UNIVERSITY OF CAPE COAST

IMPACT OF CREDIT-BASED FOOD CROP DEVELOPMENT PROJECTS

(FCDP'S) ON SOCIO-ECONOMIC LIVES OF SMALL-SCALE MAIZE

FARMERS: THE CASE OF EJURA-SEKYEDUMASE DISTRICT

BY

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ABSTRACT

This study sought to find answers to the questions of whether the Food Crop Development Project improved farmers' access to credit, changed farmers savings culture or whether small-scale maize farmers adopted the improved maize production practices. In addition, the study seeks to know whether or not there has been any significant difference in food security situation between participant and non-participant farmers. Descriptive-Correlation survey was conducted and using multistage random sampling procedure a final sample of 130 farmers was selected. Pearson's correlation coefficients indicated that participation in FCDP had a positive and significant but moderate relationship with maize output, but had no significant relationship with total farm incomes. More participants reported having easy access to credit than non-participants with Chi-square value of 17.29 being highly significant indicating the possible relationship between ease of access to credit and participation in FCDP. Pearson's Chi-square ($\chi^2_{0.01}$) of 14.44 was also found to be significant indicating the possible relationship between participation and saving in a financial institution. The OLS stepwise regression analysis showed that participation in FCDP, farm size and ease of access to credit were the main predictors of maize output while participation, income and household size were also the main predictors of food security. Thus, FCDP helped to improve the livelihoods of maize farmers in the study area. The policy implication of these findings is that subsidized agricultural input projects like the FCDP, have the potential to improve food security and farm incomes of peasant households.

ACKNOWLEDGEMENT

DEDICATION

To my parents Hajia Amaamah Abdulai and Alhaji Umar Alhassan as well as all small-scale food crop farmers struggling to feed themselves and the nation.

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ACRONYMS

DADU: District Agricultural Development Unit

DFID: Department for International Development

FAO: Food and Agriculture Organization

FCDP: Food Crop Development Project

GPRS: Growth and Poverty Reduction Strategy

HDR: Human Development Report

IFAD: International Fund for Agricultural Development

MoFA: Ministry of Food and Agriculture

NDPC: National Development Planning Commission

OECD: Organization for Economic Cooperation and Development

OLS: Ordinary Least Squares Regression

PCU: Project Coordinating Unit

UNDP: United Nations Development Programme

USDA: United States Department for Agriculture.

CHAPTER 1

INTRODUCTION

Background to the Study

A significant number of the rural population in developing countries depends primarily upon small-scale, subsistence-oriented agriculture based on family labour. However, due to their limited access to resources, technology and alternative livelihood, they are engaged in the over-exploitation of natural resources, including marginal lands. For Ghana to achieve the goals of its Growth and Poverty Reduction Strategy (GPRS II), agriculture needs to grow continuously at the rate of 6.0% per annum over the next four years (i.e. between 2006 and 2009), (NDPC, 2005). Earlier, between 1984 and 1992 the sector's growth rate averaged 1.7% per annum. This fell further to 1.2% in 1994 and improved to 4.0% in 2001 (ISSER, 2002).

Governments of Ghana, both past and present, have made serious efforts at solving the country's agricultural problems. Some of these attempts led to the initiation of programmes and projects such as "Operation Feed Yourself" in 1973, "National Agricultural Extension Project" in 1992 and the National Poverty Reduction Programme (NPRP) in 1997. Most of these programmes in rural areas which directly affect agriculture were intended to raise farm incomes through

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increased farm output and therefore reduce poverty and promote economic growth.

The Ghanaian Government in its poverty reduction strategy programme recognizes the great potential for agricultural development and the key role of agriculture in addressing the millennium development goals and poverty reduction (NDPC, 2005). Commercialization of agriculture has been recognized as a means for agricultural development and poverty reduction especially among small-scale farmers. According to Cramer et al. (2001), commercialization of agriculture implies a transformation of the agriculture system from being a way of life and for subsistence production among small-scale farmers to being a viable business for small-scale farmers. The thinking behind this approach is linking small-scale farmers not only to domestic markets but regional and global markets through the adoption of market-led agricultural production. Additionally, market-led agricultural development approach assumes that liberalization of the market would not only enhance competition but also correct price distortions and bring efficiency in the market (Cramer et al. 2001, Wold et al. 1996). This is expected to lead to higher incomes from farm produce which will serve as incentives to farmers to increase their production and market more of their produce. This is expected to create employment in the rural communities and reduce food insecurity and poverty.

The Food Crop Development Project (FCDP) Group Credit Scheme was one of several attempts by government to make credit accessible to small-scale farmers. The FCDP was a five-year development co-operation between the

African Development Bank and the Government of Ghana. The project was implemented in eight districts of four regions in the country. These were Ejura-Sekyedumase and Sekyere-East districts in Ashanti Region, Wenchi and Nkoranza Districts in Brong Ahafo Region, Nkwanta and Krachi Districts in Volta Region, and East- Dagomba and West-Gonja Districts in the Northern Region.

Under the Food Crop Development project, a total of GH¢364,800 was granted to 191 farmer groups as production and marketing credit in the 2004 budget according to the Minister of Finance (Budget Statement, 2005). In the 2005 budget, GH¢ 2.00 million was earmarked for at least 500 farmer groups for production, storage, processing and marketing in the eight project districts under the Food Crop Development Project (FCDP). This underscores the assertion that agricultural credit is a critical factor in the Ghanaian rural farming situation (Owusu-Acheampong, 1986).

It was envisaged that after its successful implementation, the FCDP group savings scheme would bring about effective mobilization of individual and group savings and would enhance the following objectives:

i.   Provide cash base as security against future unforeseen cash needs.

ii.   Enhance borrowers' capacity to make transition to self-financing of production inputs.

iii.   Help develop customer/bank relation for improved access to credit under normal bank facilities.

iv.   Add security to group savings from their operation.

v.   Enable the accumulation of assets for new or expanded ventures.

Problem statement

Small-scale farmers constitute a significant proportion of farmers in the country. They cultivate a land area of about 13.6 million hectares, constituting 57% of total land area under cultivation. Out of a total of 2 million small-holders, 85% cultivate less than 2 hectares. In addition, 80% of domestic food supply and 90% percent of export crops come from small-holders (PCU-MoFA, 2001). Despite the contribution of small-holders to the nations' agricultural output, their productivity in terms of output per unit area and per farmer remains low.

Lack of access to credit by small-scale farmers, has been one of the factors that impede the adoption of numerous innovations passed on to them by agricultural extension services. This situation has been attributed to inadequate establishment of credit services or institutions where the poor and marginalized farmers live. The assumption has always been that the poor farmers do not save and therefore constitute a high credit risk factor. The Food Crop Development Project (FCDP) was one of several measures the Government of Ghana introduced to address this state of affairs. The project was aimed at improving household food security, nutrition, farm incomes and reducing poverty among small-scale farmers through increased production, storage and processing of cereals and legumes (MOFA, 2003).

Six years after its implementation, has the project achieved these goals? Has there been a positive an improvement in income levels of participant farmers?

Has the project improved farmers' access to credit? Has it changed farmers' savings culture? Have small-scale maize farmers adopted improved maize production practices? And has there been an improvement in food security situation among participant farmers? The current study seeks to find answers to these questions. Though some studies have been done mainly by the implementing and supervising agents, namely, Ministry of Food and Agriculture (MoFA) through the Project Co-ordinating Unit (PCU) and District Agriculture Development Unit (DADU), to assess the success of the project in terms of achievement of some project goals, concerns about loan recovery have often overshadowed the desired attention that project goals deserve in some of these assessments. The current study is therefore aimed at assessing the effect of the FCDP on the lives of small-holders in the Ejura-Sekyedumase District, in terms of improvement in household food security and farm incomes and assets accumulation.

Objectives of the study

General Objective: The overall objective of the study is to assess the impact of the Food Crop Development Project on food security and socio-economic lives of small-scale maize farmers in the Ejura-Sekyedumase District.

Specific objectives: The specific objectives are to*:*

1. Describe the demographic characteristics (age, gender, level of education, household size) of farmers and examine their relationship with farmer's income levels.

2. Examine the differences in socio-economic characteristics of farmers in the FCDP area in terms of scale of production (size of farm) and ease/difficulty of access to credit, savings behaviour between participant and non-participant farmers.

3. Compare the level of adoption of recommended agronomic practices by farmers in terms of use of improved maize seed, herbicides to control weeds and other cultural practices.

4. Compare the level of living of participants and non-participant farmers in terms of income levels and distribution.

5. To analyse the effect of the project (access to credit, technology transfer) on maize output and food insecurity coping strategies of farmers in the district.

Hypotheses to be tested

1. H_0: There is no significant difference in maize output levels between participants and non-participant farmers in the FCDP.

   H_1: There is significant difference in maize output levels between participants and non-participant farmers in the FCDP.

2. H_0: There is no significant difference in income levels between participants and non-participant farmers in the FCDP.

   H_1: There is significant difference in income levels between participants and non-participant farmers in the FCDP.

3. Ho; The ease of access to credit for participant farmers is not significantly different from non-participant farmers.

   H_1; The ease of access to credit for participant farmers, is significantly different from that of non-participant farmers.

4. H_0: There is no significant difference in the level of adoption and use of recommended varieties and practices between participants and non-participants.

   H_1: There is significant difference in the level of adoption and use of recommended maize varieties and practices between participants and non-participants.

5. H_0: There is no significant difference in the levels of food security between farmers who participated in the FCDP and those who did not participate.

   H_1; There is significant difference in the levels of food security between farmers who participated in the FCDP and those who did not participate.

Table 1 shows the summary of the objectives, hypotheses and analytical tools in the study.

Table 1

Summary of Objectives and Research Approach

Objectives	Hypothesis	Data Required	Analytical Tool
Describe the demographic characteristics of farmers and examine their relationship with farmer's income levels.	Participation in FCDP did not have any significant difference on farmers' income levels.	Demographic, socio-economic, income levels	Descriptive statistics Correlation coefficients
Examine the differences in socio-economic characteristics of farmers in terms of scale of production (size of farm or and ease of access to credit and saving behaviour between participant and non-participant farmers.	Though important participation in FCDP agriculture did not contribute significantly to farmers' socio-economic status: food security status and income levels.	Socio-economic, maize output, perceptions on ease of access to credit, food security index	Descriptive statistics Pearson's Chi-Square (χ^2).
Compare the level of adoption and use of recommended practices by farmers.	There is no significant difference in the level of adoption and use of recommended varieties and practices between participants and non-participants.	Use of recommended varieties and practices	Descriptives, use of proportions, Mann-Whitney U
Assess and compare the level of living of participants and non-participant farmers in terms of income levels and asset acquisition and distribution.	Income levels and assets acquired do not depend on participation on FCDP.	Assets, income patterns	Descriptives, t-tests, Lorenz curves and Gini Coefficients
To analyse the effect of the project on maize output, farm incomes and food insecurity coping index.	Participation in FCDP did not have any significant effect on maize output, income from maize production and households' food security coping index.	Perceptions of households' coping strategies, maize output, income from other economic activities, use of improved technology, farmer and household characteristics.	OLS regression, comparative t-test.

Variables of the study

Dependent variables

Food security coping index: The Indices of Household Coping Strategies was used to estimate food security in the respondent's household. This method determined an index based on how households are able to adapt to the presence or threat of food insecurity. The person within the household who has primary responsibility for preparing and serving meals was asked a series of questions regarding how households were responding to food shortages. A weighted sum of different coping strategies was determined, where the weights reflect the frequency of use and the severity of the household's response. The higher the sum, the more food insecure the respondent's household.

Income from maize and total income: Income measures were used to give a picture of the extent of poverty reduction. Farm produce (mainly maize and other major crops produced) and their corresponding prices were used to determine farm incomes. Non-farm incomes were added to obtain total income. This approach of determining poverty reduction was adopted because of its popularity in empirical research as compared with non-monetary measures of poverty. Although some researchers argue that money income (or consumption) on its own is an imperfect measure of poverty reduction, different views exist, about the relative importance of non-monetary variables, and about the weights that are given to the views expressed by poor people themselves (Maxwell, 1999).

Independent variables

The independent variables in the study include participation in the FCDP, components of the project (access to credit, technology transfer) and a set of household and demographic characteristics - such as participation, age, sex, level of formal education attained, household size and farm size- to control for the possible heterogeneity among households in the study area.

Delimitation of the Study

The FCDP was involved in cereals and legumes food crops with regards to transfer of technologies about production, processing and storage. This study was however, restricted to only maize production technologies because maize was the dominant food crop in the study area compared to other cereals. In addition, the study covered only one of the eight pilot districts in the country.

Limitations of the Study

Some variables such as food insecurity and savings attitude were measured as personal perceptions. Accuracy of perceptions was a limiting factor because people's perceptions could be influenced by their moods. Consequently, there were bound to be variations on farmers' perceptions on these variables.

In addition, lack of sampling frame for non-participant farmers in the project area made the researcher to rely on other farmers for information to build a frame before the sampling process. The study was also restricted to small-scale maize farmers. Thus, the generalization of the results of this study to other groups or

situations with similar characteristics cannot be done without caution, extensive analysis and comparison.

