of print bibliographies and a few computerised databases by a number of individual universities have not been sustained (The DATAD Initiative).

Even when databases such as DATAD are created, effectively communicating the content for global reach is still a challenge. This is where the Internet and the World-Wide-Web (the web) becomes the medium of choice. Digitalized information is easy to disseminate and can be used in many different ways over and over again. Due to the global infrastructure that is the Internet, existing digitalized information that is properly uploaded becomes a large distributed virtual collection that is available at anytime to anyone who surfs the web.

There is, therefore, the need for information generated from within Africa, especially the output of academic research, to be made easily available on the global scene. A cost-effective way of doing this is to utilise the websites of African Universities. Since "visibility" and "rich files" are a major component of the web ranking of universities (accounting for 70% of the total weight) by Webometrics (Liu & Cheng, 2009), listing the publications of academicians and linking each cited work to its abstract or the full paper provides a cheap means of making such works accessible to others while improving the ranking profile of that university. The National Universities Commission (NUC), Nigeria, began sensitizing Nigerian universities to embark on this exercise, including the systematic digitization and upload of academic works cleared for non-copyright violation, since 2006.

**The Web as a Medium of Communication**

The web is organised as a client/server information dissemination system. The web has many possibilities for information, communication, and interaction and those who shape communication on the web require knowledge and skills in combining language, text, graphics, sound, movies, and hypertext. (http://www.december.com/web/develop/character.html)

According to Cloninger (2000), the web is first and foremost a medium of communication in contrast to a computer which is just a tool and not media, though it can read media, make media, display media, and broadcast media. He notes that the web is a global network of connected people and thus the content of a website has to be useful to the site's audience and written in a "narrative voice" similar to "story-telling" because story-telling is still the most effective way to emotionally impact people.

Most Internet surfers, including scientists, use search engines to recover information which is as much as 95% with Google (Aguillo, 2009).

The web offers the following features and advantages (Schnell, 1996; http://www.december.com/web/develop/character.html) –

- Location and time – Content on the web is accessible everyday, anytime, anywhere in the world as long as an Internet web browser is available and there is no server or network downtime.
- Associative linking – Web based hypertext fosters interlinking that connects works to networks of meaning and association resulting in links from one web work to another that is "live". Authors can create works with paths through hypertext that can strongly bind their works to others on the web.
- Distribution – Content on the web much like the Internet that has no "top", is distributed in a non-hierarchical manner. Content which is originally scattered among the many networks of the internet is further scattered among the many web servers on those networks, and the many individual webs on those servers.
- Storage and Copies – Compared to traditional documents that are bound by physical constraints of the printed form and which are accessible at physical libraries, web works which are stored electronically, can be available in unlimited copies to any web user at any time.

Schnell (1996) observed that electronic bibliographies designed for local use can be made available to the world via the web while Internet resources referenced in web documents can be updated as the resources move, change names, or are deleted. She also noted that works in progress can be made available for colleagues to comment on content and structure.

From the foregoing, it is clear that Universities in Africa and their academic staff need to embrace this medium for communicating their research works. An effective strategy for communicating these works from the universities is by listing all publications by academic staff on their respective university web sites and hyper-linking each citation to the full publication or its abstract or the URL if the journal is online, while respecting extant copyrights. Since most universities in Nigeria have their own websites, an examination of one of them was undertaken in order to have an indication of the extent to which academic staff are availing themselves of this channel of communication. The universities were sensitized on this strategy, in 2006, by the National Universities Commission (NUC), Nigeria. A university with strong web presence, as ranked by Webometrics (www.webometrics.info) and 4ICU (www.4icu.org), was selected as a case study.

**The Case Study**

The principal focus of the case study was (1) to determine the gap, if any, between the number of publications owned by respondents and the number listed on the university web site, and (2) to determine the number of such publications that were visible on the website.

The data collection was in three stages. Stage one involved the administration of a simple questionnaire which had the following two items –

1. Category: Please tick appropriately in the parenthesis below –
   Professor/Reader ( ) Senior Lecturer ( ) Lecturer I / II ( )
2. Please indicate in the space below, the total number of published journal articles that you have.

The number of journal articles listed for the respondent on the university website was noted in the second stage. The third stage, involved checking each listed publication for visibility. For the purpose of this study, a publication was regarded as visible if a hyperlink on the citation led to either an abstract or the full paper. In some instances, there were hyperlinks that led to

error pages. The numbers from the three stages were tabulated under the headings: Actual (stage one), Web (stage 2), Visible (stage 3).

Questions of adequate sample size and representativeness are usually not of primary importance in an exploratory study (Green & Tull, 1990) and given the time spent browsing the web for stage two and three, a sample size of 50 academic staff across the three cadres shown in Table 1 was deemed adequate for the study. Respondents were drawn on a convenience basis until the quotas for the various cadres as shown in Table 1, were met. The questionnaire was administered in person.

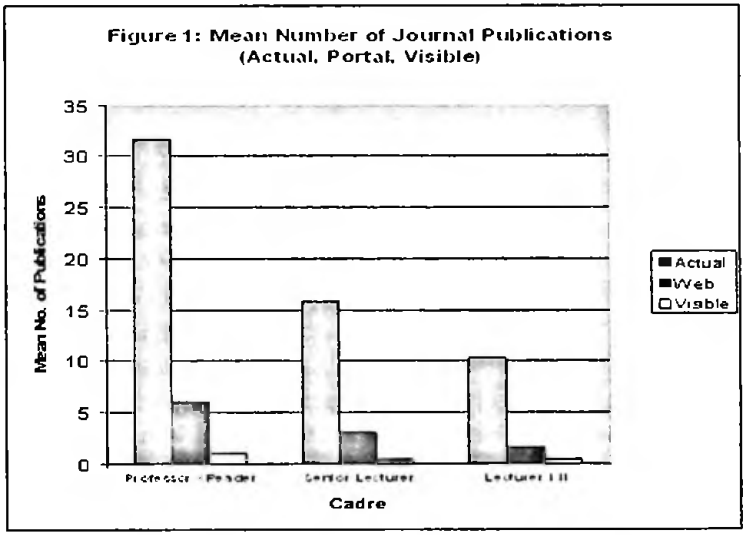
**Table 1: Distribution of Sample**

| CADRE | Frequency | Percent |
|---|---|---|
| **Professor/Reader** | 10 | 20.0 |
| **Senior Lecturer** | 18 | 36.0 |
| **Lecturer I/II** | 22 | 44.0 |
| **Total** | **50** | **100.0** |

The mean number of publications for each cadre as declared by respondents (actual), found on the university website (web), and the number of the publications found on the website which were visible as abstracts or full papers (visible), are shown in Table 2 and presented as a bar chart in Figure 1.

**Table 2 – Mean Number of Publications by Cadre and Location**

| Location | Cadre | | |
|---|---|---|---|
| | **Professor/Reader** | **Senior Lecturer** | **Lecturer I / II** |
| **Actual** | 31.70 | 15.83 | 10.27 |
| **Web** | 6.00 | 3.00 | 1.55 |
| **Visible** | 1.00 | 0.33 | 0.41 |




The graphical representation in Figure 1 shows a dramatic gap between Actual and Web listings and visible publications, across all cadres. The gap is even more dramatic for the professorial cadre.

The data was further analysed using the paired T-test and the results are summarised in Tables 3, 4 and 5 for the Professorial/Reader cadre, Senior Lecturer cadre and Lecturer I / II cadre respectively. The results show significant differences in the means of the pair of Actual and Web and the pair of Web and Visible for each of the cadres.

**Table 3 – Results of Paired Sample T-test for the Professorial Cadre**

| | | Paired Sample Correlations | | | Paired Samples Test | | |
|---|---|---|---|---|---|---|---|
| | **Pairs** | **N** | **Correlation** | **Sig.** | **t** | **Df** | **Sig. (2-tailed)** |
| Pair 1 | Actual - Web | 10 | .825 | .003 | 20.311 | 9 | .000 |
| Pair 2 | Web - Visible | 10 | .272 | .447 | 3.000 | 9 | .015 |

**Table 4 – Results of Paired Sample T-test for the Senior Lecturer Cadre**

| | | Paired Sample Correlations | | | Paired Samples Test | | |
|---|---|---|---|---|---|---|---|
| | **Pairs** | **N** | **Correlation** | **Sig.** | **t** | **Df** | **Sig. (2-tailed)** |
| Pair 1 | Actual - Web | 18 | .411 | .090 | 4.433 | 17 | .000 |
| Pair 2 | Web - Visible | 18 | .400 | .100 | 5.351 | 17 | .000 |

**Table 5 – Results of Paired Sample T-test for the Lecturer I/II Cadre**

| | | Paired Sample Correlations | | | Paired Samples Test | | |
|---|---|---|---|---|---|---|---|
| | **Pairs** | **N** | **Correlation** | **Sig.** | **t** | **Df** | **Sig. (2-tailed)** |
| Pair 1 | Actual - Web | 22 | -.068 | .765 | 7.109 | 21 | .000 |
| Pair 2 | Web - Visible | 22 | .228 | .307 | 3.306 | 21 | .003 |

The results confirm the following:

(1) A significant gap exists between the number of publications owned by respondents and the number listed on the university web site.

(2) A significant gap exists between the number of such publications listed on the university web site and the number that was visible and therefore useful as an information source.

These gaps are quite pronounced for the professorial cadre and the implication is that the rich research output characteristic of this cadre has not been effectively communicated using the university web site and unless some of these works reside in other online repositories, they are effectively not available to others.

**Recommendations**

From the foregoing sections and the findings from the case study, the following recommendations are being made:

(a) As a first step, web sites of universities in Africa should have listings of complete and up-to-date publications by their academic staff using the usual standards for referencing. Without violating publisher's copyrights, each cited publication should be hyperlinked to the complete publication or at the least, the abstract. For sustainability, academic staff should take responsibility for the up-to-date content of their works on the web.

(b) An annual or better still, a quarterly summary of published research works by academic staff and students, with hyperlinks to the publications, written in compelling "story-telling" style should be placed on university websites.

(c) The DATAD programme should be embraced by all universities in Africa as a repository for theses and dissertations emanating from African universities. To this end, the AAU should consider making access to the brief citations seamless (without the need for login and available to online search engines). Also, effort should be made to ensure that an online version of the abstracts is readily searchable by the common web search engines.

(d) The various national controlling bodies for universities, such as the National Universities Commission in Nigeria, and / or the AAU should look into the creation of a Database of Abstracts of Research Works from Africa.

(e) Journals published by African universities should subscribe to the relevant indexing / abstracting sources such as Scopus, Elsevier Bibliographic Databases, EMBASE, DOAJ, etc, so that the content would be visible worldwide. Librarians should champion this.
(f) African universities should consider publishing online open source journals instead of the traditional printed format.

**Areas for Further Research**

A limitation of this study is that only one university in Nigeria was examined. An area for further research would be to study a representative sample of universities in Nigeria and even across Africa. Furthermore, a study of how visible research works from Africa are, could be undertaken using a more rigorous definition for visibility such as how much of these works are "hit" when relevant keywords are entered into common search engines such as Google. A study of the extent to which the "narrative voice" is used to communicate research findings through the African university websites could also be undertaken.

**Conclusion**

The web has opened up opportunities for a cost-effective way of communicating the research works from Africa. Effort should, therefore, be made by African universities and their academic staff to avail themselves of this medium and ensure that research works from within their universities are effectively communicated by ensuring that an up-to-date listing of publications, properly hyperlinked to content, are available on their websites. The work of the AAU on DATAD, if sustained with vigour and the database made easily accessible through common web search engines, is a breakthrough pathway for success in communicating the dissertations and theses from African universities.

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# SECTION FIVE

# SCIENCE

# PRELIMINARY STUDIES ON COASTAL HYDROGRAPHY OF GHANA, WEST AFRICA FROM 1974-2004

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**Abstract**

*A preliminary reconstruction of hydrographic events in coastal waters of Ghana from 1974-2004 based on time series of sea surface temperature, wind speed and salinity were carried out to assess the possible occurrence of extreme events in local environmental forcing for the past three decades. The environmental data sources were from the Marine Fisheries Research Division (MFRD) in Tema, and Ghana Meteorological Agency. Mean monthly environmental data were analysed using Ocean Data View (ODV) software 3.1.0 version. There was indication of cooling cell along the west coast usually intensive off Half Assini (30 km) – Takoradi (185 km) waters (west-coast major cooling cell), and another cell along the east coast usually intensive off Winneba (330 km) - Keta (545 km) waters (east-coast major cooling cell). The coastal wind ODV analysis indicates two main wind speed sections along the coast of Ghana: the west coast wind (WCW) section, which is low speed range (1.0–4.0 ms-1); and east coast wind (ECW) section, which is high speed range (4.5–12.0 ms-1). The persistent intersectional zone of WCW and ECW occurred at the Saltpond (270 km) – Winneba (330 km) coastline suggesting a possible occurrence of ocean front in this area. Time series analysis of salinity data indicates low salinities at the west coast of Ghana (usually Half Assini -30 km, Axim -105 km and Cape Three Points -135 km) between May-June and August-September.*

*The preliminary evidence gathered in this study seems to show indirect relationship of the three local environmental parameters. The east coast cooling cell might be controlled by high wind speed that dominates the east coast of Ghana. The west coast cooling cell is likely to be controlled by heavy rains in the west coast region which bring about cooling in surface temperatures (and decrease in salinity) during the major cooling season along the west coast of Ghana. This suggested that the effect of wind on the west coast cooling might not be so important.*

## Introduction

The coast of Ghana has a coastal length of approximately 550 km, a continental shelf area of 23,700 km$^2$ and an exclusive economic zone (EEZ) of 235,349 km$^2$ (Horemans, 1996; FAO, 1998; Froese & Pauly, 2006). The prevailing current at the West African coastline, the Guinea Current (GC), influences the nearshore conditions off Ghana (Binet & Marchal, 1993). The wind system acts on the water masses and creates two upwelling periods during the year, usually between July and September (major upwelling) and between January and March (minor upwelling) (Pezennec, 1984; MFRD, 1988). Normal upwelling occurs when the surface temperature reduces to 25 °C and intense cooling occurs when the sea surface temperature (SST) during the cooling season reaches 22 °C in the coastal waters of Ghana (FRU, 1981; MFRD, 1990). Binet and Marchal (1993) recapped the overlay of the GC which flows eastwards on the Guinea Under Current (GUC) which flows westward as reported by Lemasson and Rébert (1973) in the Gulf of Guinea. The intersection of GC and GUC was located off the Ghanaian coast.

The abundance of fish is partly due to the upwelling events in the Gulf of Guinea. The upwelling creates a congenial environment as a result of nutrient-rich water masses welled up into the euphotic zone (Armah & Amlalo, 1998) for increased primary production and subsequently food for higher trophic levels and hence high fish production. Koranteng and McGlade (2001) identified climatic periods that had remarkable synchrony with the events that have occurred in the fisheries in continental shelf waters of the Western Gulf of Guinea. Bakun (1993) suggested two divergent scenarios of climate change in the Gulf of Guinea: a) long-term intensification of coastal upwelling that may be related to global climate change; and b) global climatic teleconnections to the Pacific El Nino Southern Oscillation (ENSO) system.

The objective of this study was to find out whether there had been marked or extreme events in local environmental forcing for the past three decades in the coastal waters of Ghana. With this notion, preliminary reconstruction of hydrographic events in coastal waters of Ghana from 1974-2004 based on time series of **SST, wind speed and salinity** were carried out.

## Materials and Methods

The daily sea surface temperature (SST) and beach salinity data used were from the Marine Fisheries Research Division (MFRD) of Ministry of

Fisheries in Tema, Ghana. The SST and salinity data were taken from eight recording stations spread along the Ghanaian coast between 1974 and 2004. Daily SSTs were recorded directly from the sea, and water samples were collected daily for the analysis of salinity employing an inductive salinometer by MFRD field recorders. The MFRD recording stations from west to east end of Ghana include: Half Assini (30 km), Axim (105 km), Cape Three Points (135 km), Takoradi (185 km), Elmina (230 km), Winneba (330 km), Tema (415 km) and Keta (545 km) (Fig. 1). Salinity records were incomplete in some stations and years (Figs. 4 a-c). Between 1984 and 1995 salinity records were from Tema station; and in addition to Tema station there were records from Cape Three Points in 1990, and Keta in 1986 to 1988. The daily wind speed data from 1974 to 2004 used were obtained from Ghana Meteorological Agency. They were recorded from six meteorological stations spread along the coastline of Ghana. The stations from west to east end of Ghana include: Axim (105 km), Takoradi (185 km), Saltpond (270 km), Accra (390 km), Tema (415 km) and Ada (490 km) (Fig. 1).

Monthly means of SST, salinity and wind speed were calculated from the mean daily records. Time series of mean monthly environmental data for each year were analysed using Ocean Data View (ODV) software 3.1.0 version (Schlitzer, 2006). The ODV analyses were presented in three groups of periods for each environmental parameter: a) 1974-1985, b) 1986-1997, and c) 1998-2004. These period groupings were only convenient for representing the numerous ODV output figures for the 31 year period.

**Results**

The time series plots in Figs. 2 - 4 consist of recording stations (km), time (months) and SST (°C), wind speed (m/s) or salinity (‰). Each graph shows plots of an environmental parameter averaged from daily records for each month over the seasonal period from January to December along the coast of Ghana. Each station distance indicated on the plots represents the approximate distance measured from the western tip of Ghana (that is, the boundary between Côte d'Ivoire and Ghana or reference point) to the recording station along the coast (Fig. 1). The environmental parameter scales were standardized as follows: each SST plot ranges from 17.0 to 31.5 °C (Figs. 2 a-c), wind speed plot 1.0 - 12.0 $ms^{-1}$ (Figs. 3 a-c) and salinity plot 24.0 - 38.0 (Figs. 4 a-c). In the SST plots, the intensity of grey colour indicates the intensity of cooling along the coast of Ghana. In the case of wind speed plots, there are two sections partitioned by intersection zone

(occurred between Saltpond – 270 km and Winneba – 330 km). The darkest grey portions above the intersection zone indicate areas of high coastal winds and the darkest grey portions below the intersection zone are the areas of low wind speeds. The tainted grey portions above the 200 km alongshore station in the salinity plots indicate areas of high salinity and the dark grey portions below the 200 km station are the low salinity areas.

The analysis of the SST data indicates two cooling cells along the coast of Ghana (Figs. 2 a-c). One cell occurred in the west coast usually intensive off Half Assini (30 km) – Takoradi (185 km) waters (termed west-coast major cooling cell), whereas the other cell occurred at the east coast usually intensive off Winneba (330 km) - Keta (545 km) waters (termed east-coast major cooling cell). From the SST plots, the cooling during the major upwelling usually started in May and ended in October but intensified in July-September. The duration of cooling along the coast of Ghana varied from year to year. There were seasons that had extended cooling periods and other seasons with short duration of cooling along the coast of Ghana. In 1976, 1977, 1978, 1980, 1981, 1991 and 1995, the intense cooling concentrated at the west coast; and that of 1982, 1983 and 2004 occurred mainly at the east coast. In 1975, 1984-1986, 1988-1990, 1992-1994 and 1997-2003 intense cooling were recorded on both sides of the coast. The sea temperatures recorded were unusually high in 1979 and 1987 and therefore the cooling intensities were minimal along the coast. The sea temperature plots of 1974, 1983, 1984, 1988-1990, 1996, 1998, 1999, 2003 and 2004 showed intrusion of high temperatures during minor cooling period. Sea temperature range in the period 1974-2004 was 17.23-31.12 °C.

The ODV analysis of wind data indicated two main wind speed sections along the coast of Ghana (Figs. 3 a-c). These were:

i. west coast wind [WCW] section, which is, low speed range (1.0–4.0 m/s);
   and
ii. east coast wind [ECW] section, which is, high speed range (4.5–12.0 m/s).

The meeting zone of WCW and ECW usually occurred at the Saltpond (270 km) – Winneba (330 km) coastline. Occasionally, the meeting zone occurred closer to either Takoradi or Accra (390 km) – Tema (415 km) coastline (Figs. 3 a-c). The wind plots in 1974-79, 1983-84, 1986-89, 2000 and 2004 indicated strong wind fields along the east coast which usually occurred along Accra - Tema coastline.

The strong wind fields along east coast were identified in both minor and major cooling periods. The 1976, 1977, 1979, 1986, 1988-90 and 2000 wind plots indicated weaker wind fields during the minor cooling period than during the major cooling period. In 1983, 1986 and 2004 the strong wind fields at the east coast extended to further-east towards Togo waters. Coastal wind speed range in the period 1974 - 2004 was 1.1 - 12.0 $ms^{-1}$.

The time series analysis of salinity data indicated that low salinities occurred at the west coast of Ghana (usually Half Assini -30 km, Axim -105 km and Cape Three Points -135 km) between May-June and August-September. The low salinity conditions were extended to November-December in 1974, 1979 and 1980-82. Coastal salinities on the east coast of Ghana generally remained high (Figs. 4 a-c). There were indications of low salinities during the minor cooling season at the east coast in 1981, 1985, 1994, 1997, 1998, 2000 and 2002-2004. Coastal salinity range in the period 1974-2004 was 25.1 ‰ –38.0 ‰.

**Discussion**

Environmental data sources were from Marine Fisheries Research Division in Tema, Ghana and Ghana Meteorological Agency over the period 1974-2004. Due to incomplete salinity data in some stations there were breaks in the salinity trend from 1984-1995 in the ODV analysis. Nevertheless, the time series analysis of SST, wind speed and salinity along the coast of Ghana for the 31-year period in the present study is a baseline work on coastal hydrology in Ghana and has provided an insight into the driving force of coastal cooling which had not been fully explained. Since the information was from surface data, it will be more expedient to conduct a detailed oceanographic survey to verify this assertion on cooling in coastal waters of Ghana (Gulf of Guinea). In fact, the cause of upwelling in the Western Gulf of Guinea of which the Ghanaian coast is part has been an issue of research but there has not been any acceptable explanation to the mechanism of this upwelling as it does not follow any of the classical types (Armah & Amlalo, 1998).

The 1979 unusual high temperature during the major cooling period does not synchronize with the identified strong wind field in that season (where weak wind field was expected in that scenario). The 1979 observation in sea temperature and wind is not easy to explain with the available data. Nevertheless, there were similarities in sea conditions in 1979 and 1987 which tended to synchronise the dynamics of triggerfish (Aggrey-Fynn, 2008) and

sardines (Fishbase) in coastal waters of Ghana. This may suggest there was influence of local environmental forcing on coastal fishing.

The main question pursued in the present study was whether there had been marked or extreme events in local forcing for the last three decades in the coastal waters of Ghana. It was indicated in ODV analysis that cooling along the coast of Ghana had varied from year to year and it is likely to be controlled by local and remote forcing. Possible local environmental parameters that might influence cooling events in Ghanaian coastal waters could be of a wide range, however, for the present study only sea temperature, coastal wind speed and sea salinity were considered. Sea surface temperature, wind speed and sea salinity were used because of the availability of data for nearly three decades. The remote forcing influence had been previously linked to El Nino-Southern Oscillation (ENSO) in the Pacific (Bakun, 1993) and oceanic interconnections between western and eastern parts of Atlantic (Koranteng & McGlade 2001). Houghton (1976) had reported on sea surface temperature conditions further offshore the coast of Ghana and concluded that it does not go below 25 °C and that the cold dense water is only confined to the continental shelf of Ghanaian waters which suggests the effect of wind on Ghanaian waters is more or less coastal rather than offshore. The preliminary evidence gathered in this study seems to show indirect relationship of the three local environmental parameters in the ODV analysis. It suggests the east coast cooling cell (Figs. 2 a-c) is controlled by high wind speed (Figs. 3 a-c) that dominates east coast of Ghana. This further suggests that the extent of intense cooling along the east coast for a season will depend on the 'strength' or speed of the prevailing wind. The time series of hydrographic data (Figs. 2 a-c and 4 a-c) indicates another cooling cell along the west coast which is likely to be controlled by heavy rains in the west coast region which bring about cooling in surface temperatures (and decrease in salinity as indicated in Figs. 4 a-c) during the major cooling season along the west coast of Ghana. From ODV analysis it seems the effect of wind on the west coast cooling might not be so important since the wind speed recorded along the western coastal meteorological stations never exceeded 4.0 $ms^{-1}$ from 1974 to 2004 (Figs. 3 a-c). This may suggest that the intensity of the west coast cooling might depend on the surface water cooling as a result of heavy annual coastal rains in the southwestern forest area of Ghana. These coastal rains which are likely to control the west coast major cooling off Half Assini (30 km) – Takoradi (185 km) might have a link to the relative abundance of fish in Half Assini, Axim (105 km), Cape

Three Points (135 km) and Takoradi waters (MFRD, 1988; Koranteng & McGlade, 2001).

The 1974, 1983, 1984, 1988-90, 1996, 1998, 1999, 2003 and 2004 intrusion of warm water during the minor cooling season is difficult to explain from the linkages of sea temperature, wind speed and salinity. The exact reasons for differences identified in wind intensities in minor and major cooling periods at the east coast in 1976-79, 1986, 1988-90 and 2000 could not be figured out from the available information. Again, it is not easy to explain the strong wind fields identified in 1983, 1986 and 2004 that extended further east to Togo coastal waters. The consistent formation of wind-intersection of high ECW and low WCW along Saltpond (270 km) - Winneba (330 km) coastline may suggest the occurrence of surface fronts and its persistence from 1974-2004 (Figs. 3 a-c) therefore, indicates the formation of convergence zone and its link to abundance of fish off Saltpond-Winneba waters (Aggrey-Fynn & Bannerman, in prep.). It is known that surface fronts are delineating boundaries between different surface water types which when persistent over a significant time frame is associated with a convergence zone (Bakun, 2006) and the resulting multi-trophic blooming productivity, hence possible high abundance and diversity of fish eggs and larvae (Ekau & Verheye, 2005). The intersection of GC and GUC as located off Ghanaian coast (Binet & Marchal, 1993) can be said in this preliminary study to occur off Saltpond-Winneba waters.

The three decades of hydrographic data analysed in this study provides insights into coastal wind pattern and extreme events in sea temperature which might be very useful to fishery scientists to interpret other unexplained fisheries and oceanographic events such as the out-of-phase fluctuations of *Sardinella* and triggerfish that had occurred in Ghanaian coastal waters in the past.

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## FIGURES

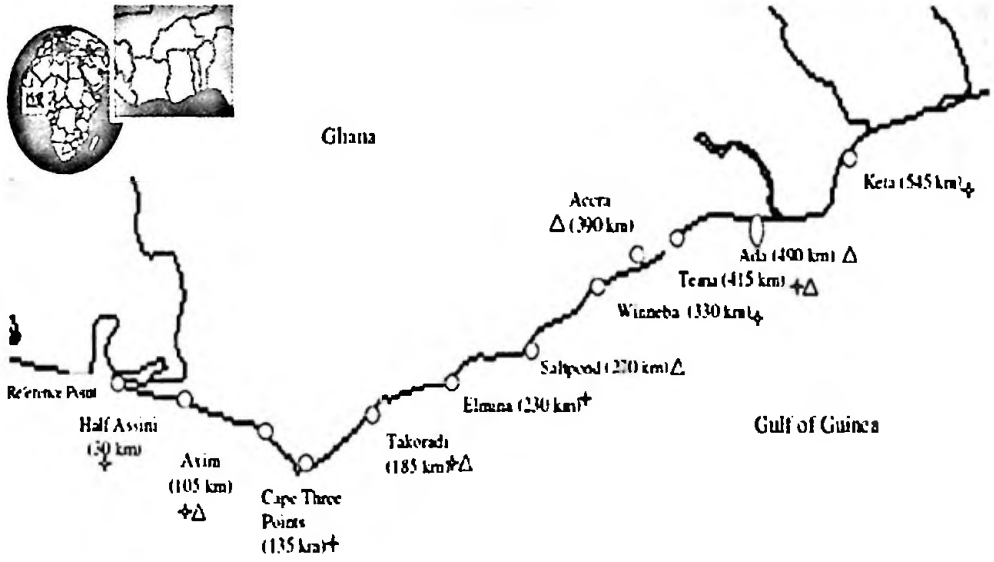



FIG. 1. Map of Ghana coast showing the hydrographic data collection stations. Distances from reference point to recording stations are indicated along the coast of Ghana. +: Marine Fisheries Research Division recording station; Δ: Coastal Meteorological recording station. Insert is the Africa and West Arica maps

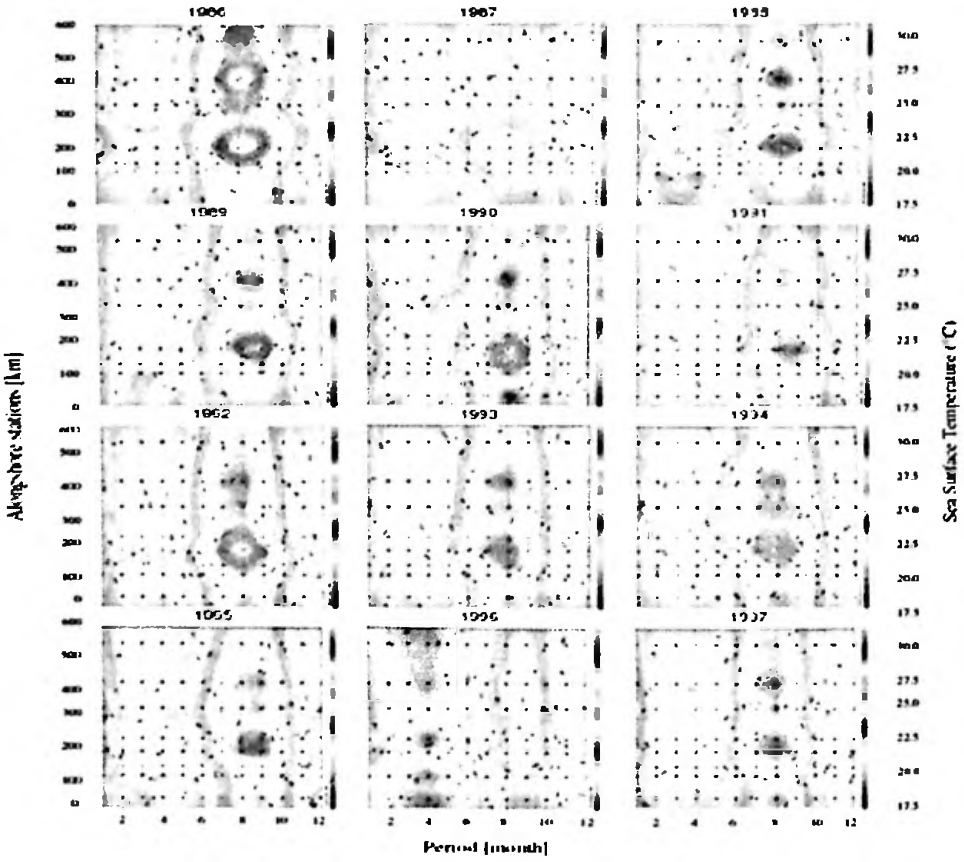
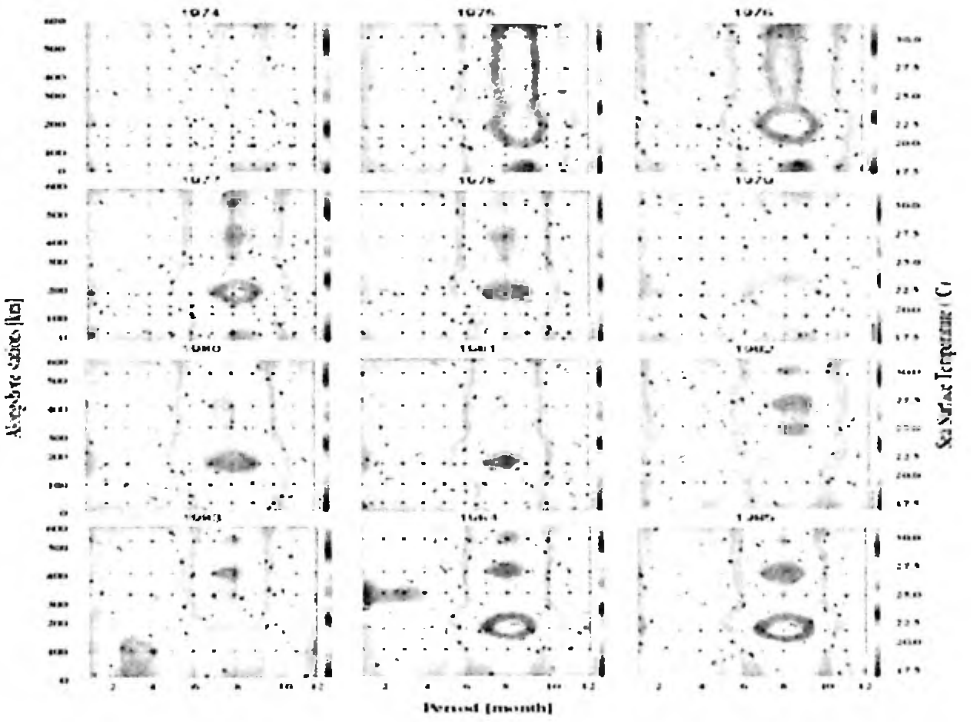



FIG. 2a. ODV analyses of monthly mean SST in Ghanaian coastal waters. Each monthly mean is averaged from daily records over the period January 1974 to December 2004. Alongshore stations: Half Assini (30 km), Axim (105 km), Cape Three Points (135 km), Takoradi (185 km), Elmina (230 km), Winneba (330 km), Tema (415 km) and Keta (545 km). SST range: 17.23°C – 31.12°C



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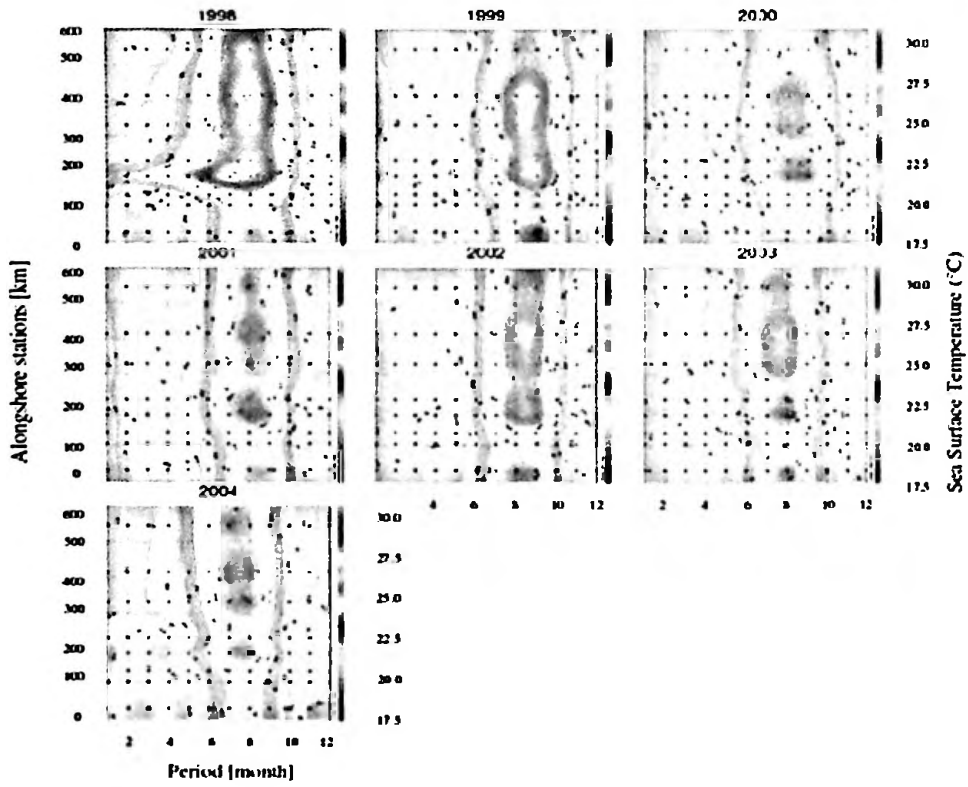