Definition of Terms

Household: Family or group of people with common eating 'pot', farm and dwelling place.

Participant: a maize farmer who directly benefited from input or cash credit and training offered by the Food Crop Development Project.

Non-participant: a maize farmer who never directly received any credit or training from the Food Crop Development Project.

Small-scale maize farmers: refer to farmers cultivating a total land size of less than two hectares.

Food security: Access by all individuals in the household at all times to enough quality food for an active and healthy life. In this study, food security is defined in terms of household heads' responses to coping strategies to deal with food insecurity.

Food insecurity: A situation of limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire quality and sufficient foods in socially acceptable ways.

Coping index: This is an index obtained by summing the coping strategies of the household to food shortages. These strategies are measured on an interval scale, with a higher index indicating more food insecurity. It is used as a proxy to measure levels of food insecurity.

Credit access: this is a measure of how easy or difficult farmers perceive their access to loans from different sources (both formal and informal). The ease or difficulty of access in this research was measured on a four point interval scale.

Adoption: The degree/extent of use of a new technology in the long-run equilibrium when the farmer has full information about the new technology and its potential (Feder, G., Just, R.E. and Zilberman, D., 1985).

Description of the Study Area

The Ejura-Sekyedumase District was created in 1988 and covers an area of 1,782.2 Sq.Km. It is about 7.8% of the total land area of Ashanti Region. Agriculture is the main source of livelihood in the district and about 60% of the economically active population is engaged in farming. Major crops cultivated include maize, yams, cassava, cowpeas, groundnut and vegetables.

Climate and Vegetation

The district lies within the transitional zone of the semi-deciduous forest and Guinea Savannah zones. It therefore experiences both the forest and savannah conditions. The district is marked by two rainfall patterns; the bi-modal pattern in the South and uni-modal in the north. Annual rainfall varies between 1,200 mm and 1,500 mm.

Relative humidity is very high during the rainy season, recording an average of 90% in its peak in June and 55% in February. The vegetation in the district is to a large extent dictated by the topography and climatic conditions. The

northern part is covered with sparse derived deciduous forest vegetation. The climatic conditions of the district together with the topographical layout favour the cultivation of food crops. Additionally, the derived form of savannah at the northern part of the district supports the cultivation of cereals.

Geology and Soils

Soils in the district are of the savannah Ochrosol type which is mainly made up of sandy loam or clay loam. Soils in this class are often well drained, deep, light in colour, well aerated and rich in organic matter as well as soil nutrients. They are easy to till and especially suited for mechanised farming.

The Ejura-Skyedumase District was selected for this study because it is located within the forest-savannah transitional zone, which is a major maize production zone. In this zone, mono-cropping is also common and account for about 60% of the area cropped to maize (Ejura-Sekmyedumasi District, 2005). The district is also known to be the major maize producing district within Ashanti Region and Ghana as a whole (Morris et al, 1999). In addition, maize has also been identified as the crop with the highest contribution to food security in the area in terms of production levels as compared to other crops such as yam, cassava, plantain and cocoyam (Ejura-Sekedumase District Assembly, 2005).

Figure 1 below is a map of Ejura-Sekyeduase District showing the study villages/areas.
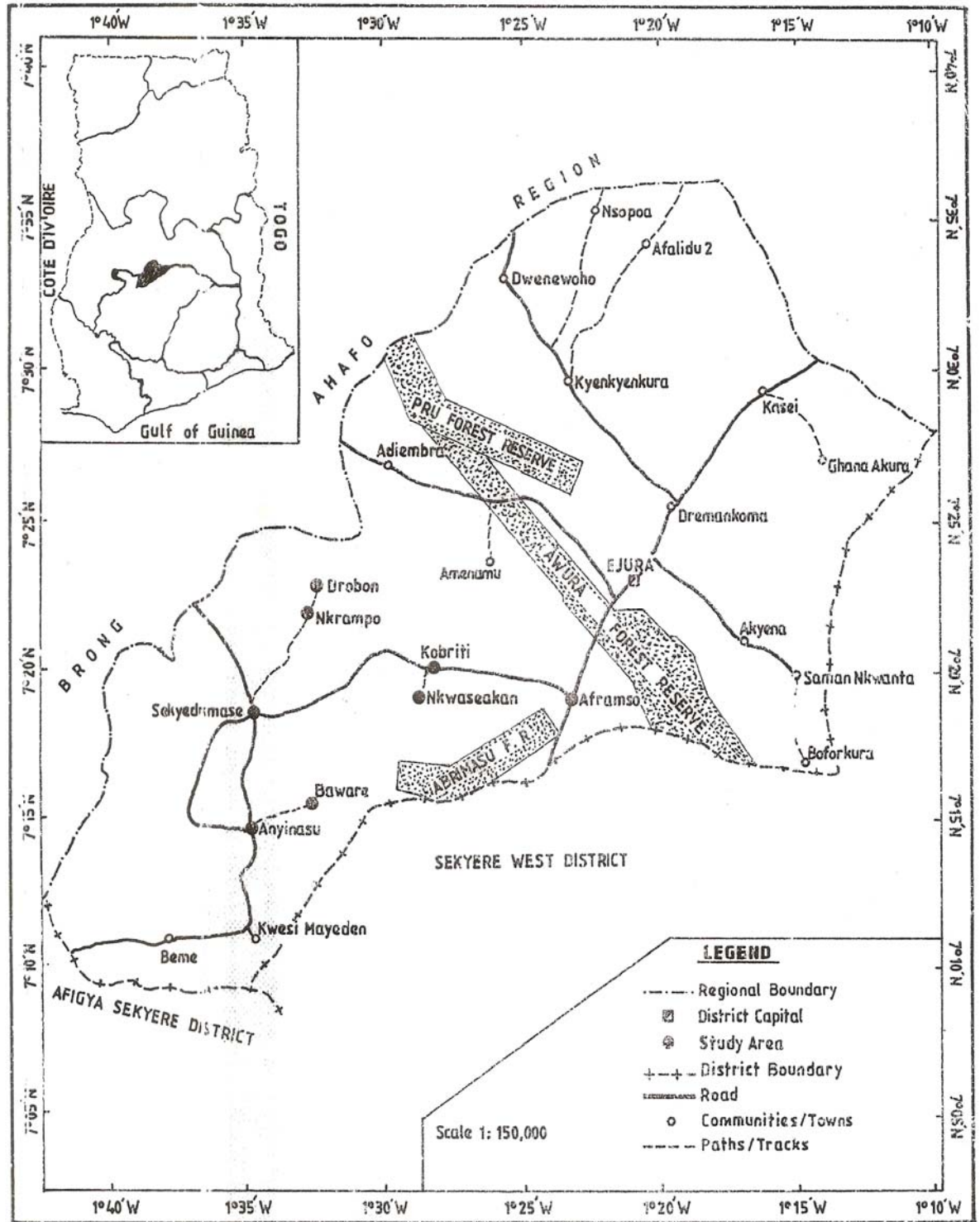
Figure 1: Ejura-Sekyedumase District Map Showing the study Areas

Source: Ejura-Sekyedumase District, (2006)

Organization of the Thesis

This thesis is organized into five chapters. Chapter one comprises the background of the study, the objectives and hypotheses to achieved. It also highlights the variables in the study as well as the operational definitions of some terms used in the study. Chapter two will present the review of related literature. Chapter three will be the methodology and it will describe the research design, population and sampling techniques, the instrument to be used, data collection procedure, and the statistical tool that will be used in the analysis of the data. The findings of this study constitute chapter four. Chapter five will constitute the discussions and interpretation of the findings, the summary and recommendations.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter reviews literature on various aspects of poverty and food security as well as their relationship with agricultural productivity. It covers theoretical/conceptual issues on poverty including the income concepts, capabilities concept, basic needs concept and the UNDP's multi-dimensional concepts. It also covers the challenges these different concepts pose for development agencies in their attempt to understand and offer the best solutions to alleviate poverty in their areas of operation. The chapter also covers food security and poverty reduction, measurement related issues on food security, constraint to agricultural development in Ghana and microfinance and its relationship with agricultural productivity and poverty reduction. The chapter also covers the conceptual framework of the study.

Concepts of Poverty

Theorizing about poverty has been complicated by the fact that the concepts and indices used have been broadened beyond the income focus and made more multi-dimensional. According to Sen (1999), Todaro (2001) and Wolfensohn & Bourguignon (2004), this has been due to changing ideas of

development and underdevelopment, which have now been widened from economic, social, and environmental development to human development in its manifold senses. The official literature and indicators, however, remain focused on income.

Income Concepts

Concepts of poverty have revolved around low income as the criterion. Income represents command over acquisition of goods and services to meet minimum needs. So the lack of income also means poverty in terms of basic needs (such as food, shelter, and clothing). An agreed-upon budget for basic needs for a society is called a poverty line (Bradshaw, 2006). The World Bank has adopted about US$1 a day as a global poverty line below which people are considered struggling to survive. Higher poverty lines from $2 to $14.40 a day have been used for richer countries (UNDP, 1997).

An important distinction between absolute and relative poverty needs to be made. Absolute poverty, according to Maxwell (1999), is the situation of all those falling below the established poverty line. This threshold is fixed across all resource distributions, time, and even countries, though its value is adjusted for variable price levels and exchange rates. On the other hand, relative poverty is measured by the income gap or poverty gap, i.e. "the average income shortfall of all the poor as a proportion of the poverty line," (Streeten, 1998) or the additional income needed by the poor to rise above the poverty line.

The distinction between absolute and relative poverty suggests that trends in income levels and distributions can take different directions; the poverty gap

can widen amid economic growth. The distinction also seems useful in setting policy goals. Most international programmes aim merely at poverty alleviation, or entirely eliminating absolute poverty. But it seems relative poverty will always be with us given the wider dimensions of poverty (Bradshaw, 2004).

Basic Needs Concept

Although income implies command over resources to meet needs, the income criterion has limitations. For instance, income may not adequately represent basic necessities such as food, shelter, and clothing. On the other hand, government programmes that address such basic needs directly may substantially improve the health and welfare of the poor without necessarily raising their income. Thus, basic needs receive a great deal of attention from international and national poverty programmes (Bradshaw, 2004). However, this concept has its share of limitations. Needs change over time. According to Gordon (1972), one reason for a shift to relative definitions of poverty was that absolute standards ignored the increasingly expensive prerequisites for daily survival in urbanizing technologically more complicated societies. For example, telephones and automobiles are becoming more and more indispensable in many countries even for the poor. To Gordon, another factor favouring the shift was the thought that relative deprivation, economic isolation, and inequality would remain although absolute poverty might disappear with economic growth and with more generous income maintenance policies.

Capabilities Concept

An even wider perspective suggests the limits of both income and basic needs concepts. According to the Human Development report (HDI, 1997), inadequate income "gives only a partial picture of the many ways human lives can be blighted. An individual can enjoy good health and live quite long but be illiterate and thus cut off from learning, from communication and from interactions with others. This thinking is in line with efforts to re-orient the concepts of economic and social development to human development. These efforts were marked by the idea of viewing social development as the end rather than merely the means of economic development, i.e. of regarding health and education as ends rather than just human capital resources (Streeten, 1998).

Sen (1999), sought to advance this view by looking at "development as freedom," i.e. people's freedom to satisfy the ends of development. A component concept of freedom is that of elementary capabilities like being able to avoid deprivations such as starvation, undernourishment, morbidity and premature mortality, as well as the freedoms associated with being literate and numerate, enjoying political participation and uncensored speech and so on (Sen, 1999).

UNDP's Multi-Dimensional Concepts

Since 1990, the U.N. Development Programme (UNDP) has produced reports that define development as both the process of widening people's choices and the level of their achieved well being (UNDP 1997). UNDP defines poverty as the denial of a person or group of persons from those opportunities and choices

most basic to human development; making it impossible for the individual to lead a long, healthy, creative life and to enjoy a decent standard of living, freedom, dignity, self-respect and the respect of others (UNDP, 1997). It thus, views poverty as multi-dimensional involving three perspectives: (a) Income perspective: A person is poor, if and only if, his /her income level is below the defined poverty line.... (b) Basic needs perspective: Poverty is deprivation of material requirements for minimally acceptable fulfillment of human needs, including food, shelter, health and education and essential services such as employment and participation. (c) Capability perspective: "Poverty represents the absence of some basic capabilities to function.... The functioning relevant to this analysis can vary from physical ones (i.e. being well-nourished adequately, clothed and sheltered, avoiding preventable morbidity) to more complex social achievements such as partaking in the life of the community" (UNDP, 1997, p. 12). In Egypt, for example, less than 10% of the people were income-poor but 35% were "affected by human poverty." In China and the Philippines, about 30% were income-poor but less than 20% were "human-poor." Thus, according to UNDP (1997), some countries have done better in reducing human poverty than income poverty.