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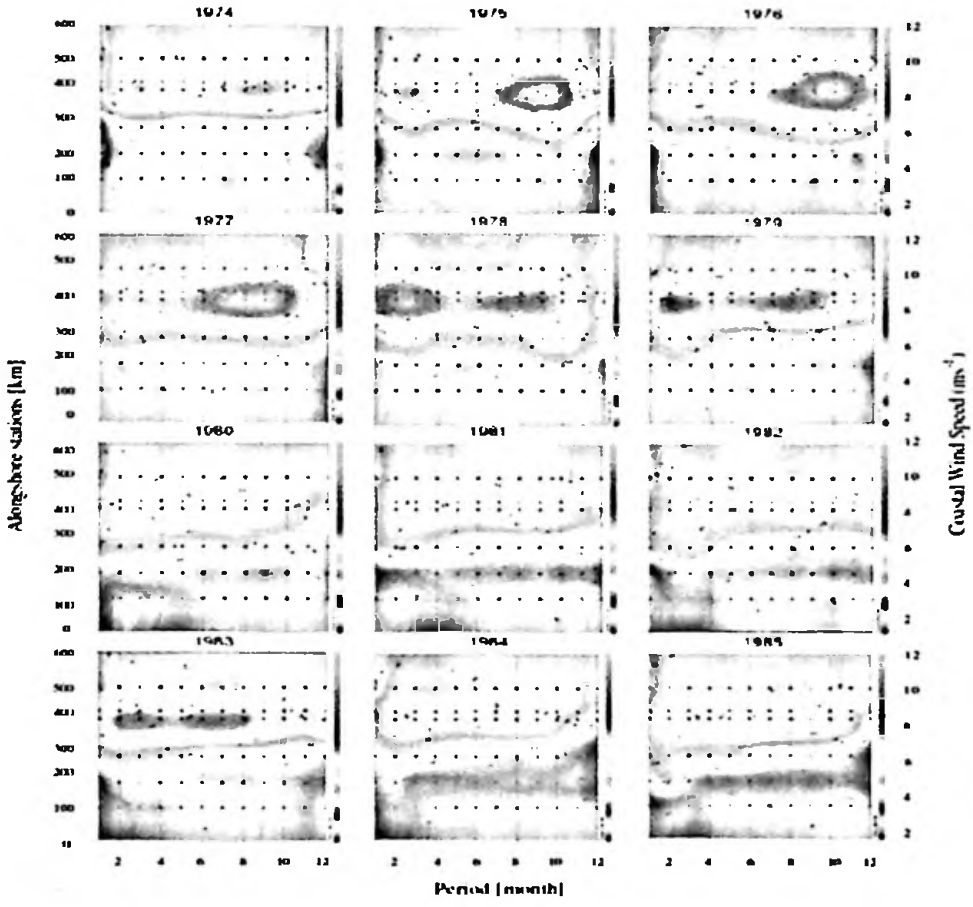
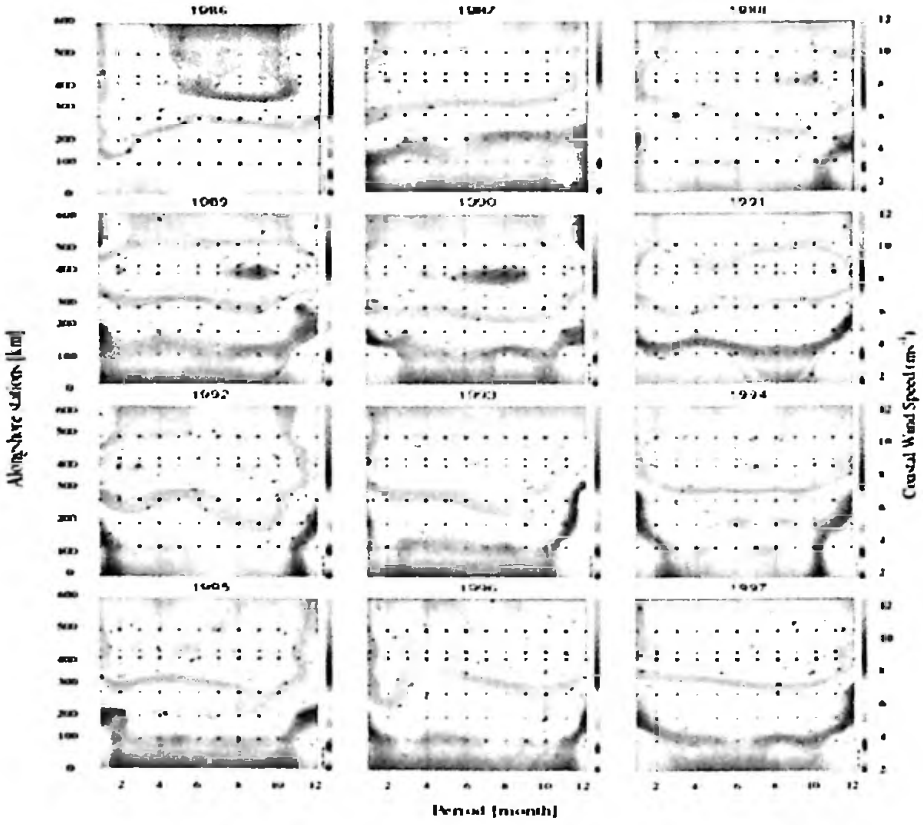



FIG. 3a. ODV analyses of monthly mean wind speed along the coast of Ghana. Each monthly mean is averaged from daily records over the period January 1974 to December 2004. Alongshore meteorological stations: Axim (105 km), Takoradi (185 km), Saltpond (270 km), Accra (390 km), Tema (415 km) and Ada (490 km). Coastal wind speed range: 1.1 $ms^{-1}$ – 12.0 $ms^{-1}$

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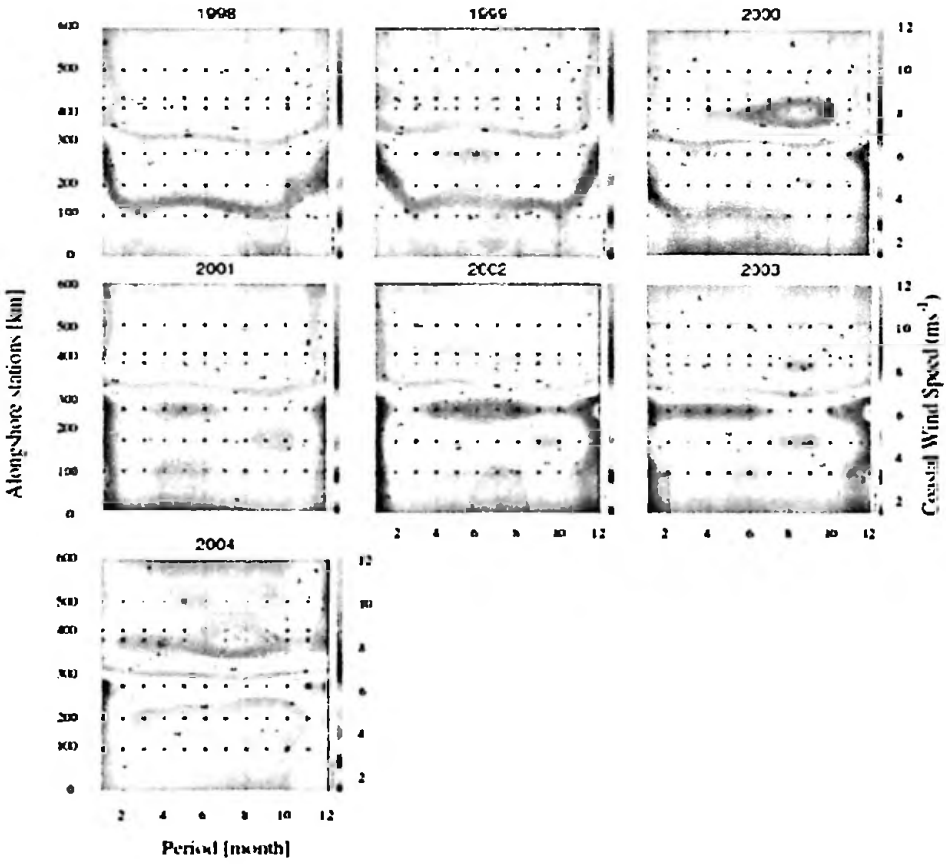


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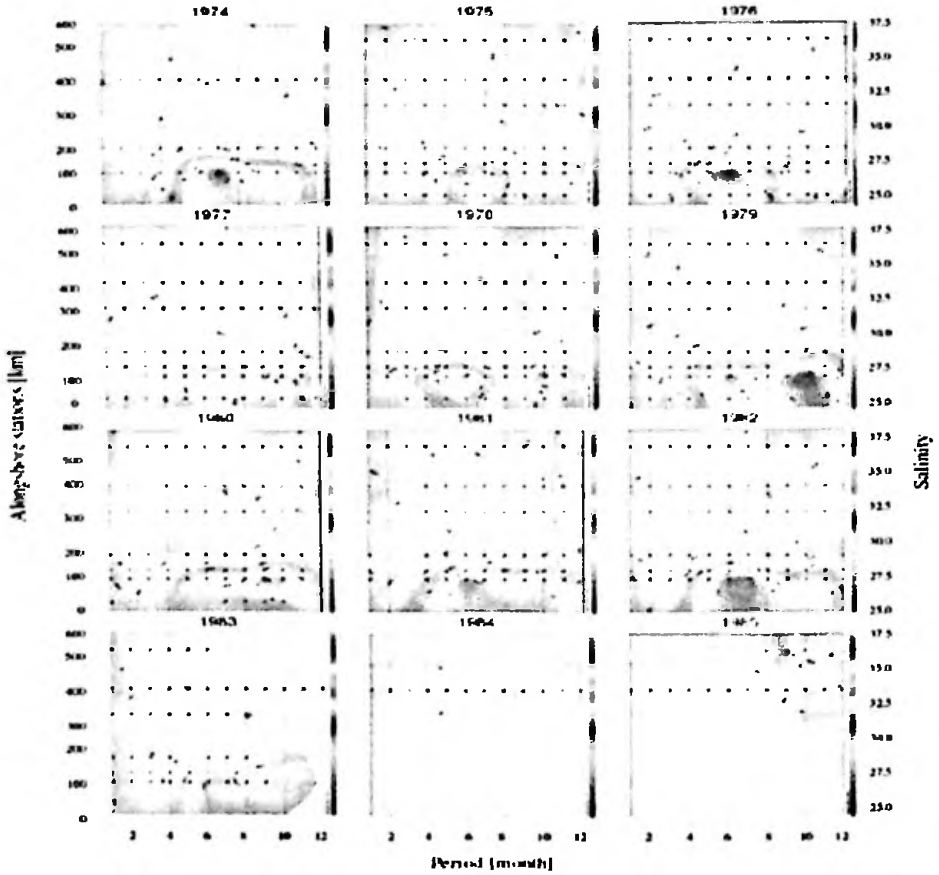


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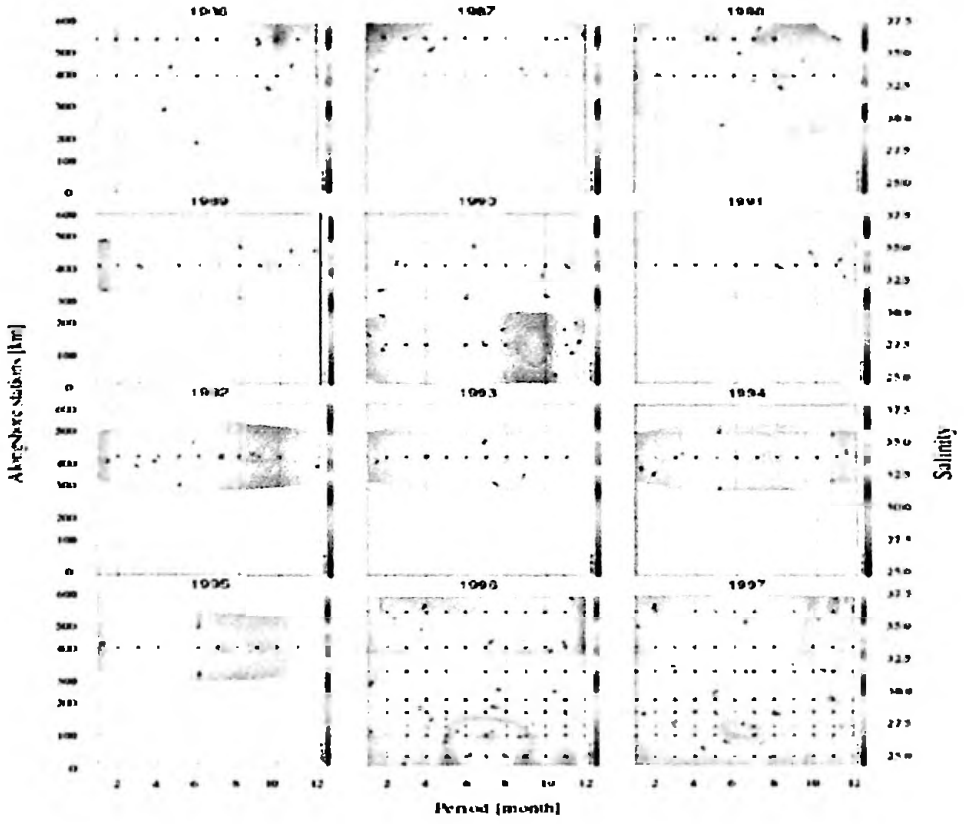


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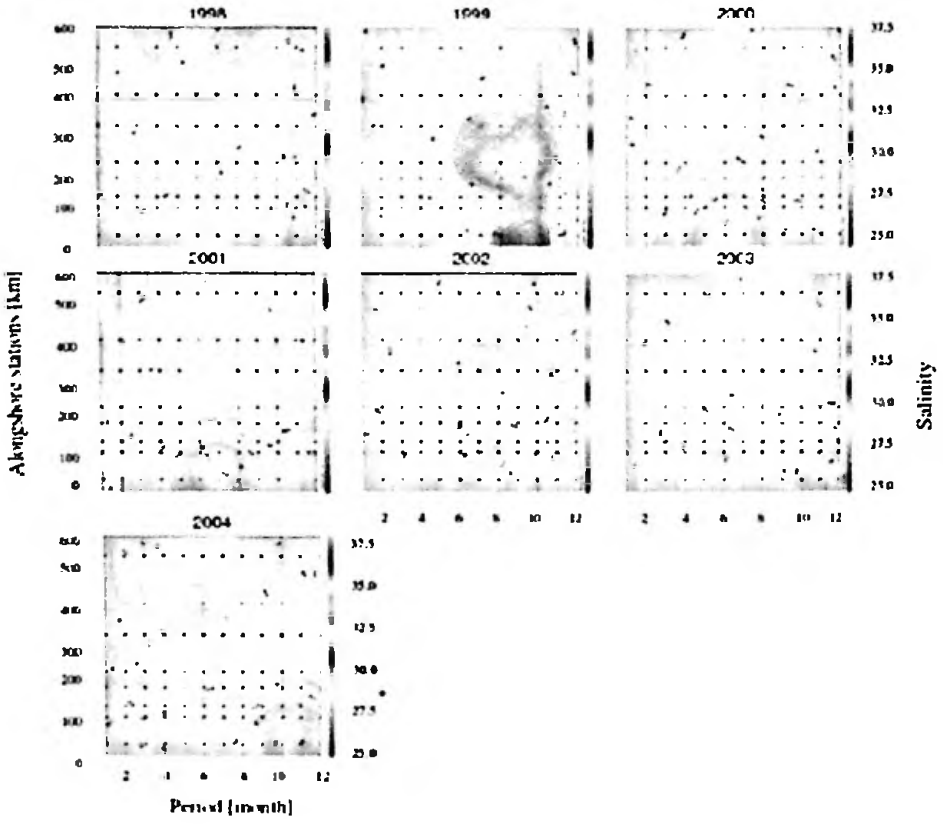


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## LEGEND

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# COMPUTATION OF THE QUANTITY OF OIL SPILLED FROM PIPELINES

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**Abstract**

*Pipelines being the cheapest means of transporting fluid from one location to another are commonly used to transport crude oil and petroleum products. Many crude oil pipelines link oil wells, terminals and production platforms in the Niger-Delta of Nigeria. Nigeria is also served by networks of pipelines carrying petroleum products between fifteen depots.*

*A major risk in using pipelines is that they can leak or rupture and thereby discharge their content into the environment and cause pollution.*

*A mathematical model was developed for unsteady flow in oil pipelines after rupture at the high pressure end. The model was used to predict the rate of outflow of oil at the ruptured end and the total amount of oil spilled. The 152mm, 180km pipeline carrying refined petroleum products from Ibadan to Ilorin were used as a case study. It was found that the total amount of kerosene lost to the environment in about 250 seconds was 10,530.8kg. The model is useful for providing input for environmental impact assessment of oil spill.*

## Introduction

Pipelines are commonly used in the transportation of fluids from one place to another. As a means of transporting fluids, it is economical and, in the absence of sabotage, safe. Dorf (1974) reported that pipelines were about 50% more energy efficient than transportation by railway and four times more efficient than transport by road.

In Nigeria, many pipelines carry crude oil between oil wells, production platforms and terminals. The pipeline carrying crude oil from Niger-Delta to Kaduna refinery is over 600km. There are also fifteen depots and four refineries linked by a network of pipelines for transporting petroleum products. The 180-kilometre, 152mm diameter pipeline linking Ibadan depot to Oke-oyi depot (near Ilorin) is in this network of pipelines.

Pipelines carrying fluids normally operate at high pressure so that a long pipeline segment may contain several tons of fluid. This makes a pipeline to constitute a risk of pollution, fire outbreak or even explosion in the environment in case of leakage or rupture of the pipeline. Leakage may occur in pipelines due to fatigue cracking and corrosion. Loss of pipeline inventory due to leakage normally occurs at a slow rate compared to the rate of loss of the fluid in the case of pipeline rupture.

Pipeline rupture may be caused by sabotage, fire outbreak or explosion in the vicinity of the pipeline, excessive pressure in the pipeline during transients induced by sudden valve closure, natural disasters such as earthquakes and landslides and damage during excavation.

Many people have worked on the analysis of unsteady fluid flow in pipelines. Olorunmaiye and Imide (1993) modeled the flow in a long natural gas pipeline following sudden rupture as unsteady one-dimensional isothermal flow.

The resulting set of hyperbolic partial differential equations was solved by a numerical method of characteristics to obtain mass flow rate out of the broken end.

Webb and Caves (1983) studied hydraulic transient in a pipeline connected to a reservoir upstream and a valve downstream which closed as a function of time. They considered pipe elasticity and non-uniformity in density of the liquid in their analysis. In another case they considered a pipeline, having a pump and an in-line heater at different locations, linking two reservoirs.

Chaudhry (1979) observed that to have an economic design of oil pipeline, it is necessary to do a detailed analysis of transients induced by various operating conditions such as opening or closing of valves, starting or stopping of pumps and change of pumping rate of oil at a pumping station.

In this paper the previous work has been extended by modeling the flow in a pipeline carrying liquid petroleum product after sudden rupture, to determine the quantity of oil spilled. The magnitude of the pressure change across the wave in this case is larger than those across waves induced due to various operating conditions which the earlier workers considered.

## Mathematical Model

The hydraulic transient in pipes is usually described by a one-dimensional model having distance along the pipe axis ($x$) and time ($t$) as independent variables. Pressure ($P$) and mean cross-sectional velocity of the pipe ($V$) are used as dependent variables.

The continuity equation for one-dimensional transient flow in a pipeline considering the elasticity of the pipe and the variation in density of the liquid due to pressure only is given by (Webb & Caves, 1993):

$$\frac{\partial P}{\partial t} + V\frac{\partial P}{\partial x} + \rho a^2 \frac{\partial V}{\partial x} = 0 \qquad (1)$$

where the wave velocity

$$a = \left[\frac{K}{\rho\left(1 + \frac{K}{E}\cdot\frac{D}{e}\right)}\right] \qquad (2)$$

where $K$= Bulk Modulus
$P$= Density
$E$= Modulus of Elasticity
$D$= pipe Diameter
$e$= Pipe thickness

The momentum equation for a horizontal pipe is given by (Webb & Caves, 1983)

$$\frac{1}{\rho}\frac{\partial P}{\partial x} + \frac{\partial V}{\partial t} + V\frac{\partial V}{\partial x} + \frac{fV|V|}{2D} = 0 \qquad (3)$$

where $f$= friction factor.

Equations (1) and (3) constitute a set of hyperbolic partial differential equations which were solved using the method of characteristics. A rectangular grid is imposed on the integration domain and the equations are integrated along the characteristic directions.

The characteristic curves of equations (1) and (3) are:

$$\frac{dx}{dt} = V \pm a \qquad (4)$$

Equation (4) gives the upstream and downstream propagation directions of a pressure wave travelling at the wave velocity ($a$) and in the x – t plane.

The compatibility equations along the characteristics having reciprocal slopes (V + a) and (V – a), respectively are:

$$\frac{\delta_+ V}{\delta t} + \frac{1}{\rho}\frac{\delta_+ P}{\delta x} + \frac{fV|V|}{2D} = 0 \qquad (5)$$

and

$$\frac{\delta_- V}{\delta t} - \frac{1}{\rho}\frac{\delta_- P}{\delta x} + \frac{fV|V|}{2D} = 0 \qquad (6)$$

It has been found that for liquids the fluid velocity is much less than wave velocity so that the contribution of $V$ in equation (4) can be neglected (Chaudhry, 1979). The characteristics reaching an internal grid point $D$ at $t+\Delta t$ is shown in Figure 1.

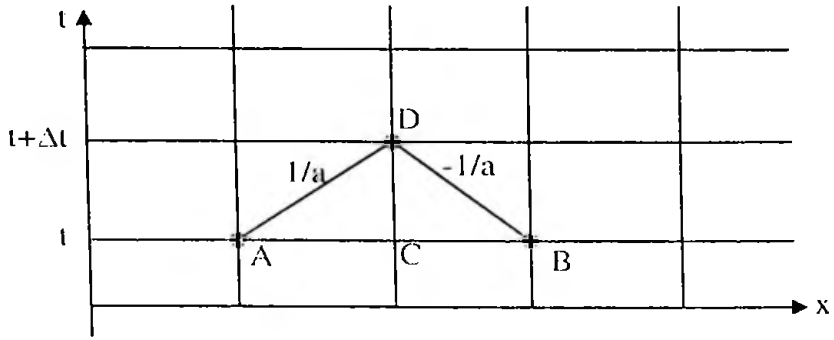


**Figure 1: Characteristics reaching an internal grid point**

Integrating equations (5) and (6) along AD and BD respectively gives

$$(P_D - P_A) + \rho_{AD}(V_D - V_A) + F_{AD}\Delta t = 0 \qquad (7)$$

and,

$$-(P_D - P_B) + \rho_{BD}(V_D - V_B) + F_{BD}\Delta t = 0 \qquad (8)$$

where

$$F = \frac{\rho f V|V|}{2D} \qquad (9)$$

and double subscripts on a term indicates that the term is the mean of its value at the end points indicated by the subscripts.

The problem solved in this paper is illustrated in Figure 2. The pipe is assumed to be ruptured at the left end which is the high pressure end and the rupture is equal to the cross-sectional area of the pipe.

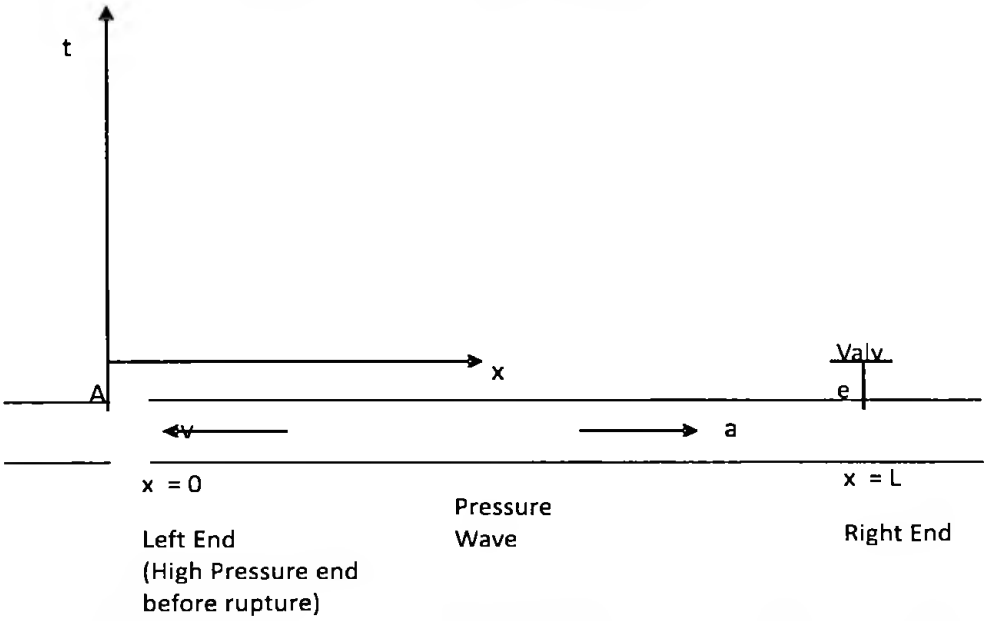


**Figure 2: Physical situation of the problem showing the Ruptured End**

**Boundary conditions**

For the left end, the liquid flows to the atmosphere after rupture and the pressure is equal to atmospheric pressure.

$$P_D(t \le t^*) = P_D(t=0) \quad (11)$$

$$V_D(t \le t^*) = V_D(t=0) \quad (12)$$

When the wave reaches the right end at time t = t* and the valve is instantaneously shut,

$$V_D(t > t^*) = 0 \qquad (13)$$

This equation is used along with equation (7) to get the pressure at the right end.

**Initial conditions**

The initial condition for the computation is the steady flow in the pipeline segment before it suddenly ruptured at the left end. More details of the computational procedure can be found elsewhere (Obadote, 2000).

**Results**

FOTRAN Programmes were written and run on Pentium AM75 personal Computer with Math Co-processor using WATFOR 87 Compiler.

The Programmes were applied to a 180km pipeline having an internal diameter of 152mm. The pipeline carried different refined petroleum products at different times and the input data for the different products are shown in Table 1.

**Table 1: Input data for petroleum products**

| FLUID | INLET PRESSURE (Bar) | OUTLET PRESSURE (Bar) | MASS FLOW RATE (kg/s) | VAPOUR PRESSURE (Bar) |
|---|---|---|---|---|
| DUAL PURPOSE KEROSINE (DPK) | 82.556 | 2.570 | 15.847 | 0.94205 |
| PREMIUM MOTOR SPIRIT (PMS) , *(PETROL )* | 86.997 | 3.049 | 15.521 | 0.93236 |
| AUTOMOTIVE GAS OIL (AGO) *(DIESEL )* | 74.827 | 2.461 | 15.438 | 0.96345 |

The mass of diesel, kerosene and petrol that flowed out of the ruptured end versus time is shown in Figure 3.

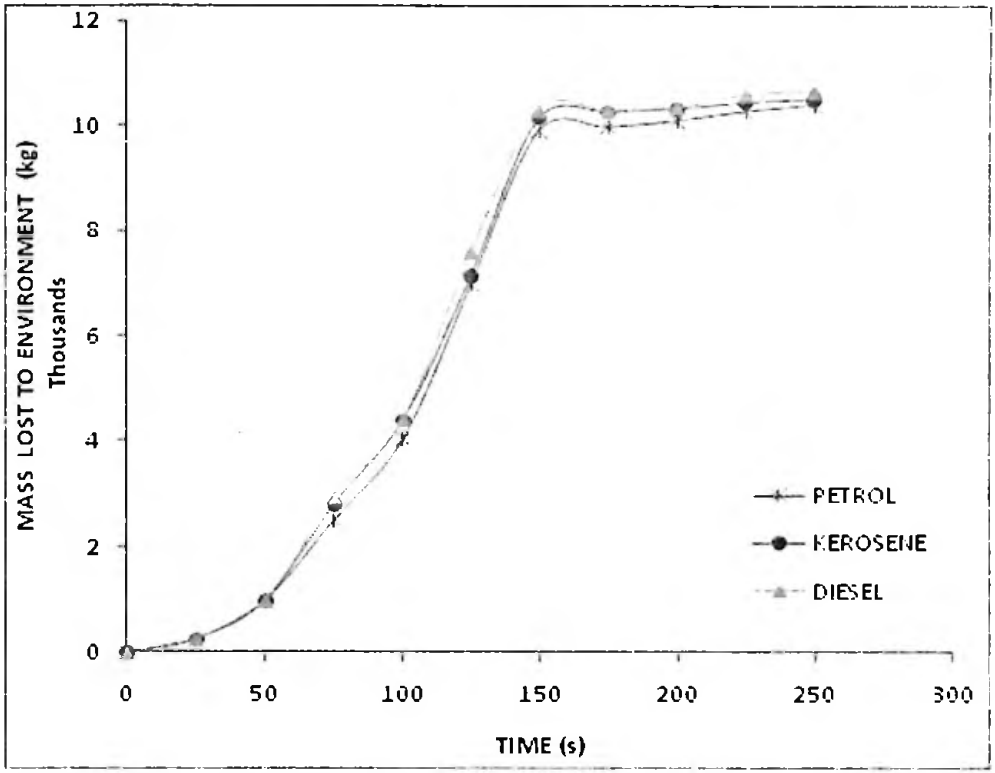


**Figure 3: Mass Of oil lost to the environment versus time (801 Grid points used for computation)**

It can be seen that after about 150 seconds, the mass of oil lost from the pipeline increased only slightly with time. Most of the mass loss through the rupture had taken place before t = 150 seconds. After 250 seconds the mass of kerosene lost through the ruptured end was 10,530.77kg.

## Conclusion

A mathematical model for computation of unsteady flow in a pipeline carrying petroleum products after rupture has been presented. It is useful for assessing the economic loss due to rupture and the environmental impact assessment of ruptured oil pipeline.

## Notation

| | |
|---|---|
| $a$ | Wave velocity |
| $D$ | Pipe Diameter |
| $e$ | Pipe thickness |
| $E$ | Modulus of Elasticity |
| $K$ | Bulk Modulus |
| $f$ | Friction factor |
| $P$ | Pressure |
| $t$ | Time |
| $V$ | Velocity |
| $x$ | Axial Distance |
| $\rho$ | Density |

Operator

| | |
|---|---|
| $\frac{\delta_+}{\delta t}$ | Differentiation following characteristic having reciprocal slope $V+a$ |
| $\frac{\delta_-}{\delta t}$ | Differentiation following characteristic having reciprocal slope $V-a$ |

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# EFFECTS OF GLOBAL CLIMATE CHANGE ON COOLING LOAD FOR AIR-CONDITIONING SYSTEM DESIGN AND REDUCTION OF GREEN HOUSE GAS EMISSION USING PETROL/ETHANOL MIXTURES IN ENGINES

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**Abstract**

*The climate is one of the factors on which the energy required to cool a building depends. Hourly dry-bulb temperature and relative humidity data for fifteen years (1978-1992) were obtained for Ilorin and Ikeja. From statistical analysis of the data, it was found that the mean dry bulb temperature and the 1%, 2.5% and 5% design dry-bulb temperature used for air-conditioning cooling load calculation were higher than the corresponding values published in 1974 from statistical analysis of weather data for the fifteen year period 1951-1965. This shows that more energy will be required for cooling buildings if the trend of global warming continues.*

*One way to reduce global warming is by using bio-fuels. A four stroke spark-ignition engine was run on pure gasoline, 5% ethanol/95% gasoline, 10% ethanol/90% gasoline, 15% ethanol/85% gasoline and 20% ethanol and 80% gasoline. When the engine ran on pure gasoline, it developed a maximum torque of 10.7Nm, a brake power of 3141.6W and a brake thermal efficiency of 25.91%. Each of these performance parameters reduced as the percentage of ethanol increased. For the 20% ethanol/80% gasoline blend the corresponding values of the performance parameters obtained were 10.2Nm, 2827.44W and 21.75%. Even though the performance of the engine declined as the percentage of ethanol increased, the emission of less green house gases is enough motivation to use bio-fuels.*

## Introduction

One of the climate variables that has effect on the performance of refrigeration and air-conditioning equipment is the ambient dry-bulb temperature. For example, the coefficient of performance of a vapour-compression refrigerating unit equipped with an air-cooled condenser is known to decrease as the ambient temperature rises. As the ambient dry-bulb temperature rises, the sensible component of the ventilation cooling load and also the heat conduction through the shell of the building into the air-conditioned space also rises.

The weather of a place is the state of the atmosphere at an instant of time and the evolution of this state through the generation, growth and decay of atmospheric disturbances (Aina & Adejuwon, 1995). The variables used in describing the weather include dry-bulb temperature, relative humidity, precipitation, cloudiness, brightness, visibility and wind velocity. The climate normals for a place are obtained from averaging weather data over a period of several decades (theoretically 30 years) (Aina & Adejuwon, 1995).

It is well known that human factors are among the causes of climate change. Lumbering and land clearing for agriculture and construction reduce vegetation that can remove some carbon-dioxide ($CO_2$) from the atmosphere. (Whereas agricultural and industrial activities and use of transportation devices involving combustion cause greenhouse gases which contribute to global warming to be released into the atmosphere). Greenhouse gases are gases which are transparent to short wavelength radiation from the sun while absorbing the relative longer wavelength from the earth. This causes the earth's surface and the lower atmosphere to get warmer. The greenhouse gases are water vapour, carbon-dioxide, hydrocarbons such as methane, oxides of Nitrogen ($NO_x$), chlorofluoro-carbons (CFCS), aldehydes and ozone. Carbon-dioxide is generally regarded as the main cause of global warming among these gases (Balogun & Salami, 1995).

The outside design state for cooling load calculation for design of air-conditioning systems is determined from long-term hourly ambient temperature and humidity data for that place. Shoboyejo and Shonubi (1974) carried out statistical analysis on meteorological data for 15 years (1951-1965) for several cities in Nigeria to determine the design value of outside air dry-bulb temperature for air-conditioning cooling load calculations.

Recently the use of bio-fuels instead of fossil fuels (such as coal and fuels obtained from crude oil) are being promoted because of the potential to lower atmospheric carbon-dioxide concentration as a result of the plants from which bio-fuels are sourced using up some carbon-dioxide in the atmosphere.

In this paper, the results obtained from the work done in determining design value of outside air dry-bulb temperature for air-conditioning cooling load calculation for 15-years weather data more recent than that used by Shoboyejo and Shonubi (1974) is presented as evidence of global warming. Another work in which a single cylinder, four-stroke, spark-ignition engine is run on a mixture of petrol and ethanol as a contribution to the promotion of the use of bio-fuels to reduce global warming, is also presented briefly.

**Analysis of Weather Data**

Hourly dry-bulb temperature data were obtained for 15 years (1978-1992) for Ilorin and Ikeja from Nigerian Meteorological Agency, Oshodi, Lagos state. The data made available were recorded using the Greenwich Mean Time.

Average dry-bulb temperatures were computed for all the 24 hours of the day for each month of the year. Average daily range, which is the difference between the maximum average hourly temperature and the minimum hourly temperature for each month was computed. Figures 1 and 2 and Tables 1 and 2 show these results for Ikeja and Ilorin.

The outside design condition for cooling load calculation for Ikeja and Ilorin were determined from the data for the four warmest months for each of the two locations. The mean and the standard deviation were determined from the hourly data for the four warmest months for each of the two locations. (Assuming the data follow the Gaussian or normal distribution, the 1%, 2½% and 5% normal probability confidence values were determined from normal distribution table as was done by Shoboyejo and Shonubi (1974). These 1%, 2½% and 5% confidence values are the values of dry-bulb temperature which are equalled or exceeded 1%, 2½% and 5% of the total hours of the four warmest months). The results obtained in this work and those obtained by Shoboyejo and Shonubi (1974) are shown in Tables 3 and 4. The month having the highest mean maximum temperature which is designated design month is also shown in Tables 3 and 4 for each location.