Social and Psychological Dimensions of Poverty

Some of the dimensions of poverty are social and psychological. Poor people are vulnerable and exposed to all kinds of risks. Incidents and accidents can destroy their social and economic statuses (World Bank, 2000). The poor

possess only a few assets and those few they possess (mainly labour) are not very productive. Many people live at the edge of poverty and can therefore easily become poor, because they are very vulnerable to any crisis, from personal or family illness to natural disaster that force them to sell whatever assets they have (Haddad, Hoddinott and Mukherjee, 2000; World Bank, 2000). Extreme vulnerability due to lack of cushioning assets is an important cause of food insecurity and poverty. Because of the lack of such assets, the poor are also less resilient. According to IFAD (2001), even a five percent fall in income, or an illness involving lost work and costs of treatment, is more threatening for those with little or no savings, insurance or access to credit. It is, therefore, essential that impact assessments of development interventions on poverty alleviation include the assessment of impact on poor people's assets, which can diminish their vulnerability, when different types of temporary or permanent crises occur; (Safiliou- Rothschild, 2001).

The IFAD Rural Poverty Report 2001 provides examples of how different definitions of poverty, based on qualitative and objective indicators, identify substantially different people as poor. In two Indian villages, for example, people whose real incomes had actually declined over 20 years reported their situation as having improved, because of decreased dependence on low-paying jobs, patrons and landlords, improved mobility and better consumption patterns (Johda, 1988). There are some qualitative changes that may be significant for poverty alleviation. How the poor, for example, cope with crises, whether or not they are reduced to abject poverty after a serious illness or accident in the household, and the extent

to which they are able to recover after crises represent important indicators of resilience and survival. If a development intervention can increase people's resilience to crises, an important step has been made toward poverty alleviation. Furthermore, how the poor think of themselves, how self-confident they are and how secure they feel and in charge of their lives are important psychological characteristics the changes of which need to be measured (Chambers, 1986).

It has been found that more rural families are now earning money from non-farm work (FAO, 2007). However, limited skills in people in these areas means agriculture is still the main source of income. According to the report released by the United Nations Food and Agriculture Organization (FAO), a growing proportion of rural family income is coming from non-farm activities such as commerce, service provision and immigrant remittances. However, earnings from agriculture continue to be a fundamental source of livelihood for 90 percent of rural households, particularly the poor (FAO, 2007).

The synthesis of some field studies in a special chapter of FAO's State of Food and Agriculture 1998 demonstrated the importance of non-farm income in rural areas for purchasing power and food security, its importance being the greatest in the poorest regions. Access to wage employment is particularly important for poverty alleviation, when there is relative assurance and continuity of this employment to provide regular income without gaps. Reliability and continuity of employment help reduce vulnerability and can enable the poor to achieve a minimum adequacy and security of livelihood (Chambers, 1994).

In addition to the indicators of the economic dimensions of poverty, an additional number of indicators are needed to measure, with some accuracy, the different dimensions of rural poverty at the household level. Safilliou-Rothschild (2001), reports that indicators often used include small farm size, landlessness and gender of the head of the household because they identify specific potentially vulnerable groups but not sufficient in themselves in giving an accurate picture of the poverty status. He further explains that farm size and landlessness provide important information about whether or not land assets are possessed by the household, while the gender of the head of the household provides information about labour availability in the household. Ramallion (1992), however, indicated that all three indicators may not provide by themselves a complete picture of the economic dimensions of poverty at the household level. Households with a small farm size may have several wage earners or only one family member and this may well determine whether or not they are poor and how poor they are. Similarly, landless households may have several family members as wage labourers and may be leasing land.

Credit Market Failure and the Poor

Dercon (2003), argues that serious market failures, combined with asset inequalities are important causes for poverty persistence. He cited three examples of market failures that contribute to poverty traps: credit market failures, geographic and other externalities, and risk-induced traps. The most obviously observable market failure is the failure of credit markets to conform to the assumptions of perfectly competitive markets. Under perfect and competitive

market system, anyone with a profitable project should be able to get a loan at the current interest rate. If markets were perfect and efficient, no bank would ask for collateral to secure the loan. In practice, without collateral, one typically would not get the loan. Collateral requirements can be understood as an important means by which credit markets handle the central problems that bedevil these markets: asymmetric information, such as moral hazard and adverse selection, and enforcement problems.

Starting from initial asset inequality, it is obvious that this may be a market failure that is particularly hurtful for the poor. But it is more than an equity issue: it may mean that the poor may not be able to use their other assets as efficiently as the rich. In a classic paper, Eswaran and Kotwal (1986), develop a simple model to illustrate its implications. A further simplified version goes as follows: consider a village with farm households, each with differing amounts of land and labour. The efficient technology to produce involves using land, labour and fertilizer as essential inputs. Labour, land rental and fertilizer markets are assumed to work efficiently – at the governing price, they can all be obtained without restriction. However, the credit market is not perfect. The result is that credit can only be obtained using land as collateral, while all inputs have to be paid for in cash.

According to Eswaran and Kotwal (1986), the nature of agricultural production implies that output is only obtained at the end of the season while inputs need to be applied early in the season. In short, there is a need for working capital to acquire inputs if needed. The land-rich farmer can easily acquire

fertilizer and, if necessary, extra land and labour to make sure inputs are used as efficiently as possible. However, the land-poor farm household must find other ways of raising the cash to farm. It would need to raise cash by working on other farmers' land or even rent out its land. Under general conditions, it can be shown that the poor farmer will be using its assets – land and labour – less efficiently than the rich farmer. The poor farmer will be using less fertilizer than optimal, and farm too intensively in terms of labour, with more labour per unit of land than efficiency would require. His poverty in terms of assets leads to inefficiency. In this example, asset inequality combined with market failure results in differential efficiency between the poor and the rich. The rich do not just earn more income because they have more assets, but also they can use them more efficiently. Market failures exacerbate the initial inequality. Better working credit markets and/or more equal asset distribution would be efficiency and equity-enhancing. This will help get the poor out of the poverty-trap. According to Dercon (2003), a poverty trap is an equilibrium outcome and a situation from which one cannot emerge without outside help, for example, via a positive windfall, such as by redistribution or aid, or via a fundamental change in the functioning of markets.

Recent Trends and Income Dimension of Poverty in Ghana

The results of the 2003 Core Welfare Indicator Questionnaire (CWIQ) updates the information on poverty for Ghana, indicating that poverty headcount continues declining, falling by around 7 percentage points between 1997 and 2003 (Table 2). Most of the reduction in poverty is associated with the movement of

people from rural to urban areas, with rural areas seeing a decline in poverty rates, while urban poverty rates increased slightly. Poverty remains, nevertheless, predominantly concentrated in the three deprived regions (Northern, Upper West, and Upper East), as well as in the Volta and the Brong Ahafo Regions.

Table 2

Distribution of Households by Place of Residence and Economic Status, 1997-2003

Place of residence	1997	2003	Change
Rural	69%	58%	-9%
Urban	31%	42%	+9%
Overall population below the poverty line	42%	35%	-7%

Source: Core Welfare Indicator Questionnaire (2003).

Thus, there is no evidence in the progress report of any significant positive spill-over effects in the poverty-endemic areas of the three northern savannah regions (the Upper East, Upper West and Northern Regions) as urbanization has not changed the regional profile of poverty, and poorer regions report higher urban poverty rates. While some progress has been made in increasing the acreage of farmland under irrigation, the report does not provide an assessment of the causal links between this and increased food-crop production. According to the World Bank (2005), the factors behind the poor productivity among others could be attributed to slow implementation of measures aimed at increasing mechanization, promotion of high-yield varieties of food crops and land reform.

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The report recognizes that post-harvest losses and food security are issues to be addressed in the coming years. The need to address weaknesses in market opportunities, the development of non-traditional exports, and the gender dimension of agricultural production, including women's access to credit were also noted.

The incidence of poverty is usually assessed at two levels: an Upper Level and Lower or extreme level. The Upper Poverty line in Ghana refers to incomes of up to GH¢90.00 a year, or GH¢7.50 a month or GH¢ 0.25 a day. The extremely poor are people with incomes below GH¢70.00 a year or GH¢5.80 a month or GH¢ 0.19 a day. The latest statistics on poverty estimates that about 40% of the Ghanaian population has incomes below the Upper Poverty Line; while about 27% of the population has incomes below the extreme poverty line (NDPC, 2006).

According to the NDPC (2006), while these figures give general indications of the incidence of poverty in the country, they mask the uneven distribution of poverty across geographical areas of the country. Five out of the 10 regions in Ghana had more than 40% of their population living in poverty; the worst affected being the three northern savannah regions (the Upper East, Upper West and Northern Regions). Nine out of ten people in the Upper East or 88%; eight out of ten in Upper West or 84%; and seven out of ten in Northern Region or 69% of their populations lived below the poverty line. Five out of ten or 48% of the people in Central Region were classified as poor. Eastern Region had 44% of the population living below the poverty line while other regions fell between; the

Greater Accra (5%), which has the lowest incidence, and the Volta Region with 38% of the population living below the upper poverty line.

Reports from the World Bank showed that poverty levels in Ghana have fallen, with consumption poverty dropping substantially, from 51.7% (1991/92) to 39.5% (1998/99) and then 28.5% (2005/06) (World Bank, 2007). Asset poverty also decreased, from 45.7% (1997) to 38.9% (2003) (Coulombe and Wodon, 2007).

Poverty is still predominantly a rural phenomenon with the rural areas accounting for more than 70% of the poor. In terms of economic activity, poverty is highest among food crop farmers with about 59% of them living below the poverty line. Other categories that are relatively poor include export farmers (39%) and private informal employees (25%), (Gyan-Baffour, 2006).

Table 3:

Percentage of the Very Poor in Different Socioeconomic Groups, 1987-92

Sector	1987/88	1988/89	1991/1992
Public employees	22.2	26.9	21.5
Private formal	18.8	29.9	19.6
Private informal	32.4	33.3	27.7
Export farmers	43.1	44.2	37.4
Food-crop farmers	46.2	53.0	38.9
Non-farm self employees	30.6	36.2	25.7
Non-working	34.5	43.1	19.5
National	36.4	41.6	31.2

Source: Ghana Living Standard Surveys, 1987-1992

It can be observed from Table 3 that, compared to other groups of people in the socio-economic ladder, food crop farmers formed the majority of the poor in Ghana in the 1987-1992 Ghana Living Standards Survey. In three different years survey the percentage of the very poor among food crop farmers exceeded the national average as compared to employees in other sectors.

Analysis of the GPRS confirmed that poverty is by far highest among food crop farmers compared to other occupational groups. Poverty among food crop farmers remains about 19% above the national average of 40% in 1998/99 and they, together with those in non-farm self-employment, experienced the least reduction (9%) in poverty (NDPC, 2005). The results of the consultative processes undertaken in the preparation of the GPRS and those of the Ghana Living Standards Survey (GLSS 4) showed that food crop farmers benefited least from the gains made in poverty reduction during the nineties. Rural poverty is largely attributed to poorly functioning markets for agricultural outputs and to low productivity because of the reliance on rudimentary technology, farming practices and low utilization of low-yielding inputs.

A survey conducted by the Ejura-Sekyedumasi District in 2006 also showed that majority of the poor (people with income below GH¢ 90.0 per annum) were farmers. Table 4 shows that farmers in the district are poorer than workers in the service and industrial sectors. Those considered not poor are mostly the service sector employees constituting 82%. This shows that the service sector is the most gainful employer among all the sectors of the economy in the district.

Table 4

Incidence of Poverty

Sector	**Not poor** (Income above GH¢90.00)	**Poor** (Income below GH¢90.00)	Total
Agriculture	63%	37%	100
Industry	78%	22%	100
Service	82%	18%	100

Source: Ejura-Sekyedumase District (2006).

Food Security and Poverty Reduction

Traditional income and poverty measures do not provide clear information about food security, even though food insecurity and hunger stem from constrained financial resources. The Rome World Food Summit defined food security as a state when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2005; FAO, 1996). According to Maxwell and Frankenberger (1992), food security is "secure access at all times to sufficient food for a healthy life." The concept of Food security is based on three distinct yet inter-related fundamental concepts: food availability, food access and food utilization (Sen, 1981; Maxwell, 1995). These concepts together determine the food security status at any level of analysis.

Food availability relates to physical existence of sufficient food either in fields, stocks or in domestic markets (Inter-Academy Council, 2004). Mediating

factors for food availability are grouped into resources and production. Resources include natural capital, physical capital, and human capital. To this list of resources, also regarded as assets, Ellis (2000) adds financial capital and social capital. Ellis observes that financial capital refers to savings, loans and credits whilst social capital take account of social relations and networks such as co-operatives and farmer associations. The contribution of household production to food security is based on two assumptions. First, it is assumed that an increase in agricultural production would increase the physical availability of food from own household production as well as increase physical availability of food in markets at affordable prices for the poor (DFID, 2004). To DFID, increased agricultural production would provide jobs and increase household income to enhance economic access to food.