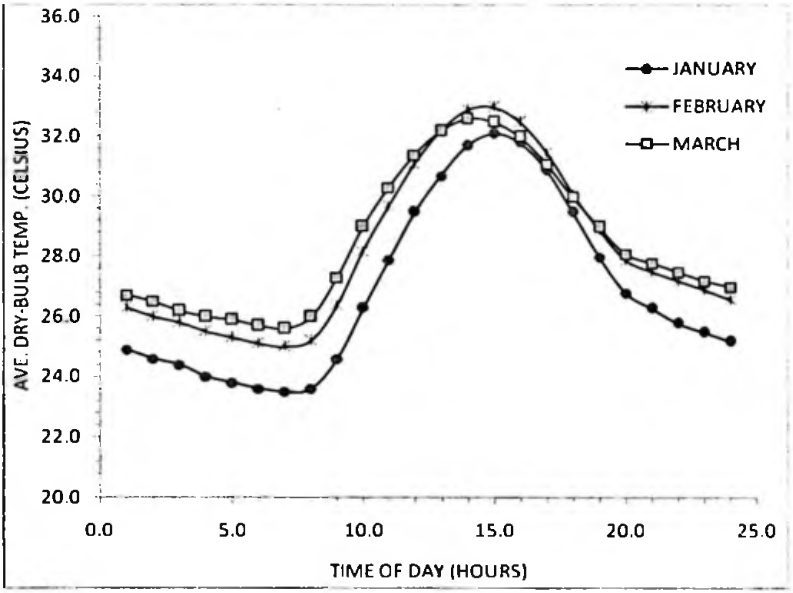
**Table 1: Monthly average temperature ( $\bar{T}$ ), Standard Deviation ($\sigma$ ), and average daily range of temperature ( $\bar{T}_{max}$-$\bar{T}_{min}$ ) for Ikeja**

| MONTH | $\bar{T}$ (°C) | $\sigma$ | $\bar{T}_{max}$ - $\bar{T}_{min}$ |
|---|---|---|---|
| January | 26.9 | 2.9 | 8.6 |
| February | 28.2 | 2.7 | 8.0 |
| March | 28.5 | 2.4 | 7.0 |
| April | 28.3 | 2.3 | 6.5 |
| May | 27.3 | 2.0 | 5.6 |
| June | 25.9 | 1.6 | 4.5 |
| July | 24.8 | 1.5 | 4.0 |
| August | 24.9 | 1.6 | 4.1 |
| September | 25.2 | 1.7 | 4.6 |
| October | 26.0 | 2.0 | 5.5 |
| November | 27.0 | 2.4 | 6.7 |
| December | 26.7 | 2.7 | 7.9 |

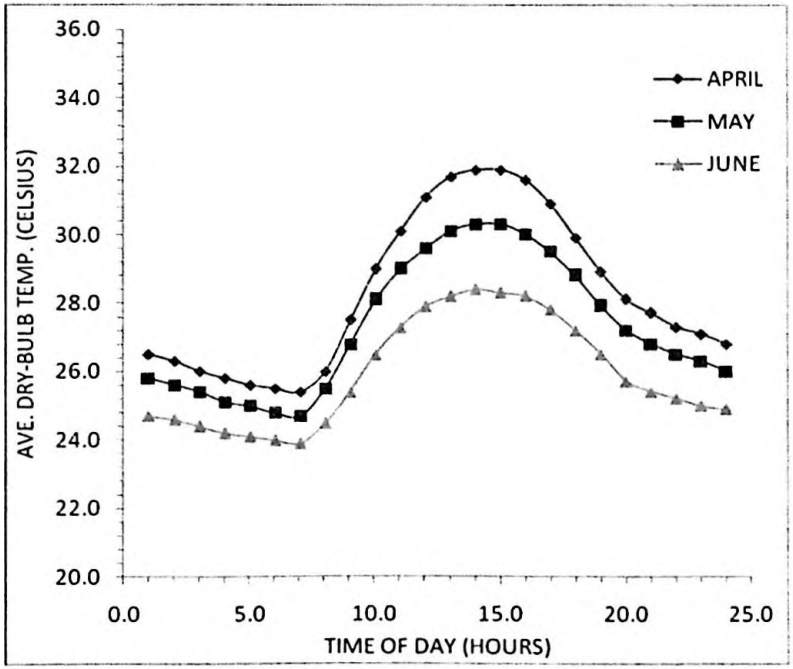
**Table 2: Monthly average temperature ( $\bar{T}$ ), Standard Deviation ( $\sigma$ ), and average daily range of temperature ( $\bar{T}_{max}$-$\bar{T}_{min}$ ) for Ilorin**

| Month | $\bar{T}$ (°C) | $\sigma$ | $\bar{T}_{max}$ - $\bar{T}_{min}$ |
|---|---|---|---|
| January | 26.2 | 4.3 | 12.7 |
| February | 28.4 | 4.2 | 12.2 |
| March | 28.9 | 3.7 | 10.6 |
| April | 28.2 | 3.2 | 9.1 |
| May | 26.9 | 2.8 | 7.9 |
| June | 25.7 | 2.4 | 6.9 |
| July | 24.5 | 2.0 | 5.8 |
| August | 24.3 | 2.0 | 5.7 |
| September | 24.7 | 2.4 | 6.8 |
| October | 25.6 | 2.9 | 8.2 |
| November | 26.7 | 3.8 | 10.9 |
| December | 25.8 | 4.2 | 12.4 |

(a)


36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
AVE. DRY-BULB TEMP. (CELSIUS)
0.0
5.0
10.0
15.0
20.0
25.0
TIME OF DAY (HOURS)
JANUARY
FEBRUARY
MARCH

(b)


36.0
34.0
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28.0
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24.0
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AVE. DRY-BULB TEMP. (CELSIUS)
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5.0
10.0
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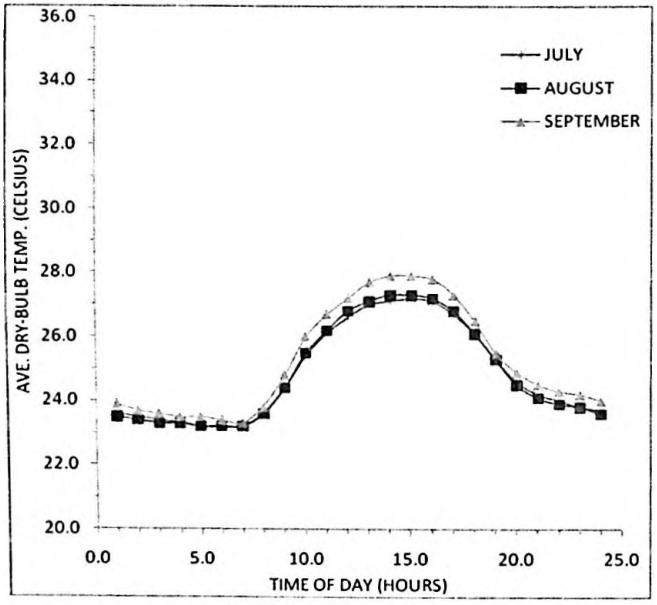
20.0
25.0
TIME OF DAY (HOURS)
APRIL
MAY
JUNE

(c)




(d)

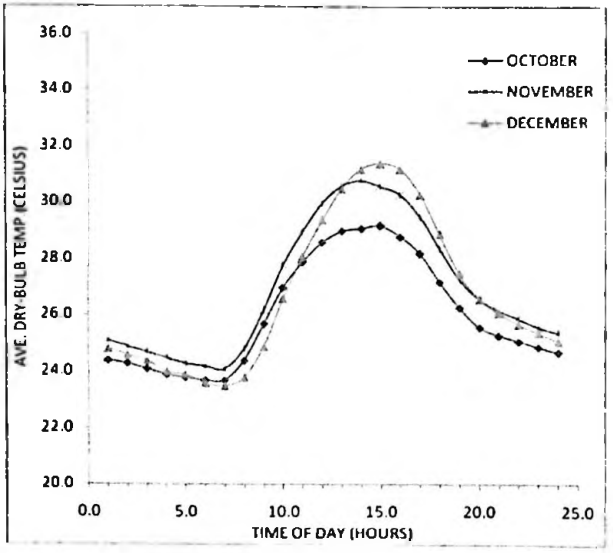
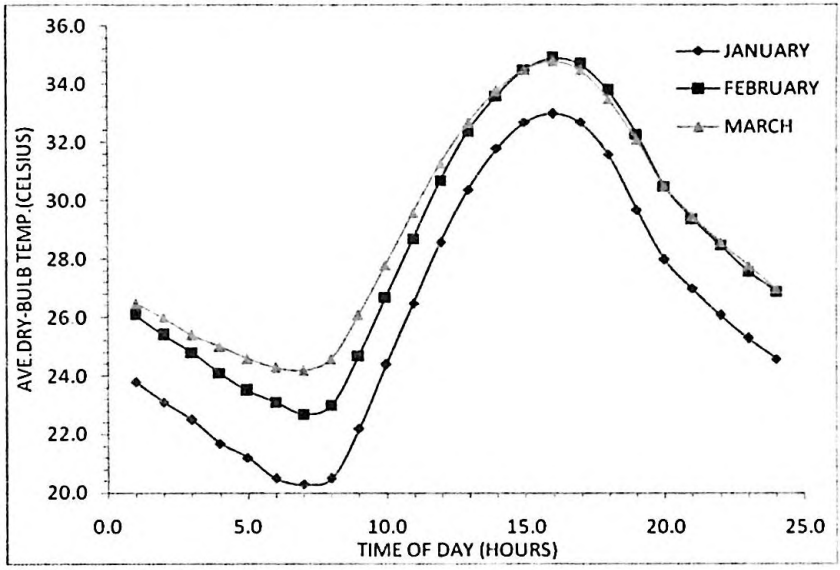
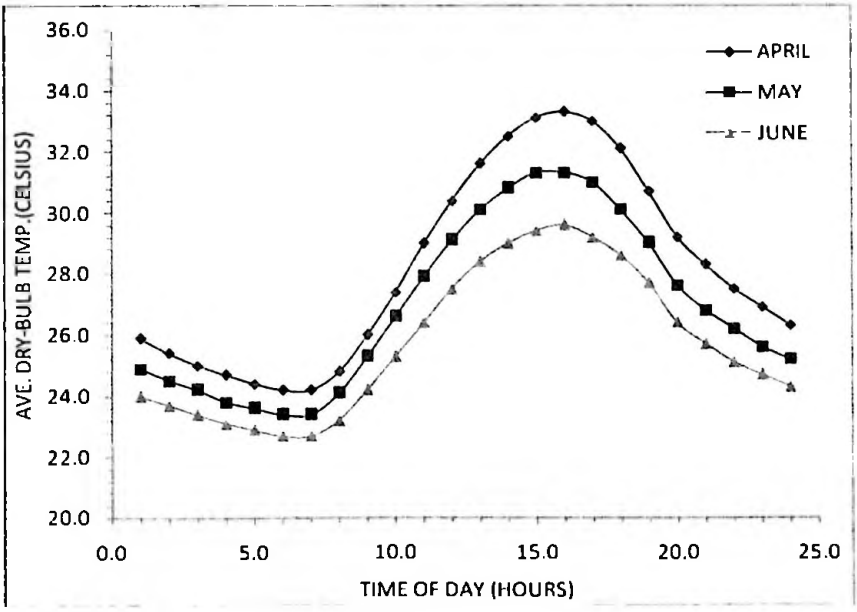



**Figure 1: Diurnal variation of monthly-average hourly dry-bulb temperature for Ikeja**

(a)


36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
AVE.DRY-BULB TEMP.(CELSIUS)
0.0
5.0
10.0
15.0
20.0
25.0
TIME OF DAY (HOURS)
JANUARY
FEBRUARY
MARCH

(b)


36.0
34.0
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AVE. DRY-BULB TEMP.(CELSIUS)
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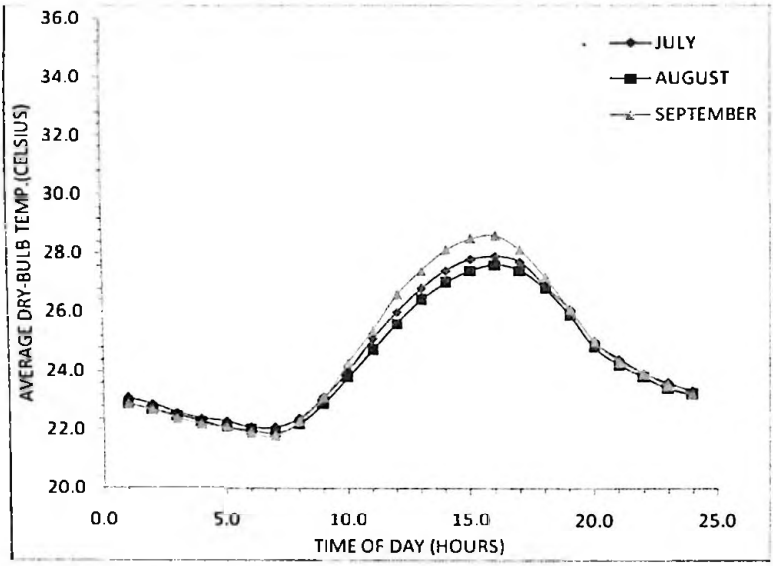
20.0
25.0
TIME OF DAY (HOURS)
APRIL
MAY
JUNE

(c)




(d)

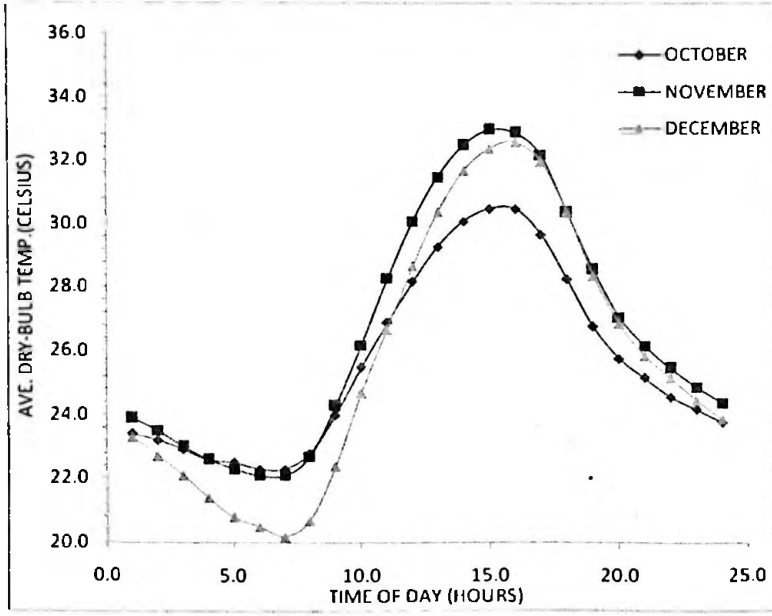



**Figure 2: Diurnal variation of monthly-average hourly dry-bulb temperature for Ilorin**

**Table 3: Design dry bulb temperatures obtained using normal statistical table for the four warmest months obtained in this work**

| | | | Design Dry Bulb Temp. (°C) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Place | Elevation (m) | Design Month | Outdoor Daily Range | 1% | 2.5% | 5% | Mean | Standard Deviation |
| IKEJA | 39.3 | March | 7.0 | 33.7 | 32.8 | 32.0 | 28.1 | 2.4 |
| ILORIN | 305.4 | March | 10.6 | 36.2 | 35.0 | 33.9 | 28.1 | 3.5 |

**Table 4: Design dry bulb temperatures obtained using normal statistical table for the four warmest months obtained by Shoboyejo and Shonubi (1974)**

| | | | Design Dry Bulb Temp. (°C) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Place | Elevation (m) | Design Month | Outdoor Daily Range | 1% | 2.5% | 5% | Mean | Standard Deviation |
| IKEJA | 39.3 | March | 9.4 | 31.7 | 30.6 | 30.0 | 25.6 | 2.8 |
| ILORIN | 305.4 | March | 13.3 35.0 | 33.3 | 32.2 | 25.6 | 3.9 | |

Another method used to determine the outside design state was plotting the cumulative distribution function for the four warmest months and reading the values of temperature corresponding to 99%, 97 ½ % and 95% to obtain 1%, 2½% and 5% confidence values respectively. The cumulative distribution function for Ikeja and Ilorin are shown in Figures 3 and 4, respectively and the values of design dry-bulb temperature obtained using this method are shown in Table 5. More details on the statistical analyses reported in this paper can be found in the work of Ariyo (1997).

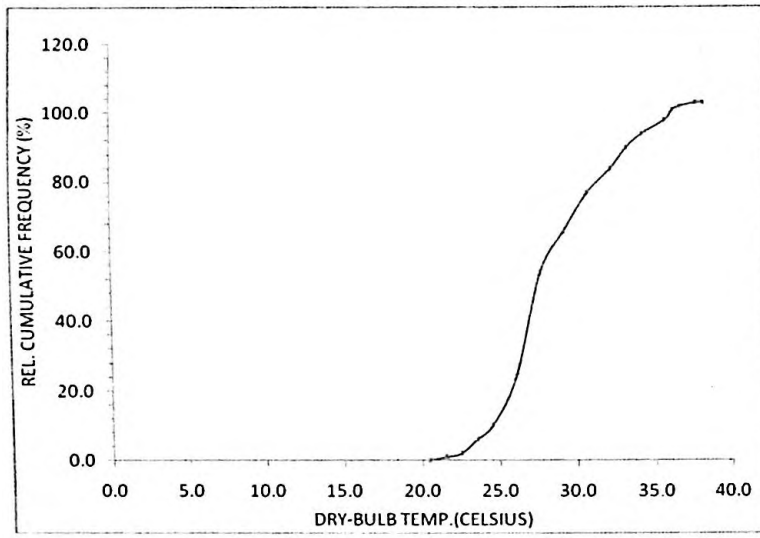



**Figure 3: Dry-bulb temperature cumulative distibution for the four warmest months for ikeja**

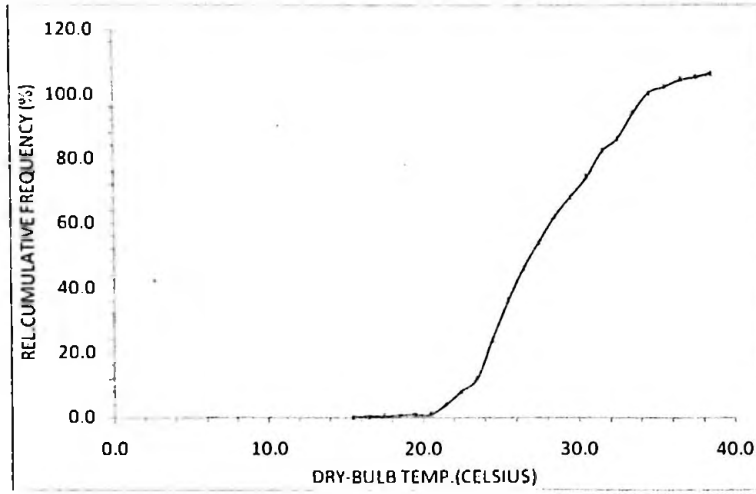



**Figure 4: Dry-bulb temperature cumulative distibution for the four warmest months for ilorin**

**Table 5: Design dry bulb temperatures obtained from the cumulative distribution function for the four warmest months obtained in this work**

| | | | Design Dry Bulb Temp. ($^0$C) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Place | Elevation (m) | Design Month | Outdoor Daily Range | 1% | 2.5% | 5% | Mean | Standard Deviation |
| IKEJA | 39.3 | March | 7.0 | 33.8 | 33.0 | 32.6 | 28.1 | 2.4 |
| ILORIN | 305.4 | March | 10.6 | 36.5 | 35.7 | 34.8 | 28.1 | 3.5 |

**Running of the Single Cylinder Four Stroke engine on Petrol/ethanol mixture**

Ethanol locally produced at Ogbomosho was dried by mixing it with lime (CaO) and allowing it to slake for 12-24 hours during which time the mixture was stirred occasionally. The dehydrated ethanol (about 99.5% pure) was decanted and filtered to separate it from calcium hydroxide formed by the reaction of lime with water taken from ethanol. The ethanol was dried further by mixing it with magnesium turnings and iodine in a flask fitted with a condenser and a calcium chloride guard. The mixture was heated to distil into a container in which the 99.96% ethanol is stored and protected from atmospheric moisture.

Petrol was bought from a petrol station at Ogbomosho and it was found to be heptane ($C_7H_{16}$). Pure petrol, 5% ethanol / 95% petrol, 10% ethanol / 90% petrol, 15% ethanol / 85% petrol and 20% ethanol /80% petrol were used to run a small engine test rig to observe the performance of the spark ignition engine while running on the different fuel mixtures. The small engine test rig used was made by TecQuipment Education and Training Ltd, Nottingham, England and it consist of:

TD 110 (single cylinder, air-cooled, four-stroke, spark-ignition engine),

T114 (an internal combustion engine instrumentation unit consisting of a tachometer, a torque meter, exhaust gas temperature meter, fuel tank and fuel volume pipette),

TD115 (a hydraulic dynamometer).

The gross reaction equations for heptane, ethanol and 20% ethanol / 80% heptanes are:

$C_7H_{16} + 11O_2 \rightarrow 7CO_2 + 8H_2O$

$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

$0.8\,C_7H_{16} + 0.2C_2H_5OH + 9.4O_2 \rightarrow 6CO_2 + 7H_2O$

It can be seen from the equations that blending ethanol with petrol causes a kilomole of the fuel to need less air for combustion and also to produce less carbon-dioxide.

Figures 5-7 show how the maximum torque, brake power and brake thermal efficiency vary with percentage of alcohol in the fuel used for running the engine. [More details of this work can be found elsewhere (Ogunshola, 2009)].

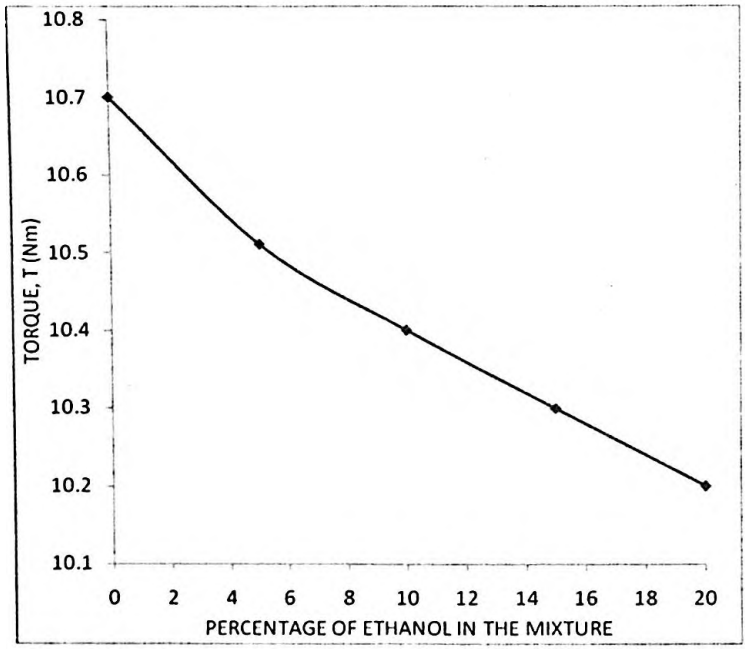



**Figure 5: Variation of maximum torque with percentage of ethanol in the ethanol/petrol mixture**

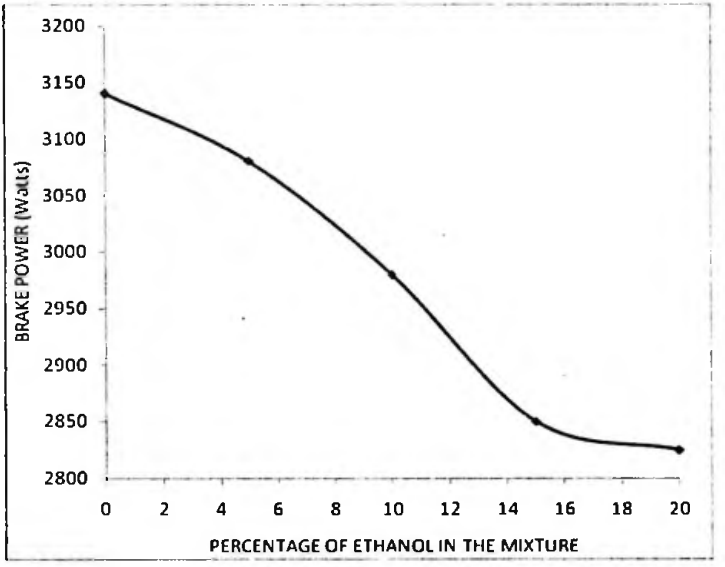



**Figure 6: Variation of maximum brake power with percentage of ethanol in the ethanol/petrol mixture**

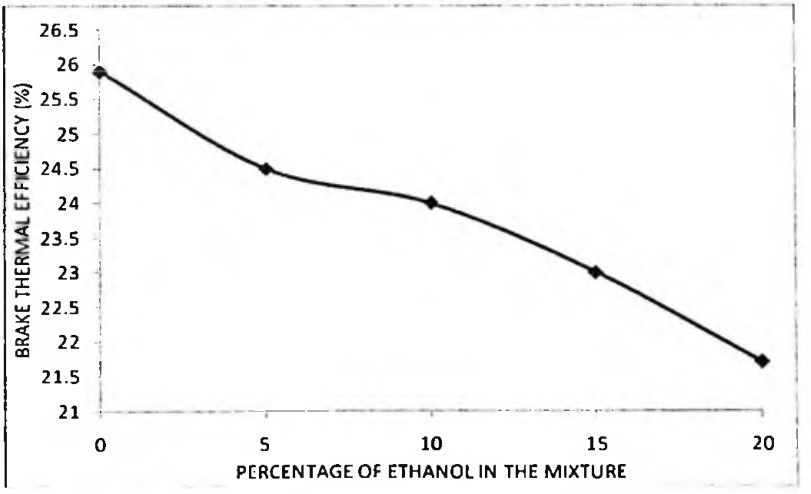



**Figure 7: Variation of maximum brake thermal efficiency with percentage of ethanol in the ethanol/petrol mixture**

**Discussion of Results**

Comparing the results of Shoboyejo and Shonubi (1974) and the work reported in this paper in Table 3 and 4, it can be seen that the average temperature of the four warmest months increased by 2.5°C for both Ikeja and Ilorin. The 2½% outdoor design state normally used for calculating cooling load increased by 2.2°C and 1.7°C for Ikeja and Ilorin respectively. Adesina and Adejuwon (1995) for lack of information on the rate of warming in Nigeria assumed that the warming for Nigeria may not be more than 0.5°C.

This study shows that such assumption may be an underestimation. However it is necessary to keep in mind that this work has concentrated on the four warmest months in the year in comparing the more recent past average temperature with that of the more distant past.

The values of 2½% outdoor design state obtained by the Cumulative Distribution Function method are higher than those obtained assuming the temperature is normally distributed by 0.2°C and 0.7°C for Ikeja and Ilorin, respectively.

This shows that the results obtained assuming the temperature distribution is normal is good in spite of the simplicity of the statistical analysis that goes with this assumption.

From Figures 5-7, it can be seen that the performance of the engine falls as the percentage of ethanol in the mixture increases. The maximum torque, brake power and brake thermal efficiency fell from 10.7Nm, 3141.6W and 25.91% for the engine running on petrol to 10.2Nm, 2827.4W and 21.75% for the engine when running on 20% ethanol / 80% petrol, respectively. The operation manual for the engine states that the typical value of brake thermal efficiency is 30% but small engines such as the one used in this work can have a value significantly less than 30% because of the more pronounced effect of mechanical losses in small engines. (TQ Education and Training Ltd, 2004)

**Conclusions and Recommendations**

The effect of global warming is to increase the cooling load and thereby increase the energy required for running air-conditioning systems. For accurate cooling load estimate, the outside air design state should be reviewed every ten or fifteen years.

The governments of developing countries in the tropics should encourage the use of petrol blended with 10% ethanol as is done in some other countries since the automobile engines currently being used can run on it

without problem. The slight derating of the performance is a small price to pay for reduction in carbon-dioxide emission. The emergence of energy farms or plantations where crops for production for bio-fuels are grown should also be encouraged.

To reduce the quantity of carbon-dioxide in the atmosphere, government of developing countries should encourage development of timber and fuel wood plantations where wood can be systematically harvested and new ones grown to replace them to check the indiscriminate felling of trees as is currently practiced in these countries.

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# EFFECTS OF CHANGING EXTENT ON LANDSCAPE PATTERN METRICS

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**Abstract**

*This paper investigates the effects of changing extent on 18 commonly used landscape pattern metrics of two maps from Northern Ghana using an indirect approach to multi-scale analysis.*

*The approach involves a systematic change of the extent of each of two landscape maps, while keeping their grain size constant. This resulted in nine maps with extents ranging from 56km2 to 5,633km2 to from each map. The values of the eighteen metrics were then estimated from each map. The results indicate that, in general, changing extent has significant effects on landscape pattern metrics and the effects can be grouped into three main types:*

*Type I – metrics with simple scaling relationships; Type II – metrics with unpredictable behaviour and Type III – metrics remained constant irrespective of extent.*

## Introduction

Spatial heterogeneity is ever-present at all scales and its formation and interactions with ecological processes are central to landscape ecology (Wu *et al.*, 2000; Wu *et al.*, 2002; Wu, 2004; Shen *et al.*, 2004). In order to understand how landscapes affect and are affected by ecological processes, one must be able to quantify spatial heterogeneity and its scale dependence.

The term *scale* is used by several different specialists including remote sensing specialists, ecologists, cartographers, mathematicians, geographers and geo-statisticians. It has various meanings which are often conflicting, because the meanings depend on the context and the disciplinary perspective of the user. One definition which applies to the various forms of scale is given as follows: *scale denotes the resolution within the range of a measured quantity* (Schneider, 1994). This definition encompasses *resolution* and *range* which are two

interacting and very important facets of scale. Resolution, also known as grain size, refers to the finest distinction that can be made in an observation set. Referring to the data maps used in this paper, the resolution is represented by the cell size in each map. On the other hand, range which is also known as extent is defined as the size of the study area (Allen & Hoekstra, 1991). Scaling is concerned with what happens to the characteristics of an object when its scale is changed.

In order to quantify the multiple-scale characteristics of landscapes, one of two general approaches – the direct approach and the indirect approach, to multi-scale analyses must be employed. The indirect approach to multi-scale analysis employs methods that are designed for single-scale analysis such as landscape metrics. The scale multiplicity in this approach is realized when a landscape map is re-sampled at different scales according to grain size or extent, and the landscape metrics estimated with appropriate methods for the re-sampled data at the different scales.

Scale effects have been studied using landscape metrics in ecology, remote sensing, and geography in the past two decades (Meentemeyer & Box, 1987; Turner *et al.*, 1989, 2001; Moody & Woodcock, 1994; Wickham & Riitters, 1995; Qi & Wu, 1996; Wu *et al.*, 2002). Scale effects on spatial pattern analysis may be observed in each of the following three situations: (1) changing the size of the smallest observable measurement (grain) within the landscape data only, (2) changing the size of the study area (extent) only, and (3) changing both the grain size and extent. The second case is the concern of this paper. That is, this paper will only be concerned with scale effects that may occur as a result of the extent of the map.

The main objective of the study is to perform a multi-scale analysis of two landscape maps from northern Ghana using an indirect approach. The specific objectives include:

1. to investigate how some commonly used landscape metrics change with changing grain size; and
2. to formulate scaling relations for landscape metrics whose change with grain size are consistent across the landscapes.

**Dataset**

The size of the study area is approximately 10,000 km$^2$. It is located in the Northern Region of Ghana and lies between latitudes 8o 50 and 10oN, and also between longitudes 0°30' and 1°30' W. The datasets consist of two Land Use and Land Cover (LULC) maps. The first dataset is a satellite map of the study area which was acquired in November 1984 by the Remote Sensing Unit of the Centre for Development Research, University of Bonn, Germany. The second dataset is also a satellite map of the same area acquired by the same Unit in November 1999. The 1984 map is labelled LULC84 and the 1999 map is labelled LULC99 (see Figure1). Classification of the maps was carried out using the maximum likelihood algorithm (Braimoh, 2004).

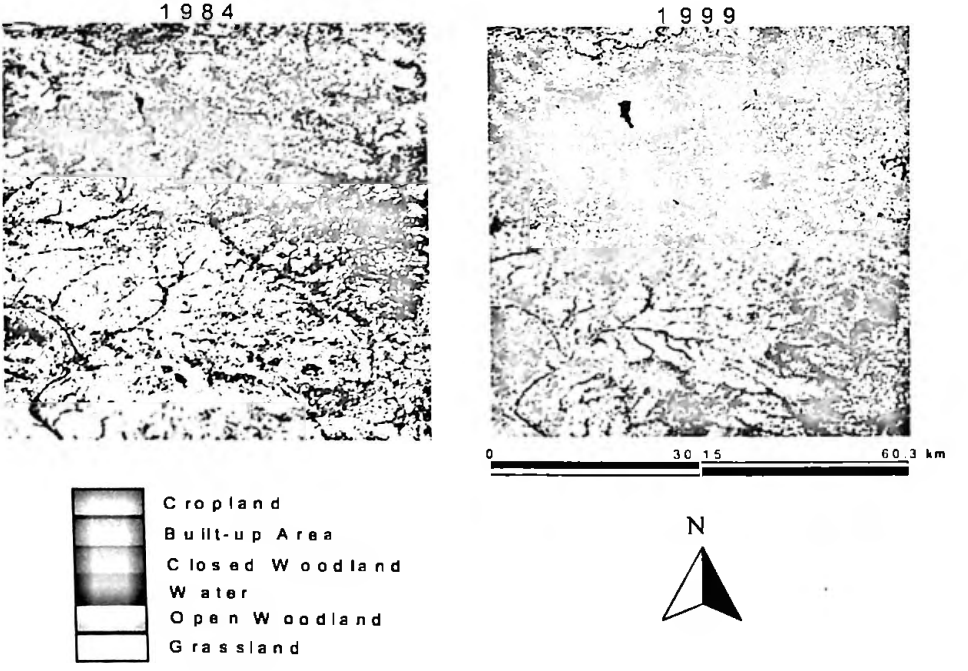



***Figure 1: Land use and land cover maps of the study area in 1984 and 1999***

A brief description of the land use and land cover types is given below:

| Land cover type | Description |
|---|---|
| Closed woodland | Mainly trees over 5 meters high, riparian vegetation ( >150 trees/ha) |
| Open woodland | Mainly trees (75-150 trees/ha) with shrub undergrowth |
| Grassland | Mainly combination of grasses and shrubs with or without scattered tress (<10 trees/ha) |
| Cropland | Agricultural land with crops, harvested agricultural land |
| Built-up Area | Settlements, airports and roads |
| Water | Rivers, inland waters, reservoirs |

For both LULC84 and LULC99, *Built-up Area* is the least abundant class, representing less than 1% of the total number of cells in each map. *Water* also represents less than 1% of the cells in both LULC84 and LULC99. *Closed Woodland* is the most abundant in the LULC84, representing over 28% of the total number of cells; whilst *Cropland* is the most abundant in the LULC99, representing almost 40% of the total number of cells. Figure 2 helps to compare the various components in the two maps. It is observed that the proportions of *Closed Woodland* and *Grassland* in LULC84 exceed those in LULC99; while the proportions of *Open Woodland* and *Cropland* in LULC99 exceed those in LULC84. The differences in the portions of *Built-up Area* and *Water* in the two data are not significant.

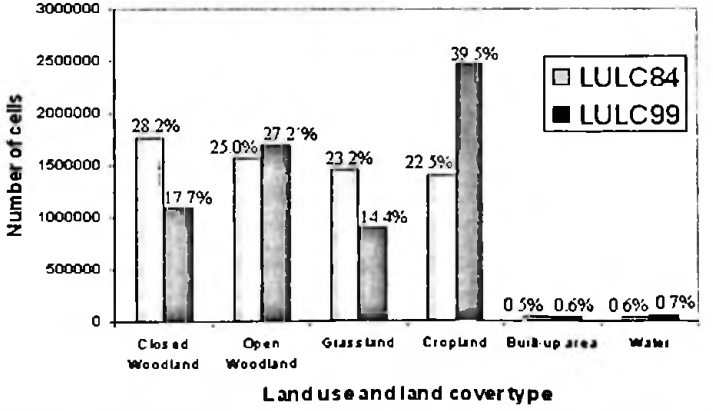



**Figure 2:** ***A comparison of land use and land cover types of LULC84 and LULC99***

## Methods

To estimate the landscape metrics of LULC84 and LULC99 at different extents, the extent of each map was increased systematically, while keeping the grain size constant. Nine maps with different extents ranging from 56 $km^2$ to 5,633 $km^2$ were clipped from each of LULC84 and LULC99 (Figure 3)

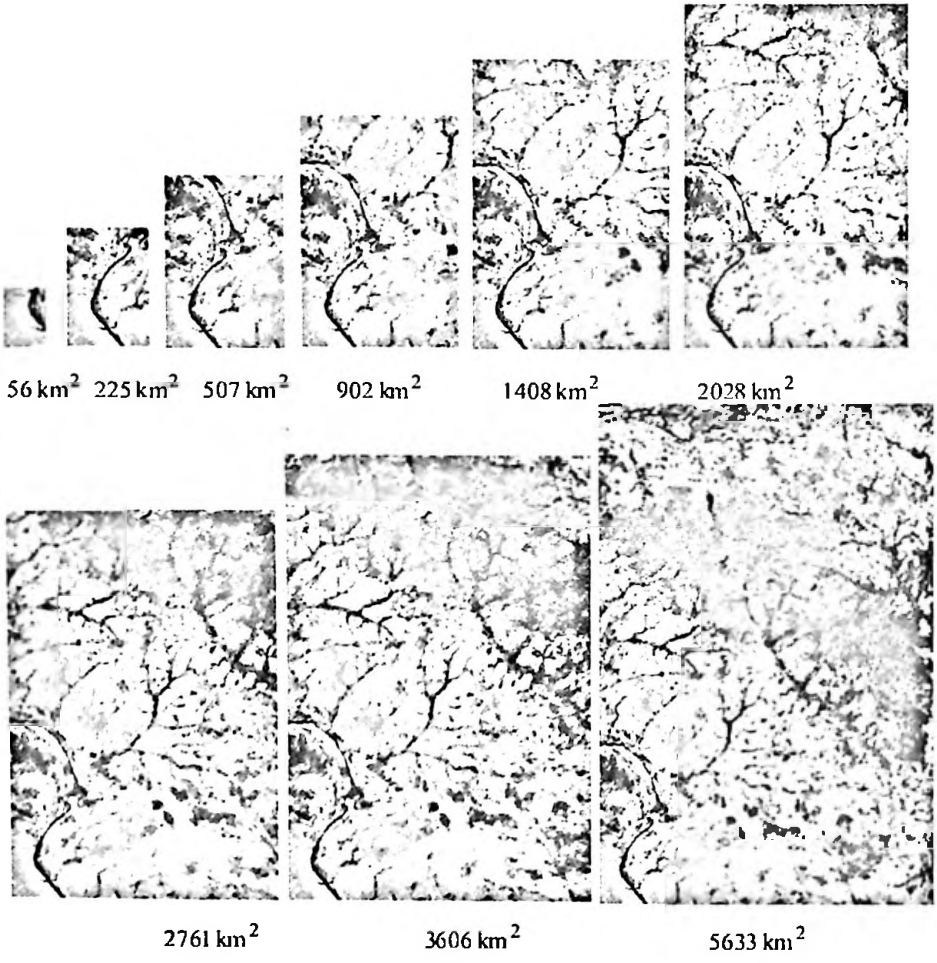



**Figure 3:** ***LULC84 maps with different extents used to investigate the effects of changing extent on landscape metrics***

Starting from the south-western corner and traversing the diagonal to the north-eastern corner, maps with increasing extents were clipped from each original landscape map. The clipping process was repeated starting from the north-east to the south-west; from the north-west to the south-east and from the south-east to the north-west. The increment in the extents is in the ratio of 1:10 to the extent of the original map. In all, 72 maps (2 land use and land cover maps x 9 extent levels x 4 directions of clipping) were used in this study.