According to Ellis access to food is looked at in the dimensions of economic access and social access. The rural growth linkages model attempts to explain the connection between, two major determining factors of economic access to food, production and income components. Concerning production, the rural growth linkages suggests a symbiotic relationship between farm production and non-farm production where an increase in farm production leads to an increase in non-farm enterprises that in turn enhance investments in farm production.

Food utilization is a third equally significant attribute of food security. Physiological utilization of food is a nutritional component of food security that is important in determining the extent to which the body is able to make use of

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ingested food in order to achieve an active and healthy life. There are several factors grouped into consumption and health categories that influence food utilization. Household consumption consists of expenditure on both food and non-food items that are enhanced by an increase in household income. However, some aspects of consumption, such as number of meals per day, access to clean water, dietary diversity, food prices, food quality, food taboos and share of non-food expenditure (e.g. education and health services) are vital in mediating food utilization (Webb, et al. 2002; WFP, 2002). These features shape the nutritional and health condition that essentially has a decisive impact on the extent of physiological utilization of food in realizing food security.

According to the Gary, et al. (2000), analyses of several food security data show that many low-income households appear to be food secure, whereas a small percentage of non-poor households appear insecure. The reasons for these differences are not yet well understood, although they probably include unexpected changes in circumstances, variations in household decisions about how to handle competing demands for limited resources, and geographic patterns of relative costs and availability of food and other basic necessities, such as housing.

Most programmes designed to ensure food security at the regional and national levels fail to examine the major obstacle in guaranteeing access to enough, good quality food at the household level. One obvious strategy is to produce more food. In addition, it must be ensured that people can afford the food that is available so that food security for families becomes a reality. According to

Engo-Tjega (as cited in World Bank, 1993), food security means food produced, preserved, processed and distributed as close as possible to where it is consumed.

Food is the most basic measure of empowerment. The problems of failed societies such as persistent poverty, unsustainable population growth, abuse of the environment are all factors which can be traced to hunger and food insecurity (World Bank, 1993). According to the report, hunger affects diverse areas of human society including the following:

a. Hunger is an issue of economic growth, especially among poor people because when people are uncertain about what they will eat in a particular day, they cannot be economic participants.

b. Hunger is a population issue, because poor nutrition is intimately related to poor maternal health, high rates of infant mortality and the disempowerment and illiteracy of women.

c. Hunger is also a health issue because persistent malnutrition makes people vulnerable to endemic diseases and epidemic infections which make them unhealthy and unproductive.

d. It is also an environmental issue since food insecurity drive people to exploit marginal lands exhaust soils and deforest the land.

e. Hunger is also a democratic issue because hungry people make freedom difficult to sustain. Thus, the availability of food and access to it say much about the consolidation of democracy.

According to the World Bank (1993), to address hunger it is essential for countries to initiate and pursue programmes that will bring about agricultural

success and building of local capacity including access to inputs, such as, improved seeds, fertilizer, credit, technology, information and land. In addition, the World Bank continues, long term programmes to address the problem of hunger should ensure food availability, income and distribution issues that affect access to food, issues of harvesting, storage and processing as well as health and nutrition issues that affect food use and consumption. Attempts by governments to appease urban consumers by keeping food prices low has led to the widening gap in incomes between urban and rural populations who are mostly food crop farmers in Africa. For instance whereas the rural-urban income ratio is 1:2 to 1:2.5 in Asia, it is estimated to be 1:4 to 1:9 in Africa (Griggs, 1985).

According to the Department for International Development (DFID, 2003), agriculture contributes to food security in three ways. Firstly, it helps keep prices low so that food is affordable to poor people. Secondly, it provides income and employment that help poor people access food. In addition, it provides a tax base to support service delivery that helps ensure access to food by poor people. For instance, in the 'State of Ghana's Economy in 2003' agriculture's contribution to government's tax revenue was 36.5 million Ghana Cedis (ISSER, 2004). Agriculture thus, has a fundamental role in the fight against poverty. The DFID maintains that, agriculture is central to the livelihoods of the rural poor who, in spite of rapid urbanisation, still account for the majority (around 70 per cent) of the world's poor. The same report has found that in Asia, where economic growth and diversification have been rapid, agriculture provides jobs for 60 percent of the working population and generates 27 per cent of gross

national income (GNI). The fastest rates of economic growth have occurred where agricultural productivity has risen the most. Recent research also shows that, a one per cent increase in agricultural yields reduces the percentage of people living on less than $1 per day by between 0.6 and 1.2 per cent (DFID, 2003). Thus, rapid agricultural productivity gains could lift millions out of poverty as well as provide the platform for diversified economic growth.

Food Security at the National and Household Levels

Attaining food security is a primary requirement for development. The measurement of food security at the national level according to Safiliou-Rothschild (2001), entails the calculation of the extent to which the production of staple food in the country can provide the population with nutritional minimum of 2,400 calories per person per day. This classical definition of national food security has, however, been criticized because it does not take into account the need for a variety of foods (meat, fish, oils, dairy products, vegetables and fruits) that provide protein, fat, micro-nutrients as well as energy, that make up a nutritious diet (FAO, 2000). According to Alderman and Garcia (1993), food security, defined only in terms of the staple food, does not provide a sufficient input for an adequate nutritional status.

Food security at the national level can be ensured through import from other countries with surplus food production. Many countries, especially many less-developed countries, import a part of the needed cereals for national food security at present (FAO, 2000). The existence of national food security, however,

does not guarantee that all regions and all people, especially the poor, will have access to the nutritional minimum because of existing regional, economic and social inequalities (Safiliou-Rothschild, 2001). Many development agencies therefore regard the concept of household food security as the guiding principle for designing interventions in rural areas. Household food security means access to adequate and nutritionally balanced food at all times throughout the year and from year to year.

Although there may be food security at the national level, there may be food insecurity for some rural and urban populations. Some urban populations may not have sufficient purchasing power to ensure food security. There may be food insecurity for some rural populations because they do not produce sufficient food and/or do not have sufficient purchasing power to cover their food needs. Alternatively, they may produce enough staple food and a variety of other foods, but they may market a part of the staple foods and all the non-staple foods to get cash to cover other basic needs (Safiliou-Rothschild, 2001). According to the FAO (2000), it is only when their overall household income is sufficiently high to afford non-staple foods that it can be said that the household truly enjoys food security and an adequate nutritional status. It is, necessary, therefore, to measure food security at the household level, since there is usually considerable social and economic inequality between households.

A research on Urban Agriculture on Livelihood and Food Security in Harare by Mutonodzo (2006), indicated that, food security is a function of the physical environment, social environment and policy environment, which

determine how effectively households are able to utilize their resources to meet their food security objectives. Consequently, drastic changes in these conditions, such as during periods of drought or social conflict, seriously disrupt production strategies and threaten the food access of affected households.

To cope with insecurity shocks and minimize potential declines in food access, households adjust their consumption patterns and re-allocate their resources to activities, which are more insulated from the influence of those risks. In drought periods, for instance, households may shift their labour resources from crop production to non-farm wage employment or sell-off small assets to ensure continued income. They may also adjust their consumption patterns, reducing their dietary intake to conserve food and relying more on loans or transfers and less on current crop production and market purchases to meet their immediate food needs. Over time, household responses to food insecurity become increasingly costly, leading to the loss of productive assets which can ultimately undermine future livelihoods and again, their long-term food security status (Mutonodzo, 2006).

Measurement Related issues on Food Security

According to Hoddinott (1999), there are approximately 200 definitions and 450 indicators of food security. The most promising indicator for measuring the extent of nutritional inadequacies in large populations is the deficit in dietary energy measured in calories (World Bank, 2000). The implementation of dietary method (individual food intake data) is considered infeasible under relatively

straightforward survey conditions (Hoddinott, 1999), and therefore it is unlikely to be an indicator that can be collected as part of many development projects.

Nutritionists have always tried to draw a distinction between the qualitative and quantitative aspects of nutrition. The quantitative aspect is often associated with under-nourishment which according to Gill (1991), refers to a situation where the amount of food eaten is insufficient to maintain the body weight at current activity level. The qualitative aspect is also associated with malnourishment which refers to a situation where an individual's diet contains inadequate nutrients, one or more essential nutrients for bodily maintenance and growth (Gill, 1991). Protein consumption has been found to be an unreliable indicator of malnutrition because protein utilization depends on specific conditions such as amino acid composition and whether part of the protein is used as calories in calorie-deficient diets. While insufficient intake of food energy or calories is generally regarded as the dominant nutritional problem in developing countries, qualitative aspects of nutrition, according to Gill are usually important to the discussion of poverty.

Three approaches may be adopted to estimate the level of hunger and therefore food insecurity. One way is to count the number of people with symptoms of nutritional diseases, but this approach is difficult (Griggs, 1985). Another but indirect approach is to measure the amount of food consumed by individuals, households or groups and to compare with some estimate of minimum requirements. The third approach is to record the amount of money spent on food, to determine the cost of a minimum diet, and then to estimate the

numbers who cannot afford the minimum diet. Working on the cost of balanced diet at the household level Opare-Obisaw and Hevi-Yiboe (1999), observed that low income is still a serious obstacle to feeding families adequately in Ghana.

It has been estimated that, adult males on light activity require 2,700 calories per capita per day, 3,000 calories for moderate activity, 3,500 calories for a very active occupation and 4,000 calories for exceptional activity. Griggs (1985), however, notes that, it is difficult to prescribe calorific intake that is necessary to avoid under-nutrition. This is because there is evidence of considerable variation in calorific requirements due to metabolic rate differences, age and sex. It has also been established that men with a very low calorific intake can carry out the same work as efficiently as men on a much higher calorific intakes without adverse effects on health.

Constraints to Agricultural Development in Ghana

Agriculture as a whole and especially food production is dependent on natural conditions. Though Ghana is not in the Sahel zone, there is not enough water all year round for crop production (NDPC, 2005). This has been attributed to lack of a systematic policy to conserve and utilize ample rainfall in all parts of the country. Other important constraints in the agricultural sector include bush-fires, post-harvest losses and uncertainties of prices falling, storage, transportation and other marketing problems. Another important factor also identified as a constraint to agriculture led strategy for growth is lack of affordable credit. According to NDPC, food crops till today do not have adequate marketing and

financial support'. This makes crop farming a high risky enterprise for producers, marketers and bankers. Under such a situation, it is only strenuous government intervention that can break the cycle and ease the risk on both sides (i.e. producers on one hand and marketers and bankers on the other).

To achieve overall agricultural productivity under the GPRS II, some interventions have been initiated. These include strategic research and development activities, appropriate financing of the agricultural sector, value addition, improved marketing and pricing systems, efficient organisation of production and enhanced capacity of producers (NDPC, 2005). According to MoFA (2007), as cited in the FASDEP II report, constraints of the agricultural sector can be classified under the following; human resource and managerial skills; natural resource management; technology development and dissemination; infrastructure; market access; food insecurity and irrigation development and management. These factors combine to slowdown the growth of the sector.

An enabling macroeconomic environment also impacts positively on agriculture. Statistics in 2000 indicated that end of period inflation rate rose from 13.8% in 1999 to 40.5% in 2000 falling to 21.3% in 2001. Interest rate also increased to 42% in 2001 before falling to 22% in 2002 (Steel and Andoh, 2004). Since 1992 the rate of inflation has been unstable. The rate of inflation rose from 10% in 1991 to 34% in 1994 and estimates for 1995 vary from 55-70% (IFAD, 2007). This macroeconomic instability greatly affected growth in the agricultural sector. The report further indicated a number of factors that affected the implementation of IFAD's agricultural projects: (a) the total elimination of

subsidies on fertilizer and steep devaluation of the cedi led to multiple fold increase in fertilizer prices, while the increase in farm-gate prices lagged severally. This situation rendered input utilization impossible by small-scale farmers; (b) the increase in the interest rate for rural credit combined with falling farm-gate prices negatively affected demand for crop production credit and their loan recovery rate. (c) the Government of Ghana budgetary constraint associated with the Economic Recovery Programme (ERP) negatively affected the flow of government counterpart funds to all IFAD projects.

According to the Bank of Ghana cite by the MoFA (2007), high interest rate is a key constraint to investment in agriculture. Lending rates for the agricultural sector fell between 20% and 33.5% in 2006. As a result producers in the agricultural sector, with their low productivity, cannot compete with the commercial sector for funds.

Microfinance, Agricultural Productivity and Poverty Reduction

According to Binswanger and Khander (1990), the amount of credit borrowed is determined by the decisions of the financial institutions to make it available and by the decision of farmers to borrow it. Thus, one cannot estimate the impact of credit properly by simply regressing the volume of credit on output or fertilizer use. This is because farmers will borrow more if they plan to produce more and to use fertilizer. They also identified the number of commercial bank branches as an important explanatory variable in estimating the impact of improved financial intermediation on output. The decision to locate a branch in an

area is up to the commercial bank and therefore reflects the supply of credit, making it exogenous to farmer's decision-making (Binswanger and Khander, 1990).

Binswanger and Khander, found that cooperative credit, commercial bank branches and overall credit expansion increased the rate of investment in tractors, irrigation pumps, draft animals, milk animals and small livestock. Their survey in India showed that the growth of commercial bank branches and overall credit reduces agricultural employment with respective elasticities of 0.7 and 0.4 respectively.

Writing on household access to formal and informal credit markets in Malawi, Diagne (1999), observed that, the composition of household assets is found to be much more important as a determinant of household access to formal credit than the total value of household assets or landholding size. In particular, a higher share of land and livestock in the total value of household assets is negatively correlated with access to formal credit. However, land remains a significant determinant of access to informal credit. Therefore, poor households whose assets consist mostly of land and livestock but who want to diversify into non-farm income generation activities may be constrained by lack of capital. As informal loans are usually too small to help poor households start a viable non-farm business, these households may be forced to rely on farming as the sole source of income, despite its unreliability because of the erratic rainfall patterns in some parts of the country.

A study on the impact of the financial crisis on the agricultural sector in Thailand in 1996 revealed that consumption and income level of the poor fell much more than their rich counterparts (World Bank, 2001). The policy conclusion of this research was that interventions that negatively influence farm-gate prices or enhance the availability of credit have limited impact on the poor. It has also been established that micro-credit targeted to women has a positive influence on their power to purchase household goods; their ability to make decisions about fertility, children's education and general household welfare; their access to household savings; and their social and political awareness (Ardayfio-Schandorf, et al. 1995; World Bank, 2001). This confirms an earlier study in Bangladesh by Khandker and Pitt in 1991/1992 which showed that micro-credit programmes have a substantial effect in reducing poverty and that credit given to women has a larger effect than credit given to men (World Bank, 2001). World Bank, in another study on the impact of technological change on poverty showed that targeting technological change to poor farmers – to their crops, farming systems, market failures and institutional gaps – is essential for reducing poverty especially in Africa.

Under structural adjustment, input subsidies attracted attention from donors especially from the World Bank because such subsidies tend to favour large producers at the expense of the bulk of small-scale holders (World Bank, 1985a). Under the Economic Recovery Programme (ERP) in 1984, the Government of Ghana agreed to phase-out input subsidies (Commander, Howell and Seini, 1989). The combination of a bumper maize crop, food imports and mass price increases

choked off demand for fertilizer (FAO, 1985). Consequently, fertilizer imports declined sharply though this had little effect on agricultural productivity because of two reasons: firstly, cocoa producers were not using fertilizer and secondly, barely 5% of cultivated area was fertilized (Commander, Howell and Seini, 1989). According to Kapusta (1986), only 15% of the maize farms mostly in the Northern and Upper Regions were undergoing fertilization. The OECD (Organisation for Economic Cooperation and Development) (1995), noted the impacts of structural adjustment on urban areas as:

i. Higher food prices as a result of liberalized agricultural output markets and the lifting of subsidies and state control over grains and other food products;

ii. Higher prices for imported goods caused by the liberalization of imports and exports;

iii. Growing joblessness among middle–class residents, that had been pushed out by the privatisation and downsizing of the civil service;

iv. Lower wages resulting from increasingly competitive labour markets and

v. Reduction in basic health, education and other social services as governments reduced expenditures.

According to Maxwell, et al. (2000), although the intention of the reforms was to stimulate agricultural productivity, lay the foundation for renewed growth and reduce the urban bias, they created in the process a new class of vulnerable people in urban areas. Other recent research on the impact of structural adjustments suggests that while structural adjustment policies have improved agricultural

incentives, they have not significantly altered the pattern of rural-urban migration (OECD, 1995; Becker, Jamer and Morrison, 1994).

A research on the effectiveness of different types of government expenditure on poverty alleviation in India showed that additional government expenditure on roads was found to have the largest impact on poverty reduction as well as on productivity growth. Also, additional government spending on agricultural extension and research had the largest impact on agricultural productivity, which led to the largest benefit for the rural poor (Fan, Hazell and Thorat, 1999). The research results further showed that, additional government expenditure on education had the third largest impact on rural poverty reduction, largely as a result of increases in non-farm employment.

According to the UNDP (1994), study after study on credit for the poor confirms that the poor are creditworthy because of the following reasons: the poor can save, even if only a little; they are reliable borrowers with a repayment rate of 90% or more and that the poor are able and willing to re-pay credit at market interest rates. The above indicates that credit schemes for the poor (including peasant farmers) stand a good chance of becoming viable, self-financing undertakings. According to a report by the Micro-Credit Summit Campaign, a study by the World Bank in Bangladesh established that, 3% of clients of the three microfinance institutions (MFIs) left poverty each year because of micro-loans, that 1% of non-clients left poverty due the spill-over effect of increased economic activity, and that microfinance accounted for 40% of the entire

reduction of moderate poverty in rural Bangladesh (Micro-loans Offer Hope for Millions, 2005).

Review of Agricultural and Food Policies in Ghana

According to Hanson (1987), two main views have shaped food and agricultural policies in Ghana since the colonial era. One view is that there is adequate food production but there is a problem of marketing and distribution. Proponents of this view argue that production and marketing are closely related because if the producer is unable to market his produce in one season, the chances are that he would cut back output in the next season and this would lead reduction in supply and consequently, price fluctuations.

The second view is that there is inadequate food production due to the use of outmoded technology. For those attracted to this type of thinking, the answer lies in transforming the basic form of agricultural production through the establishment of large scale mechanized farms. In March 1976 a statement attributed to the Commissioner for Works as cited by Hanson (1987) urged the country to switch from traditional to modern methods of farming: "the small farms must give way to plantation type of farms. Seasonal crops designed to depend on the rainy seasons must give way to all year cropping assured by irrigation". These two ideas in Hanson's view have provided the basic tenets on which food and agricultural policies have been formulated in Ghana from the colonial era till today.

During the colonial era, the state intervention in agriculture was at two levels. At the production level, the state undertook the cultivation of mainly vegetables favoured by the European community but merely encouraged peasants to grow more African food crops (Hanson, 1987). At the marketing level, however, the Colonial Government decided to buy up what could not be sold at the market at an agreed price. It also constantly reviewed local food prices which were monitored by marketing officers. It is therefore clear that, this intervention in the domestic food supply by the colonial government was only an emergency measure, but not as a basis on which to form a national food policy.

The First Republic under the leadership of Kwame Nkurmah favoured the dominance of the state in seeking agricultural transformation. This view according to Hanson led to the establishment of large scale mechanised state farms. The plan of Nkrumah's Government to intervene in agriculture at the production level was considered a novel one. To achieve this goal of increased production, four main working units were established namely the State Farms Corporation, the Workers' Bridge, the United Ghana Farmers Council and the Young Farmers' League.

According to Hanson the plan was to transform agricultural production from small-scale peasant production units to large-scale mechanised farms relying on heavy use of inputs like fertilizers and improved varieties. Despite this effort to mechanise agriculture only 40% of acreage was devoted to food crops; mainly rice and maize, (Hanson, 1987). This greater focus by the CPP Government on industrial and export crops as compared to food crops made the

implementation of its agricultural policies not different in any meaningful way from that of the Colonial Government.

The National Liberation Council (NLC) and Progress Party (PP) Governments embanked on policies aimed at private sector involvement in agricultural transformation. As a result, some of the state organizations involved in agriculture were abolished.

The state continued to pursue the policy of transforming the peasant based agriculture but this time through large scale commercial farming with private entrepreneurs. The state however, provided incentives in the form of agricultural inputs such as fertilizers, high yielding varieties and weedicides in addition to agricultural credit. According to Hanson, this policy like that of Nkrumah did not make much impact on food production because the small-scale farmers, who produced much of the country's food needs, were ignored. According to IFAD (1993), even with the change in public emphasis in the late 1970s toward small-holder oriented projects, little attention was given to labour intensive techniques of production which could have led to a more socio-economic impact.

The Government of the National Redemption Council (NRC) Supreme Military Council (SMC) under the leadership of General Acheampong launched the "Operation Feed Yourself" (OFY) in 1972. To Hanson, the main objective of this programme was increased food production and increased self- reliance. The programme also for the first time devoted attention to the production of staple food (maize, cassava, plantain, yam etc.) for the domestic market.

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Many agencies were revived by the state such as the State Farms Corporation, Food Production Corporation, Food Distribution Corporation and The Grains and Legumes Development Board. These were expected to organize agricultural programmes for the production of food and industrial raw materials to feed local industries. The state also encouraged food producers through the provision of credit. Schemes were provided by which credit was granted to senior civil servants who wanted to go into agriculture. However, most of the loans went to large scale producers most of whom failed to repay the loans. A remarkable finding in a research by the Agricultural Development Bank about the credit scheme revealed that between 1971 and 1977 the mean recovery rate among small scale farmers was 43% compared to only 23% among large scale farmers.

The Government of the Third Republic under the leadership of Dr. Hilla Limann continued to show interest in Acheampong's policy of attracting trans-national co-operations into agriculture. However, this Government failed to provide any clearly thought out schemes and social institutions through which the policy could be implemented. Thus, its policy of promoting parastatal corporations in the agricultural sector did not make much impact on food production until its overthrow in 1981.

The Provisional National Defence Council (PNDC) Government under the leadership of Flt Lt Jerry John Rawlings proclaimed green revolution in its agricultural and food policy. This policy emphasized the increased production of selected crops, namely maize, rice and cassava. As part of credit policy towards

the agricultural sector, the PNDC Government in its 1993 Budget on pages 12-14 indicated that:

"To give more concrete expression to its agricultural policy, the PNDC government adopted policy measures which sought to increase credit in the agricultural sector …all commercial banks were required to lend at least 20% of their total portfolio, as at every reporting date to the agricultural sector. This proportion was to comprise at least 12.5% of that portfolio to the small scale farmers and 7.5% to other farmers".

The PNDC also undertook a major economic reform of structural adjustment with tremendous effects on food productivity and agricultural output in general. According to Commander, et al. (1989), the feature of agricultural policy reform under the Structural Adjustment was increase in output prices especially that of cocoa relative to other crops. There was therefore a general fall in the relative real prices of food crops relative to cocoa. This constrained the growth in the acreage under cultivation as well as productivity of food. In addition, income distribution in the agricultural sector was also skewed towards farmers who planted cocoa as against majority of farmers who were mainly food crop producers.

In spite of the tremendous efforts by various governments towards achieving sustainable self-sufficiency in food production in the country, small-scale agriculture is still beset with a lot of problems. Some of these have already been identified as unavailability of high cost credit, low soil fertility, high cost of agricultural inputs, inadequate storage/processing facilities or skills (resulting in

high post harvest losses), poor market information and deteriorated condition of farm and market access roads (MoFA-PCU, 2001).

In 2002, the Food and Agricultural Sector Development Policy (FASDEP I) document was formulated to provide a framework for modernizing the agricultural sector and making it a catalyst for rural transformation in line with the goal set for the sector in the Ghana Poverty Reduction Strategy I (GPRS I). In 2007 FASDEP II was subsequently, formulated to address shortcomings of FASDEP I identified by a poverty and social impact analysis (PSIA). The Poverty and Social Impact Analysis (PSIA) identified five categories of farmers as follows: (1) Large Scale Commercial; (2) Small Commercial; (3) Semi-Commercial; (4) Non-Poor Complex Diverse Risk Prone and (5) Poor Complex Diverse Risk Prone Farmers. The weakness of FASDEP I, in terms of targeting, was that it failed to recognise the different categories of farmers and that smallholders are not a homogenous group. The pursuit of a modernised agriculture in FASDEP II will therefore target the different categories of farmers according to their needs MoFA, (2007).

Currently, the agricultural sector still contributes greatly to national income accounting up to 39.8% of GDP in 2003 and 37% in 2005. The government has declared its intention to modernise agriculture as clearly recognized in many documents, which, also identify such requirements as promoting farm mechanisation, providing irrigation facilities and expanding access to inputs. On access to credit and agricultural inputs, the National Development Planning Commission (NDPC, 2005), reports that special

interventions will be initiated to improve access to affordable credit by farmers. There will also be promotion and support of the establishment of farmer-based organisations to enhance access to group credit and crucial inputs and services.

The State of the Ghanaian Economy in 2003 indicated that, agricultural output of major crops still depends on area that farmers are able to able to cultivate in a given season while the use of fertilizers and improved seeds remains low (ISSER, 2004). As part of its policy to fight poverty, the Government of Ghana is currently pursuing an agricultural led growth strategy.

Providing loans for small-scale agriculture poses a special challenge to both government and non-governmental organisations. Apart from the weak financial infrastructure in most rural areas, incomes from agriculture are unpredictable and a great source of risk for most conventional financial institutions. As credit lines to the agricultural sector continue to diminish, new needs are emerging such as finance for farmers' groups/organisations.

According to the Bank of Ghana Statistical Bulletin cited by MoFA (2007) in FASDEP II, following the liberalisation of the financial sector in the early 1990s, the share of agricultural credit in total bank lending initially fell from the mandatory 25% to about 10% before recovering to 12% in 1998. The report further stated that the share of agriculture and forestry in the outstanding credit balance of money deposit banks (MDBs) in December 2005 and 2006 were 7% and 5% respectively. This is an indication of a low and deteriorating level of credit supply to the agricultural sector.