The landscape pattern analysis software, FRAGSTATS 3.3 (McGarigal and Marks, 2002) was used to estimate the values of 18 landscape metrics for each of the 18 maps. The 18 landscape metrics include *number of patches* (NP), *patch density* (PD), *largest patch index* (LPI), *landscape shape index* (LSI), *total edge* (TE) and *edge density* (ED). Others are *mean patch area* (MPA), *patch area standard deviation* (PASD), *patch area coefficient of variation* (PACV), *area-weighted mean shape index* (AWMSI), *area-weighted mean fractal dimension* (AWMFD) and *mean shape index* (MSI). The rest are *total area* (TA), *mean fractal dimension index* (MFDI), *contagion* (CONTAG), *patch richness* (PR), *patch richness density* (PRD) and *Shannon's diversity index* (SHDI).

## Results and Discussion

The estimates of the 18 pattern metrics from LULC84 are summarized in Table 2. The corresponding values for LULC99 are summarized in Appendix A.

**Table 2: Estimates of 18 landscape metrics of LULC84 map with different extents**

| | Landscape metrics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Area of extent ($km^2$) | No. of patches (*NP*) | Patch density (*PD*) | Largest patch (*LPI*) | Landscape shape ind. (*LSI*) | Total edge (*TE*) | Edge density (*ED*) | Mean patch (*MPA*) | Patch area std (*PASD*) | Patch area coeff of var (*PACV*) |
| 56 | 3424 | 61 | 52 | 25 | 720930 | 128 | 1.6412 | 51 | 3115 |
| 225 | 13411 | 60 | 16 | 52 | 3028650 | 134 | 1.6807 | 47 | 2767 |
| 507 | 31478 | 62 | 9 | 80 | 7110450 | 140 | 1.6103 | 49 | 3012 |
| 902 | 54148 | 60 | 19 | 105 | 12483390 | 139 | 1.6651 | 84 | 5038 |
| 1408 | 82294 | 58 | 18 | 129 | 19143540 | 136 | 1.7113 | 104 | 6100 |
| 2028 | 121077 | 60 | 15 | 157 | 28068180 | 138 | 1.6746 | 107 | 6358 |
| 2761 | 159972 | 58 | 17 | 181 | 37774020 | 137 | 1.7256 | 150 | 8678 |
| 3606 | 197525 | 55 | 17 | 198 | 47341680 | 131 | 1.8251 | 196 | 10742 |
| 5633 | 319837 | 57 | 13 | 257 | 76930860 | 137 | 1.7613 | 200 | 11337 |

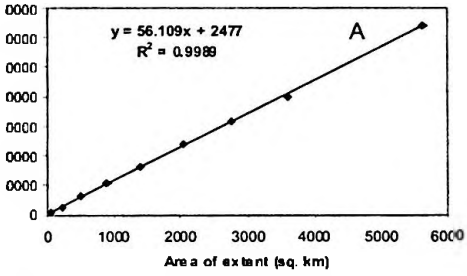
**Table 2:** (*Continued*)

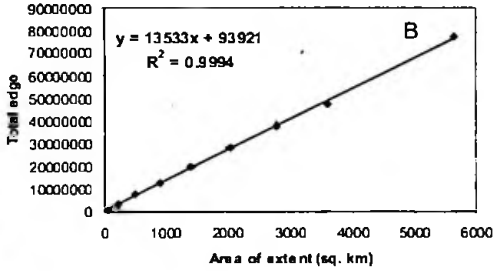
| Area of extent (km²) | Estimates of landscape metrics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total Area (TA) | (AWMSI) | (AWMFD) | Mean shape ind (MSI) | Mean frac dim ind (MFDI) | Contagion N4 | Patch richness (PR) | Patch rich density (PRD) | Shannon's div. ind. (SHDI) |
| 56 | 5626 | 11 | 1.2520 | 1.1015 | 1.0212 | 50 | 6.0000 | 0.1066 | 1.1744 |
| 225 | 22540 | 10 | 1.2489 | 1.1094 | 1.0215 | 44 | 6.0000 | 0.0266 | 1.3182 |
| 507 | 50688 | 11 | 1.2597 | 1.1055 | 1.0208 | 45 | 6.0000 | 0.0118 | 1.2861 |
| 902 | 90161 | 17 | 1.2754 | 1.1057 | 1.0211 | 45 | 6.0000 | 0.0067 | 1.2728 |
| 1408 | 140831 | 20 | 1.2848 | 1.1046 | 1.0210 | 45 | 6.0000 | 0.0043 | 1.2810 |
| 2028 | 202753 | 20 | 1.2848 | 1.1043 | 1.0210 | 43 | 6.0000 | 0.0030 | 1.3572 |
| 2761 | 276053 | 28 | 1.3011 | 1.1035 | 1.0212 | 41 | 6.0000 | 0.0022 | 1.4197 |
| 3606 | 360497 | 34 | 1.3105 | 1.1041 | 1.0215 | 41 | 6.0000 | 0.0017 | 1.4331 |
| 5633 | 563323 | 34 | 1.3024 | 1.1091 | 1.0221 | 40 | 6.0000 | 0.0011 | 1.4369 |

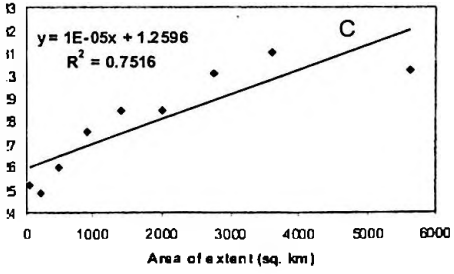
In general, changing the extent of landscape maps had significant effects on the values of its metrics. The responses of landscape metrics to changing extent can be grouped into three main types: Type I, Type II and Type III. The response curves of Type I metrics showed consistent and simple scaling relationships across the two landscapes. However, the values of the estimates in the scaling relation changed considerably among different landscapes, indicating structural differences for distinct extents. Table 3 and Figure 3 together depict the effects of changing extent on Type I metrics of NDVI84.

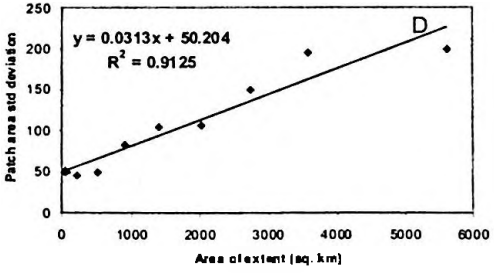
## Table 3: Scaling relations of the effects of changing extent on Type I metrics

| Type I landscape metrics | Scaling relation and characteristics |
|---|---|
| Number of patches<br>Total edge<br>Total area<br>Patch area standard deviation<br>Patch area coefficient of variation<br>Area-weighted mean shape index<br>Area-weighted mean fractal dimension index | **An increasing linear function**<br>$y = ax + b$ $a > 0$, $b > 0$ and $x > 0$,<br>where $y$ is the value of the metric, $a$ and $b$ are constants and $x$ is the value of the extent |
| Landscape shape index | **An increasing power law functio n**<br>$y = ax^b$ $a > 0$, $b > 0$ and $x > 0$,<br>where $y$ is the value of the metric, $a$ and $b$ are constants and $x$ is the value of the extent |
| Patch richness density | **A decreasing power law function**<br>$y = ax^b$ $a > 0$, $b < 0$ and $x > 0$,,<br>where $y$ is the value of the metric, $a$ and $b$ are constants and $x$ is the value of the extent |



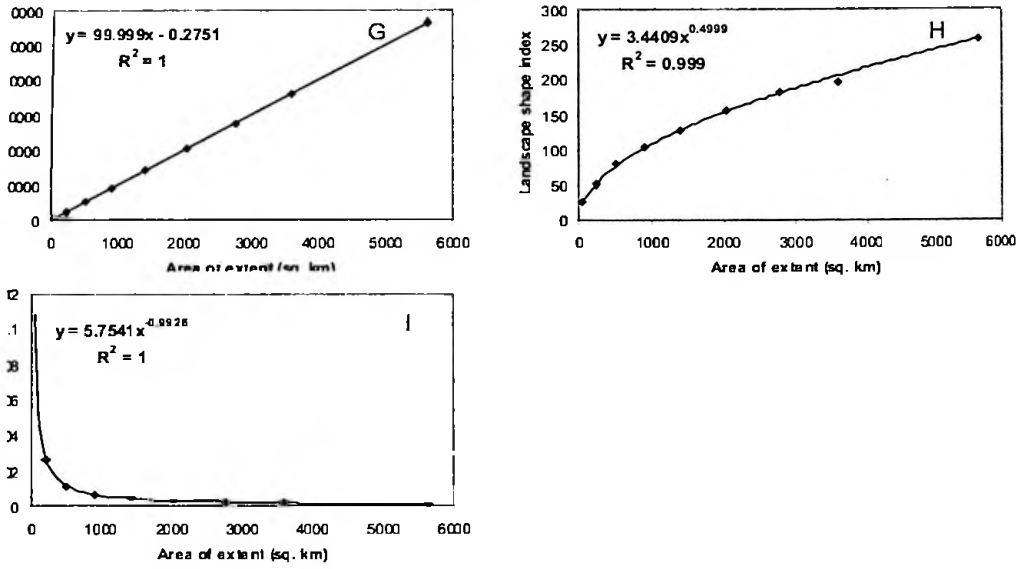
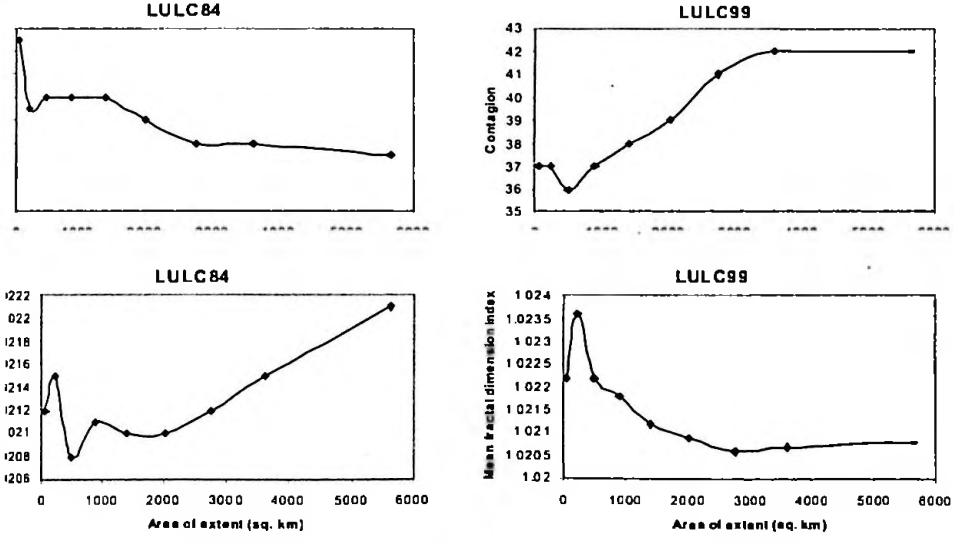



**Figure 3:** ***Scalograms of the effects of changing extent on Type I metrics of NDVI84***

Nine of the 18 landscape metrics belonged to Type I. They included *number of patches, total edge, patch area standard deviation, total area, patch area coefficient of variation, area-weighted mean shape index, landscape shape index,* area-*weighted mean fractal dimension index* and *patch richness density*. Each of these metrics could be described by simple scaling relations such as linear or power law function (Table 3 and Figure 3 (A-I)). The scaling relations fitted the metrics of both landscape maps very well; with $r^2$ ranging between 0.752 and 1.000. Seven of the Type I metrics increased in value with increasing extent via a linear relationship. A third-order polynomial function fitted three of these metrics (*PASD*, *PACV* and *AWMSI*) better. Using *PASD* as example, $r^2$ values for fitting a third-order polynomial function and a linear function were 0.977 and 0.913 respectively. However, for easier interpretation and applicability, the linear fits are preferred. *Landscape shape index* and *patch richness density*, the other two Types I metrics, followed a power law relation as the extent was increased. The equations derived from these response curves could be used to predict the values of such metrics when the extent of a landscape with similar characteristics is known.

In contrast, the response curves of the Type II metrics did not show simple trends or consistent patterns across the two landscapes. For these reasons, scaling relations could not be formulated for prediction purposes. There were eight Type II metrics for LULC84; these did not exhibit any clear trends with changing extent and did not show consistency in their trends across the two landscapes (Figure 4.). These included *largest patch index, edge density, mean patch area, mean shape index, mean fractal dimension index, contagion, patch density* and *Shannon's diversity index*. For LULC99, there were five Type II metrics. This is because linear models fitted *patch density, edge density* and *mean patch area* reasonably well, unlike those of LULC84. This is one of several inconsistencies in Type II metrics across the two landscapes. It was observed that, in general, *contagion* decreased (LULC84) or increased (LULC99) with increasing extent (the two graphs at the top in Figure 4). As the extent of landscape increased, *mean fractal dimension index* and *Shannon's diversity index* increased (LULC84) or decreased (LULC99). For both landscapes, largest patch index decreased monotonically as extent increased from 56 $km^2$ to 507 $km^2$. However for larger extents (1000 $km^2$ or more), largest patch index increased in the case of LULC99, but remained fairly constant for LULC84. Between 56 $km^2$ and 2028 $km^2$, the pattern exhibited by mean shape index for both landscapes is similar. However, from 2761 $km^2$ upwards, it increased in the case of LULC84 and decreased for LULC99.



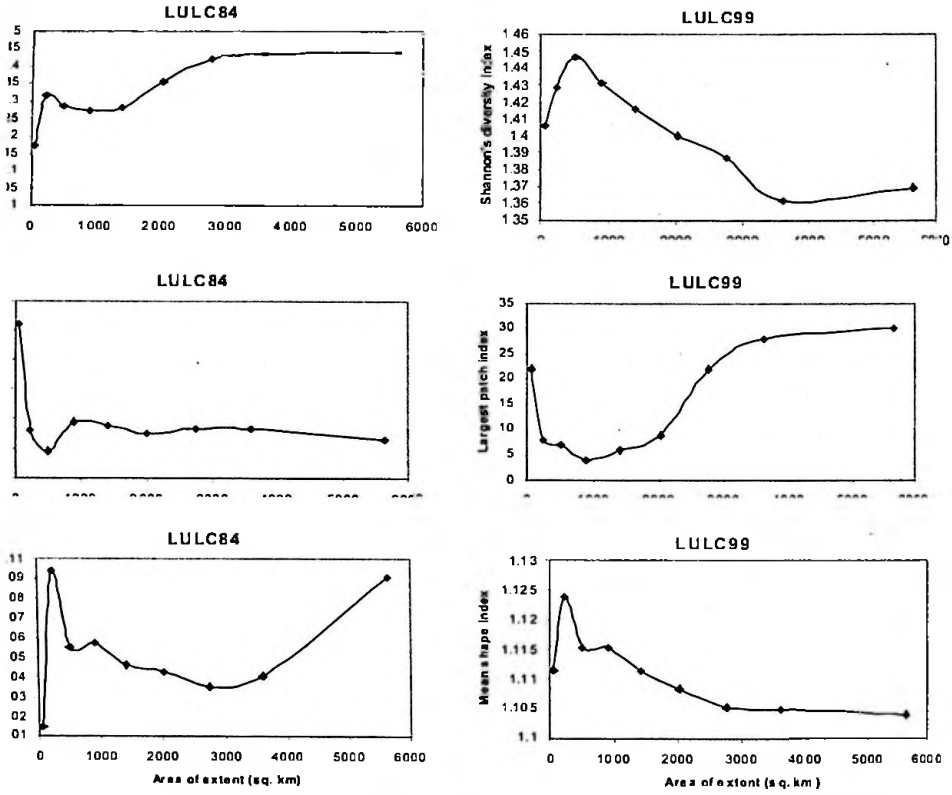



**Figure 4** *Scalograms of the effects of changing extent on Type II metrics of LULC84 and LULC99*

Type III metrics remained constant irrespective of extent. Only one metric, *patch richness*, fell into this category. *Patch richness* had a constant value of 6 across all the extents of both LULC84 and LULC99. This indicated that even the smallest extent (56 km$^2$) of LULC84 and LULC99 contained all the six land use land cover types.

## Conclusion

Two land use and land cover maps (LULC84 and LULC99) were used in an indirect approach to multi-scale analysis. The extent of both maps were changed systematically from 56 km$^2$ to 5,633 km$^2$ whilst grain size was kept constant. Eighteen commonly used landscape metrics were estimated from each

aggregated map. The study then investigated how these landscape metrics respond to changing extent by exploring for general scaling relations and idiosyncratic behaviours. The results showed that changing extent had significant effects on landscape metrics. The patterns exhibited by the landscape metrics as a result of changing extent also reflected the statistical correlations that exit among them. The response curves of the metrics to changing extent could be grouped into three main types: Type I – predictable responses with simple scaling relationships (e.g. power law, linear); Type II – unpredictable or fluctuating responses with no clear simple scaling relations; and Type III – fixed responses irrespective of changes to extent. Fifty percent of the metrics studied showed consistent scaling relations with changing extent, indicating that the effects of changing extent are generally predictable.

The study also established that the direction of analysis had significant effects on landscape pattern analysis. Type II metrics showed the most pronounced directionality. Most metrics in this category exhibited large differences at smaller extents among the four directions. However, the differences became smaller with increasing extent until eventually all four response curves converge at the full extent of the landscape. The four response curves for each metric could be grouped into two: NW-SE and NE-SW in one group, and SW-NE and SE-NW in another. The two curves in each group resembled each other in terms of the closeness of their values. The divergence of the response curves along different directions was a result of the anisotropy of landscape patterns. The characteristics of the curves and their relationships together carry useful information on landscape structure. For example, if the landscape pattern were completely isotropic, then the response curves of all metrics would be identical. However, isotropy in all directions is at best an idealized situation for real landscapes. In general, the differences among response curves in different directions increases with increasing anisotropy.

The quantification of spatial pattern is necessary to link the effects of landscape heterogeneity with ecological function and to use remotely sensed data to measure change in large spatial units. The study results indicate that the spatial scale at which these patterns are quantified influences the results and measurements made. In addition, the results may provide practical guidelines for scaling of spatial pattern. For example, landscape metrics that do not change (Type III) and those that change predictably (Type I) across scales reflect landscape features that can easily be extrapolated or interpolated from fine scales to broad scales. In contrast, unpredictable metrics (Type II) represent

landscape features whose extrapolation may be difficult and which may require information on the specifics of the landscape of concern at several different scales. Finally, to quantify spatial heterogeneity using landscape metrics, it is both necessary and desirable to use landscape metric scalograms.

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## APPENDICES

### Appendix A: Estimates of 18 landscape metrics of LULC99 map with different extents

| Area of extent (km²) | Landscape metrics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | No. of patches (*NP*) | Patch density (*PD*) | Largest patch (*LPI*) | Landscape shape ind. (*LSI*) | Total edge (*TE*) | Edge density (*ED*) | Mean patch (*MPA*) | Patch area std (*PASD*) | Patch area coeff of var (*PACV*) |
| 56 | 5118 | 91 | 22 | 34 | 997980 | 177 | 1.0993 | 20 | 1786 |
| 225 | 18329 | 81 | 8 | 66 | 3835440 | 170 | 1.2298 | 22 | 1764 |
| 507 | 42660 | 84 | 7 | 99 | 8825400 | 174 | 1.1882 | 26 | 2153 |
| 902 | 74288 | 82 | 4 | 132 | 15714420 | 174 | 1.2137 | 24 | 2004 |
| 1408 | 106630 | 76 | 6 | 154 | 22990170 | 163 | 1.3207 | 43 | 3282 |
| 2028 | 148470 | 73 | 9 | 179 | 32029050 | 158 | 1.3656 | 64 | 4670 |
| 2761 | 193415 | 70 | 22 | 199 | 41574090 | 151 | 1.4273 | 146 | 10222 |
| 3606 | 236647 | 66 | 28 | 215 | 51412650 | 143 | 1.5234 | 212 | 13903 |
| 5633 | 374752 | 67 | 30 | 271 | 81224070 | 144 | 1.5032 | 257 | 17119 |

### Appendix A: (Continued)

| Area of extent (km²) | Estimates of landscape metrics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total Area (*TA*) | (*AWMSI*) | (*AWMFD*) | Mean shape ind (*MSI*) | Mean frac dim ind (*MFDI*) | Contagion | (*CONTAG*) Patch richness (*PR*) | Patch rich density (*PRD*) | Shannon's div. ind. (*SHDI*) |
| 56 | 5626 | 7 | 1.2107 | 1.1115 | 1.0222 | 37 | 6.0000 | 0.1066 | 1.4057 |
| 225 | 22540 | 6 | 1.2110 | 1.1240 | 1.0236 | 37 | 6.0000 | 0.0266 | 1.4284 |
| 507 | 50688 | 8 | 1.2263 | 1.1153 | 1.0222 | 36 | 6.0000 | 0.0118 | 1.4465 |
| 902 | 90161 | 8 | 1.2291 | 1.1154 | 1.0218 | 37 | 6.0000 | 0.0067 | 1.4310 |
| 1408 | 140831 | 10 | 1.2437 | 1.1114 | 1.0212 | 38 | 6.0000 | 0.0043 | 1.4160 |
| 2028 | 202753 | 13 | 1.2545 | 1.1084 | 1.0209 | 39 | 6.0000 | 0.0030 | 1.4002 |
| 2761 | 276053 | 22 | 1.2753 | 1.1053 | 1.0206 | 41 | 6.0000 | 0.0022 | 1.3869 |
| 3606 | 360498 | 28 | 1.2890 | 1.1049 | 1.0207 | 42 | 6.0000 | 0.0017 | 1.3613 |
| 5633 | 563323 | 36 | 1.2972 | 1.1041 | 1.0208 | 42 | 6.0000 | 0.0011 | 1.3689 |

# VALUATION OF COMMUNAL AND PRIVATE OWNERSHIP OF MANGROVE RESOURCES ALONG THE WESTERN COAST OF GHANA

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## Abstract

*This study explored the use of valuation techniques for an economic assessment of ecological services and goods derived from mangrove resources in relation to salt pond enterprise development with special reference to a small fishing community in the western coast of Ghana. The purpose was to quantify the extent to which mangrove products contribute to subsistence or income generation by analysis of the various value components of the ecosystem. The study confirms that mangrove ecosystems provide important incentives that support economic justification for establishing management regimes for their protection and sustainable use for the broader net social benefits of the populace.*

*This study highlights how costs and benefits could be mutually considered integrating ecological, socio-cultural, business and direct utilization patterns into mangrove conservation planning efforts in Ghana and other comparable countries along the West Africa coast.*

## Introduction

The use of economic valuation as a tool in decision-making for mangrove resource management in Ghana is virtually non-existent. Mangroves have generally been proven to be ecologically significant and diverse in terms of fisheries production, shoreline protection including mitigation of floods, and enhancement of overall regional marine productivity (Odum, 1971, Entsua-Mensah, 1997, Sathirathai, 2003). From a socioeconomic standpoint, they directly support local subsistence through the exploitation of a range of goods it provides including timber production, fuel wood, and provision of wildlife for food (Ajao & Dore, 1997). However, in recent years, mangrove resources of Ghana have been increasingly subjected to widespread exploitation for industrial, residential and agricultural purposes while chemical and biological degradation have been subtle over the long term (Mensah, 2003).

Most of the physical losses are attributable to a number of reasons: (i) Rapid urbanization and widespread poverty in coastal areas (World Bank Group, 1998); (ii) Improper waste management practices around lagoons and toxicity problems from heavy metal pollution (Essumang et al., 2007); (iii) Absence of direct observable value for many of its goods and services because they are not traded on markets. In addition, most of its goods and services occur off-site and are therefore not easily recognized (Hamilton et al., 1989); (iv) There appears to be an apparent lack of political commitment and institutional capacity to invest in the critical monitoring and rehabilitation of mangrove resources. These issues have largely contributed to mangrove resource degradation; in particular, conversion attempts to other land uses including salt exploitation by local salt industries have been very significant (Sackey & Adomako, 1990). The latter follows a privatization approach where the previously communal open access of mangrove resources is restricted in favour of exclusive private rights among others, in the form of salt pond construction (Figure 1).

***Theoretical concept***

Brenu, a small fishing community along the western coast of Ghana is used as a test case to quantify the extent to which mangrove products contribute to subsistence or income generation. The analytical scheme developed and established in the context of ecological economics according to Barbier (1993) was applied. The approach is to assign direct use values to any item collected from the mangrove, assigning monetary terms also to indirect uses (e.g. flood and storm protection, mangrove function as fish nursery grounds) and option- or existence values involved in cultural practices.

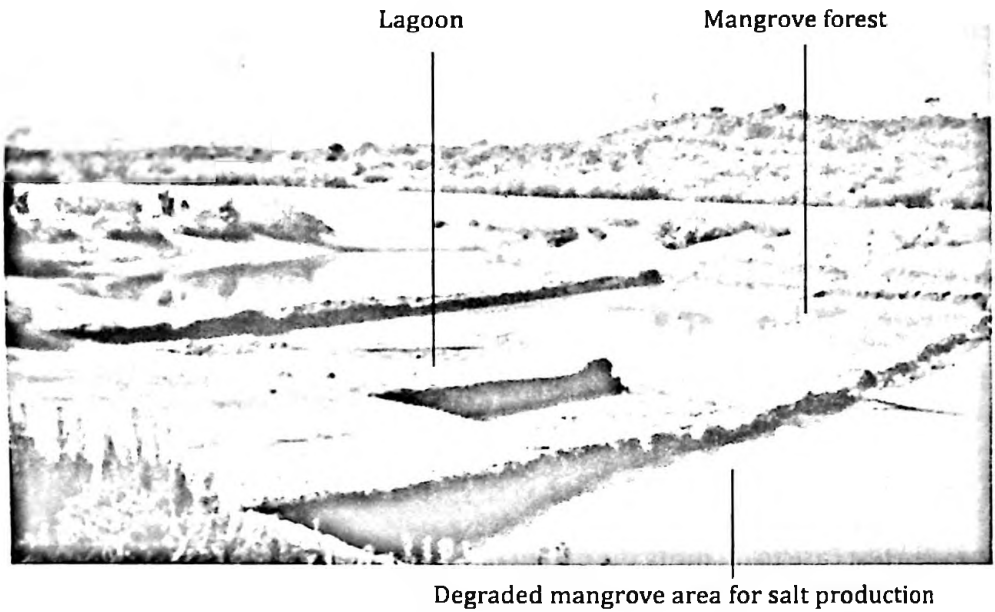


**Figure 1: Salt pond/extraction.. an alternative mangrove land use option in Brenu**

The idea of prices for these products was based on respondents' willingness to pay for certain mangrove related options. For situations where the product was found within the domain of markets, marketed prices were directly elicited per specific quantities or volume of products. Finally, in the absence of market prices, surrogate-proxy method was applied. This method valued mangrove-related goods based on the price of a marketed substitute. The relevance of these data relate to the wide lack of comparable data for West Africa. The specific objectives were to:

1) quantify the total economic value (TEV) of the coastal mangroves.
2) assess the distributional benefits and costs of local community use of mangrove resources vis-à-vis salt extraction projects.
3) estimate the feasibility of integrating economic or private business concerns into mangroves resources conservation and coastal planning.

The following hypotheses were examined: (1) the exploitation of

mangroves is widespread among the lower income earners having lower diversification in their livelihoods (2) the full value of mangrove areas for salt production may not be worthwhile if consideration is given to the forgone benefits that are provided by the mangrove ecosystems. The following are emerging possible conclusions to be derived:

a) The former hypothesis if proved right implies that the benefits from the mangroves may be regarded as incentives for the local communities to protect the ecosystems from conversion to other land uses, notably salt ponds.
b) The latter if also proved right, reinforces the first hypothesis, implying that the rights to local utilization of the mangroves-and its associated resources- by the local people as opposed to the conversions should be further recognized.
c) If both are proved wrong, then both the communal and private interests may be considered. In this regard, some portions of mangrove areas should be kept for local utilization (irrespective of the fact that the higher income groups benefit more from the mangroves but also considering broader net social benefits accruing to a group), while some other portions may be converted.
d) If the former is proved right and the latter wrong, then it implies that those who benefit from a possible conversion to other land uses should compensate those who lose out, in this case the local community, mostly the poorer groups.
e) If the former is proved wrong and the latter right, then local utilization of the resource should be favoured due to broader net social benefits going to the local people, irrespective of they being higher income earners. Conversion therefore, taking also into account its externalities in terms of mangrove destruction and pollution should be accepted.

**Methodology**

The methodology mainly based on a questionnaire approach, which was specifically developed for this purpose and gained the active co-operation of about sixty respondents in the community. The study comprised 12 months of work from 2003-2004.

*Study area*

The study was conducted in Brenu (*Latitude*: 5° 4' 0 N, *Longitude*: 1° 25' 0 W), a small fishing village in the western coast of Ghana (Figure 2). A 52 ha mangrove area around the Brenu lagoon was selected for the analysis. Locally, mangroves are known as 'Supruw'. Species identified were *Avicennia africana* and *Laguncularia racemosa*. The trees were relatively small and sparsely distributed. The vegetation also includes a number of medicinal and wild fruits. The faunal component of the Brenu mangrove ecosystem is represented by several species of lagoon crabs especially the swimming crabs (*Callinectes amnicola*), some species of molluscs including *Littorina* sp. Fishes include the lagoon tilapia *Sarotherodon melanotheron*, mullets and some shrimp species. Monkeys, antelopes, rats and grasscutters constituted the important wildlife species caught by local inhabitants from the mangrove forest.

*Mode of analysis*

The approach used in this study was to estimate Total Economic Value (TEV) that accounts for both market and non-market values of the mangrove forest following Barbier (1993).

**(1) Estimation of Total Economic Value (TEV):**

The TEV is the aggregate sum of Direct Use Values (DUV), Indirect Use Values (IUV), Option Values (OV) and Existence Values (EV)

$$TEV = DUV + IUV + OV + EV \quad (1)$$

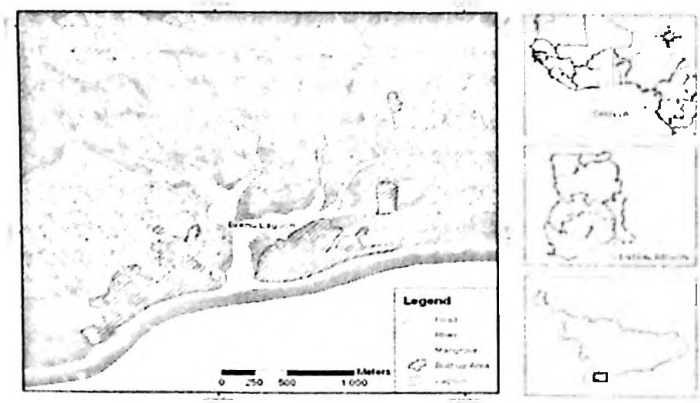


**Figure 2: Map of Ghana showing the location of Brenu**

*(a) Direct use values (DUV):* relate to values derived from direct use or interaction

with mangrove's resources and services e.g. firewood, timber, fish, crab and shrimps caught in water ways, alcohol or vinegar derived from nipa palms or traditional medicines (Spaninks & van Beukering, 1997). Information categories used in this study include estimation of value of forests, wildlife as well as fisheries products. The amounts harvested per trip, market prices and operational costs mainly food, fuel and equipment longevity and costs were requested to know from the local people to determine:

Local Direct Use Value: $DUV = Bfo + BWi + Bfi$ (2)

Where BWi = direct benefits derived from wildlife; Bfi = direct benefits from fisheries and Bfo = direct benefits derived from mangrove forest products. Using forestry as an example, the products derived were quantified as 1= firewood, 2 = timber, 3 = leaves, 4 = seeds. Therefore benefits from mangrove forest products (Bfo) were estimated as follows:

$$Bfo = \sum_{i=1}^{4} fo \quad (3)$$

Local Direct Use Value = Net Income generated for local Use:

i.e. $\Sigma (PnQn - Cn)$ (4)

Where Pn = Local market price of product n; Qn = Amount of product n being collected, and Cn = Operational costs involved in the collection of product n. The same procedure was applied for wildlife and fisheries.

*(b) Indirect use values (IUV):* refers to 'the indirect support and protection provided to economic activity and property by the wetland's natural functions, or regulatory environmental services (Barbier, 1993). The questionnaire covered estimates for support for off-site fisheries through their nursery function. Another is the protection provided against weather-related damage to productive activities located in or just behind mangrove ecosystems (aquaculture, agriculture) and to assets such as housing and infrastructure located inland (Spaninks & van Beukering, 1997).

$IUV = IBfp + IBng + IBsp$ (5)

Where IBfp = indirect benefits from flood protection; IBng = indirect benefits as

nursery grounds; IBsp = indirect benefits as storm protection.

*(c) Option values (OV):* this relates to the amount that individuals are willing to pay to conserve the forest for future use. That is, no use of it now but use may be made of it in the future. Option value is thus like an insurance premium to ensure the supply of something the availability of which would otherwise be uncertain (Pearce, 1993). **Respondents' perception regarding the role of mangroves in biodiversity conservation (e.g. for potential ecotourism) and cultural heritage were examined here.**

$$OV = \sum_{r=1}^{n} (OVr) \qquad (6)$$

where OVr: Option vale of respondent r and n: total population.

*(d) Existence/ bequest values (EV/ BV):* this relates to valuations of the environmental asset unrelated to either current or optional use. Its intuitive basis is related to the fact that many people reveal their willingness to pay for the existence of environmental assets through wildlife and environmental charities but without taking part in the direct use of the wildlife through recreation (Pearce, 1993). This was derived based on how much satisfaction individual respondents derive from continued existence of mangroves and how much they are prepared to pay for it.

$$EV = \sum_{r=1}^{n} (EVr) \qquad (7)$$

where EVr: is existence value of respondent r and n: total population.

**(2) Assessing the distributional benefits of mangrove resources:**

This analysis explored the relation between local mangrove dependence and respondents' income. In this regard, regression analysis was used to test the hypothesis if the dependence on mangroves is more widespread among lower income earners in the study location.

Percentage (%) of mangrove income in overall income =

Local Direct Use Value/ Annual Income x 100 (8)

Annual income per respondent =

Per capita money used for daily living x 30 days x 12 months (9)

**(3) Cost-Benefit Analysis (CBA) of Alternative Land Uses Options:**

CBA is a procedure for comparing alternative possible courses of investment or action by references to the net benefits that they are likely to produce (Gilpin, 2000). The CBA methods used in this evaluation were the Net Present Value (NPV) and Benefit-Cost Ratio (BCR). NPV is a discounted cash flow technique that takes into account the time value of money. It recognizes for example that a dollar received immediately is preferable to a dollar received at some future date. The NPV method accepts all independent projects whose NPV is greater than zero and ranks their NPVs, selecting the project with the higher NPV (Weston, 1975). In this study, the present value of expected cash flows of an investment, less the costs were discounted based on commercial bank interest rates- of 6% - at time of research using the following equation:

$$NPV = \{\sum_{t=1}^{n} (B_t - C_t) / (1-r)^t\} \quad (10)$$

Where r: $1/(1+i)^t$ = Discount factor

t: Current time span of project

$B_t$: Benefits derived from all salt pond/ Local utilization of mangroves

$C_t$: Operational costs of salt pond/ Local utilization of mangroves

n: Life span of project estimated to be 25 years.

i: Rate of bank interests (6%) at time of study.