There is therefore the need to strengthen rural institutions that would enhance sustainability through locally managed credit systems and technical assistance, local production and distribution facilities for inputs, appropriate equipment and small-scale processing units, as well as marketing and distribution systems. A report by the United Nations on Sustainable Development urged governments to establish mechanisms that will increase access of farmers, in particular women and farmers from indigenous groups, to agricultural training, credit and use of improved technology in order to promote food security.

The Role of Credit in Agricultural production

According to Owusu-Acheampong (1986), credit is the most critical factor in Ghanaian rural farming situation, and plays an important role in rural development. According to him, credit can transform unproductive traditional farming by providing farmers with necessary capital and resource which will help them adopt modern production techniques utilizing more sophisticated equipment and other essential inputs recommended by the extension agent. Farmers can expand their operations and farm sizes; buy essential inputs such as improved seeds, fertilizers, and other agricultural chemicals. The critical point is that with credit, the farmer can augment his productivity, which in turn would ensure greater farm yield and subsequently increased income. A research on the impact of micro-credit on crop productivity and farmers' income in Pakistan by Muhammed et al. (2006), showed that micro-credit disbursed on time significantly increased production of wheat and sugarcane which increased the

farmers' incomes. Thus, micro-credit scheme improved the living conditions of the farmers.

The adoption of new technology plays a fundamental role in the development process. In the 1950s and 1960s, the Green Revolution transformed agricultural production in developing countries by introducing high-yield crop varieties and other modern cultivation practices (Colman and Young, 1997). To Feder, Just and Zilberman (1985), while the modernization of production brought about significant increases in agricultural productivity and growth, the Green Revolution also resulted in enormous variation, within regions and between regions, in the extent to which households have benefited from the availability of these new technologies. Among the cited reasons why technology has failed to diffuse among farmers, were credit constraints, aversion to risk and limited access to information. In addition, in policy circles the lack of access to credit has traditionally been considered a major obstacle to technology adoption and development. With complete and frictionless financial markets, fluctuations would not be a source of concern as households would be able to protect consumption, and credit would flow to activities with the highest marginal return. But in developing countries, credit markets are typically incomplete or altogether absent. In this environment, the separation of consumption and production decisions may not obtain (Benjamin, 1992), and thus, the relative importance of credit constraints and risk aversion may be confounded (Chaudhuri and Osborne, 2002).

Credit and Savings in the Informal Sector

Standard models of savings behaviour indicate that total savings will fall as a result of improved access to credit (Deaton, 1995). Not only will the precautionary savings motive be mitigated, but accumulation of savings for investment, household purchases or social events becomes less important. A research on impact of access to micro-credit on savings indicate that increased access to credit induces borrowers to shift their savings in livestock, jewelry and other assets with low or negative returns into deposit accounts with positive returns. This shift takes place as micro-entrepreneurs develop an understanding of, and confidence in, the various operations and services of the financial sector. As a result of this shift, borrowers tend to achieve a better return on their savings.

Micro-entrepreneurs can turn to moneylenders for credit when personal and family savings are insufficient. They can also use the cash flow generated by their businesses or, at times, obtain credit from their suppliers. In some instances, they have access to rotating savings and credit associations (ROSCAs) (Vogel and Burkett, 1986). For savings, the options of poor households are often limited to storing excess income as cash at home or in the form of less liquid assets. In Peru, for example, 43% of all households and 37% of low-income households kept some of their wealth in the form of gold and silver jewelry (Lepp, 1996).

According to Ellis (1994), the most important attribute of a successful credit system is that of self-sustaining in the long run, not reliant on ever increasing subsidies to cover losses and not dependent on injections of external funds from foreign aid donors. He rejected the traditional view that interest rates

discourage farmers from using credit. This is demonstrated in part by the continued high proportion of total credit that is often supplied by private moneylenders, usually involving interest rates of 50% or higher on short term loans.

Small-scale farmers and use of improved crop varieties

Existing studies document that hybrid seed use is correlated with wealth and other indicators of household socioeconomic status. A survey conducted in Malawi by the World Bank in 2005 showed higher adoption of hybrid maize among households in the highest quintile of land ownership (66%) than in the lowest quintile (53%) (World Bank, 2006). The study indicated that among maize farmers in southern Malawi close to 60% do not use hybrid maize varieties, and that adoption rises with increasing income level, education, and plot size. Simtowe and Zeller (2006), observed higher maize adoption among households with access to credit. Various reasons have been found as the cause of farmers' inability to use improved seeds with the common ones being farmers' inability to afford the expensive complementary inputs. According to Govereh and Alii (2002), improved varieties being promoted in some countries tend also to be more sensitive to the variability of climatic and agronomic conditions, and require supporting inputs (such as fertilizers), which are not always easily accessible to small-scale farmers. In addition hybrid varieties restrict farmers' option to grow their own seeds.

Determinants of Technology Adoption

Jha, Hojjati and Vosti (1991), in a study conducted in Zambia found out that age and gender of the head of the household significantly influenced the adoption of humid maize as a crop. Heads of household who are older and female were less likely to adopt humid maize. Other variables included in the study of the determinants of adoption were categorised into endogenous and exogenous. For the endogenous, they were: Fertilizer use, Hybrid maize use, Cultivation technique, Use of cotton, soybeans and sunflower, Plant nutrients used per fertilized hectare, and Percent of area fertilized. The exogenous factors were (a) age of the household head, (b) gender of the household head, (c) education of the head of household, (d) area cultivated (hectares), (e) dependency ratio (number. of dependents/number of adults), (f) member of co-operative, (g) income from non-farm sources, (h) use of extension advice, and (i) index of infrastructure.

In their study Drost, Long, Wilson, Miller and Campbell (1996), found that older farmers were more resistant to adoption of low –input practices and perceived them to be impractical. They also reported that farmers approaching retirement were unlikely to risk learning and applying new production practices, especially if there are added costs with adoption.

Food Crop Development Project in Ejura/Sekyedumasi District

The Food Crop Development Project (FCDP) in the district started with initial demonstration area of 53.2 hectares for maize in the major season and only 7.6 hectares in the minor season in 2001. Cumulatively, the demonstration area

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for maize reached a total of 265 hectares by 2006, (MOFA, Progress Report, 2006). In addition, yield per acre from these demonstration plots stood at 3.04 tonnes (Obaatampa tilled) and 3.05 tonnes (Obaatampa, No-tilled). This sharply contrasts the low yield of about 0.5-1.25 tonnes per hectare obtained from low yield variety combined with poor cultural practices.

The demonstrations were established by the FCDP in farmer's field with the aim of improving upon technology in modern farming. An assessment of 100 farmers across the district indicated that up to 97% of beneficiary farmers of FCDP as compared to 70% of non-beneficiaries used improved varieties. In addition, 96% of beneficiaries as compared to 75% of non-beneficiaries used recommended spacing in their farming practices. Another area of greater impact was the adoption of zero-tillage. 90% of beneficiaries and 75% of non-beneficiaries used zero-tillage by the fifth year of its existence in the district. The promotion of minimum or zero tillage systems was to enable households to minimize their farm power requirements as well as use cover crops and mulches to suppress weeds and improve soil fertility (MoFA, 2001).

Credit Component of the Food Crop Development Project (FCDP)

In 2001 minor season (September, 2001) a total of 335 farmers made up of 160 male and 175 females benefited from the micro-credit scheme of the project. By 2006, the number of credit beneficiaries increased to a total of 5,297 farmers. Out of this, 1,935 and 3,362 were male and female respectively.

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A total of 347 groups were formed for production purposes [mainly maize or cowpeas] as compared to 103 groups for marketing. An amount of GH¢22,352,800.00 was disbursed to project groups in 2001. A cumulative repayment of GH¢ 20,633,000.00, representing a 92.3% loan recovery was achieved. By 2006, the disbursement stood at GH¢894,835,800.00 with a cumulative repayment of GH¢414,922,100.00 or 46.37% recovery (ADB, 2006). This was attributed to bad weather conditions, institutional lapses and disloyalty on the part of some group members. This low recovery rate really threatened the sustainability of the project and the subsequent achievement of the project goals.

Conclusion

The literature has revealed that poverty is more of rural phenomenon than urban. It has been found that poverty is a complicated concept and multidimensional; -income concept, basic needs concept, capability concept and psychological concepts. Both qualitative and quantitative measures are required by development agencies in identification of poverty for planning. Poverty trends in Ghana also revealed that, poverty remains predominantly in the rural areas (about 70%) and in terms of economic activity; poverty was found to be more prevalent among food crop farmers than employees in other sectors.

The literature also revealed that one obvious strategy to ensure food security is to produce more food through the use of improved technologies (improved seed and fertilizer). To adopt and implement these technologies however, credit is essential. Food security at the national level can also be ensured through food imports. National food security does not however imply all people

have access to the nutritional minimum because of economic and social inequalities (Safiliou-Rothschild, 2001). Household food security should therefore be the guiding principle for designing and implementing interventions in rural areas.

Access to credit has been found to impact on farmers' ability to increase investment in tractors, irrigation pumps and draught animals as well as framers' ability to implement recommendations of extension agents. The Food Crop Development Project (FCDP) led to increased maize yield per hectare and also brought about increased use of improved maize production technologies by farmers in the Ejura-Sekyedumase District. MoFA reports indicated that up to 97% of beneficiary farmers are now using improved maize technology (improved varieties, row planting, and use of weedicides to control weeds). Average maize output per hectare has increased from 0.63 tonne to 3.05 tonnes per hectare on demonstration plots. Poor loan recovery rate is threat to the sustainability of the project especially ability of farmers to access capital from banks to purchase inputs. The focus of the current research was to find out whether or not beneficiary farm households are better of in terms of incomes, maize yields, use of better maize production technologies and level of food insecurity using the coping strategies of households, as compared non-beneficiary farmers.

Livelihood conceptual framework

The agricultural sector offers avenues for policy interventions that reach the poor with sustainable improvements in their access to food as well as offer opportunities for escaping poverty. These policy interventions may touch the entire agricultural system from production through marketing to nutritional supplementation (Timmer, Falcon and Pearson, 1983).

The framework in this research is adopted from the Tinbergen Framework of policy analysis as cited in Ellis (1994). The basic theory underlying this framework is that the goal of government is to maximize social welfare and it chooses target variables such as improved food security, farm outputs and income levels, which it seeks to achieve. The task of policy analysis in the view of Ellis is to select the best instruments (methods) to achieve the selected targets taking into consideration (i) the constraints such as resources, (ii) factors outside the control of the policy maker and (iii) side effects of the policy.

 In this study the government's policy intervention through the Food Crop Development Project (FCDP) had the objective of increasing social welfare by reducing poverty through improvement in farm incomes. The intervention came in the form of supply of high yielding varieties of selected crops, inputs and cash credits to farmers as well as education on the use of these improved production technologies.

Exogenous Variables	Relationship between variables	Endogenous variables	Ultimate goal
Policy instrument (FCDP) Constraints Poor production technologies, inadequate credit, etc Factors beyond control: - poor rainfall - pests and diseases - marketing and storage problems	Supply of improved seeds and production technologies	Goals Target variables -Increased output -improved farm incomes Side Effects - low yields - Excess supply -low price of maize	W -Poverty Alleviation -Livelihood improvement

Figure 2 Framework showing relationship between the variables in the study

Source: Adopted from Tinbergen Framework as cited in Ellis (1994)

The relationship between the intervention and the expected goals could be depicted in Figure 2. Empirical research has shown that, high yielding varieties significantly increase the profitability of growing cereal in monoculture stands, especially when the package programme of fertilizer and other inputs are available with subsidized credit (Timmer, et al. 1983).

This research therefore posits that participant farmers in the FCDP are expected to observe significant positive changes in the target variables (namely,

improvement in maize output, improved farm incomes, better food security) as compared to non-participant farmers. This position is subject to two assumptions: (a) that, the constraints that are exogenous to the intervention such as climatic factors which influence agricultural production are similar for both participants and non-participants; (b) the intervention improved participants' access to credit and therefore access to purchased inputs as well as better production technology.

Food security conceptual framework

Achieving food security requires that the aggregate availability of physical supplies of food is sufficient, that households have adequate access to those food supplies through their own production, through the market or through other sources, and that the utilization of those food supplies is appropriate to meet the specific dietary needs of individuals. Figure 3 outlines the food security framework, highlighting the three dimensions of availability, access, and utilization, and the nature of their relationship to one another, as well as a brief description of their determinants.
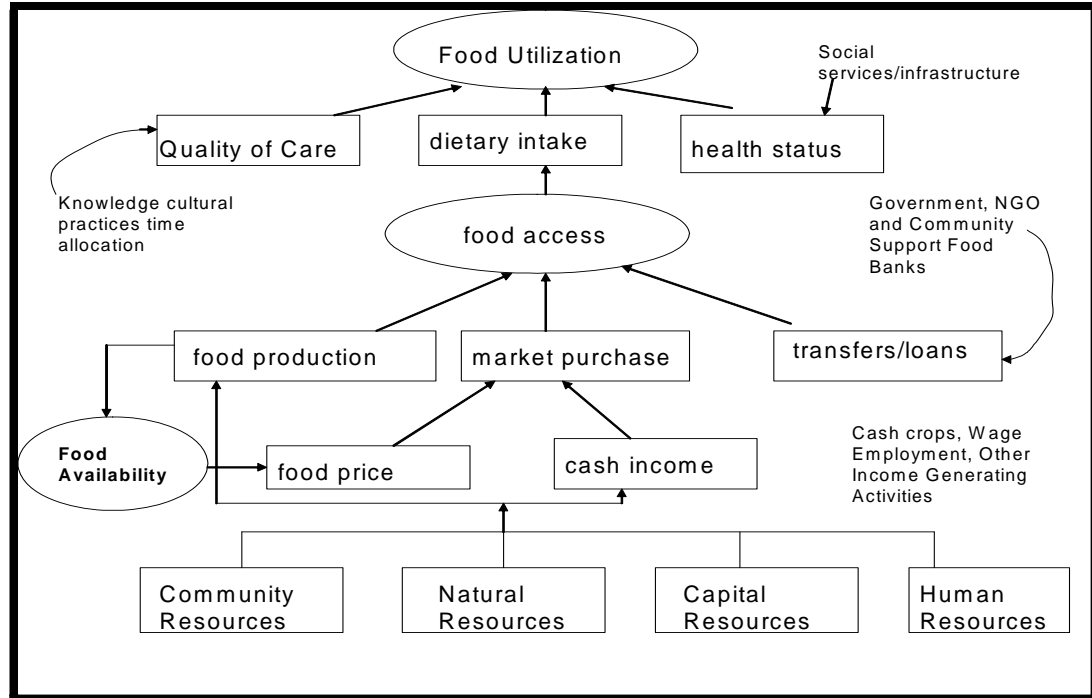
Figure 3. Framework showing various aspects of food security as they affect households

Source: Adapted from: USAID IMPACT, (1996)

As indicated, food availability is a function of the combination of domestic food stocks, commercial food imports, food aid, and domestic food production, as well as the underlying determinants of each of these factors. Use of the term availability is often confusing, since it can refer to food supplies available at both the household level and at a more aggregate (regional or national) level. However, the term is applied most commonly in reference to food supplies at the regional or national level.

Food access is influenced by the aggregate availability of food through the latter's impact on supplies in the market and, therefore, on market prices. Again, Figure 2 indicates that access is further determined by the ability of households to obtain food from their own production and stocks, from the market, and from other sources. These factors are, in turn, determined by the resource endowment of the household, which defines the set of productive activities they can pursue in meeting their income and food security objectives.

Food access also is a function of the physical environment, social environment and policy environment, which determine how effectively households are able to utilize their resources to meet their food security objectives. Drastic changes in these conditions, such as during periods of drought or social conflict, may seriously disrupt production strategies and threaten the food access of affected households. To the extent that these shocks often lead to the loss of productive assets such as livestock, they also have severe implications for the future productive potential of households and, therefore, their long-term food security.

Food utilization, which is typically reflected in the nutritional status of an individual, is determined by the quantity and quality of dietary intake (Hoddinott, 1999), general hygiene and feeding practices, along with health status and its determinants. Poor hygiene and feeding practices, inadequate access to, or the poor quality of, health services are also major determinants of poor health and nutrition. While important for its own sake as it directly influences human well-

being, improved food utilization also has feedback effects, through its impact on the health and nutrition of all household members, and therefore, on labour productivity and household income-earning potential.

This study focused on the coping strategies of farm households when faced with food shortages (food-insecurity). The household head with responsibility of ensuring availability of food in the house was asked a series of questions regarding how his/her household was responding to food shortages. These data were measured on interval scale ranging from how "often" or "rarely" the different coping strategies were used by the household. The different strategies were weighted, where the weights reflected the frequency and severity of the household's response. For instance, a weight of 1 was ascribed to the use of strategies such as eating less preferred foods, a weight of 2 to strategies which involved skipping some meals while a weight of 3 was ascribed to those that involved skipping eating all day. These were then summed to obtain an index; and the higher the sum, the more food-insecure the household. The researcher posited that participating in FCDP was expected to reduce the coping indices of households due to increased food access either from increased production or increased farm incomes which increase the household choices of preferred foods.

CHAPTER 3

METHODOLOGY

Introduction

This chapter looks at the methodology for the study. The chapter dealt with the study population, research design, approaches used in impact evaluation, sample and sampling technique, the research instrument and its administration, model specification and the technique for data analysis.

Population of the study

The study focused on the effect of the Food Crop Development Project on the livelihood of small-scale maize producers in the Ejura-Sekyedumase District. The main study populations therefore comprised (a) Participant Farmers in the Maize Production Groups of the Food Crop Development Project (FCDP) and (b) Non-participant maize farmers in the project area.

Research Design

Descriptive-Correlational survey of participant and non-participant farmers in the Food Crop Development Project (FCDP) was conducted in the Ejura-Sekyedumase district. According to Sarantakos (1998), surveys are methods of data collection in which information is gathered through oral or written questioning. Ary, Jacobs and Razavieh (1979), have also noted that, correlational

surveys enable the measurement of a number of variables and their relationships simultaneously and also allow the study of behaviour in a more realistic setting. Sarantakos (1998), further noted that, compared to rapid appraisal, participant observation and case studies, surveys have high representativeness, ease of data standardisation, aggregation and synthesis as well as high ability to isolate and measure non-project causes of change.

Some Approaches to impact evaluation

According to Hulme (1997), the commonest methods used in impact assessments are sample surveys, rapid appraisal, participatory observation, case studies and participatory learning and action. The following sections attempt to highlight the strengths and weaknesses of the methods with respect to their application in impact studies.

Surveys

In surveys, quantifiable data are collected through questionnaires/interviews. Usually, a random sample and a matched control group are used to measure predetermined indicators before and after an intervention. According to Montgomery as cited in Hulme (1997), compared to other methods surveys are common in impact studies because they have high coverage/scale applicability, high representativeness, ease of data quantification and standardization and high ability to isolate and measure non-project causes of change. Despite their weakness of low ability to elicit views from women and

disadvantaged groups, surveys are still popular in impact studies because of their high ease of data aggregation and synthesis.

Rapid appraisal

According Sarantakos (1998), rapid appraisal involves the use of focus groups, semi-structured interviews with key informants, case studies, participant observation and secondary sources to elicit information. This method has been found to have high ability to capture qualitative information, as well as diversity of perceptions and negative impacts. However, this method has medium to low coverage and representativeness, low ability to isolate and measure non-project causes of change.

Participant observation

In this method there is extended residence in a programme community (project area) by field researchers using qualitative techniques and mini-scale sample surveys. The method has low scale applicability, and ability to isolate and measure non-project causes of change. It however, has very high ability to capture diversity of perceptions and unexpected impacts, (Montgomery, cited in Hulme, 1997).

Case studies

These usually involve detailed studies of a specific unit/group/locality involved in a project in order to assess impact. This is normally done through the used open-ended questioning and preparation of histories. In impact studies, case

studies have the ability to elicit qualitative information compared to surveys. However, case studies have low coverage, low representativeness and low ability to isolate and measure non-project causes of change as well as difficulty in data standardization and synthesis. Hulme (1997), argues that case studies are not appropriate when indicators of project impacts are easily measurable or when information is needed quickly.

Participatory learning and action

This involves the preparation by the intended beneficiaries of a project, impact flow chart, village and resource maps, well-being maps etc., under the assistance of a facilitator. This approach has been found to have high ability to capture qualitative information and diversity of perceptions (Hulme, 1997). According to Montgomery, cited in Hulme (1997), the approach is, however, not appropriate when indicators of project impacts are uncontroversial or when standardized statistically representative generalizations for large and diverse project populations are of essence.

Before-After Design

In this design, only the experimental group (beneficiaries of an intervention) is involved. The situation of respondents is determined with respect to the outcome/dependent variable before they are exposed to the intervention (pre-test). After being exposed to the intervention for sometime the group is tested again (post-test) with respect to outcome variable. The differences between the

pre-test and post-test results indicate the possible effect/impact of the intervention (Sarantakos, 1998). This design fails to account for changes in the outcome variable that would occur without the intervention, hence its non-suitability in some impact studies.

With-Without Design

This design is sometimes referred to as the classical experimental design (Sarantakos, 1998). In this design, two groups are employed, namely the experimental/'with' group and the control/'without' group. Measurements with respect to the response/dependent variable are taken for the two groups. The differences between the two results indicate the possible effect/impact of the intervention. This design takes into consideration changes in the in situation of the two groups with respect to the outcome variables that might occur without the intervention. This design therefore enables the researcher to accurately estimate impact of an intervention (Gittinger, 1974).

In this study, the 'with-without' design was adopted because, the dependent variables such as maize output levels, income, etc many improve over time without the intervention of the FCDP. This was to enable the researcher to accurately estimate the possible impact of the FCDP on small-scale maize farmers.

Approach of this Study: Survey and Case Study

In this study the situations of the two groups of farmers in terms of food security, maize output, farm incomes as well as total income were measured and

compared. The non-participant farmers therefore served as the control in this 'with-and-without' study design.

Impact in this design was determined as follows:

Impact = $Y_p - Y_n$, where

Y_p = situation of farmers in the FCDP

Y_n = situation of non-participating farmers

According to Hulme (1997), impact assessment assesses the difference in the values of key variables between the outcomes on participant households which experienced the intervention directly against the values of those variables that would have occurred on households without the intervention. The 'with'-and-'without' approach enables the researcher to take into account changes in the situation of farmers who did not take part in the project. The before-and-after only design often fails to account for changes in production that that occur without the project (Gittinger, 1974).

Sampling Procedure

Multi-stage sampling procedure was used. According to Poate and Daplyn (1993), it is more convenient to use multi-stage sample design for large or geographically dispersed populations. In this particular study, small-scale farmers who are numerous and widely dispersed in the study was among other factors considered in the use of this sampling design. The multi-stage sampling design was therefore considered more convenient in this research because of logistic and

organizational reasons, in order for the sample to be grouped together in a more limited number of geographical areas.

In addition, with this design, the sample units can be more concentrated and the work of preparing a frame reduced, since it is only necessary to have at each stage frames relating to the larger units selected at the previous stage (Poate and Daplyn, 1993). Multi-stage sampling also allows the establishment of a sample that is directly related to the research objective as well as a sample that is more relevant to the research objective/question (Sarantakos, 1998).

In all, the district (Ejura-Sekyedumasi District) was divided into nineteen operational areas, with each area managed by an agricultural extension agent (AEA). To start with, two operational areas were randomly sampled. The second stage involved the selection of communities in the operational areas selected. This was done by compiling a list of all communities in each operational area and using simple random sampling, four communities were selected using the lottery method. With the help of the agricultural extension agents (AEA's) the list of households of participants in the FCDP in each selected community was obtained. To obtain a sampling frame for the non-participant farming households, a snowball sampling technique was used. In the snowball technique, the researcher asked a few respondents to recommend other persons who met the criteria of the research (small-scale maize farmers) and who were willing to participate in the project. The researcher then collected the information required from these persons who also recommended other persons until all persons who met the criteria of the research were covered. The snowball sampling method is often employed when,

(a) lack of sampling frames makes it impossible for the researcher to achieve a probability sample; (b) when the target population is unknown; and (c) when it is difficult to approach the respondents (Sarantakos, 1998). In this particular research, to be able to use probability statistical analysis, the snowball technique was only used to compile a sampling frame after which linear systematic sampling method was employed to obtain the final sample.

In the linear systematic sampling method the total number of units in the frame (N) was divided by the sample size required to obtain the sample interval, k. A table of random numbers was then used to obtain one random number between 0 and k inclusive. Now, all numbers between 0 and N (total count on the frame) that resulted from adding k to the random number were identified. The names on the sampling frame that corresponded to the numbers drawn were located as the households to be interviewed (Poate and Daplyn, 1993 and Sarantakos, 1998). It has been established that, for the purposes of analysis, linear systematic sampling can be treated just like simple random sampling, on condition that there is no intrinsic regularity/periodicity in the sampling frame (Poate and Daplyn, 1993 and Sarantakos, 1998).

The final list of communities and the corresponding samples of participants and non-participants are presented in Table 5. For ease of comparison equal number of participants and non-participants were selected from each farming community. The number of participant groups engaged in maize cultivation was also a factor used in determining the number of respondents from

each farming community. Communities with greater number of maize production groups had greater representation of both participants and non-participants.

Table 5

Distribution of respondents in the study area

	Number of respondents		
Town/village	Participants	Non-participants	Total
Anyinasu	30	30	60
Drobong/Nkrampo	15	15	30
Frante	5	5	10
Kwesiakan& Kobirti	15	15	30
Total	65	65	130

Source: Field Data (2007)

Design and administration of the research instrument

The research instrument for households was a pre-tested structured interview schedule containing 43 items. The pre-test was done at Sekyedumasi Zongo A with a sample of 30 respondents. This was necessary in order to assess the reliability of the instrument. A chronbach alpha reliability coefficient of 0.77 and 0.72 was obtained for ease/difficulty of access to credit and perceptions about time spent farming activities after applying new maize technologies respectively. According to Allen and Yen (1979), a reliability coefficient that falls within the ranges of 0.70 - 0.74 is interpreted as good and consistent.