Therefore the economic viability of prevailing alternative mangrove land use option of salt extraction (NPVa) were assessed and compared with the forgone benefits of the mangrove ecosystems (NPVf) over a 25-year period. The conversion is worthwhile if:

(NPVa) (NPVf) (11)

Furthermore, BCR were used to compare 'net social benefits' and 'social costs' with 'net private benefits' and 'private costs'. In general, a project having higher benefit-cost ratio will take priority over the other with lower ratios (Gilpin, 2000). However, a project approves if BCR is greater than one. The BCR analysis was done according to the following equation:

$$BCR = \{\sum_{t=1}^{n} (B_t / (1-r)^t\} / \sum_{t=1}^{n} (C_t / (1-r)^t\} \quad (12)$$

t: Current time span of project (years)

$B_t$:Direct benefits derived from salt pond/ Local utilization of mangroves

$C_t$:Operational costs of salt pond/ costs of obtaining products from the mangroves

n: Life span of project estimated to be 25 years each.

i: Rate of bank interests (6%) at time of study.

## Results and discussion

### (a) Value of mangrove natural environment

The results indicated in Figure. 3 show that mangrove's natural environment provides goods and services that are valuable to the local people. However, the non-market values account for far greater part of the total economic value. In sum, total economic value estimated to $100.99/individual/ha/year while the net market (direct use values) and non-market values (indirect, option and existence values) respectively accounted for 12%, 32%, 31% and 25%. This indicates that the population expressed a willingness to pay for indirect uses that go far beyond the direct benefits obtained for subsistence purposes. This strongly suggest that the subsistence of a major part of the population crucially depends on the ecosystem functioning. As a pre-condition to make the living it represents a considerable "natural capital". So it is reasonable that within the total economic value estimates, the non-market ecological services are considerably higher than the annually obtained direct uses.

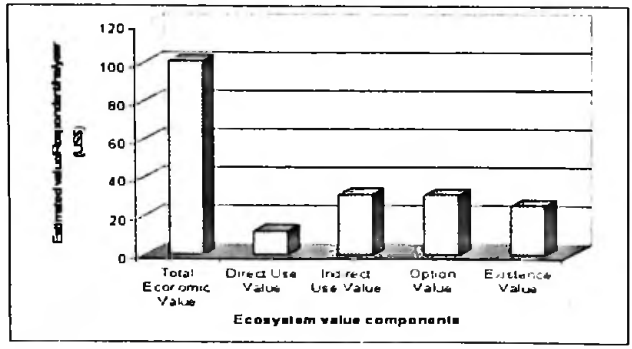


**Figure 3: Contribution of Use and Non-use Values to Total Economic Value**

**(a) Analysis of distributional benefits of the mangrove resources**

The hypothesis whether poverty in coastal areas is widespread is analyzed here by using a criteria of level of mangrove resource dependence. The relationship is best described by a logarithmic regression (Figure 4). A negative correlation (R2 = 0.3; p0.05) is revealed. The result confirms a higher dependence on the resources slowing down with an increase in overall annual income. This finding suggests that serious and realistic welfare arrangements should be made within the context of mangrove management for sustainable development. The data substantiates the assertion that poverty and environmental degradation have often been characterized as being part of a vicious cycle with implications for economic, social and environmental security. It shows that that in some situations, lower incomes may have forced individuals and their families to place greater priority on their immediate subsistence requirements leading to overexploitation of the resource. Therefore, the hypothesis that poorer segments of the society relied more on mangroves is confirmed.

**(b) Mangrove ecosystem utilization and alternative scenario judgment (Financial analysis from both private and social perspective)**

Cost-benefit Analysis was conducted to test the hypothesis whether the 'full conversion of the mangrove ecosystems into salt ponds is a worthwhile option'. The result indicates that the NPV per hectare of salt pond could go as high as $6,470.67 in the first five years of operation (see Table 1). This figure even though is less compared to estimations for local utilization $14,176.94 could be described as considerably high, with the argument that such economic benefits from salt business largely goes into private hands.

The data shows that conversion of mangroves into salt is a financially viable option for those who can afford the venture (from a private perspective). However, given its externalities such as pollution and the destruction of ecologically important services provided by the mangroves, conversions should not be encouraged. This is especially so when the poorer members of the society depend largely on the mangroves (Figure. 4). Conversion generally is therefore not a worthwhile option. Munasinghe and McNeely in 1994 confirmed that there are many situations where true economic returns are negative as nature is destroyed, while financial returns - that neglect external costs are positive and private profits are made.

A limitation observed was that some respondents are not used to calculating their activities and valuations of their gains quantitatively. The study indicates that the respondents apparently were not aware either of the value of the goods they actually consumed over the year or of their actual income situation. To deal with the situation, it was assumed to be a complete dependence of the individuals and their families on the mangrove products harvested. This observation supports the expectation that dealing with subsistence, the economic concepts are applied at the boundary zone of their validity. Income may be a well understood economic category, but it is not a predominant social constituent. Using cost benefit information in Table 1, both NPV and BCR indicated that the salt project is a gainful business but the communal utility of the mangroves is more economically efficient.

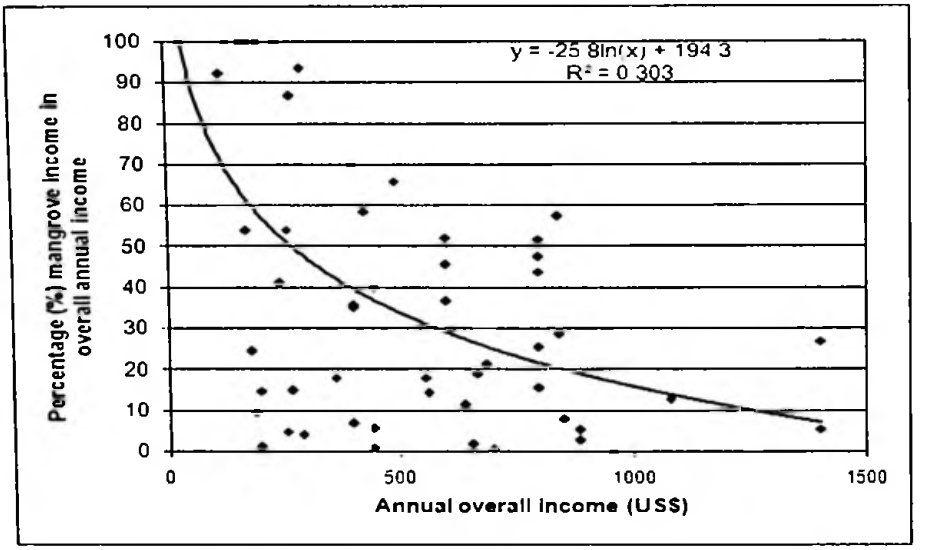


**Figure 4: Relating local dependence on mangrove resources with respondents' income**

There should be a strong recognition for a well-defined property rights regimes, land ownership and institutional mechanisms that would allow for effective co-management of the resources. Salt project could be justified if it makes one person better off and no one worse off. Unfortunately, it is not bearing in mind that the full conversion of mangroves could lead to loss of local livelihood.

**Table 1: Cost and Benefit Information of alternative land use scenarios**

| Commercial salt project from private perspective | | | | | Use of mangroves from societal perspective | | | |
|---|---|---|---|---|---|---|---|---|
| YEAR | Project Total Costs ($) | Net Benefits ($) | NPV | BCR | Total Operational Costs ($) | Net Benefits ($) | NPV | BCR |
| 1 | 10770.01 | -547.78 | -547.78 | 0.95 | 2019.53 | 17897.83 | 17897.83 | 9.86 |
| 2 | 2053.13 | 8169.09 | 7706.28 | 4.98 | 2019.53 | 17897.83 | 16884.56 | 9.86 |
| 3 | 2053.13 | 8169.09 | 7270.56 | 4.98 | 2019.53 | 17897.83 | 15928.78 | 9.86 |
| 4 | 2053.13 | 8169.09 | 6859.11 | 4.98 | 2019.53 | 17897.83 | 15027.94 | 9.86 |
| 5 | 1803.58 | 8169.09 | 6470.67 | 4.98 | 2019.53 | 17897.83 | 14176.94 | 9.86 |
| 6 | 1803.58 | 7640.86 | 5709.11 | 5.24 | 2147.31 | 17770.06 | 13278.67 | 9.28 |
| 7 | 1803.58 | 7640.86 | 5387.11 | 5.24 | 2147.31 | 17770.06 | 12527.21 | 9.28 |
| 8 | 1803.58 | 7640.86 | 5081.72 | 5.24 | 2147.31 | 17770.06 | 11818.04 | 9.28 |
| 9 | 1803.58 | 7640.86 | 4794.22 | 5.24 | 2147.31 | 17770.06 | 11149.12 | 9.28 |
| 10 | 1803.58 | 7640.86 | 4522.06 | 5.24 | 2147.31 | 17770.06 | 10518.03 | 9.28 |
| 11 | 2050.83 | 5726.87 | 3198.28 | 3.79 | 2275.08 | 17642.28 | 9851.41 | 8.75 |
| 12 | 2050.83 | 5726.87 | 3016.83 | 3.79 | 2275.08 | 17642.28 | 9293.79 | 8.75 |
| 13 | 2050.83 | 5726.87 | 2845.61 | 3.79 | 2275.08 | 17642.28 | 8767.73 | 8.75 |
| 14 | 2050.83 | 5726.87 | 2684.61 | 3.79 | 2275.08 | 17642.28 | 8271.44 | 8.75 |
| 15 | 2050.83 | 5726.87 | 2532.56 | 3.79 | 2402.86 | 17642.28 | 7803.13 | 8.75 |
| 16 | 2256.04 | 432.82 | 180.55 | 1.19 | 2402.86 | 17514.50 | 7308.25 | 8.29 |
| 17 | 2256.04 | 432.82 | 170.33 | 1.19 | 2402.86 | 17514.50 | 6894.51 | 8.29 |
| 18 | 2255.28 | 432.82 | 160.74 | 1.19 | 2402.86 | 17514.50 | 6504.27 | 8.29 |
| 19 | 2255.28 | 432.82 | 151.67 | 1.19 | 2402.86 | 17514.50 | 6136.14 | 8.29 |
| 20 | 2255.28 | 432.82 | 143.11 | 1.19 | 2402.86 | 17514.50 | 5788.72 | 8.29 |
| 21 | 2313.67 | -1541.00 | -480.57 | 0.33 | 2530.64 | 17386.72 | 5423.78 | 7.87 |
| 22 | 2313.67 | -1541.00 | -453.48 | 0.3 | 2530.64 | 17386.72 | 5114.43 | 7.87 |
| 23 | 2313.67 | -1541.00 | -427.80 | 0.33 | 2530.64 | 17386.72 | 4824.89 | 7.87 |
| 24 | 2979.39 | -2206.72 | -577.81 | 0.26 | 2530.64 | 17386.72 | 4551.83 | 7.87 |

## Conclusion

It is concluded that salt production is a profitable venture. However, their development in mangrove areas does not follow a sustainable path. On account of ecological considerations, salt ponds would impact negatively among others, on ecologically sensitive nursery habitats for important fish species with economic ramifications for a larger part of the population.

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# A NOTE ON RELEVANCE OF STOMATAL COMPLEX TYPES IN *AZADIRACHTA INDICA* A. JUSS. TO ITS UBIQUITY AS SHADE PLANTS IN NIGERIA

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**Abstract**

*Azadirachta indica A. Juss. has a high frequency of stomatal complex types with few subsidiary cells around the guard cells. These are namely pericytic, paracytic, diacytic and anisocytic stomata. This paper attempts to link the stomatal complex structure in the species to its ubiquity, being able to thrive in various ecological zones in Nigeria, from the wet forest to the dry savannah locations. Widespread cultivation of the species is recommended as a more affordable mitigation measure for climate change, than the Carbon Capture and Storage (CCS) strategy.*

## Introduction

Climate change has been described as the greatest environmental challenge that is currently facing mankind. As a result of its global dimension, international collaborative research efforts have been engaged so as to understand its processes and impacts as well as to identify various strategies for mitigation and adaptation (Frederick & Rosenberg, 1994; Pickering & Owen, 1997). With respect to its mitigation, several strategies have been suggested e.g. Carbon Capture and Storage (CCS), which is an engineering technique to capture and store carbon dioxide away from the atmosphere. This technique could be capital-intensive and more expensive than the biological processes e.g. tree plantations and use of shade plants.

*Azadirachta indica* A. Juss. is one of the tree species used as shade plant in Nigeria. The species is ubiquitous, being found almost everywhere from forest locations through Guinea savannah, Sudan savannah to Sahel savannah. Its ubiquity may be due to several factors such as deep root system, seed dispersal system etc. The present study attempts to examine the structure of its stomatal complex so as to detect a possible linkage with its distribution and its potentials to mitigate climate change. This attempt is informed by the crucial role that stomata play in purification and humidification of the atmosphere, resulting in cloud and rain formation (Parkhurst, 1994; Xu & Zhou, 2008).

## Materials and Methods

Leaf specimens of *Azadirachta indica* A. Juss. were collected from the Biological Garden, University of Ilorin, Ilorin, Nigeria. The epidermal layers were isolated by maceration of leaf segments in 20% chromium trioxide (Alvin & Boulter, 1974). The layers were rinsed in distilled water, stained in 1% aqueous safranin and mounted in glycerine for microscopic study. Frequency of stomatal complex types was determined as percentage occurrence of each stomatal type based on all occurrences in 200 fields of view at x40 objective on an Olympus microscope (Bennett & Humphries, 1974; Dilcher, 1974).

## Results and Discussion

There are 5 types of stomatal complex observed in *Azadirachta indica*. These are pericytic, paracytic, diacytic, anisocytic and polycytic stomata. The most frequent and common stomatal type is paracytic i.e. having 2 subsidiary cells enclosing guard cells followed by anisocytic, polycytic, diacytic and pericytic respectively (Table 1). When pooled together, stomata with few subsidiary cells, namely 1 -3 subsidiary cells enclosing guard cells have a frequency of 80% (Table 1). This pattern may have some implications with regard to stomatal opening and conductance. Carr and Carr (1990) proposed that a large number of subsidiary cells per stoma may be responsible for a more precise and rapid stomatal opening, while having few subsidiary cells per stoma may slow down the process. Similar conclusions were drawn by Obiremi and Oladele (2001), Oyeleke et al. (2004), AbdulRahaman and Oladele (2009) and Saadu et al. (2009) on their studies of some species of *Citrus* Linn., *Eucalyptus* L'Herit, *Polyalthia* Blume and *Cocos* Linn.

In *Azadirachta indica* A. Juss., the high frequency of stomata with few subsidiary cells around guard cells, suggests that the species has a stomatal system that is water-conserving. This may be one of the factors responsible for its ubiquity, being able to thrive in dry savannah locations as well as in wet forest locations. Some species of *Ficus* Linn. have been reported to have high frequency of stomatal complex types with many subsidiary cells, surrounding the guard cells i.e. 3 – 8 subsidiary cells per stoma (Ogunkunle & Oladele, 2008). These tree species of *Ficus* Linn. are known to be less ubiquitous than *Azadirachta indica* A. Juss.. They do not thrive in the drier Sudan and Sahel savannah locations, as neem trees do. This paper thus renders support for widespread cultivation of neem tree species as part of efforts to mitigate climate change, as well as to enhance the rural and urban landscape of African continent.

**Table 1: Stomata in the leaves of *Azadirachta indica* A. Juss.**

| Stomatal complex types | Number of subsidiary cells per stoma | Frequency (%) |
|---|---|---|
| Pericytic | 1 | 3 |
| Paracytic | 2 | 47 |
| Diacytic | 2 | 10 |
| Anisocytic | 3 | 20 |
| Polycytic | 5 – 6 | 20 |

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# THE INCIDENCE OF URINARY SCHISTOSOMIASIS AND THE FACTORS AFFECTING ITS TRANSMISSION IN THREE COMMUNITIES IN THE CENTRAL REGION OF GHANA

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## Abstract

*The incidence of urinary schistosomiasis and factors affecting its transmission were studied in three communities (Brimsu Apewosika, Baafikrom and Enyan Akotoguah) along the banks of two freshwater bodies, the Brimsu and Mankessim reservoirs, in the Central Region of Ghana. Examination of urine samples by microscopy revealed the presence of eggs of Schistosoma haematobium in 113 (60 .8%) out of 186 pupils. Prevalence rates were 45.5% at Brimsu Apewosika (near the Brimsu reservoir), 58.3% at Baafikrom and 74.6% at Enyan Akotoguah (both near the Mankessim reservoir). Age related distribution of S. haematobium infection in the study areas revealed that the highest prevalence was among the 11-13 year group. More males were affected than females. Water contact activities influencing the transmission of the disease were swimming, water fetching, wading, fishing, defecating and urinating. Swimming was the most important water contact activity.*

## Introduction

Schistosomiasis is a disease of the tropics and subtropics and one of the world's major public health problems, with more than 600 million at risk of contracting it (Odei, 1961., TDR, 1997). Approximately 200 to 300 million people suffer from schistosomiasis world wide (Nash *et al.*, 1982; Savioli, *et al.*, 1990). In the early 1990's, it was estimated that the disease had a world mortality rate of 200,000 per year (TDR, 1991). According to Odei (1964) and Bosompem et al.

(1996) the disease continues to exist and spread because of the activities and unhygienic tendencies of man. Aryeetey *et al.*, (1999) reported that human behaviour plays an important role in the life cycle of *Schistosoma sp.*, the parasite that causes the disease. The association of schistosomiasis with water and recreational activities put many people at risk (Cetron *et al.*, 1996; Madsen *et al.*, 2001). Children are the high-risk groups. Heavily infected children experience disabilities and reduced scholastic abilities (Christensen and Furu, 1987). Most of the morbidity associated with the disease is due to the massive egg output by the adult female which embeds in various tissues and cause organomegalies. The eggs laid in veins penetrate the walls causing loss of blood leading to anaemia (Manson-Bahr and Bell, 1987).

The prevalence of the disease among children is usually a good indicator of the overall prevalence of the disease in the community because of their high output of *S haematobium* eggs when infected. It has been shown that infection is highly influenced by the presence of certain types of water bodies, which harbour the intermediate hosts, and the frequency of human contact with water (Ernould *et al.*, 2000). Two reservoirs in the Central Region of Ghana, the Brimsu and the Mankessim reservoirs are known to harbour aquatic snails. The Brimsu reservoir in the Abura-Asebu-Kwamankese district was constructed in 1928 to provide treated water for domestic use in the Central Region, while the Mankessim reservoir in the Ajumako-Enyan-Essiam district was constructed to irrigate about 320 hectares of land for rice and vegetable cultivation. It is currently adapted to provide treated water for people in the Mfan tsiman West district, part of the Central Region. Several villages are situated in the proximity of the two water bodies. Although Mintah (1992), Danquah (1993) and Asante-Addai(1995) reported the presence of schistosome infected snails from the two reservoirs, none of them established a link between the infected snails and the incidence of schistosomiasis in the communities sited along their banks. This study assessed the incidence and prevalence of urinary schistosomiasis in three selected communities along the two water bodies and the factors affecting the transmission and endemicity of the disease in the selected communities.

## Materials and Methods

*Study Area*

*Determination of factors affecting transmission of urinary Schistosomiasis*

Questionnaires were administered to 206 school pupils from three communities: 60 from Brimsu Apewosika and 73 each from Baafikrom and

Enyan Akotoguah. The respondents were aged between 2 and 19 years. The questionnaire sought responses to knowledge about symptoms of schistosomiasis and their water contact activities. The pupils were assisted by their teachers to complete the questionnaire.

**Prevalence Determination**

This was done by analysis of urine samples. Fifty millilitres of urine sample was obtained from each of the 186 school children used for the study. The urine samples were collected between 10.00 and 13.00hrs GMT and transported to the laboratory on ice to prevent schistosome eggs if any, from hatching. Two methods of urine analysis were used. These were the filtration quantitative technique and the sedimentation quantitative technique.

***Filtration Quantitative Technique***

Using a pair of blunt-ended forceps a nucleopore polycarbonate filter of pore size 25µm was fitted into 25mm diameter Swin-Lok Holder. Ten millilitres of each urine sample was filtered separately through the Swin-Lok Holder with the nucleopore polycarbonate filter. Air was pumped through the filter twice. This helped to stick the eggs to the filter. With a blunt-ended forceps, the nucleopore filter was removed and transferred unto a clean microscope slide, placing the filter face downward with the eggs trapped between the slide and the filter paper. A few drops of physiological saline were added to stick the eggs and filter to the slide. Using the X10 objective lens with the condenser iris closed sufficiently to give good contrast, the entire filtrate was systematically examined for *Schistosoma haematobium* eggs.

*Sedimentation quantitative technique*

Ten millilitres of each urine sample was centrifuged at 1,500rpm for 5 minutes. The supernatant fluid was removed with a Pasteur pipette and the entire sediment transferred onto a microscope slide and covered with a cover slip. Each preparation was examined under the microscope as described before.

**Results**

*Factors affecting transmission of urinary Schistosomiasis*

Out of a total of 206 pupils interviewed, 115 (55.8%) responded positively to having blood in their urine. The following water contact activities recorded by the questionnaire could be the possible factors responsible for the

transmission of schistosomiasis in the study areas. These were defecating and urinating in and around water bodies, swimming, water fetching, wading and fishing. The level of contact with water due to these activities differed from each of the study areas (Fig. 1). The most important water contact activity in all the study areas was swimming. It recorded percentage prevalence of 79.5% at Enyan Akotoguah, 65.8% at Baafikrom and 30.0% at Brimsu Apewosika. At Brimsu Apewosika and Baafikrom water fetching was found to be the second most important water contact activity, with percentage prevalence of 25.0% and 42.5% respectively. However, water fetching was rather the least of all the activities at Enyan Akotoguah (13.7%). Wading (72.6%) and fishing (71.2%) ranked second and third highest water contact activities at Enyan Akotoguah, which brought respondents into close contact with schistosome infested water bodies.

With regards to defaecating and urinating in and around water bodies, Enyan Akotoguah had the largest value whilst Brimsu Apewosika had the least value. At Enyan Akotoguah 64.4% of the respondents defecate and 26.0% urinate in the water body. At Baafikrom 13.7% defecate whilst 16.4% urinate. Brimsu Apewosika had 8.3% defecating and 13.3% urinating (Fig. 2). It should be noted that with the exception of water fetching, Enyan Akotoguah recorded highest values for the remaining water contact activities.

A test for significance (t-test) revealed no significant differences between any of the water contact activities ($P>0.05$). All the activities are equally important in the transmission of schistosomiasis.

*Prevalence of S. haematobium*

This was based on the presence of eggs in urine samples as well as verbal responses.

Examination of urine samples by microscopy revealed the presence of eggs of *Schistosoma* sp. The eggs were identified as those of *S. haematobium* by their characteristic terminal spine (Plate 1). Miracidia hatched from *S. haematobium* eggs that came into contact with distilled water. The fully emerged miracidia moved actively but randomly about in the distilled water contained in a petri dish.

Out of 186 pupils examined in the study areas 113(60.8%) had urinary schistosomiasias (Table1)

Prevalence rates recorded at each study area revealed that Enyan Akotoguah had the highest prevalence of 74.6%; Baafikrom had 58.3% whilst Brimsu Apewosika recorded a prevalence of 45.5%.

In all the study areas males had a higher rate of infection than females. Prevalence for males and females were 70.2% and 51.1% respectively (See Table 1). Chi-square test showed a significant difference between *Schistosoma haematobium* infection in males and females($P<0.05$).

*Comparison Between Verbal Response and Urine Analysis*

Results obtained from responses to questionnaires, which was regarded as verbal response, compared well with analysis of their urine samples by microscopy in the three localities (Table 2). Brimsu Apewosika had a prevalence of 40.0% verbal and 45.5% urine analysis. Baafikrom had 56.2% verbal, 58.3% urine analysis. Enyan Akotoguah recorded the highest of 68.5% verbal and 74.6% urine analysis. Although the verbal responses were consistently lower than the urine analysis the differences were not statistically significant when subjected to a t-test ($P>0.05$)

*Age related distribution of S. haematobium infection in pupils*

The results shown in table 3 revealed that the age group with the highest infection (38.1%) was the 11-13 year group. The 8-10 year group, 14-16 year group, 5-7 year group and the 17-19 year group followed in that order with 23.9%, 18.6%, 10.6%, 6.2% and 2.7% respectively. The highest prevalence rate within the age groups was 66.2%(11-13 year group) and the lowest was 42.9%(17-19 year group). Even though prevalence rates did not reveal marked differences among the age groups, the percentage frequency did show apparent differences among them as shown by the pie chart in Fig 3. The greatest arithmetic mean egg count per ten millilitres of urine was found in the 14-16 age groups (441.9) and the least in the age group 2-4 years(41.1) (Table 3).

## Discussion

*Prevalence of urinary Schistosomiasis in the three communities*

The gross percentage prevalence of *Schistosoma haematobium* infection ranged between 45.5% and 74.6% in the study areas. This is an indication of the endemic nature of urinary schistosomiasis in these areas. The inhabitants are mainly peasant farmers who use the fertile land along the banks of the reservoirs

and the rivers that feed the reservoirs, for farming. They also depend on the water from the reservoir for domestic and recreational activities. These activities constantly render them prone to infection.

Marked differences were observed in the gross prevalence rates in the three settlements. This could be due to the unique characteristics of each settlement. Conditions prevailing in Enyan Akotoguah favour high transmission of schistosomiasis. It is the most rural among the three settlements. Floodwaters of the Mankessim reservoir get very close to the village, especially during the rainy season. The inhabitants lack basic sanitary facilities such as public baths, pipe-borne water, recreational centre and places of convenience. Most of the school children spend a lot of time in the pools of the floodwaters of the reservoir. They swim and fish as a form of recreation. Swimming and fishing are activities that involve spending considerable length of time in water. Swimming, especially involves immersion of a greater portion of the body, thus increasing the risk of infection. Enyan Akotoguah recorded the highest prevalence of all the water contact activities except waterfetching(See Fig. 2). It is therefore not surprising that as high as 74.6% of urine samples examined by microscopy, contained eggs of *S. haematobium*. Reports on the significance of human-water contact in the transmission of schistosomiasis demonstrate increased prevalence in villages closer to a lake shore (Ernould *et al.*, 2000). Enyan Akotoguah is the closest of the three settlements to a large freshwater body, the Mankessim reservoir, thus supporting the results obtained.

Residents of Baafikrom have access to pipe-borne water yet there was a high prevalence rate of urinary schistosomiasis (58.3%) second to Enyan Akotoguah. Baafikrom is quite close to the Mankessim reservoir. Children depend on the water for domestic and recreational activities especially during the warm dry season when pipe-borne water is in short supply and demand for water is very high. Unfortunately the dry season happens to be the peak transmission period with peak cercaria shedding and peak urinary output (Danquah, 1993).

Prevalence rate of urinary schistosomiasis at Brimsu Apewosika (45.5%) was the least among the three settlements covered in this study. The inhabitants of Brimsu Apewosika are restricted in the use of the reservoir for domestic and recreational activities. Although the reservoir itself is a restricted area, there are many communities sited along the banks of the river Kakum that feeds the reservoir. Contamination of the river upstream seems to maintain the transmission of schistosomiasis in the area.

*Prevalence of Schistosomiasis by sex*

In all the study areas males were observed to have higher prevalence rates than females. This could be due to the fact that, apart from swimming, wading and water fetching, males in the study areas spend considerable amount of time fishing. Males of all ages are less shy than females; again they have fewer responsibilities at home and therefore, spend a considerable amount of their leisure time outdoors. They swim with very little clothes on and expose a greater portion of their body to infected water bodies. The results obtained are in agreement with previous works by Okpala (1957), Bozdech(1972) and Bosompem *et al.* (1996).

*Prevalence of S. haematobium Infections by Age*

The highest prevalence rate was observed in the 11-13 age group (66.2%). This is in conformity with previous studies by Bozdech (1972) and Bosompem *et al* (1996), which revealed that infection was highest between 10-14 years. In this study 62% of those infected with *S. haematobium* were between eight and thirteen years (8-13 years). Children within this age group are very active and roam about the village playing football or swimming and fishing as a form of recreation. Children play an important role in epidemiology of schistosomiasis because of their high output of *Schistosoma* eggs when infected. They bathe in pools of water during the warm season. The 17-19 years age group had the lowest prevalence rate and the main reason could be that they have fully developed secondary sexual characteristics and so feel shy to expose themselves among the lower age groups. The 2-4 year age groups are well protected and are hardly allowed to come into close contact with water bodies. However, in Enyan Akotoguah where the floodwaters reach within 5 metres of the outskirts of the village, very small children are sometimes attracted to the water. They play in the shallow parts under the care and supervision of older siblings. They therefore acquire infection by playing in the pools of water. Children between the ages 8 and 16 pass a large number of *S. haematobium* eggs through their urine into water bodies as they swim, thereby contaminating the water and playing a major role in the transmission of urinary schistosomiasis. In this study the 14-16 years group had the highest arithmetic mean egg count of 441.9 per 10ml of urine.

## Conclusion

- Schistosomiasis is endemic in the communities sited along the banks of Brimsu and Mankessim reservoirs. Very high rates of the disease were recorded in the settlements studied and this was attributed to poor sanitary conditions, lack of public places of convenience and absence of recreational facilities that led to high water contact activities.
- Enyan Akotoguah, the most rural among the three settlements, recorded the highest prevalence rate of the disease.
- The filtration quantitative technique proved to be a better method for ascertaining the percentage prevalence and intensity of urinary schistosomiasis than the sedimentation quantitative technique.
- Eggs of S. *haematobium* in urine samples were observed from pupils whose activities brought them into close contact with infected waters bodies.
- The factors affecting the transmission of schistosomiasis in the study areas were swimming, water fetching, wading, fishing and urinating or defaecating in and around water bodies.
- The factors affecting the transmission of schistosomiasis in the study areas were swimming, water fetching, wading, fishing and urinating or defaecating in and around water bodies.

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**Table 1: Prevalence of urinary Schistosomiasis**

| Settlement | Number Examined | Number Positive | Male | | Female | |
|---|---|---|---|---|---|---|
| | | | No. Examined | No. Infected | No. Examined | No. Infected |
| Brimsu Apewosika | 55 | 25(45.5) | 34 | 18(52.9) | 21 | 7(33.3) |
| Baafikrom | 60 | 35(58.3) | 29 | 21(72.4) | 31 | 14(45.2) |
| Enyan Akotoguah | 71 | 53(74.6) | 31 | 27(87.1) | 40 | 26(65.0) |
| Total | 186 | 113(60.8) | 94 | 66(70.2) | 92 | 47(51.1) |

Numbers in parenthesis represent percentage prevalence

**Table 2: Verbal Response and Urine Analysis Compared**

| Settlement | Verbal Response | | Urine Analysis | |
|---|---|---|---|---|
| | Number Examined | Number Positive | Number Examined | Number Positive |
| Brimso Apewosika | 60 | 24(40.0) | 55 | 25(45.5) |
| Baafikrom | 73 | 41(56.2) | 60 | 35(58.3) |
| Enyan Akotoguah | 73 | 50(68.5) | 71 | 53(74.6) |
| Total | 206 | 115(55.8) | 186 | 113(60.8) |

Numbers in parenthesis represent percentage prevalence

**Table 3: Prevalence and Intensity of Urinary Schistosomiasis among age groups**

| Age Group | Number Examined | Number Positive | % Frequency of Positives | AMEC/10ml Urine |
|---|---|---|---|---|
| 2 - 4 | 14 | 7(50.0) | 6.2 | 41.1 |
| 5 -7 | 22 | 12(54.5) | 10.6 | 49.3 |
| 8 -10 | 41 | 27(65.9) | 23.9 | 415.1 |
| 11 - 13 | 65 | 43(66.2) | 38.1 | 425.0 |
| 14 - 16 | 37 | 21(56.8) | 18.6 | 441.9 |
| 17 - 19 | 7 | 3(42.9) | 2.7 | 109.0 |
| TOTAL | 186 | 113(60.8) | | |

AMEC = Arithmetic mean egg count

Numbers in parenthesis represent percentage prevalence

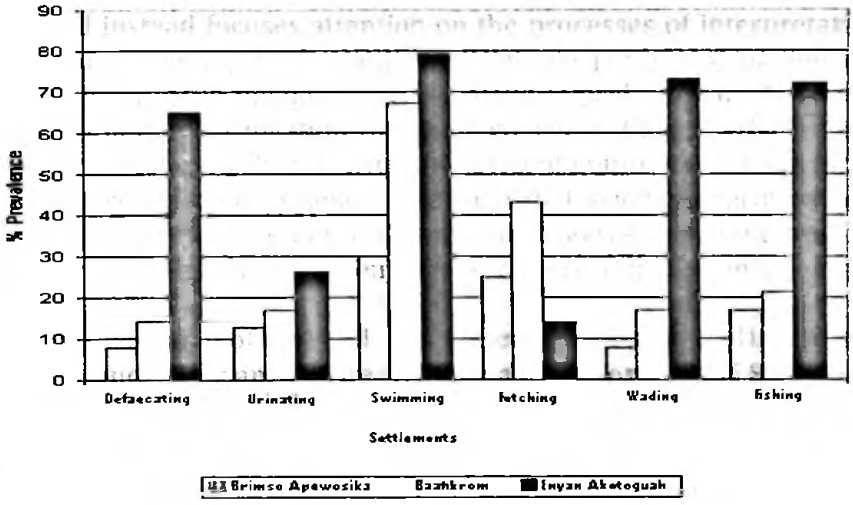


**Fig.1 Water Contact Activities of Respondents in the study areas**

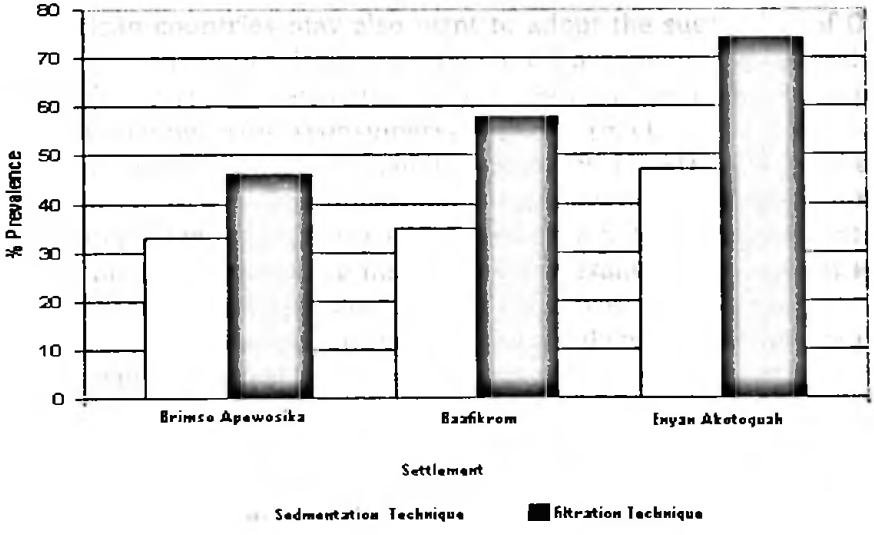


**Fig.2 Comparison Between Sedimentation and Filtration Techniques**

**Filtration and Sedimentation Techniques**

When the two methods were used to analyse urine samples, it was observed that the sedimentation method gave lower prevalence and intensity values. The prevalence for Brimsu Apewosika, Baafikrom and Enyan Akotoguah were 32.7%, 35.0% and 46.5% respectively for the sedimentation technique. The filtration method gave higher prevalence; Brimsu Apewosika 54.5% Baafikrom 58.3% and Enyan Akotoguah 74.6% (Fig.2). A test for significance (t-test) revealed no significant difference between the two methods ($P>0.05$).

The filtration (quantitative) technique proved better in ascertaining the prevalence and intensity of urinary schistosomiasis than the sedimentation technique. It gave higher prevalence and intensity values. It was very good for confirming positive cases in urine samples that had very low infection and were easily missed by the sedimentation technique. The sedimentation technique often produced thick deposits, which masked the presence of eggs and made accurate counting of eggs quite difficult. The filtration technique, using the nucleopore filter paper was quick, simple and reproducible

# THE USE OF MULTIMEDIA TECHNOLOGY TO IMPROVE PRE-SERVICE MATHEMATICS TEACHER EDUCATION: ISSUES AND OPTIONS FOR GHANA

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**Abstract**

It is well documented that the overly theoretical coursework in conventional mathematics teacher education programmes does not effectively challenge pre-service mathematics teachers' preconceived ideas about the teaching of mathematics. In addition, field experiences provided for pre-service teachers have been shown to have inherent limitations. Consequently, several mathematics educators have drawn attention to the need to engage pre-service mathematics teachers in experiences that present actual teaching practices and make it possible for them to study or critique those practices reflectively. In the developed countries like the US there appears to be a growing interest in the potential of multimedia systems to bring this type of reflective and critical thinking about the teaching of mathematics. In the developing countries such as Ghana, very little of such efforts, if any, is being done to improve mathematics teacher education. This paper looks at the potential of these multimedia environments to improve education of prospective mathematics teachers in Ghana. It focuses on how multimedia programmes fit into contemporary theories of teacher learning and supports this with a discussion of empirical research efforts at using multimedia programmes to facilitate education of prospective mathematics teachers. Implications for pre-service mathematics teacher education in Ghana are also presented.

**Introduction**

In conventional teacher education programmes, pre-service mathematics teachers learn about the teaching of mathematics as a form of "school knowledge" (Lampert & Ball, 1990). In addition, the courses are offered in isolated circumstances and mostly in a theoretical manner that many pre-service teachers do not easily establish the linkage (see for example, Ball, 1988b). At the University of Cape Coast in Ghana, for instance, pre-service mathematics teachers are exposed to college-based mathematics courses, foundations of education courses and a number of mathematics education

courses are offered theoretically and in isolated circumstances. In addition, micro-teaching sessions, under the guidance of experienced professors, are provided during the third year of the undergraduate teacher education programme to help pre-service mathematics teachers put into practice the theories of mathematics teaching and learning they have previously been exposed to. Thereafter, pre-service teachers are attached to schools for one semester for supervised internships (Off-Campus Teaching Practice), with the help of experienced mentors. During the internship, pre-service teachers observe lessons and take lead roles in teaching under the mentorship of experienced teachers in their subject areas while faculty from the University occasionally visit to assess their performance and progress. What conventional teacher education at the University of Cape Coast in Ghana offers, as in many conventional teacher education programmes, can therefore be likened to a process of initially exposing pre-service teachers to 'maps' of the classroom situations under which they would later be working and later, testing their ability to reproduce the maps through the micro-teaching and off-campus teaching practice arrangement (Lampert & Ball, 1990). Lampert & Ball (1990) have argued that due to the largely theoretical nature of these maps, many newly trained teachers are left with very few guideposts, if any, to guide them when they arrive at the work situation. New teachers are therefore compelled to invent their own maps; hence the argument sometimes that no matter how much teachers learn during preparation, learning to teach inevitably occurs on the job.

The above-mentioned arrangement of taking courses in isolated circumstances makes it difficult to effectively challenge the preconceived ideas about mathematics and the teaching of the subject that pre-service teachers bring with them to the college of education. Lortie (1975) has estimated that on average, students spend about 13, 000 hours in direct contact with classroom teachers by the time they graduate from high school. During this period, many pre-service teachers would have been exposed to mathematics teaching that transmits mathematics content and procedures in a prescriptive and repetitive manner and this makes it possible for them to develop the thinking that mathematics should be taught in a procedural manner emphasizing the explanation of algorithms and how they could be applied (Eisenhart, Borko, Underhill, Brown, Jones & Agard, 1993). Even in situations where they are exposed to exemplary teaching, students are not equipped with sufficient theory and ability with which to analyze the actions of their teachers. Consequently, instead of preconceiving the teaching of mathematics in an explicit and analytic

manner based on pedagogical principles, there is the tendency for students to preconceive of it (i.e. mathematics teaching) in an intuitive and imaginative manner. Thus, before they enter colleges of education, pre-service teachers are likely to have formed subjective understanding of what it means to teach a subject like mathematics by imagining why their teachers pursue certain agendas in their classrooms. Research is replete with the findings that these preconceived ideas and thinking about mathematics and the teaching of mathematics affect what pre-service teachers learn from their courses and field experiences (see Lortie, 1975; Fieman-Nemser; & Buchmann, 1986; Ball, 1988a, 1988b). Ball (1988b) for instance, has argued that due to the lack of connection between the overly theoretical coursework in traditional teacher education courses and the realities of classroom life, the experiences and preconceived assumptions of pre-service mathematics teachers, for the most part, remain unchallenged by conventional teacher education programmes; and beginning teachers are likely to teach using the same unproductive methods they are so familiar with.

While it is true that field experiences and supervised internships help pre-service teachers construct practical knowledge that is detailed, concrete, and integrated around problems of practice, it has been argued that such field experiences could have inherent weaknesses in terms of their effectiveness (Buchmann & Schwille, 1982; Shulman, 1987; Masingila & Doerr, 2002). First, in attaching students to schools for field experience or internship purposes pre-service teachers are usually attached individually to particular teachers in their field placements and never together, as a cohort, in the same teacher's classroom. Their individual experiences in this arrangement are, therefore, never the same. Masingila & Doerr (2002), for instance have argued that pre-service teachers' lack of common experience limits their ability to reflect and analyze the teaching and learning process generally with their classmates in a meaningful manner. Second, it is documented that expert teachers have the ability to deviate from their "curriculum scripts" (e.g. Putnam, 1987) and engage in "actions associated with teaching quickly, accurately, flexibly and inventively under several types of constraints" (Leinhardt, 1988, p.120). Unfortunately, even when individual pre-service teachers are placed in the classroom of exemplary teachers, it is doubtful whether they (the pre-service teachers) possess the ability and experience to completely and meaningfully deconstruct what is "good" from simply observing the rapidly changing and complex interactions (both spoken and unspoken) that

take place in the classroom (Shulman, 1987). In addition, it is quite difficult, if not completely impossible, for pre-service mathematics teachers to interrupt the classes they are observing and pose questions to their mentors in order to fully understand the actions of their mentors. Their learning in these arrangements could therefore be intuitive, imaginative and in some cases unreflective in nature. Consequently, it is possible that pre-service mathematics teachers draw faulty inferences from their field experiences and internships (Buchmann & Schwille, 1982). Furthermore, in reality, because the number of exemplary reform-based classrooms is few, it is difficult to get sufficient mentors who can help pre-service teachers deal with the disparity between the theoretical courses they take in college and the reality they face in their field placements (see for instance, Masingila & Doerr, 2002).

The foregoing suggests that neither the university-based theoretical study of teaching nor learning to teach through unreflective apprenticeship, either separately or together, are likely to produce a career-long orientation of professional learning. These issues, namely; the lack of connection between the overly theoretical college-based courses for pre-service teachers, the problems inherent with the type of learning pre-service mathematics teachers engage in during their field placements, have led several mathematics educators to draw attention to the need for intensive practical orientation through the presentation (to pre-service teachers) of experiences that present actual teaching practices and make it possible for them to study or critique those practices (Lampert & Ball, 1990; Merseth & Lacey, 1993; Mousley & Sullivan, 1997; Sullivan, 2002). Currently, many mathematics educators seem to suggest that exposing pre-service mathematics teachers to teaching in a reflective manner has the potential of effectively challenging the initial ideas pre-service mathematics teachers' formed from their apprenticeship of observation and helping to learn about the teaching of mathematics practically. Sullivan (2002), for instance, has observed that, "studying teaching in simulated or real situations offers considerable potential for stimulating thinking not only about the application of theory to practice but also for creating personal theories for the study of [teaching] practice" (p. 291). To achieve the type of reflective practical orientation suggested here, many mathematics educators have began to investigate and advocate for the use of multimedia systems to support pre-service teacher education (e.g. Lampert & Ball, 1990; Merseth & Lacey, 1993; Mousley & Sullivan, 1997; Herrington, Sparrow & Oliver, 1998; Masingila & Doerr, 2002; Sullivan,

2002). It is suggested that multimedia systems that capture the complexities of an exemplary "can become sites for investigation, reflection and study by pre-service teachers in ways that are not easily accomplished with actual classroom experience" (Masingila & Doerr, 2002, pp. 236-237).

In the developed countries, many mathematics educators have already started using multimedia systems to improve mathematics teacher education, both in pre-service and continuous teacher education (see for example, Putnam & Borko, 2000; Derry & the STEP Team, 2002; Krainer, 2002; Oonk, Goffree & Verloop, 2003). Unfortunately, developing countries like Ghana have not made any strides on the use of multimedia systems as tools for reflective teaching in mathematics education yet. It is in the light of this that this paper recommends the use of multimedia systems in pre-service mathematics teacher education in Ghana.

**Critical Features of Multimedia Programmes**

This paper relies on the definition of the term multimedia provided by Herrington, Herrington, Sparrow & Oliver (1998) who see "multimedia simply [as] a combination of media, such as text, video, graphics, sound and animation in a computer-based learning environment which enables users to interact with a wide variety of resources and activities" (p.92). By their design, multimedia systems, whether web-based or produced on CD-ROMs, have the potential to expose pre-service mathematics teachers directly to the terrain of teaching to enable them learn about the teaching of mathematics. This is essential in pre-service mathematics teacher education because learning to become a mathematics teacher involves both learning what mathematics teachers know, do, and how they think (Lampert & Ball, 1990).

A key feature of multimedia systems is the multiplicity and non-linearity of the learning opportunities it provides to users. It is important to bear in mind that multimedia systems allow teacher educators to provide genuine or authentic examples of classroom teaching and learning environments in their classes. Authentic here is used to mean that the lessons videotaped are not staged but can be said to mirror real classroom experience as much as possible. In addition, the videotaped lessons can be presented in the raw form without any editing to perfect them. As a result, it is possible to retrieve both good practices and mistakes from multimedia systems. Though, in some cases, the multimedia developers are able to select 'best' teachers and at times develop the lesson plans with them, it is reasonable to consider such cases as cases of expert teachers

rather than a form of Hollywood-scripted and staged lessons. These videotaped lessons together with accompanying transcripts of the lessons, teachers' and students' thinking as well as textual representations of the mathematics content provide flexible links that allow pre-service mathematics teachers multiple paths through a non-linear network of information (Lampert & Ball, 1990) for cognitive flexibility in their learning.

Also, in traditional mathematics teacher education programmes, pre-service teachers learn the content of what to teach and how to teach it often in separate sessions. Multimedia systems open a new approach to teacher education as it helps to bridge this gap between the content and theory Dolk (2000). And this is facilitated by the wider range of teaching practice provided to pre-service teachers.

Another crucial aspect of multimedia programmes is their interactivity (i.e., the interactive environments they are able to generate) (Sudzina, 1999). This idea of interactivity can better be appreciated if we are willing to take an ecology view of pre-service mathematics teacher education classes (Nardi & O'Day, 1999). By taking an ecology view of our classes the spotlight is not put on technology but on human activities that are served by technology (which in this case is the multimedia programmes). In applying this view, pre-service mathematics teacher education classes could be perceived as information ecologies with a collection of people (students and their instructors), in a network of relationships, and technologies (including multimedia systems), all focused on the activity of helping students to construct their own knowledge of teaching. In field experiences traditionally provided for pre-service teachers to engage first hand with teachers, it is impossible to pause the teaching and learning process and pose questions, reflect on particular aspects of classroom practice, share ideas and challenge each others' thinking about what is happening in the classroom. Multimedia systems permit these to be done in ways that help learners interact among themselves and the classrooms interactions they are presented with (i.e., they provide situated learning opportunities to pre-service teachers). This helps to engage learners in critical thinking about the videotaped teachers' and students' actions and thinking while they (pre-service mathematics teachers) take responsibility for their own learning (Brunner and Tally, 1999). Herrington et al. (1998) have referred to multimedia this way as "vehicle for the situated learning environment" (p. 93).

**How Multimedia Systems Fit into Contemporary Theories of Teacher Learning**

Ideas about effective ways of teaching and learning have changed from the didactic teacher-centred models in which students are perceived as passive recipients of knowledge to student-centred models, which require teachers to engage students in activity-based settings for learners to construct knowledge themselves (Cuban, 1984). These changes demand that the way teachers are prepared must change. Prospective teachers, in general, and those hoping to teach mathematics, in particular, therefore need to be provided with experiences that help them to think deeply about teaching and students' learning (Hatfield, 1996). Conceptualizing pre-service mathematics teachers as learners (who are in the process of learning to teach) then makes it imperative for teacher education to ensure that experiences provided for pre-service mathematics teachers' learning are consistent with contemporary theories of teaching and learning.

One of such theories of teaching and learning is constructivism. Constructivist teaching is difficult to characterize because constructivist learning is conceptualized differently by various groups of theorists, depending on whether the emphasis is on individual cognitive processes or the social co-construction of knowledge. In this paper the view of constructivism is that, which encompasses both the individual cognitive processes and the social co-construction of knowledge so as to emphasize the interaction between learners and environments in the learning process (Vygotsky, 1962, 1978; Bruner, 1962, 1979; and Piaget, 1970). As Bereiter (1994) puts it, "constructivism tells us to pay close attention to the mental activities of learners, [as they interact among themselves and the environment provided to support their learning]" (p. 21). In other words, for the principles of constructivism to be effectively followed there is the need for the creation of appropriate learning environment. And multimedia systems have the potential of providing the environments needed to facilitate the education of prospective mathematics teachers.

Also, child centred approaches emphasized in constructivist paradigms demand adherence to *inquiry* approaches in teaching mathematics. The process of thinking needed to be elicited from learners in this type of teaching requires mathematics teachers to be able to help learners to explore deeper into content and context; a form of higher order thinking (Black & McClintock, 1995; Manzo, 1998; Swain & Pearson, 2001). One way of preparing prospective mathematics teachers to engage in this type of teaching is to expose them to a learning situation or context that encourages broader thinking about teaching (Hatfield,

1996). This is possible with the use of multimedia environments because they can be used to present vignettes that offer prospective teachers valuable teaching contexts that encourage questions to be asked, and permit analysis and contextualization of teaching real practices.

Another type of activity encouraged by constructivists in learning is *reflective thinking* (Swain & Pearson, 2001). Multimedia programmes allow people to 'chunk' or break information apart in a way that puts less pressure on their short-term memories and possibly aids retention (Roblyer, 1999). When used in the education of pre-service mathematics teachers, multimedia systems permit authentic teaching practices to be chunked into segments and deliberated on and even returned to where necessary to aid reflective thinking of the users. Thus, multimedia systems have the potential to enhance pre-service mathematics teachers' reflective thinking skills.

Another way to think about how multimedia programmes fit into existing theories of learning is to look as socio-constructivists notions of situated cognition, promoted by the works of Brown, Collins and Duguid (1989), as well as Lave and Wenger (1991). They emphasize the social and situated nature of learning and shifted the discussion of learning away from an emphasis on individual learning to participation in a community of practice. Socio-constructivism emphasize the "kinds of social engagements provide the proper context for learning to take place" (Lave & Wenger, 1991, p14). Thus, to Lave and Wenger (1991), learning takes place through participation in social settings and is aided by the cultural artefacts provided to support, extend and reorganize mental functioning. Adding to this view of the social nature of learning, Wenger (1998) would later purport that "a central aspect of learning is that people are social beings; . . . [and that] knowing is about active engagement in the world" (p.40-41). Pre-service teachers, as the name implies, are students who are learning to teach. Therefore, engaging them together in a critical reflection and analysis of teaching practices fit Lave and Wenger (1991) social nature of learning. This is where multimedia systems fit in. Multimedia systems, whether on CD-ROMs or hypermedia format, can be used to make the practice of experienced teachers available to pre-service teachers for discussion, analysis, and to stimulate reflection.. In other words, interactive multimedia systems fit into this notion of situated learning because they can be used as resources to provide authentic activities and contexts for the learning process in general.

**Empirical Evidence of the Use of Multimedia Programmes in Pre-Service Teacher Education**

As already mentioned, this section focuses on discussing empirical research efforts at using multimedia programmes to facilitate education of prospective teachers. This has been approached in two subsections. First a number of cases are discussed showing the benefits that these provided. Next a look is taken at the constraints associated with these cases in order to help direct attention to some of the unanswered questions that might provide possible directions for future research in this area.

*Benefits observed in the use of multimedia programmes*

The use of multimedia systems in pre-service teacher education has not been a long experience. In spite of this, it can be seen that it has the potential of "promoting access to massive amount of data [in this case, authentic teaching practices] in their original formats, preserving their ecological validity and contextual richness, while also allowing for condensation for interpretive analysis" (Lampert & Ball,1990, p.6). A good example of this is Lampert and Ball's multimedia systems called SLATE (Space for Learning And Teaching Exploration) and School Learning Environment (SLE), which enables students to access their actions as teachers over a period of one year in two elementary school mathematics classrooms-- a third-grade class taught by Ball and a fifth-grade class taught by Lampert. SLATE, for instance, and gives users access, among other things, to digital video and transcripts of classroom sessions, copies of students' class work, student interviews, as well as copies of teachers' notes. Their effort encompasses a broad range of issues and has guided development of more interactive multimedia systems worldwide. In terms of their effectiveness, Putnam and Borko (2000) had this to say about the SLE,

> within this [Student Learning Environment] environment teachers investigate pedagogical problems that arise as they view and read about Ball's teaching of mathematics in a third-grade classroom and Lampert's in a fifth-grade classroom, simultaneously becoming familiar with new technological tools and exploring new ideas about teaching and learning. Most students saw teaching and learning through pedagogical and psychological lenses, exploring features of the classrooms such

> as teacher-student relationships, instructional strategies, classroom management, and student participation, rather than mathematical content or curriculum. The students' investigations in this multimedia environment sometimes pushed their thinking beyond where it was when they started (p.11 of the online version)

One of the approaches to teaching recommended by the NCTM in their *Agenda for Action* is the problem solving approach (NCTM, 1980). Cases of the use of multimedia systems in pre-service education of mathematics teachers indicate that their use could enhance pre-service mathematic teachers' ability to initiate problem solving approaches in their teaching practice. An example of this is the *Investigations in Teaching Geometry* CD-ROMs developed at the Vanderbilt University to provide a common context within which to highlight some of the pedagogical issues that arise during mathematics lessons (Barron & Goldman, 1994). The CD-ROM portrays a three-day lesson sequence on geometry. The main features of this CD-ROM is a video, text, and graphic information that provides an authentic context in which teachers can explore issues raised in recent mathematics reform documents. These CD-ROMs have been field-tested at Vanderbilt University in mathematics methods courses for prospective elementary and middle school teachers. Evaluation results indicate that the CD-ROM resource encouraged the pre-service teachers to use a problem-solving approach to teaching, helped them plan mathematics lessons, and increased their comfort in using technology. In addition, the Vanderbilt experience has shown that multimedia systems are capable of enhancing reflective discussions among pre-service mathematics teachers (Barron & Goldman, 1994).

Another empirical effort at using multimedia programmes to facilitate education of prospective mathematics teachers can be found in the Multimedia Interactive Learning Environment (MILE) created by the Freudenthal Institute (University of Utrecht) in the Netherlands. According to Oonk et al. (2003), initial experiences with MILE indicate that it is helping pre-service teachers to engage in reflective conversations about teaching in a way that helps them bridge theory and practice. In other words, MILE generally helps student teachers to relate theories as a means to explain the practical situations they observe from the videos and these in turn helps them to generate new questions. In terms of

students' investigative processes in MILE, research has led to the observation of four levels of pre-service teachers' knowledge construction. These are a) assimilation, when pre-service teachers adopt the videotaped teachers' actions and beliefs, b) accommodation, when pre-service teachers modify the videotaped teachers' actions and beliefs to fit their own purposes c) seeing new links, when pre-service teachers establish a connection between an event on the video and aspects of their mathematics education course they are taking, and d) theorizing, when pre-service teachers design their own theories (Krainer, 2002).

The potential of multimedia systems to promote critical thinking of pre-service mathematics teachers' emerging teaching practice has also been well documented. One of such cases is discussed in *Understanding pre-service teachers emerging practices through their analyses of a multimedia case study of practice,* by Masingila and Doerr (2002) in their report of an NSF (National Science Foundation) funded study. The main project used multimedia programmes to facilitate education prospective seventh to twelfth grade mathematics teachers. However the Masingila and Doerr (2002) report was based on one cohort of only nine of the teachers who volunteered to participate in the study. The multimedia system used included, video overview of the school setting, a teacher's lesson plans, video recorded lessons, students' written work and a video journal of the teacher's reflections and anticipations on each lesson as well as transcripts of all videos. Study guides and specific mathematical activities for the pre-service mathematics teachers were also included. The nine pre-service teachers had early in a seminar class identified goals for themselves, which they wanted to address in their own teaching practice. Then in a different setting they were made to watch the videos on the multimedia system with an assigned journal question. The videos they watched and their own reflections of it then became the focus of their discussions in latter seminar classes. This lasted for four weeks after which they made presentations of their experiences. According to the authors, they "found that having the multimedia case study as a site to investigate, analyze, and reflect on another teacher's practice supported [these pre-service teachers] in (a) focusing on issues that were meaningful to their own teaching practice, and (b) thinking critically about another teacher's practice which in turn promoted critical thinking about their own practice" (Masingila & Doerr, 2002, p. 259).

Multimedia environments for pre-service teachers' learning have also been created on the web. One such design is the STEP (Secondary Teacher Education Project) web developed by Sharon Derry and the STEP Team at the

University of Wisconsin-Madison. The goal of STEP is "to help pre-service teachers acquire useful scientific knowledge about cognitive psychology and other learning sciences that can flexibly be applied to the design and analysis of instructional environments" (Derry and the STEP Team, 2002, p.2). This project has created a complex website with resources such as videos of lessons and student learning in actual classrooms, expert commentary and case analysis in addition to commentaries that go with each lesson. There are also networks of case-related links to web pages and other resources discussing core concepts in cognitive psychology as well as a site to support online discussions of video cases. These resources are designed to support facilitated video discussions in secondary teacher education programmes. A trial of this web in the spring of 2000 revealed that the use of STEP resources in pre-service secondary teacher education courses is capable of enhancing transfer and flexible use of course concepts. For instance, of the 18 volunteer pre-service teachers who participated in the study, only two of them continued to use teaching models in which teaching is merely a one-way transmission of information. In addition, written analyses of the video cases produced by students showed flexible application of pieces of different theories rather than application of coherent theoretical frameworks (Derry and the STEP Team, 2002). These findings are significant for two reasons. First, available literature point to difficulties in getting the initial ideas pre-service teachers effectively challenged in traditional teacher education programmes (Cohen, 1998; Lampert & Ball, 1990; Ball, 1988b; Zeichner, K. M. & Tabachnik, R.B, 1981) Overcoming this problem in this study emphasizes the potential of multimedia programmes in satisfying this need. Second, the flexibility with which pre-service teachers in the study used various theories point to the potential of the STEP resources in particular, and multimedia programmes in general, to support the acquisition of the type of the non-linear type of learning that the Cognitive Flexibility theorist suggest as being an essential ingredient in learning complex things in ill structured domains like mathematics. In other words, pre-service teachers' ability to flexibly apply pieces of different theories in analyzing the lessons in this project is a sign of the potential of this type of resources to enhance high construction and transfer of professional teaching knowledge and skill.

*Constraints, unanswered questions and future direction*

The aforementioned benefits of multimedia programmes notwithstanding a critical look at the various cases point to a number of constraints in their use in teacher education programmes. Some of these constraints are discussed in this section. In order to broadly conceptualize the constraints associated with multimedia systems I shall discuss them under a number of broad categories. These are 1) Structural, 2) Pedagogical, 3) Practical, 5) Financial and 6) Technical Constraints.

By *structural constraints*, I mean those that are related to getting the design of multimedia systems to effectively facilitate reflective and critical thinking among its users. Lessons from MILE digitized learning environment, for instance, point to a constraint that falls into this category. From the Netherlands experimentations, Oonk et al. (2003) report that in their studies about the use of MILE systems in teacher education, some pre-service teachers engage in reflective conversations about teaching only with tutor support. This finding from the MILE trials is contrary to what has been reported in the STEP project where it is reported that reflective and critical thinking among students occurred (Cohen, 1998; Lampert & Ball, 1990; Ball, 1988b; Fieman-Nemser & Buchmann, 1986). The lack of agreement shows that using multimedia systems in pre-service mathematics teacher education classes may not automatically get students to have reflective conversations. This suggests that in terms of the design of these multimedia systems, in-depth analyses of their structure (i.e., of the various versions being used) and their benefits need to be conducted to show which aspects of the designs can facilitate reflective and critical thinking among users before they are used in teacher education (Roblyer, 1999). Findings from such studies could be useful in not only supporting future multimedia system developments but also serve as general framework for future development of effective multimedia systems for pre-service mathematics teacher education.

Next, is the type of constraints that could be described as *pedagogical* in nature. These are constraints that are related to the mode of introduction of the systems in pre-service mathematics teacher education courses. It is well documented that pre-service teachers come into the subject specific pedagogical courses with initial ideas derived from their long experience in schools as students. The problem with these initial ideas is that they have the potential to impact the knowledge of teaching that these students construct. The question that results from this is how best to combine the use of multimedia systems with what traditional pre-service teacher education models offer for optimal

outcomes (Munby, Russell, and Martin (2001) have emphasized this need). The work with SLE for example, provides an example of such pedagogical constraints. Putnam and Borko (2000) had this to say about the empirical evidence available with work with SLE,

> after carefully examining the empirical evidence . . . [it can be seen that] the investigations sometimes reinforced beliefs that the students brought with them into the teacher education programme . . . strong normative assumptions such as their notions about a "good" classroom environment or "helpful" teacher . . . framed the students' inquiry and were rarely challenged by doing the investigations. Rather, the collection and interpretation of records of practice simply reinforced the students' entering assumption (p.11 of the online version).

This raises the question of how best to organize class sessions using multimedia systems to effectively challenge students' entry assumptions about mathematics teaching. The question is relevant especially because the use of multimedia systems in teacher education is relatively new; which means that several mathematics educators now available in various colleges of education are not used to how to integrate it effectively in their classes. Research is needed in this direction.

Another type of constraint is what I call *practical constraint.* This has to do with the reality of expertise available in colleges of education to effectively implement multimedia systems for the effects discussed earlier in this paper. There are mathematics teacher educators in colleges of education who do not have the right background and expertise with technology to automatically use them. Even if these teacher educators are willing to under professional development to make them capable the reality with technology is that it takes time and effort to learn and many people do not have the luxury of abundant free time for it (Sudzina, 1999). This is a practical constraint that needs to be addressed in education schools if multimedia usage is to go to scale.

*Financial constraints* are those relating the supply of technology needed to support multimedia infusion in education schools. The fact is that advancement in software and hardware development is occurring so rapidly that there is the need to plan not only for getting enough computers and the right

software for necessary for multimedia infusion into pre-service mathematics teacher education. There is also the need to plan for sustainability financially. This constraint is even more pronounced in education schools in developing countries and those that have limited financial resources and could affect effective implementation if not well addressed.

Finally, there are *technical constraints* involving the need for colleges of education to provide technical support to keep computers running as well as improve the design of multimedia systems as new knowledge about them get developed.

**Conclusion**

In conclusion, it can be said that multimedia systems have the potential of improving pre-service mathematics teacher education. In spite of this, multimedia systems should not become the only focus of instruction because they cannot completely replace all the traditional experiences (e.g. field experiences) students are exposed to (Hatfield, 1996). It is also necessary to consider, prior to how best to effectively introduce the use of multimedia systems into our teacher education programmes. This could involve restructuring of content, rethinking of methodology and even the way pre-service teacher learning is assessed. Until these issues are considered objectively the benefits of multimedia systems may not be derived in our pre-service mathematics teacher education.

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# SECTION SIX

# SOCIAL SCIENCES

# CREATING ENVIRONMENTAL AWARENESS TECHNIQUES IN NIGERIA

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**Abstract**

*The paper identified the various techniques of creating public awareness on environmental issues. In its first few introductory sections, attempts have been made to clarify concepts such as 'Environment' and 'Environmental problems'. Environmental problems in Nigeria were discussed with reference to their causes, effects and control measures. In addition, public awareness, which was found to be central to the identified environmental problems in terms of solutions, was belaboured, on. Consequently, the various techniques through which public awareness that are considered effective as well as the strategies for their implementation were discussed in the light of the achievement of sustainable environment.*

## Introduction

The totality of all external conditions and influences to which an organization is subjected is what is referred to as 'Environment'. In other words, environment literally means 'that which surrounds'. Environment is thus all of the external factors affecting an organism. These factors may be other living organisms (biotic factors) or non-living variables (abiotic factors) such as temperature, rainfall, day length, wind and ocean currents. The interactions of organisms with biotic and abiotic factors form an ecosystem. Even minute changes in any one factor in an ecosystem can influence whether or not a particular plant or animal species will be successful in its environment (Zimmerman, 2007).

Environment of man according to United Nations (1978), is a global concept, which consists of 'natural and man-made resources' available at a given time for satisfaction of human needs. Man interacts with his environment in order to satisfy his needs including food, shelter and clothing.

At the beginning, man's activities were limited by what the environment could offer, i.e. the environment was dictating what man can do. Later, the need arose from increasing population which propelled man to develop technologically enough to suit his needs, mode of meeting the needs and perhaps, the level of his technological advancement (Goudie, 1989).

Just as the environment of man affects man's activities, man also affects his environment to the negative because of his technological advancement. Buttressing this fact is the biblical passage, which reads:

> *"And God saw everything that He had made. And Behold, it was very good"*[1]

On its face value, one is tempted to say that the environment of man was 'very good' when God created it. The reality of our time now is that we have, by our activities and mission, individually and collectively, contributed to our environment negatively than in the positive. This is because, in the process of man's consumption of natural resources in his natural environment, a number of stress is created, which affects adversely, the quality of the environment in which he lives. It is this set of negative contributions that are referred to as 'Environment problems'. Take the 'Hydrological Cycle', which has its natural course as an example. When man is in quest for derivable benefits from 'dam' construction and thus, dam a river, little or no water gets-downstream and the settlements downstream begin to suffer from shortage of water, which affects all other activities.

**Some Environmental Problems in Nigeria**

"Today, across the length and breadth of our great nation (Nigeria), we are faced with the stark realities of the errors of our past development activities and indiscipline life styles" (Abacha, 1997). Justifying this statement is a long list of observable environmental problems resulting from man's continuous interaction with the environment in Nigeria. According to Adebiyi (1998), Adesina (1996), Ajibade (1997, 1998a, 1998b and 1999), Olaniran (1983), and Sada and Odemerho (1988), The environmental problems facing Nigeria today include among others, the following:

a) Deforestation
b) Flooding
c) Erosion
d) Industrial pollution
e) Oil pollution
f) Rainstorm
g) Bush-burning
h) Solid waste management

[1]Genesis, 1 - 3

These environmental problems encourage insufficient utilization of resources, damage or reduce productive resources, which generally reduce people's standard of living. Thus, it has become a subject that has gained international recognition because it goes beyond the strength of a single nation. In fact, the 70s marked the beginning of the broad awareness of actual and potential conflict between economic development and the environment. Since then, the environment has become the subject of intensive research in both developed and developing nations. No wonder then that international bodies have come to the aid of Nigeria in the area of environmental protection. Such bodies include United Nations Development Programme (UNDP), United Nations Children's Fund (UNICEF), European Economic Commission (EEC) now European Union (EU) and Africa Development Programme (ADP) among others. It is on this note that the various environmentalists have suggested possible corrective measures after recognizing the causes and effects. The primary objective of any country today is to achieve 'environmentally friendly' sustainable economic development, which is only possible if environmental degradation is reduced. To this end, Nigeria government have recently shown great concern for the environment in the area of promulgating laws and enacting decrees such as River Basin Development, Environmental Sanitation, Forestry Decrees, etc. Not only these, 'Ecological Disaster Fund' and Environmental Impact Assessment (EIA) decrees were also created along with 'Relief Fund" given to victims of environmental hazards as well as the Federal Environmental Protection Agency (FEPA), set up at national and state levels, to pursue the goals of the Nigerian Environmental Policy as outlined in Aina (1991). These include:

(i) To preserve important ecological, aesthetic and cultural values of our national heritage.

(ii) To conserve and use wisely the natural resources of our nation for the benefit of present and future generations of Nigerians.

(iii) To restore, maintain and enhance the natural man-made ecosystems in terms of the productivity, variety, beauty and other measures of quality.

(iv) To introduce and encourage development without unnecessary destruction of the environment.

(v) To create new opportunities for Nigerians to use and enjoy the environment

(vi) To educate and create awareness for the ecological systems and natural resources important to the nation.

**The Need for Environmental Awareness**

A lot of control measures, majority of which are preventive in nature, have been suggested to the environmental problems. This rests on the premise that, preventing an environmental problem from occurring is cheaper than what the government will be spending to relief victims yearly.

Good and appropriate as these preventive measures are, it is clear that none of the measures can work effectively without carrying along the people concerned. In other words, the people must be aware of the possible consequences of their actions with respect to their interaction with the environment. In addition, they must also be informed of all legislations guiding against the destruction of the environment. For instance, the Sanitary Inspectors of those days, which the Yoruba speaking people of Nigeria used to refer to as 'Wole-Wole' did not enjoy much goodwill from the people because they were only enforcing laws. The laws themselves were not known or widely accepted as many people did not know why they should be punished for storing mosquito breeding water for domestic use.

Public Environmental Awareness is referred to as a synthesis of people's conception, interpretation and perceptions of environmental issues, which affect their behaviour, and the quality of responses and reactions to environmental problems (Chokor, 1988). According to him, its utility in shaping desirable environmental management practices and effecting control can therefore, not be overemphasized.

According to Olorunfemi and Odita (1997), Adeniji (1991), Olurin (1999), Jimoh and Ajibade (1995), and Chokor (1988), environmental awareness is a necessary ingredient for a successful implementation of environmental policy in Nigeria. This is because failure of some of the measures is sometimes attributed to lack of public awareness. It is through people's awareness that all efforts towards preventing damages to the environment can be effective. No wonder then that Oloyede-Kosoko and Odebunmi (2009) suggest the need to increase awareness on vulnerable areas to flooding in Ibadan if the effects of flooding are to be reduced.

If people are aware of the dangers in some of their actions, it will bring about a positive change and thereby prevent any future catastrophe that may arise from environmental problems. It can then be posited that the magnitude of the existing environmental problems depends on the individual's level of environmental awareness and perception. Therefore, there is the need to re-awake and re-orientate the individual's mental state of perceptions to the environment.

**Techniques of Creating Environmental Awareness**

Various researchers have designed series of public awareness programmes on environmental issues and some of these have been implemented in some parts of Nigeria. Yet, not many people tend to be aware up to date. This is, perhaps, because of the brief nature of their implementation. For instance, people were only responding positively (though few) to the call to plant tree during the short period of cry by the government. In addition, experiences of environmental-related disaster do not normally last in people's memory for they tend to forget easily. In another way, it may well be that the strategy designed for their implementation is faulty.

Below are some of the possible techniques useful in creating environmental awareness among the Nigerian people:

a) Legislation
b) Training programmes
c) Drama
d) Discussion
e) Jingles
f) Print and electronic media
g) Visual displays (Posters)
h) Community forum/ public campaign
I) Establishment of environment related clubs and associations
j) Incorporation of Environmental Education (EE) in school curricula
k) Indigenous Techniques.

It is pertinent to note that the issue of environment is all encompassing, requiring both multi-disciplinary and multi-sectoral approach (Iwugo, 1991). Thus, an integrated approach involving all these techniques will be better applicable if majority of the people is the target. In any case, there is no best method for all cases for a particular audience at a particular time in a particular place.

***Strategies for Implementation***

***Legislation:*** Laws and decrees are the bedrock of all environmental control measures since nobody can be apprehended for an offence if there are no laws,. Buttressing this is a Yoruba (a tribe in Nigeria) saying that '*Ilu ti ko si ofin, ese ko si*' meaning 'no offence is committed in a community without laws'. The laws and decrees must be clear, gazetted and must be made known to the public. The contents of various laws are not understood by the public because of the legal

terminologies involved. They should be simplified, interpreted in various languages and make them reach the people. Such legislation must spell out the rights and responsibilities of individuals and the limits to which the environment can be exploited. They should also spell out possible practices, which will prevent environmental problems. Sometimes, awareness is not created until some people are punished and used as examples. The laws should be properly enforced.

***Training:*** Local, State and Federal government officials, traditional rulers, rural and urban dwellers may be brought together and trained at workshops, symposia and public lectures on the need to respect and conserve the environment. Public campaigns can also be organized to educate the public as suggested by Jimoh and Ajibade (1995). Meanwhile, it must be ensured that the trainers are well knowledgeable in their area of concern. Olorunfemi and Odita (1997) however, observed that it is not that people do not know what to do, using waste disposal as an example. The situation is that they will clean their environment but will have no prepared places to empty their waste because government does not provide for that, such people end up dumping refuse in drainage channels and highways. Efforts should be made to back-up training with provision of essential public facilities such as refuse dumping sites, public toilets, etc.

***Drama:*** Drama is one of the effective tools of mobilizing people. Arrangement can be made to reach Associations of Home-Video Artists all over the country with a view to encourage them to put up shows that will focus on the use and abuse of the environment. Recent plays by the associations have, in one way or the other, positively modified our social and moral behaviour to an extent. Theatre groups can be hired to stage plays on prominent environmental problems in specific area in their dialects. Social plays can even be sponsored on the electronic media.

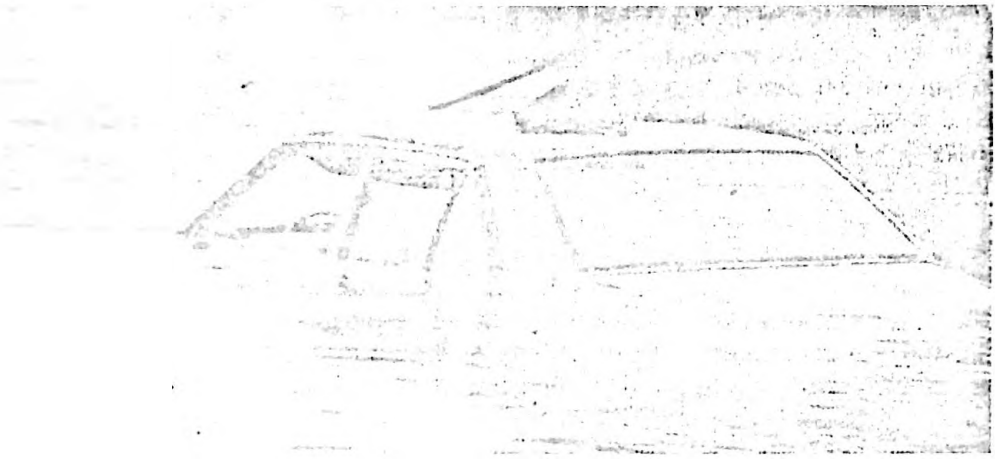
***Discussions:*** Environmentalists, lawmakers and law enforcement agents can discuss topical environmental issues on radio and television in different languages. It can also take the form of community discussion, where the traditional leaders, whom people respect, are charged with responsibility of arrangement for discussion with the people.

***Jingles:*** Stimulating programmes on radio and television such as News, Drama etc, can be made to have environmental jingles at interval's where good songs can be composed to reveal how generous and friendly the environment is to man. Such should be clear and short enough to inform, educate and bring about attitudinal changes in the use of the environment. Public Unit Vehicles with Public Address System (PAS) can also be used from one community to another.

***Print and Electronic Media:*** National Dailies have been very useful in this direction for some of them have a whole page usually devoted to environmental issues. The electronic media too should emulate this gesture even if they can be presented in documentary form. This they should do to arouse environmental consciousness among Nigerian public.

***Visual Displays:*** **Visual displays are** one of the effective techniques of imparting knowledge. Instructive and advisory public awareness captions can be written in handbills, posters, stickers, bill boards, face caps, and vests to remind and inform the public of the illegality of abusing the environment. Pictures can as well be used to show various problems arising from improper use of the environment. An example of such could be a sketch or photographs of flooded houses and vehicles (Plates 1&2) with caption:

**Plate 1: Submerged Houses in Ibadan, Southwest, Nigeria.**



**Plat 2. Submerged car on Obbo Road**
***"You can prevent these, don't dump refuse in gutters and rivers"***

Other captions can ordinarily be written as follows:

a) ***"The law forbids reckless and indiscriminate exploitation of the environment, avoid any rush with the law:***
b) ***"Keep your surrounding green, it checks erosions"***

***Establishment of Environmental related Clubs and Associations:*** Though this is financially involving for sustenance, it is seen as one of the good ways of committing the public to fight the course of environmental protection. Such clubs and associations can be established at community level where some of the tools required for use will be provided. They will be charged with the responsibility of educating the people, preventing the occurrence of environmental hazards, or assisting people that are faced with the problems. Such clubs and associations should be funded at the beginning to later become self-financing. They should be extended to schools. Indeed, the existing 'Conservation Club" which seems not to be popular, should be reviewed while related ones should also be established. The establishment of Climate change Club for pupils of the Lagos State primary and secondary schools by Lagos State Governor, Babatude Fashola (Mindiaga, 2008), is a related development.

The Federal Environment Protection Agency can establish the likes of the Federal Road Safety Corps that may be tagged "Environment Safety Corps". This

will have staff of the Agency as Regular Marshals; interested public volunteers as Special Marshals; and student volunteers as Cadets. They should be charge with the following responsibilities among others:

a) enforce environmental regulations
b) apprehend offenders
c) punish offenders
d) monitor and source for causes of environmental problems
e) education and awareness creation on the use of the environment.

***Incorporation of Environmental Education (EE) in School Curricula:*** "Catch them
Young". they say, introduction of EE in schools will guarantee that the younger generation will have the required knowledge and attitude to preserve an ideal environment. EE should be taught in simple language. In fact, it should also be extended to non-formal educational institutions. Jimoh and Ajibede (1995) stressed that Environmental protection should be taken as a compulsory subject right from primary to tertiary levels of education. In a recent development, the Lagos State government, in an effort to boost the awareness about land information and to make more residents know the value of land, has said that 'land education' may become part of the school curriculum in the State. This is with the understanding that when school children are taught basic land education, they will be able to transfer the knowledge to their parents and make it easier for government to enforce laws regulating land use (Aderibigbe, 2008).

***Indigenous Techniques:*** these are techniques that are gradually fading out in the face of civilization and educational advancement. These are particularly useful in the rural areas. For instance, it used to be a taboo in Yoruba traditional setting, for people to interfere with natural vegetation that is reserved for a particular purpose. According to Ajibade (1998), communities set aside forests and unconsciously protect them by local laws and customs. Depending on purpose, such forests are known and called by various names such as:

(a) Igbo-Ode (Hunting forest)
(b) Igbo-Ogan (High forest)
(c) Igbo-Erin (Elephant forest)
(d) Igbo-Efon (Buffalo forest)
(e) Igbo-Oro (Ritual forest)
(f) Igbo-Iwin (Abode of faired and spirits)

Superstitions too, which used to assist in protecting the environment can tactically be given cognizance. For instance, it used to be forbidden to empty wastes in moving water when rain falls. These are useful measures which should be given recognition especially now that efforts are on to promote indigenous knowledge system in African societies.

**Conclusion and Recommendations**

Dealing with environmental problems is no doubt an uneasy task because it requires tough and bold decision on the part of the government. Consequently, established agencies should be vigorously supported. Creating public awareness should, however, not be left to FEPA alone. It is pertinent to note that the issue of the environment is all-encompassing requiring both multi-disciplinary and multi-sectoral approach (Iwugo, 1991). Environment refers to everything that surrounds man, attempt should therefore be made to create separate department in each of the ministries, which will be charged with the responsibility of creating public awareness. In fact, it should be seen as a collective responsibility while FEPA coordinate.

Environmental awareness should be seen as a continuous activity until the term no longer need be used, when the activities that it comprises of become an accepted and normal part of human behaviour towards the environment. It therefore, becomes relevant to monitor the implementation of these public awareness techniques constantly in order to determine their continuity or change. While these act of creating awareness on environmental issues among the people continue, attempts should also be made to achieve a sizeable population control measures as suggested by Ajibade (1997b) and also good leadership and sound economic policies which will assist in the implementation of the environmental control measures.

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# FEMALE SOCIO-ECONOMIC STATUS AND FEMALE CRIMINALITY IN NIGERIA

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**Abstract**

*Criminality among female in Nigeria has been fostered and encouraged by cultural prejudice and domestic responsibilities which disadvantaged them from getting employed in stable and well paid jobs. Some of such women end up in criminal acts in order to survive. Consequently it has been observed that there has been a progressive increase in female criminality in Nigeria. Females' involvement in criminal acts however, has negative impact on the nation's socio-economic development. There is therefore a need to examine female criminality in Nigeria in order to arrive at policies and programmes that will curb this social malaise. These need stem from the fact that there has been a progressive increase in female criminality and the apparent inability of law enforcement agents to check increase in crime particularly among female.*

*A geographical analysis of female criminality is therefore under taken in order to identify those factors responsible for female criminality in Nigeria. Crime is defined based on socio-cultural characteristics. And since women all over the world, operate under different socio-cultural setting, two states Osun and Niger states of Nigeria processing contrasting socio-cultural attributes were selected to under study. For instance Osun state is mainly made up of Yoruba ethnic group while Niger state has a large proportion Nupe ethnic group. The two tribes define prostitution, a female crime type differently. Among the Nupes a promiscuous daughter who becomes pregnant is exiled with her mother from the community. The case of an adulterous wife among the Yoruba tribe is treated as a civil matter and it is settled in the court of law. The outcome of this it hoped will help explain female criminality in the different parts other country and therefore apply appropriate measures to curb female criminality in Nigeria.*

## Introduction

Development processes have an inherent functional value in raising the socio-economic standards and the lifestyle of the citizens (Mabogunje, 1980). There are however different approaches to the development processes depending on the ideology and philosophies of the founding fathers of any nation (Seer, 1976).As such development processes could be in the form of socio-economic transformation, modernization, economic growth and distributive justices (Harvey, 1992). The process of development through whatever approach has never been a smooth one. It usually exhibits overlapping conflicts or at times damage some cherished values. For instance the economic approach adapted by the Nigerian government after her independence for self-reliance and self-sufficiency, involves a radical reorganization of the society itself. The approach however succeeded in transforming only a part of the society and changed the different societal roles and specialization with its attendant social problems (Ley, 1977).Among the social problems so created are increased male unemployment, inequalities, exploitation, poverty and frustration. All of these motivate criminal activities among both male and female alike (Odekunle, 1986).

Criminality among female in particular have been fostered and encouraged as a result of many factors. Firstly, because females generally are disadvantaged in formal education, due to cultural prejudice and domestic responsibilities, they are unable to work in the more stable and high income occupations. Quite often they end up in low-paying and sometimes health impairing jobs including prostitution (International Labour Organization, 2000; Shukla and Saxena, 1987). Some of these women work in the domestic services which is often characterized with inadequate salaries. The inadequate salaries might pressure them to steal or prostitute. Prostitution by females is regarded as crime because the culprits sell their body for a token of money for a short time.

Another factor that has contributed indirectly to female criminality is marriage. According to Bunnett (1991) and Shelley (1981), migration disrupts women's life especially those who are forced to migrate along with their husbands from the rural to urban centres in search for a better socio-economic status. Such women may not be able to get jobs and therefore engage in criminal activities like shoplifting, fraud, forging cheque, etc (Nagel and Hagan,1983).This behaviour according to the anomie theory is a reaction to a rapid or violent social and economic change(Durkhein,1966). In other words, the wives' migration to the urban centres, which may be forced on them, exposed such women to sudden

or rapid social and economic change. Urbanization may lead to erosion of traditional (social) values. For instance the lack of intimate ties coupled with the removal of protective cover of impersonality and anonymity of the rural settings, radically reduce internal and external control of criminal behaviours. Thus such wives or women easily engage in criminal acts. Crime, apart from the economy, is one of the key social indicators of the general level of living or social well being of any nation (Smith, 1974; Radzinowicz et al, 1977).

Sexual division of labour apart from beings crucial is universally and socially essential to the development of any society beyond the most rudimentary type. For instance women play a very important socialization role of providing support services for their men, rear and nurture the next generation and ensure stability in the civil society (Merton, 1957; Gibbons, 1983). Women's involvement in crime affects the quality of life of its people. For instance increased male unemployment due to globalization necessitated an alternative income. Women therefore had to add income earning to their socialization role. Women's absence from home in order to work or incarceration however, has its toll on child rearing, nurturing and moral development (or decadence) of their children- male and female .Thus the seed of criminality is inadvertently planted in many children from youth. All of the above are evidences to the negative social cost of Nigeria's development plans that need urgent attention especially from the point of view of reducing or eliminating female criminality.

**Statement of Research Problem**

The growth in female criminality is no doubt a worldwide phenomenon. For instance about 5% of prisoners in America are females while for Nigeria it is 7%.The Nigerian experience is important because the figure increased from 2% in 1995 to7% in2002 just over a period of 7 years!(Nigerian Police Record, 2002).Also notorious women are now behind many notorious armed robbers to who they act as armourers, nurses and bed mates (Tell Magazine, Jan,2004). Big time crimes apart, women have also been caught on lesser crimes like shoplifting, cheque forging, prostitution and child-trafficking, etc to which the law enforcement agents in Nigeria have been unable to find solutions. The continuous growth in female criminality in Nigeria and the apparent inability of the enforcement agents to control female criminality, call for a thorough investigation of female criminality in the country. This is more than necessary and urgent because women as mothers not only influence the socialization of children but also the stabilization of adult personalities.

Women's involvement in crime according to Gibbons, (1983) is the outcome of a variety of social, economic and other pressures. In order words, women's life experience and the generally poor background with its attendant impoverished home environment propelled them into criminality. Criminal behaviour therefore consists of a number of discrete actions which are heavily induced particularly by situation and the balance of risks and rewards involved (Toby, 1974). Hence female criminality has to be explained in the context of the environment or the processes that created the social inequalities like educational disadvantages and other cultural prejudices. Thus by focusing on the concept of women regarding their social and economic status, this study may provide a complete understanding of female criminality a social malaise, and facilitate adequate correction strategies that will eliminate or reduce malaise.

**Aim and Objectives**

The apparent neglect of the cost benefit analyses of female criminality not only as part of social policy but also as it influences development processes generally prompted this study. Criminality is a spatio-cultural concept (Toby, 1974). For instance social reaction to deviant behaviours of women differs from one society to another. Adultery and promiscuity by men is approved in northern Nigeria (especially Muslims) but not for women. An adulterous or promiscuous female is said to have destroyed their values as the property of husband and corrupt family standards and are therefore deemed to be destroyed (Microsoft 2008). Since women all over the world operate under different socio-cultural conditions a geographical study of female criminality in two states; Osun and Niger, Nigeria with different contrasting socio-cultural will help identify and remove the socio-cultural factors that aggravate female criminality Nigeria as a whole.

The following objectives will be pursued in order to predict the where and why of female criminality the study area and Nigeria as a whole.

1. Identify the environmental factors that promote female criminality
2. Highlight factors predicating female criminality In the study area and
3. Identify the patterns or distribution of female criminality in the study area.

**Study Area: Niger and Osun States, Nigeria**

Niger State located between latitudes 8° 20'N and 11° 30' and between Longitudes 3° 30' and 7° 20'has a diverse people and culture. The ethnic group include the Nupe (30.44%) followed by the Gwari (21.98%) and Hausa (16.03%). The remaining proportion is made up of several other ethnic groups like Kambari, Da Karkari, Koro, Koro-poi, Ka muku, Pangu, Ushaman among others(Baba, 1993).Among the Nupes, adultery and prostitution by women is highly abhorred. Thus an adulterous wife if caught, is flogged publicly to death, while a promiscuous daughter who becomes pregnant illegitimately, will not only be exiled along with her mother, but will have to put to bed alone in a sacred forest (Aliyu, 1998).

Osun State which is located on Latitudes 7° 60' and 8° 20'N and between Longitudes 4° 5' and 5° 10' E is mainly of the Yoruba ethnic group (Fadare, 1983).The state is not only blessed with resources, but with people renowned for their enterprise especially the women because by culture, they are expected to contribute to family income. Therefore the Yoruba women traders of the western region of Nigeria, Osun State women being part of it, have been known to command formidable for to be reckoned with even by politician (Little, 1965).Among the Yoruba ethnic group, adultery by a wife is regarded as a civil offence that is settled in the court of law (divorce)

**Conceptual Framework**

There have been significant changes over time and through space and between cultures in what is regarded as the particular attributes of femininity and masculinity (Ryekman et al, 1989). Such development threw up series of questions about the origin and the nature of female criminality with no ready-made answers. Some of the questions often asked include:

1. Are there any relationship between female criminality rate and some socio-economic variables?
2. To what extent can women's intense struggle for survival, even through crime, be a result or consequence of certain territorial and or environmental failure to satisfy their basic needs,
3. Are there any relationships between female labour participation and female criminality?

An explanation of the questions will be done through the various conceptual issues raised.

## Methodology

A structured questionnaire were administered on women in crime especially those serving their terms in the selected prisons; Osun and Niger states, Nigeria. The questionnaire was used to expunge information about the occupational status before imprisonment to ascertain the social and economic factors that predicated their criminality.

Information on the life experience of female criminals as regards their socio-economic status expunged from the respondents was analyzed through multiple regressions in order to establish the relationships between female socio-economic status and criminality. The variables used to measure economic status include unemployment, income which is the opportunity for the female base crimes. For the social or cultural factors, age marital status, educational qualification on offence and offence type within each of the states under study. This is needful because social structure of a society at any time reflects the permeability or otherwise of female criminality, thus highlighting the effect of social structure on crime rate at different stages of the society's development.

## Discussion

The analysis of variance [ANOVA} revealed that a value of 0.117 which is higher than 0.007 acceptable level hence all the 3 social factors contributed to female criminality in Osun State. Further analysis to identify the factors with strongest influence on the female inmates in Osun State prison revealed regression coefficient of -0.127 for age, 0.592 for educational qualification and -0.082 for marital status. The implication of this result is that the low educational qualification positively influenced the females to commit crime; marital status and age on the other hand, have negative influence. Consequently, if these females were more educated perhaps their involvement in criminal acts will be minimal.

**Table1: Summary of Regression of Social Predictors of Female Criminality (Osun State)**

Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Zero-order | Partial | Part |
| 1 | (Constant) | 2.023 | .604 | | 3.349 | 007 | | | |
| | Age | -.107 | .202 | -.127 | -.532 | .607 | -.162 | -.166 | -.127 |
| | What is your highest educational qualificatior | .236 | .095 | .611 | 2.481 | 032 | .638 | .617 | .592 |
| | Marital Status | -4.61E-02 | .135 | -.084 | -.342 | .739 | -.232 | -.108 | -.082 |

a. Dependent Variable: State of Origin

**Table :2 Summary of Regression of Economic Predictors of Female Criminality (Osun State) respectively**

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Zero-Order | Partial | Part |
| 1. | (Constant) | 2.218 | .476 | | 4.664 | .001 | | | |
| | What was your occupation before incarceration | -2.87E-02 | .157 | -.056 | -.183 | .858 | -.059 | -.055 | -.055 |
| | What was your income being arrested | -5.75E-03 | .180 | -.010 | -.32 | .975 | -.022 | -.010 | -.010 |

a. Dependent Variable: State of Origin

The analysis of variance for economic factors in Osun state (Table.2) revealed coefficient of 0.981. This higher than the acceptable level of significance of 0.001 this means that all the economic factors chosen- income and occupations- propelled the Osun state female prison inmates to commit crime. Further analysis revealed that occupation and income has correlation coefficient of 0.055 and -0.010 respectively This implies that occupation mostly petty-trading often characterized with low income of N6000.00, has a strong negative influence on female criminality among the Osun state prison inmates. In other words their poverty nature motivated them to commit crime.

In the case of Niger state the multiple regression coefficient for social factors at 0.05 significant level revealed the following, the following correlation coefficients, age -0.604, marital status -0.239 and educational qualification 0.423 This result implies that age and marital status at the time of arrest and incarceration, has a lesser negative influence on the female criminal activities while educational qualification with correlation coefficient 0.423 has positive influence on female criminality among the state prisons (Table 1).In other words the age (20-40years) and marital status of the respondents had little or no influence on female criminality. However their generally low educational qualification (mainly secondary school level) influenced them in the commission of crime.

For economic factors the multiple regression coefficient(Table 2) at 0.006 significant level the indicators have the following values income 0.047 and occupation 0.253.The income has significant influence on female criminality because it is close to 0.05 significant level ;occupation has 0.155 which is higher than 0.95 the significant level. Hence their income before incarceration has no significant influence on the female's criminal activities while occupation had.

**Table 3: Summary of Regression of Social Predictors of Female Criminality (Niger State)**

Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig | 95% Confidence Interval for B | | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound | Zero-order | Partial | Part |
| 1 | (Constant) | 5.643 | 1.664 | | 3.391 | .008 | 1.879 | 9.408 | | | |
| | Age | -1.567 | .654 | -.778 | -2.397 | .040 | -3.046 | -.088 | -.386 | -.624 | -.604 |
| | Marital Status | -.309 | .327 | -.296 | -.946 | .369 | -1.048 | .430 | -.036 | -.301 | -.239 |
| | What is your highest educational qualification | .486 | .290 | .483 | 1.677 | .128 | -.170 | 1.142 | .241 | .488 | .423 |

a. Dependent Variable: State of Origin

**Table 4: Summary of Economic Predictors of Female Criminality (Niger State)**

Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig | 95% Confidence Interval for | | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound | Zero-order | Partial | Part |
| 1 | (Constant) | 3.102 | .888 | | 3.491 | .006 | 1.122 | 5.081 | | | |
| | What was your income before being arrested | 3.04E-02 | .350 | .048 | .152 | .882 | -.726 | .832 | .030 | .048 | .047 |
| | What was your occupation before incarceration | .119 | .243 | .154 | .489 | .635 | -.423 | .661 | .148 | .153 | .153 |

a. Dependent Variable: State of Origin

**Conclusion of Findings**

The result of the multiple regressions implies that the social factors in particular, the level of educational qualification as at time of arrest and incarceration has a strong influence on female criminal acts. Also among the economic factors occupation had a strong influence on the inmates to commit crime simply because majority was traders earning less than N6, 000.00 per month.

It could be concluded from these analyses that the generally poor economic conditions of low income, poor occupation and social factors (particularly low educational qualification) of females in the study area, are strong motivators for female criminality. However, cultural requirements influence those female criminals that are indigenes, particularly the Yorubas of Osun state prison state to commit. The non-natives status, a social factor in addition to economic factors mentioned above motivated females in Niger state to commit crimes.

**Policy Implication of Findings and Future Research Directions**

The ultimate aim of this study is to relate its findings to the practical needs of the society and the reform of both the local environment in which crime and criminals are found and of the conditions which produces them. The following suggestions are made.

For Niger and Osun state both economic and social conditions motivated females to commit crime. However the social factors that predicate female criminality in the two states differ. For instance in Osun state it is their marital status through culture probably made the females to commit crime. While educational qualification is predicator of female criminality in Niger State. Economic condition has a strong influence on female criminality in both states. The criminal acts were propelled by their poor economic condition. Not all poor people however commit crime because crime rate among the poor in the developing countries are lower than the crime rate of the poor in the developed countries. Hence the poverty alleviation strategies of dishing out loans in cash and kind to women in rural area as it is in Nigeria's poverty alleviation programmes, may not curb female criminality rather, it may rather lift more people above the poverty line. This approach may however raise some people's expectation of economic prosperity that might not be achieved. These categories of people may then end up committing crimes against policies that

frustrates them. As such the same strategy for the eradication of female criminality may not however be applicable to female criminality in the study area (Osun and Niger state prisons) because of the socio-cultural differences that exist there.

According to the liberal school of thoughts to crime problems seems to lie in the policies that deal with the underlying causes of crime [Bayer, 1981]. Hence policies that will reduce female unemployment, stabilize the economy, provide technical skills, job counselling and minimize the disruptive effects of social changes .Such policies should include not only include poverty alleviation strategies but should provide legitimate opportunities for everyone to work.

The poverty alleviation programmes already in place should therefore be tailored towards adult and female education. This will facilitate female employability in the high income salary sector. Also vocational and entrepreneurship training with enabling facility like capital both in kind and cash should be included. The vocation should however be feasible and relevant to particular socio-economic situation of the community such females find themselves. The mechanization of rice processing by men denied the Nupe women of their major source of income. Hence efforts should be made to retrain these women in mechanized rice processing in order to keep them empowered. This will further enhance the success of the poverty alleviation strategies of the federal government of Nigeria, Job opportunities should be made easy and accessible to female after graduating. This will help reduce deprivation which encourages deviance and eventual criminal acts.

Integrated development of rural areas is recommended in order to discourage or reduce rural-urban migration particularly amongst women who happens to be the majority of rural dwellers.

Policies like liberalization and rationalization in which more males are laid off should be done in such a way that, even these males that are laid off are retrained and encouraged to be self employed and paid promptly after laying them off. Policies that ban importation of certain items or commodities like rice, clothing that is sold by women should therefore have a rethink because it encourages such women to engage in smuggling of such goods into the country.

The economic development approach which dwells much on material or wealth acquisition should be reversed through a process that will change people's attitude towards wealth. In this case the religious beliefs on discipline in all the different type of religions practiced in the country will go a long way to help.

The cultural prejudice that discriminates against female education, especially at the tertiary level should be removed in every part of the country. Higher educational qualification will therefore enhance their easy entry into the high income sectors of the economy when they even migrate along with or without their husbands to the urban centres.

These suggestions, it is hoped will help policy makers and planners implement programmes that will adequately reduce or eradicate female criminality in the study area and the country as a whole.

**Future Research Areas**

National policies, extant law, judicial practice and law enforcement are all elements in the production of space. There is therefore a need to study the relationship between the negative consequences of government policies that can frustrate people to deviate and precipitate social malaise. As such, more behavioural research is needed to examine ways in which known offenders perceive the city and behave in space and how the general public reacts to the stress which crime generates.

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# POPULATION GROWTH AND ECONOMIC DEVELOPMENT: THE DEBATE CONTINUES

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**Abstract**

This paper explores the immensely crucial, but rather complex and controversial question as to whether population growth constitutes a positive, negative, or a neutral factor in economic development. The neo-Malthusian or pessimistic; anti-Malthusian (pro-Natalists) or optimistic; and the Neutralist schools of thought provided the basis for our argument. Available evidence suggests that population growth is the determinant of urbanisation, rather than being a consequence of development. Although, population concentrations promote greater personal and societal economic prosperity, (hence, rural-urban migration), but it does not engender greater parsimony in environmental resource consumption. It is our opinion in this paper that developing countries must of necessity embark on a paradigm shift in favour of planned population growth, regional cooperation and indigenous/local research that will bring true development, economic prosperity and improved standard of living.

## Introduction

The question as to whether demographic trends impact on economic performance in positive or negative ways, or not at all, is a long-standing and crucial theme in literature. It is especially critical for present-day less developed countries, which account for most of current world population growth [Population Crisis Committee (PCC), 1985; see also Bloom. et al., 2003]. However, it is also a highly complex and contentious issue. It has been the subject of intense debate amongst various specialists (economists, demographers, environmentalists, etc.) for the last several years, and a consensus opinion is yet to crystallise.

The earliest school of thought on the subject in question is the Malthusian theory (also called the "pessimistic" theory), the viewpoint of which, though largely discredited, has had great influence on contemporary social

policy and on such famous economists as David Ricardo (Encyclopaedia Britannica Inc., 2005). This theory suggests that population growth in the poor nations of Asia, Africa, and Latin America is the most severe problem facing the world. Its proponents hold that population growth represents the root cause of hunger, poverty, disease, social unrest, and environmental destruction (Robbins, 2004). They claim that population pressures more often overload fragile economic and political institutions, impede capital formation just when more is needed, add to a pool of unproductive or unemployed labour, and contribute to the overexploitation of scarce natural resources (see, for instance, PCC, 1985).

The Malthusian standpoint is strongly countered by anti-Malthusians who argue that population growth will be beneficial to development in the Third World by contributing to greater economic innovation, increased investment, and more efficient exploitation of natural and human resources (see for instance, Bloom. et al., 2003, and PCC, 1985). Rather than blaming the less developed countries, the global expansion of the culture of capitalism is to blame (Robbins, 2004).

The "Neutralist" theory, holds the view that population growth is a neutral factor in economic growth and development. In other words, it exerts neither significant positive impacts nor significant negative effects on economic development (Bloom. et al., 2003).

According to Robbins (2004, p. 1) '. . . if by reducing population growth, we can solve the world's problems, then, obviously we must work at it, however, if population growth is not the major problem, then we must put our energies to finding out their real sources'. We shall attempt a closer examination of the major arguments advanced by proponents of the two conflicting schools of thought mentioned here and where appropriate relate this to contemporary situations in our environment. But do the countries of developing nations truly know how many they are? This base-line question must be addressed and the earlier the better, if we must reasonably address the population factor in sustainable development. However, that is not the objective of the present paper, so let us quickly get cracking.

## Malthusian (or "Pessimistic) Theory

*Original formulation*

The Malthusian theory traces its lineage to the British economist, clergyman, and demographer, Reverend Thomas Robert Malthus (1766 - 1834), the first scholar to develop a consistent and comprehensive population theory in relation to economic conditions (Microsoft Corporation, 2004a; United Nations, 1973). Malthus developed his ideas on population mainly in his *Essay on the Principle of Population as it Affects the Future Improvement of Society*, first published in 1798. Therein, the author derived his famously dismal twin propositions to the effect that while population tends to increase in a geometric ratio, the resources for survival, primarily agricultural produce, increases at an arithmetic ratio.

Accordingly, in Malthus's opinion, unless (voluntary) "preventive" population checks – notably moral restraint (which consisted mainly of the deferring of marriage) and "vice" (which could take the form of extra-marital sexual relations, prostitution, and prevention of births) – kept population growth down, population would expand to the limit of subsistence and would be held there by "positive" checks or "misery" (which include epidemics, famine, war, and ill health, and which invariably fall mainly on the great mass of mankind at the bottom of society's pyramid). Malthus concluded that under these conditions, moral restraint (celibacy and/or deferring of marriage), together with frugal conduct, was the only practicable and morally acceptable alternative to unrestrained population growth (United Nations, 1973, p. 39). According to him, the encouragement of marriage, as opposed to moral restraint, would invariably lead to higher mortality, while the reduction of mortality due to one cause of death would increase mortality due to some other cause (United Nations, 1973).

In an attempt to substantiate this thesis, Malthus reviewed conditions in various societies and countries, based on which he concluded that the history of mankind validated his basic propositions (United Nations, 1973). Bloom, et al. (2003) cited certain historical experiences that appear to corroborate this claim. They observed that:

> Innovations in agriculture, such as irrigation in China and potato cultivation in Ireland, were accompanied by enormous increases in population that hampered improvements in living standards. Until 1700, income gaps between countries were fairly small and,

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> Innovations in agriculture, such as irrigation in China and potato cultivation in Ireland, were accompanied by enormous increases in population that hampered improvements in living standards. Until 1700, income gaps between countries were fairly small and,

> even in 1820, real income levels in the advanced European nations were only about two to three times those found in Africa, Asia, and Latin America (Bloom, et al., 2003, p. 12).

Today, we all know that due to the lack of a more objective approach and a less restrictive interpretation, Malthus failed to realise that the scheme he proposed was not inevitable. As a matter of fact,

> Malthus' predictions were not sustained by the preponderance of experience over the next two centuries ... Food was not unduly constrained by land availability. Instead, technology blossomed and food expanded apace in the very geographic regions where Malthus focused his empirical studies. Ironically, food surpluses turned out to be a "problem" confronting many nations, and governments implemented policies designed to curtail farm production (Kelly, 2006, p.2).

*Neo-Malthusianism*

Notwithstanding the facts just cited, the mid 20th century witnessed the resurgence of the concern for sustainability of population growth – coupled with the emergence of neo-Malthusians – spanning the outright alarmist to the mildly pessimistic (Kelley, 2006). Rapid population growth was observed in a number of developing countries of Latin America, Africa and the Middle East due, to the simultaneous occurrence of declining mortality and unprecedented and sustained fertility. It was recognised that at such rates, the populations of these countries would double in less than 25 years, and a concern emerged that these rates could not be sustained over long periods of time. These concerns, which were voiced by various specialists – demographers, social scientists, environmentalists, etc. – were based on the assumption that such growth would dilute and in some cases impede or even "serve as a break" on economic development (Bloom, et al. 2003; PCC, 1985).

Overpopulation was considered the driving force behind a global crisis that is devastating our environment. It was asserted that,

> ...the current size of the human population has wreaked unprecedented damage on the biosphere, and is going to accelerate that damage. Millions of plant and animal species have been driven to extinction. ... A billion people are hungry, morning,

> noon and night. The ozone layer is thinning, with consequences that are lethal for every living organism. The air, water, and soil across the planet have been fouled. The forests in many countries are gone or nearly gone. And the mammary glands of every mother on Earth are now infiltrated with DDT and other harmful chemicals. These essential facts - truths that distinguish this century from any other in our history - are all the byproduct of uncontrolled human fertility and thoughtless behavior (quoted in Bleier, 1997, p. 1).

The argument that population growth would lead to overpopulation or resource scarcity and environmental degradation, which, in turn, would precipitate human conflict would appear to be having an upper hand today if we go by the happenings around us. Thus Bleier (1997) believes that "at the most basic level, if there were fewer people there would be less human-caused environmental degradation and scarcity." He further argued that

> ... higher population numbers require more homes, factories, and infrastructure to house, employ, and provide for their needs. In the long run, such capital can be constructed, but periods of rapid population growth may well lead to reductions in capital per worker and lower living standards. When population growth is rapid, a large part of investment is used to supply the needs of the growing population rather than enabling an increase in the level of provision per capita (Bleier, 1997, p.13).

To the extent that we in Nigeria are not even sure of our exact or near exact population, it becomes rather a herculean task to expect government to supply the needs of the growing population. The demand for University education in Nigeria quickly comes to mind in this perspective. It will be recalled that when in the early 1970's the then Head of State Gen. Yakubu Gowon said money was not the problem in Nigeria, but how to spend it followed the **Baby boom** era. Simple arithmetic addition of 16-20 years will show that between 1986 and 1990, children born in the 1970's would have reached the age of between 16 and 20 when they are ripe for higher education. It was not surprising therefore that, that period marked the beginning of the age of an unprecedented demand for University placements in Nigeria.

The foregoing concerns amongst others, of the neo-Malthusians motivated a widespread implementation of family planning programmes in many areas of the developing world – often under the pressure of, and with substantial technical and financial assistance from, the United States and other industrialised donors. The reasoning was that by helping to reduce fertility, family planning programmes would slow population growth, which would, in turn, contribute to improved economic performance by freeing resources that otherwise would be devoted to child rearing and by reducing strains on infrastructure and the environment (Bloom, et al., 2003).

Nonetheless, when in 1973 the United Nations updated its 1953 study on '... determinants and consequences of population trends', it arrived at a less eclectic, and a somewhat more pessimistic (but by no means alarmist) evaluation of the various impacts of population growth. Kelley (2006) further observed that,

> The most important new contribution to the population debate deriving from the 1973 study was a finding by Simon Kuznets that, based on simple correlations, a net negative impact of population growth on per capita output was not obvious in the data ... Given the strong priors of demographers and policy makers that the negative impacts of population growth on development were large, the inability to easily "confirm" this hypothesis through simple, albeit inconclusive, correlations more than any other factor kept the population debate alive during the ensuing decades. The stage was set for a new round of debate (Kelly, 2006, p. 8).

**Anti-Malthusianism (or "Optimistic" Theory)**

Indeed, the stage was set and by the early 1980s, economists were beginning to reject the pessimist view, and organisations like the National Academy of Sciences had begun to revise their earlier views. First, empirical research had weakened the pessimists' case; second, economic theory had begun to give increasing importance to technology and human capital accumulation rather than to the old key growth factor of physical capital; and thirdly, demographic theory started to look to the intermediate and long term, where the short-term effects of population growth were likely to have at least partly smoothed out (Bloom, et al., 2003; see also Kelley, 2006).

The notion that global problems–poor health, hunger, poverty, environmental devastation, and violent conflicts–are basically attributable to overpopulation and rapid population growth was unacceptable. It was further argued that the poor who procreate the most that are largely accused of the problems consume less than the rich people and countries whose extravagant lifestyles and activities exert more damaging per capita impacts! Let us briefly consider some of the arguments of the optimists.

***That Malthusianism is based on class distinction, which formed the basis of Eugenics.***

Some critics of Malthusianism point out that the Malthusian theory is based on class distinctions. For example, in his book titled *Global Problems and the Culture of Capitalism* (1999), Richard H. Robbins observed that:

> Population growth was not, for Thomas Malthus, the major issue. What concerned him was the rising number of poor in England, why they should exist and what should be done about them. Poverty, according to Malthus, was not a consequence of expanding industrialism, enclosure laws that evicted people from common lands, or the need of manufacturers for a source of inexpensive labor ...
>
> The Malthusian position assumes that if poverty exists it must be because of overpopulation, which is the fault of those people who, because of a lack of moral standards, refuse to change their reproductive behavior. There also may have been in the Malthusian position a fear that the army of the poor gathering in cities such as London would stimulate revolution, much as it did in France in 1787 (quoted in Shah, 2001, p. 5).

Shah (2002) holds that, in the light of the above, Malthus was in essence scapegoating or blaming the "victims".

Anti-Malthusians like Robbins (2004) argue that one implication of the Malthusian stance just described is that population should be controlled by limiting the reproduction of "undesirable" people, determining who was worthy of having children. According to Robbins (2004), Francis Galton, who founded eugenics in the late nineteenth century, proposed income as the determinining factor. One may ask if this is morally right. Undesirable to who? What is not useful today may become the pillar of development tomorrow.

The second viewpoint was that Malthusianism is based on geopolitical considerations, especially in light of the fact that it was not until in the 1950s and 60s that population growth in poor countries started to become a concern to western governments. As Shah (2001) noted, one of the bases of these concerns is a U.S. National Security Study memorandum produced in 1974 by the National Security Council at the request of then U.S. Secretary of State, Henry Kissinger, which concluded that there were four types of reasons that population growth in poor countries could be a ***threat*** to U.S. national security namely: (1) larger nations would gain greater political power (2) populous nations would be more able to deny the West access to resources and materials (3)Growing number of younger people might be more able to challenge global power structures (4)Growing populations may be a threat to U.S. investors in those countries.

Shah (2001) reports that the memorandum mentioned nations like India, Brazil, Thailand, Turkey, Ethiopia and Colombia as countries of concern in this respect. He added that the resulting report - which serves as an official foreign policy guide to population issues for the U.S. today as well - was titled *Implications of Worldwide Population Growth for U.S. Security and Overseas Interests* (Shah, 2001). Robbins (1999) upheld this assertion (citing others, p.159) and concludes:

> Thus, as Steven Polgar (1972, 1975) puts it,
> population concerns in core countries stem not from a fear of overpopulation but from a change in the role of exploited countries. People in the periphery were needed at first for *labor and later for markets*. In fact, until the 1940s core countries not only were unconcerned with population growth in the periphery, but they complained it was too slow [quoted in Shah, 2001, p. 4 (emphasis mine)].

For how long shall developing countries remain a market for goods from developed countries? It is time for us to take the bull by the horn and focus our future development on the West African subregion and Africa in general. Individual countries must identify their areas of competitive advantage and develop in that direction. That is the sure way to success and emancipation.

## The Real Causes of Global Problems

Anti-Malthusians strongly contest the idea that the incidence of global problems like poverty and land-endangering resource use is due primarily to

overpopulation in poor countries and because the poor have too many children. For example, Shah (2001, p. 2) argued that "large populations in and of themselves may not be a bad thing. Many cities in Europe for example, have a higher population density compared to places we normally think of as over crowded, such as India or China".

What then are the real causes of global problems to the extent that today they are of major concern? On the one hand, the intemperate and inequitable resource consumption by developed countries and rich people; exploitative international trade, misrule, bad economic policies, and inequitable control of land; and lack of appropriate and effective institutions and policies are examples of real causes of global problems rather than population growth.

On the other hand, it is argued that population growth stimulates greater technical progress and economic output; and greater efficiency in resource utilization are positive contributions of population growth rather than creating global problems. In other words, population growth can have both positive and negative consequences on population itself. The management of population as a resource and natural resources in such a way as to be sustainable would appear to be the major challenge of our time. Let us examine these causes in succession.

**The Intemperate and Inequitable Resource Consumption by Developed Countries and Rich People**

The nuclear family of western cultures often consumes far more resources than that of developing countries. Thus, population optimists argue that over-population has to be in relation to the use of resources to qualify it being over. Canada for example, that has only four percent of the actual population of India, has the same consumption-adjusted population as India while, the United States, has a consumption-adjusted population that is more than twice that of China (cited in Robbins, 2004). The US that has four percent of world population, consumes 20-25% of worlds resources! In orders words, mere number may not necessarily result in overpopulation.

Another manifestation of inequitable resource use is seen in the agricultural practices and land use in poor nations, whereby the poorer people don't get to see much of the farm produce. According to Shah (2001),

> Land in poor countries is often cleared to grow cash crops to export to the wealthier nations, leaving less for the use by the poor themselves, reducing their chance to get out of poverty and hunger, and also increasing the damage to the environment, due

> to unsustainable use of the land, water and other resources. And it is not always the poor that are clearing these lands and forests; it is often multinational corporations or the nation at the suggestions of institutions like the IMF and World Bank (Shah, 2001, p. 9).

The Share/Shonga, Zimbabwe farm project in Kwara State is a typical example where most of its products are for export almost. The argument of increase in standard of living and economic prosperity of the people is not commensurate with the intensity of land usage and eventual burden on the poor and perhaps helpless indigenous people of the area.

**The Exploitative International Trade, Misrule, Bad Economic Policies, and Inequitable Control of Land**

The argument that hunger emanates from inordinate population growth and overpopulation in poor countries is countered by Shah (2002) in the following words "...people are hungry not because the population is growing so fast that food is becoming scarce, but because people cannot afford it". "Food may be scarce", he noted, "but it is international trade, economic policies and the control of land that have led to immense poverty and hunger and therefore less access to food, not food scarcity due to over population" Shah, 2002.

Other more specific factors to which population optimists attribute the global problems include the often (1) harsh structural adjustment policies and programmes prescribed (and often enforced) by the World Bank and the IMF, which have forced poor countries to cut back on investment in health, education and other basic services (things that have led to a better quality of life in Europe after the Second World War) and (2) exploitative and growth-inhibiting trade agreements and relations between poor countries and wealthier nations, notably the USA, Japan, and West European countries, etc. These factors are seen to be largely responsible for poverty, poor health, and hunger in many places, which often lead to unsustainable use of the environment just to survive (Shah, 2001).

**The Lack of Appropriate and Effective Institutions and Policies**

Lack of appropriate and/or effective institutions and policies represents yet another factor which some analysts attribute to the global problems. A comparable assessment was echoed in a report compiled in 1986 by a Working

Group on Population Growth and Economic Development under the auspices of the National Research Council (NRC) with regard to the more specific issue of renewable resource degradation. Kelley (2006) summarises the views of the NRC group on this issue in the following words:

> Unlike non-renewable resources, property rights are difficult to assign or maintain for renewable resources like fishing areas and rain forests. Overuse can result. The problem is not population growth per se, but rather institutional failure. Cutting population growth in half would not solve the problem; it would only postpone the deleterious outcome of resource degradation. The solution requires policies to focus on the causes of failure (the need for more effective property rights, market responses, and government policies to correct externalities) rather than a focus on population pressures, which mainly exacerbate the environmental responses (Kelly, 2006, p. 13).

Notwithstanding the views expressed above, there are some positive effects of population growth on economic development. Let us consider the two enumerated earlier.

**That Population Growth Stimulates Greater Technical Progress and Economic Output**

One of the major contentions of population optimists is that population growth is often the driving force behind economic expansion and technological change (PCC, 1985). Citing historical precedents in Western countries and post-war economic successes in Japan, Taiwan, South Korea and elsewhere, they make three general points:

> First, that population growth is the natural result of improvements in the human condition, especially improved health; second, that an expanding labour force, an expanding market, and other consequences of population growth spur economic growth; third, that economic progress, in and of itself, will cause population stabilisation through changes in desired family size (PCC, 1985, p. 1).

Bloom, et al (2003), further argued that..

> In the last 30 years – during which the world's population has doubled – per capita incomes have increased by about two-thirds. Famines have occurred, but Ehrlich's "hundreds of millions" of people have not starved. The famines that have occurred were largely caused by poverty and lack of funds within a section of the population to buy food rather than by any absolute shortage of food ... Technological progress, in both agriculture and industry, has been more rapid than during any other time in human history. There have been equally dramatic social and institutional innovations: in the way people work, the standard of their education and health, and the extent to which they participate in the political process ... Rather than being constrained by fixed resources, the prices of many raw materials are in long-term decline, and some parts of the economy are becoming "dematerialised" as knowledge becomes an increasingly vital asset ... (Bloom, et al., 2003, p. 15).

These trends, argued Bloom et al. (2003), have corroborated the notion that population growth can be an economic asset, which notion represents the fundamental idea that population optimists have sought to promote. One such optimist cited by the authors is Simon Kuznets, who is reported to have argued that as populations increase, so does the stock of human ingenuity – since larger societies (with the capacity to take advantage of economies of scale) are better positioned to develop, exploit, and disseminate the increased flow of knowledge they receive (Kuznets, 1960, 1967, as cited in Bloom et al., 2003).

According to Kelley (2006), Simon (1981) hypothesised and attempted to verify that the pace of technical change, as well as its bias, were actually governed by population pressures, particularly in agriculture, where he advanced Ester Boserup's model [first expounded in her *The Conditions of Agricultural Growth (1965)]*. Boserup (1965, 1981) observed that population growth creates pressure on resources, and that people are resourceful and are stimulated to innovate, especially in adversity (cited in Bloom, et al., 2003). To prove this point, she pointed out that when rising populations overwhelmed traditional hunter-gatherer arrangements, slash-burn-cultivate agriculture emerged, adding that when that arrangement, too, became inadequate, intensive multi-annual cropping was developed. More recently, argued Bloom, et al.,

(2003), "the Green Revolution, which has almost quadrupled world food production since 1950 using just 1 percent more land, was a direct reaction to population pressure" (Bloom et al., 2006, p. 16). Could it be that necessity is truly the mother or is it father of invention?

**Greater Efficiency in Resource Utilisation**

Unlike the widely accepted (Malthusian) supposition that demographic pressures would ultimately cause natural resource exhaustion, evidence from literature suggests that over longer periods, most natural-resource prices actually declined, even in the face of rising demands stimulated in part by expanding populations (see also Bloom, et al., 2003). This result is attributed to: (1) price-induced *substitutions* in production and consumption of natural resources, and (2) an *expansion of supply* through *discovery and technical advance* (Kelley, 2006).

If we look beyond, some of what may appear useless or irrelevant today may be the cornerstone of development in future. There are a variety of resources out there yarning for exploration and exploitation. Research and development into these indigenous raw materials is key to our true development. That is the only way for developing countries; otherwise they shall remain, as it were, the dumping ground for outdated equipment from developed countries, but 'modern' in developing countries.

**Population Growth and the Environment**

Though the Malthusian argument that population growth would have a strong adverse effect on economic growth and human welfare has been largely disproved, the demographic debate is not quite over and may not be over for as long as there is human existence. However, the focus of the debate appears to have shifted away from the effects of population growth on economic growth. Instead, much of the debate in recent years centres around the relative importance of economic growth and population growth in generating negative global environmental impacts like greenhouse climate change (global warming), ozone depletion, acid precipitation, species loss, dispersion of toxics, as well as less global problems such as local air and water pollution (Dietz and Rosa, 1994).

Four distinct viewpoints regarding effects of population and economic growth on the environment have been identified. Firstly, there is the view that anticipated population growth will have very severe, even catastrophic, impacts

on the natural environment and human welfare - a view held most notably by Ehrlich and his collaborators (see also Barlett, 1998, 1999; Daly, 1993; Harding, 1996 and McCluney, 1999). Secondly, there are those who, while acknowledging that population growth and economic growth create increased demand for resources, argue that the resulting perceived or anticipated scarcity drives technological progress and with it the search for substitutes and increased efficiency. Thus, according to this position, which is derived in part from the work of Ester Boserup (and whose most forceful advocate is Julian Simon), the net effect of population and economic growth on resource scarcity, human welfare and the state of the environment is neutral or even positive.

The third position suggests that technologies used to stimulate growth are often selected without regard to their environmental impact. Proponents of this view hold that adverse environmental impacts are more a function of the political economy of technological choice than of population or economic growth *per se*. Thus, in so far as population has an effect on the environment, it is an indirect effect that could be toned down by institutional or technological change. Take for example the change in technology in the manufacturing of refrigerators. Finally, there is a middle ground position, which sees population not as the dominant driving force, but as a contributor to environmental impact acting in association with affluence, technological choice, institutional arrangements and other factors.

However, according to Dietz and Rosa (1994), there has been little empirical work on the impacts of population on the environment. It was observed that the most extensive literature was found in a series of papers prepared for the U.S. Commission on Population Growth and the American Future, adding that the general conclusion of the editor of those papers and of the Commission itself was that population growth does contribute to environmental degradation, but that the impact of population is generally less than the impact of economic growth. The editor also notes that the effects of both kinds of growth can be mitigated by the appropriate choice of policies, technologies and institutions (Dietz and Rosa, 1994). Ladies and gentlemen, what other conclusion can we draw beyond this?

## Conclusion

The utility of this debate has been greatly hampered by the fact that little or no attention has been paid to a critical variable: *change in level of urbanisation* as

population grows. In other words, all the aforesaid theories have fallen short of adequately analysing the relevance of urbanisation as a nexus between the phenomenon of population growth and that of economic development. We reckon that this is a crucial gap in knowledge that warrants investigation. Such investigation promises to contribute significantly towards clarifying the exact nature of the interrelationships between the phenomena in focus given the fact that there are compelling empirical evidence to the effect that population growth is a major determinant of the pace of urbanisation, and that urbanisation is, in its turn, a strong positive factor of development.

Table 1 provides empirical evidence to the effect that the pace of urbanisation is heavily dependent upon that of national population growth. The table shows the result of part of an on-going research based on the annual percentage rates of change in population growth (predictor variable) and rates

**Table 1:** Effects of population growth on city growth rates, 2000 –2005 (annual % rates of change)

| | | Effect of one unit change in population growth rate on rate of change in level of urbanisation | |
|---|---|---|---|
| **Independent Variable** | **Unit of measurement** | **Beta** | **Significance** |
| Rate of population change | Per cent | 1.334(*) | .000 |
| **Constant:** | | .440 | |
| **$R^2$:** | | .819 | |
| **(N):** | | 191 | |
| **Period of observation:** | | 2000 – 2005 | |

(*) Unstandardised simple linear regression coefficient.
**Source:** United Nations (UN) database (www.un.org), as quoted in Microsoft Corporation (2004b).

of change in level of urbanisation (dependent variable) for 191 developed and less developed countries during the period 2000-2005. It shows that a one percent increase in national population growth rates of the affected countries during the period in question increased urbanisation levels by over 1.33 percent. This implies, for instance, that if a country with an annual population growth rate of 2 percent experienced a 3 percent annual increase in its level of urbanisation, then a country that experienced 3 percent increase in population growth rate had an increase of over 4.33 percent per annum in the proportion of its urban population.

The significance of this finding to the demographic debate is best appreciated by those who subscribe to the belief that, on balance, urbanisation plays a positive role in economic development - that "cities are the ... engines of national economic growth" (Brockerhoff, 1999, p. 15). In a study by Mabogunje (1976), it was revealed that continents with a low percentage of their population living in cities have a relatively low per capita gross domestic product (GDP). As this percentage increases, there is a strong tendency for GDP to increase, which is an indication of a rise in the level of economic development. Indeed, according to a World Bank report "evidence suggests that ..., urbanisation helps to reduce poverty" (World Bank, 1990, p. 30).

It has also been observed that rapid urbanization may be a positive development for the environment because, although urban areas generate higher concentrations of pollution, they also deliver services, such as water and electricity, much more efficiently (Microsoft Corporation, 2004c).

If cities indeed play a primarily constructive role in economic development and population growth results in urbanisation and urbanisation is for the most part beneficial to development, then it is probably safe to take sides with population optimists (i.e. to accede to the argument that in population growth is, beneficial to economic development). However, this stance cannot be isolated from the need to have a focussed, positive and people oriented governance in Africa. There is no reason why any West African country should be poor. Natural resources abound in Africa. The major problem in our opinion is wealth distribution. We should therefore begin to act as pressure group(s) in our various institutions, organisations, and at different fora to advocate for a more equitable distribution of our nations resources; investing in research and development to identify frontiers; and a reasonable rate of growth so as to raise family and individual standard of living and status. The doctrine of a small number of high quality children, as opposed to a large number of low quality children should be preached. The right to education and decent living should be the right of every human being. Our leaders in Africa should evolve policies that will ensure this. What is 'decent' living will be a matter for debate by the African Union so that appropriate resolutions can be passed for implementation by member nations.

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# RELIGION AND RELIGIOUS CONFLICTS IN NIGERIA: IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT IN THE TWENTY-FIRST CENTURY

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**Abstract**

*Religion suggests an attempt by man to work out a relationship with a super-ordinate being often epitomized in God. Implicit in this is an interaction between religion and the society within which religion functions. This occurs first, at the level of the state/social institutions and second, at the level of individual relations. Consequently, because of its tendency to colour relationships, religion has become a major influence in politics, playing significant roles in the entire societal process especially in multi religious societies such as Nigeria. Nigeria is a heterogeneous society comprising different ethnic and religious groups. However, Islam and Christianity have assumed a dominant character to such an extent that necessitates state's intervention in order to stem a potential source of conflict.*

*By examining the religious dimension of Nigeria's heterogeneous character and the nature of interaction between the two dominant religious groups on one hand, and on the other hand, the nature of interaction between the state and religious groups, this study analyses the implications which the complex web of interaction have for sustainable development in Nigeria, especially in the 21st century. This study argues that while religion could be a veritable tool for societal development, attaining this objective in Nigeria requires that the issue of religion and harmonious inter-faith relation be given more than a passive attention by both the government and the entire citizens at large; much as the state must clearly redefine its role in religious matters in order to escape the destructive potentials of inter-religious acrimony.*

## Introduction

The quest for a peaceful and stable polity is a pivotal aspiration of countries all over the world. This has been amplified on the fact that peaceful coexistence of all groups within the state is a prerequisite for any developmental aspiration thereby necessitating state intervention in any issue or situation that could jeopardize the attainment of peaceful coexistence. Indeed, the 20th century witnessed the emergence of several modern states, especially in Africa, as

heterogeneous entities defined by one or a combination of different competing identities – ethnic, religious, and cultural among others – which more often than not constitute a potent source of threat to peaceful coexistence and attainment of developmental goals of these entities. It is axiomatic to note that Nigeria, being a product of European ambition and rivalry in Africa, is a case in point. Nigeria emerged as an independent country after prolonged years of colonial rule formally established in the early 20th century. With a land area of about 923,708 square miles, it is composed of multiplicity of ethnic and religious groups. The existence of multiplicity of religious groups consequently places the burden of creating a peaceful atmosphere and co-existence among the various groups on the government. Thus, cognizance of the potent consequences which an unbalanced relation could engender for the country's developmental aspirations, the Nigerian state devised some balancing mechanisms aimed at ensuring a harmonious relation between its religious groups. This needs not be surprising given the fact that following the emergence of modern nation-state and institutionalization of democratic culture happed on fundamental rights of citizens and the rule of law, the state naturally becomes a neutral arbiter that guarantees the security and freedom of all segments of the society. With regards to matters of religion and religious coexistence, this idea finds relevance in the secular ideology - the belief that the state is and should be independent in matters of religion or at best, perform a mediatory role. However, with persistent socio-economic crises in different countries, declining state capacity and increase in the level of religiosity of people in the society, all of which combine to shape inter faith interactions, there has been a growing crisis of confidence in the secular ideology accompanied by demands for a review of the secular ideology that underpins the state (Suleiman & Muhammad, 2006; International IDEA, 2000).

The above situation consequently further raised the tempo of interaction between religion and politics manifesting in perennial intra and inter faith conflicts and its attendant implications for national development. In Nigeria, the interaction between religion and politics is rooted in its multi-religious character engendered by her colonial experience. Interestingly, Nigeria has an interwoven of its ethnic and religious character such that the north is predominantly Muslim and comprises mostly Hausa/Fulani ethnic group; the western Yoruba are partly Christian and partly Muslim while the eastern Ibo including the southern minority groups are predominantly Christian. This is not to suggest that there are no other religious groups in existence, but the duo of Islam and Christianity

have assumed a dominant status over other forms of religion such as the African Traditional Religion (ATR). Consequently, relations between the two have been characterized by series of ups and downs to the extent that since independence, religious polarization has been a common feature of and powerful influence on governance much as it, at times, affects citizens' perception of state policies and developmental programmes. It is against this background that this paper attempts to x-ray the issue of religion and religious conflicts in Nigeria as it affects developmental aspirations of the country.

**Theoretical Discourse**

The history of mankind has shown the pervasive influences of religion yet, the attempt to evolve a concise and acceptable definition of religion has been difficult to attain. This is not unconnected with the fact that while every religion has its unique properties, an attempt to find essential ingredients common to all religions or make inter religious comparison has proved largely herculean. Nonetheless, some attempts at a broad conception of religion can be discerned in the literature. Essentially, the idea of religion suggests an attempt by man to work out a relationship between humans and a supreme being whether God or something else. This is premised on the belief that human perceptions of things, wimps and caprices require higher powers to help them respond to all their concerns (Odey, 2004). According to scholars, it is any system relating man to an ultimate value, epitomized in God or Supreme Being and embodying a creed, code, cult and a mode of communion (Kenny Op, online; Adegbesa, 1987). This is in tandem with Durkheim's conception of religion as a 'unified system of beliefs and practices relative to sacred things' (Schaefer, 2003, p. 379). According to Schaefer, religion involves a set of beliefs and practices that are uniquely the property of religion as opposed to other social institutions and ways of thinking thereby distinguishing between the sacred and the profane – a distinction which lies at the heart of all religions. Implicit on this view is that religion, though a form of social institution is a unique one in that it is a system of roles and norms organized around the sacred realm that binds the people together in social groups (Thomas, 1995).

The attempt at conceptualizing the nature and role of religion in the society has led scholars to espouse on different perspectives of religion dominant among which are: (i) the **evolutionary perspective** which sees animism as the earliest form of religion and therefore central to understanding

the concept. By combining archaeological evidence of prehistoric peoples, on one hand, and anthropological evidence of primitive peoples, on the other, anthropologist John Lubbock (1834–1913) in his book, *The Origin of Civilization and the Primitive Condition of Man*, outlines an evolutionary scheme of religion, beginning with atheism (the absence of religious ideas) and continuing with fetishism, nature worship, and totemism (a system of belief involving the relationship of specific animals to clans), shamanism (a system of belief centring on the shaman, a religious personage having curative and psychic powers), anthropomorphism, monotheism (belief in one god), and, finally, ethical monotheism. This thesis of animism as the earliest and most basic form of religion was later expounded by the English ethnologist E. B. Tylor (1832–1917), in his book, *Primitive Culture*. According to him, out of animism evolves fetishism, belief in demons, polytheism, and, finally, monotheism, which derives from the exaltation of a great god, such as the sky god, in a polytheistic context. A somewhat similar system was advanced by Herbert Spencer (1820–1903) in his *Principles of Sociology*, though he stresses ancestor worship rather than animism as the basic consideration; (ii) the **functional perspective** which reflects in the writings of Emily Durkheim, Sigmund Freud and Parsons and sees religion as performing a functional role of reinforcing the collective conscience of the society requisite for social order and stability. An important underpinning in this category is 'that all the objects of religious worship symbolize social relationships and, indeed, play an important role in the continuance of the social group'; and (iii) the **radical perspective** which receives stimulus from the writings of Karl Max. This view is based on a social interpretations of religion based on the theory of the class struggle. Thus, it sees religion as a sigh of the heartless world, feeling of the oppressed creature and opium of the people. Religion from this perspective is an instrument in the hand of the state to maintain its rule and perpetuate its hegemony over the masses (Gofwen, 2004; Ogunji, 2004, p. 115; Odey, 2004, p. 81).

In spite of the conceptual logjam and different perspectives, what is crystal clear is that there is, generally, an interaction between religion and the society within which it functions. On the one hand, religion affects and influences individual behaviours (morality) and to that extent confers on the individual a form of identity in the society. It is thus part of the complex pattern of other social identities that colours human relationships, struggles and competition. Consequently, because of its penchant for colouring relationships especially in multi-cultural societies such as Nigeria, it plays significant roles in societal

politics including the process making vital public policy decisions (Muhammad & Suleiman, 2006). On the other hand, religion interacts and influences other facets of social institutions. That is, policy and economy. These institutions also in turn influence the religious institutions, the effect of which affects in a fundamental way, a people's way of life (Gofwen, 2004). Thus, religion from this stand point becomes a significant influence in the developmental process.

Although the concept of development has been characterized in the literature by varying interpretations, there seem to be crystalisation of opinion on the fact that it is a multi dimensional process leading to transformation in the entire social, political and economic spectrum of the society. It leads to enhancement of the capacity of the individual to realize its inherent potentials and to cope effectively with the challenges of life (Mabogunje, 1978). Indeed, there is a growing body of literature on the relationship between religion and development. While some have viewed religion in relation to economic growth and development *per se* (Baro & McCleary, 2003; Noland, 2005; Grier, 1997), others have engaged it in the general context of development (Ellis & Haar, 2004). Underscoring the relevance of religion in political discourse and development in general, Ellis and Haar (2004), observe that:

> initially, ideas about development generally overlooked the role of religion, or assumed that religion would be relegated to a matter of private belief in Africa as secular states gained strength and confidence, or even saw religion as an obstacle to development. Yet it is now apparent that religion is a growing force in public life in Africa, as in many other parts of the world (p. 1)

While pointing out that there could be few areas where religion or other cultural resources will result in a major breakthrough in development, the authors nonetheless, argue that it is essential to integrate religion into thinking about development because of its positive role especially in terms of stimulating economic growth, management of natural resources, conflict prevention and peace building, health and education and, governance. Similarly, Khan and Bashar (2008) have established a correlation between religion, economic growth and development as long as religious beliefs and practices promote 'moderation' rather than 'extremes' (p. 7). Based on a review of theoretical and empirical evidences, the authors argue that religion can be seen as a promoter of growth because they direct people towards the virtues of honesty, discipline, hard work, education and absenteeism from harmful activities. Thus they

submitted that a peaceful coexistence of various religious groups (or sects) in a country and various nations with different religious affiliations within the global community is a prerequisite for growth and prosperity in today's highly interconnected world. In other words, the tendency for religion to serve as a positive tool of societal development is predicated of peaceful coexistence and harmonious relations among the various religious groups and sects that cohabit a political entity. Where such is lacking, the implication is that religion becomes a political tool, pushing in different directions much as it becomes counterproductive to developmental concerns.

**Religion, State and Society in Nigeria**

Nigerian state as presently constituted represents a plural society *par excellence.* This derives from its multiplicity of ethnic and religious groups. But while emphasis in the literature on Nigeria's plurality has often been on its ethnic character, little has been done to espouse its religious concomitant. At best, religious plurality is viewed from the angle of Islam and Christianity while other belief systems are subsumed under the label of African Traditional Religion (ATR). These include, *Ogun* (God of iron); *Sango* or *Amadioha* (God of thunder) and several others[1]. The reality however is that all the groups subsumed under the ATR are not in themselves of the same content as they often assert their differences to the extent that an individual is not expected to be a member of more than one belief system. But this is not to say that adherents of the ATR do not participate in the celebration each of other's festival – at least, in showing solidarity with fellow members of the community.

Of equal importance is that most of the ATR predates Islam and Christianity though these two have come to be domineering especially in the post colonial era. Some factors, perhaps, serve to explain this. First is the imperialist character of the colonial state with the tendency to, impose its own civilization on other cultures. Other religions are thus classified as barbarism while the imported ones are portrayed as a saving grace. This is true of Christianity which came along with colonialism. At another level, each of the imported religions has an inherent tendency to dominate and in the case of Islam, it sought to bring people out of their *Jahiliyah* state into one of enlightenment based on teachings of the *Quran* and *Hadith.* Second, in the post colonial era and following from established practices during the colonial era, the government is more disposed to the two religions, Islam and Christianity, than any other religion in existence. Third, there is also the tendency, as Davies (1995) argues, for people irrespective

of their ethnic or professional background to show themselves more as either Muslim or Christian outwardly whereas they are sentimentally attached to the ATR. These factors encouraged preponderance of Islam and Christianity above other belief systems.

Apart from the existence of multiplicity of ATR groups along with Islam and Christianity, there are also other imported religious belief systems. These include, Harri Krishna from India, Eckankar movement, among others. Again these groups have not been influential enough as to assert their presence beyond the domineering character of Islam and Christianity.

In terms of establishment, religious plurality in Nigeria could be said to occur at three different epochs in history. First are those already established before colonialism and which are autochthonous to Africa. These are those categorized under ATR. Second are those formally established during colonial period and which enjoyed support of the colonial state, they are Islam and Christianity. Commenting on their arrival in Nigeria, Kurian (1979) notes that, Christianity came through the Southern coast with the arrival of Europeans in Southern Nigerian. With the establishment of formal colonial rule, it became firmly rooted in the South and spreading towards Western Nigeria but met Islam there. Islam on the other hand came through Northern Nigeria via trade contact with Arabs of North Africa and through activities of Islamic *Jihadists*. It became firmly established in Northern Nigeria and was spreading to the South but was stopped in the West. Thus:

> ... the resulting religious composition closely follows geographic and ethnic lines; the Southern Ibo are predominantly Christians, while the Northern Hausa are... Muslims, and the Western Yoruba are partly Christian and partly Muslim (Kurian, 1979).

Note worthy is that, their different origin coupled with their been rooted within separate geographical localities as well as differential pace of socio-political and economic developments between the localities typified by the North and South during colonial era are what sowed the seed for a discordant relationship between them after the country's independence.

Finally at the third level of establishment of Nigeria's religious plurality are those belief systems that registered their presence in Nigeria after independence, though with few followers. These are the Harri Krishna, Eckankar and so on. All the above arguments notwithstanding, all the various groups have

come to stay and co-exist within the Nigerian State. What is to be noted is that multiplicity of ethnic and religious groups have now become institutionalized diversities within the Nigerian state. It is within these historical facts therefore that we can locate the reasons behind the pre-emptive relation that exists between Islam and Christianity in Nigeria and the role carved out by the state for itself. In other words, cognizance of its responsibility of maintaining inter religious coexistence in order to achieve relative peace conducive to the attainment of its socio political aspirations, the Nigerian state adopted both constitutional and extra constitutional strategies aimed at avoiding a potent source of conflict within the state.

While the constitutional strategy was informed by the ideology of not adopting any religion as state religion (section 10 (1), Nigerian Constitution, 1999) complemented by the guarantee of the individual's 'right to freedom of thought, conscience and religion' (section 38, (1), Nigerian Constitution, 1999), the extra constitutional strategies were informed by the philosophy that 'every religion has a positive and soul redeeming message which ought to be propagated formally and informally in order to promote a culture of religious tolerance in a multi religious society' (Muhammad, 2006; Momoh, 1992, p. 20). These endeavours which, have seemed to contradict the state's multi religious posture to some extent, includes, government sponsorship of religious festivals and programmes, building of places of worship from state funds, financial support to religious groups and other goodwill and sentimental supports among others ( Muhammad, 2006; Davies, 1995; International IDEA, 2000).

At the supranational level, the Nigerian state has continued to maintain relations with supranational religious bodies and actors. This is done with a view of harnessing its multi religious advantage to achieve meaningful development through bilateral and multilateral relations. These include maintaining relations with the Vatican, the organization of Islamic Conference, the D8 among others. However, despite these efforts by the state, religion has continued to exercise considerable negative influence on Nigerian government and politics including areas such as census, elections, national integration efforts and foreign policy issues among others. From the explosive debate over the inclusion of sharia provisions in the country's constitution in 1979, through the controversy over Nigeria's normalization of relations with the Vatican and its membership of the OIC, to the series of inter religious disagreements, Nigeria has remained a hotbed of inter religious crises. Indeed, between 1999 to date, explosive religious conflicts have remained an annual event with its attendant implications for

social, political and economic developments. Incisive commentaries on these issues have been documented by Suleiman (2004); Birai (1996); Gofwen (2004); Kukah (1993), Akinwunmi (2004); Davies (1995); Akinyele (2002). In other words, ignoring religious undercurrent in Nigerian politics can only be done to the detriment of grasping the substance of some of the issues that have arisen in the history of its political development.

**Impacts and Implications for Sustainable Development**

As already noted earlier, virtually all thoughts of development by scholars emphasizes a multi-dimensional process – social, political and economic – that results in the transformation of the whole societal system and enhancement of the individual's capacity to realize his inherent potentials and to cope effectively with the challenges of life. Such processes ultimately lead to the achievement of whatever is regarded as a general good for the society at large (Thomas, 2000). This imperative came more forcefully to the fore at the dawn of the 21st century with several countries coming up with various development agenda for the new millennium and adoption by the United Nations of the Millennium Development Goal (MDG) Agenda. The developmental challenges confronting Nigeria is better appreciated when we consider the UNDP Human Development Report (2008), which shows that the Human Development Index (HDI)[1] for Nigeria was 0.499, which gives the country a rank of 154th out of 179 countries surveyed. The drive for sustainable development also comes against the background of the quest for peace and stability as a central concern in development efforts. In other words, whatever the aspirations of any political entity, such can only be achieved within an atmosphere of peaceful co-existence of all citizens or groups and a harmonious relation between the rulers and the ruled. As Ake (2001) notes, the task of societal or national development is one that has the people as the central focus and object of development. This, on one hand, requires harnessing the human resources of the society and on the other hand, paying particular attention to relations among the various segments of the society by ensuring that all are bounded together in the pursuit of a common aspiration and a common destiny. By implication, effective integration is *sine-qua-non* to sustainable development of countries especially those with

[1]The HDI provides a composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), being educated (measured by adult literacy and enrolment at the primary, secondary and tertiary level) and having a decent standard of living (measured by purchasing power parity, PPP, income). The index is not in any sense a comprehensive measure of human development. It does not, for example, include important indicators such as gender or income inequality and more difficult to measure indicators like respect for human rights and political freedoms. What it does provide is a broadened prism for viewing human progress and the complex relationship between income and well-being.

fragmented culture and ethno-cultural groups like Nigeria.

At the level of governance, religious politics have implications for the legitimacy of the government in power. The point here is that, political elites in Nigeria see religion as a cheap platform of political mobilization. This coupled with the fact that religious groups in Nigeria often take glory from state patronage of their activities, consequently gives the politicians good leverage in mobilizing religious supports. But the resultant effect however is that a government formed in this process enjoys a low degree of legitimacy. This is because, the party or religious group that fails in the bid to have its adherent capture power perceives the government so formed as not representative enough of its interests. Thus, no Nigerian leader since independence seems to have enjoyed absolute support of all the religious groups. In other words, people view issues from a religious angle rather than objectively from the angle of politics. Antagonisms that greeted composition of the 2005 National Political Reform Conference in which the government had to appoint a co-secretary in order to balance up the religious composition of the conference leadership; the religious insinuations that greeted the removal of the Arabic inscription from the country's currency in 2006; the building of a church within the State House by the Obasanjo administration in order to balance up with an existing mosque and; several other issues necessitating religious balancing points to the extent at which religious colouration affects objectivity in government business. Thus, as International IDEA (2000, p. 40) noted, when the state is perceived as serving some particularistic interests of one group, it begins to loss its legitimacy and authority.

It also needs to be stated that every religion has a soul redeeming message which is expected to impact positively on the citizens especially in the area of moral integrity, aversion to vices and other anti social behaviours. Such messages are usually passed at moments of religious sermon and worships. However, where there is high rate of religious or sectoral violence, there is no doubt that there will be a gradual erosion of the essence of religion in human society manifesting in moral decay and anti social behaviours such as greed and corruption, prostitution etc, all of which constitutes threat to social and economic development. While the menace of corruption in Nigeria may not be linked directly to the level of religiosity of the society or otherwise, its pervasiveness may as well be attributed to the failure of social institutions of which religion is part. In other words, the moral imperative required to complement the fight against corruption and economic crimes will remain

lacking as long as religious groups are more engrossed in settling inter and intra faith disputes.

**Conclusion**

Religion as a system of communion that relates man to an ultimate deity has the capacity to promote such virtues as honesty, integrity and aversion to avarice among others. It thus has a role to play in the developmental endeavours of nation-states. This requires, on one hand, peaceful coexistence and harmony of all religious groups and sects within the state and, on the other hand, it requires deliberate effort on the part of the state to harness the positive virtues of its religious groups. In Nigeria which is characterized by multiplicity of religious groups and sects, it is observed that successive governments since independence have attempted to harness the inherent virtues of religion as a positive force in its developmental challenges through both constitutional and extra constitutional strategies. However, all seemed to have work on the contrary evidenced in the increasing tempo of inter and intra faith disputes. Explanations for this could be hinged, partly, on the contradictory nature of governments response (professing non support for any religion, that is secularity and, constantly supporting the two most popular religions to the point of creating mutual rivalry between them) and partly, to the tendency of mixing religion with politics. Consequently, Nigeria has remained a hotbed of religious crisis with its attendant implications for sustainable development in the country. In order for the Nigerian state to escape from this interlock and be able to harness, more profitably, the positive virtues of its religious groups for national development, there is the need to: (i) embark on more positive measures aimed at ensuring peaceful coexistence of all religious groups. This also requires putting mechanisms in place to detect early warning signals of religious violence. Admittedly, past and present governments have set up committees and councils (e.g. NARETO and currently, NIREC – National Inter Religious Council) to facilitate smooth relations among the religious groups. However, these bodies are more elitist in nature. For instance, the 50-member NIREC whose membership includes eminent Nigerians and religious leaders from among the Islamic and Christian faiths as of now, have no standard structure that penetrates to the grassroots. But this is quite essential given the fact that the armoury of religious violence lies at the grassroots. In other words, it is essential that the council devises structures that will help carry-on its activities at the state and local government grass root levels. Equally, considering

the fact that competition for resources is a major source of acrimony between the two dominant faiths; there is the need for NIREC to abstain from making donations to victims of religious crisis as this may pull the council into an unexpected controversy. It is noteworthy that the council recently donated millions of Naira to victims of religious violence in some states of the federation. While it is essential to assist such victims, the endeavour should be left for some other agencies to handle such as the National Emergency Management Agency (NEMA). (ii) There is also the need to strengthen the capacity of existing government agencies to accurately gauge the mood of the society. This also has the advantage of helping to detect, early, potential religious threats and thus put up proactive measures. This is against the background that religious crisis don't just occur, they are instigated; therefore, agencies such as, the National orientation Agency (NOA), with structures that run from national to the grassroots level could be strengthened not only to enlightened and re-orientate, Nigerians but also collate relevant information which would facilitate early detection of impeding religious violence. (iii) There is the need for more enlightenment on the dangers of politicizing religion. This calls for proactive action on the part of government and the civil society at large. Indeed, the government could facilitate the setting up of an army of volunteers among the civil society groups for this task. It is expected that incorporating the above measures into the mainstream of policy framework would go a long way in averting the destructive impacts which religious violence has been having on the country.

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