The interview method was used because of the several advantages it has over other methods including self administered questionnaire. According to Sarantakos (1998), interviews encourage 'participation' not just 'response'. In this wise interviewing is often perceived as a cooperative venture rather than a one-sided exercise. It also ensures that the interviewer has an opportunity to control the conditions under which the questions are answered, and to channel the reactions and comments to the researcher. In addition, the method has the capacity for correcting misunderstandings by respondents. Such an option is very valuable and not available in other forms of data collection, such as questionnaires. In addition most farmers in the study area were illiterate and could not have been able to supply written responses if a self administered questionnaire method was used (Sarantakos, 1998).

The instrument was divided into eight parts. Part I looked at the demographic characteristics of respondents. This part contained items ranging from category of the respondent, age, marital status, educational status, household size, and experience in farming, farm size as well as the major crop cultivated by the farmer

Part II looked at the economic activities of the farm household; income from crops, livestock, and income from non-farm sources. It also looked at the expenditure pattern of households. The expenditures looked at include those on children's education per annum, expenditure on social activities, fuel/energy , utilities and miscellaneous/others, such as expenditure on food, health, transport etc.

Part III determined the level of living of respondents. This looked at the household conditions such as the nature of building, composition of assets acquired by the household since 2001.

Part IV assessed the access of respondents to financial services. Items in this section included whether or not respondents saved and the reasons for saving or otherwise. This section also solicited information about other forms of savings respondents made apart from cash savings. This section also attempts to establish how easy/difficult it is for respondents to obtain credit from different sources, namely family and friends, money lenders, banks and financial non-governmental organisations (NGO's). Finally respondents will be asked as to whether their access to credit since 2001 has improved or has become worse. An open-ended item in this section sought to solicit suggestions from respondents about ways to enhance farmers' access to credit.

Part V sought to obtain acreage and output data from respondents over the past six years. This was used to estimate the mean output of maize for the two categories of farmers. An independent t-test was then used to determine the statistical significance of any differences in the mean yields. The data was collected from respondents mainly by recall.

Part VI contained items which sought to establish whether or not farmers use recommended maize production technologies that came with FCDP. These include use of certified maize varieties namely Obaatampa and Mamaba, reasons for use or non use of these varieties as well as farmers assessment on the time spent on major cultural practices of maize production.

In Part VII the State of food security/insecurity in the household was determined. Items in this section were answered by the individual in the household responsible for preparing food (usually a house wife, if any). A food security index (called the coping index) was determined from the responses. Part VIII contained items which were answered only by participants in the FCDP. These items covered how farmers became group members, their understanding of the objectives of the FCDP, effectiveness or otherwise of these groups through meeting attendance, to reasons why some groups got dissolved.

The interview schedule was administered to the selected maize farmers (household heads) by the researcher assisted by two trained extension staff from MoFA. The farmers' responses were recorded separately on the interview schedules.

Some relevant data were collected from secondary sources; such as (i) climatic information for the district from the Meteorological Services, (ii) background information and area maps from the District Planning Office (Ejura) and (iii) prices and output data from MoFA, Kumasi.

Model Specification

This study was interested in a model that could estimate the relationship between the dependent variables (Effect on coping index, maize output, farm income and total income) and the series of explanatory variables composing of demographic and socio-economic characteristics. OLS and regression model was used. The specified model is as follows:

OLS: $Y_i = \beta_0 + \beta_i X_i + \beta_i Z_j + \varepsilon_i$

Y is a dependent variable (Maize output, total household income and coping index as proxy measure of food security).

X is a matrix of observations of independent variables.

β_0 **is** the intercept, while β_i is a column vector of coefficients of the independent variables.

ε_i is a column vector of error variable, and

Z_j is a dummy variable indicating participation or non-participation in the FCDP; Z has values of 1 for participation and 0 for non-participation. Dummy variables are useful because they enable us to use a single regression equation to represent multiple groups. This means that we do not need to write out separate equation models for each subgroup. This makes it possible to treat a qualitative variable as a quantitative one in regression analysis (Keller and Warrack, 1999).

Model for empirical approach

The theoretical model underpinning the econometric approach is the standard unitary household model. This model controls for the possibility of heterogeneity in intra-household allocation rules by using household and headship variables.

Maize Output model

The household output model was represented by the following:

$Q_h = f(X_h, X_p, X_{imp}, X_{crd}, U)$; ………………………… (1) where

Q_h = household maize output

X_p = participation in FCDP

X_{imp}= use of improved maize variety

X_{crd} = ease of access to credit

U = unobserved characteristics

This function can be linearised to

Qh $= B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + U$ ....(2)

where

Q_h = maize output (in tones per hectare)

X_1 = age of household head in years

X_2 = experience of household head in farming in years

X_3 = average farm size in hectares

X_4 = ease of access to credit. This variable was measured on a four point interval scale and the mean response indicated farmers' perception of ease/difficulty of credit access.

X_5 = participation in FCDP (dummy variable, X_5 = 1 for participation and 0 if otherwise)

Food security model

The food security equation is

HHFS $= B_0 + B_1X_I + B_2X_2 + B_3X_3 + B_4 X_4+ B_5X_5 + B_6X_6 + U,$……. ......(3)

where,

HHFS is household food security (measured by using food insecurity coping index (CI), Hoddinott, (1999).

$$\mathbf{CI} = \sum_{i=1,6}^{I} \sum_{k=1,4}^{K} f_{j=1,3} S_{ik} \quad \text{........................ 4}$$

CI = coping index, f= weight/severity of a strategy, S_i = strategy i,

S_k= scale of strategy k

X_1 is age of household head (years)

X_2 is size of household (number of persons)

X_3 is the level of formal education of household head

X_4 is expenditure on food (GH¢)

X_5 is dummy variable representing participation or non-participation in FCDP

X_6 is ease of access to credit (measured on a scale of 1 to 4 with 1 = very difficult, 2 = difficult, 3 = easy and 4 = very easy).

U represents unobserved heterogeneity in the household.

Calculating the Gini Coefficient of Inequality

It was assumed that possible improvement in farm incomes may result in differences in income distribution between participants and non-participants. The gini coefficient would therefore be determined to establish the existence of such a difference. The gini coefficient (G) is a measure of inequality, defined as the mean of absolute differences between all pairs of individuals for some measure (income, wealth, etc). The minimum value is zero (0) when all measurements are equal and the theoretical maximum is 1 for an infinitely large set of observations where all measurements but one has a value of 0, which is the ultimate inequality

(Stuart and Ord, 1994).

The classical definition of G appears in the notation of the theory of relative mean difference:

$$G = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \left| x_i - x_j \right|}{2n^2 \bar{x}} \quad \text{... 5}$$

Where G is the gini coefficient, x is an observed value, n is the number of values observed and x bar is the mean value. The numerator is the number of pairwise absolute differences and the denominator is the number of pairs, (Mills and Zandvakili, 1997).

Data Analysis

For comparison of participants and non-participants descriptive statistics obtained from the summary of data in the form of frequencies, means and standard deviation were used. Comparison of the percentages of participant and non-participants who had obtained higher output levels, were used to determine whether or not the intervention had some effect. Pearson moment correlation coefficients computed to examine the relationships between the dependent and independent variables and also between the independent variables.

Quantitative assessment of impact of the project was performed through regression analysis. SPSS version 12.0 and excel statistical data analysis software were used at various stages of analyses of the data.

CHAPTER 4

RESULTS AND DISCUSSION

Introduction

This chapter deals with the results of the study as well as the discussions. The basis of the results and the discussion dwelt on the objectives of the study set up earlier on in chapter one. The first objective was to describe the demographic characteristics of farmers and examine their relationship with farmer's income levels. This was achieved using descriptive statistics and correlations. The second objective was to examine the differences in socio-economic characteristics of farmers in the FCDP area in terms of scale of production (size of farm) and ease/difficulty of access to credit, between participant and non-participant farmers. The third objective attempted to assess and compare the level of living of participants using mainly frequencies and percentages. In objective fourth, frequencies and percentages were employed to compare the level of adoption and use of recommended practices by maize farmers. In the fifth objective Ordinary Least Squares (OLS) regression analyses have been used to analyse the effect of the project on maize output, farm incomes and food insecurity coping strategies of farmers.

Age Distribution of Farmers

Table 6 shows the age distribution of farmers in the study area. The results indicated that farmers of varied age groups cultivate maize. Majority of farmers are in their active working life. An average age 43.48 years for total, 44.98 years for participants and 41.98 years for non-participants reflect the youthful age of crop farmers in the area. This is an indication that food crop production has a bright future in the area. Majority of farmers (about 74%) were in age range of 41-50 years.

Aging farmer population with low technical knowledge has been identified as one of the factors which adversely affect agricultural productivity in Ghana (MoFA, 2007). This is because the older farmers are often conservatives and less more likely, compared to younger farmers, to adopt new innovations. In a research to determine the adoption of farm technologies by resettled farmers in Zimbabwe, it was found that, the younger the household head, the more likely he was to enroll in training and at a statistically significant level. In their study Drost, Long, Wilson, Miller and Campbell (1996), found that older farmers approaching retirement were unlikely to risk learning and applying new production practices, especially if there are added costs with adoption.

Table 6

Age Distribution of farmers

Age range	Participants		Non-participants		Total	
	F	%	f	%	f	%
≤30	2	3.0	8	12.3	10	7.7
31-40	20	30.8	22	33.8	42	32.3
41-50	23	35.4	21	32.3	44	33.9
51-60	16	24.6	12	18.5	28	21.5
>60	4	6.2	2	3.1	6	4.6
Total	65	100	65	100	130	100
Mean	44.98		41.98		43.48	
SD	9.49		10.34		10.00	
Min:	28		23		23	
Max:	65		77		77	

Source: Field Survey, 2007.

Sex Distribution of Respondents

Table 7 shows the sex distribution of maize farmers in the area. It can be observed that about 69% (90 farmers) in the study area are males as compared to about 31% (40 farmers) females. This observation could be due to the fact that males dominated the production group as compared to the marketing groups where the females also dominated.

Table 7

 Sex Distribution of respondents

Sex	Participants		Non-participants		Total	
	F	%	F	%	f	%
Male	39	60	51	78.5	90	69.2
Female	26	40	14	21.5	40	30.8
Total	65	100	65	100	130	100

Source: Field Survey, 2007.

Distribution of Household size

The classic definition of household generally used for survey research in Ghana, which involves co-residence and consumption 'from a common pot' is adopted for the current study. An overall picture is given for most of the characteristics of the household head (ie, the farmer), followed by a detailed discussion in the relevant sections. According to Table 8 household sizes ranged from 2 to 17 persons and showed a wide variation with mean of 5.37 persons per household and standard deviation of 2.89 persons per household in the sample of farmers covered in the study area. The large standard deviation shows that household size varied and was not consistent among farm households. However, some households (16% participants and 24.6% for the total sample of farmers) contained more than 6 persons. This shows that less than 25% of households are still relatively large.

Table 8

Distribution of Household size

Household size	Participants		Non-participants		Total	
	f	%	f	%	f	%
2	7	10.8	9	13.9	16	12.3
3	7	10.8	15	23.1	22	16.9
4	11	16.9	6	9.2	17	13.1
5	7	10.8	13	20.0	20	15.4
6	17	26.1	6	9.2	23	17.7
>6	16	24.6	16	24.6	32	24.6
Total	65	100	65	100	130	100
Mean	5.69		5.05		5.37	
SD	3.02		2.73		2.89	
Minimum:	2		1		1	
Max	17		13		17	

Participants = 65   Non-participants = 65.

Source: Field Survey, 2007.

Level of Education of Farmers

The level of formal education among farmers in the study area was very low. Up to 43.1% of farmers in the study had no formal education at all with only 9.2% of participants and 3.1% of non-participants receiving up to secondary education. This picture presents a serious challenge for agricultural modernization in the country. This is because education has positive effect on farmers' ability and willingness to adopt and use modern technologies (Yifu-Lin, 1991). Thus, a low level of formal education could lead to majority of farmers being unable to read and apply instruction on labels on agricultural inputs such as fertilizers,

certified seeds and other agro-chemicals. Education also helps to improve the managerial efficiency of farmers (Fane, 1975). Using farmers' level of education as a proxy for human capital development Kumar-Deb (1995), observed that, the higher the level of human capital development, the greater the level of adoption of modern agricultural technologies. He also found that, the higher the level of average education of the family members, the greater the level of non-farm income of the family. Employing logistic regression analysis, Jha, Hojjati and Vosti (1991), observed a statistically significant relationship between training and the probability of adoption of new innovations.

Table 9

Level of Education of Household head

Level of formal education	Participants		Non-participants		Total	
	f	%	F	%	f	%
No formal education	28	43.1	28	43.1	56	43.1
Basic level	31	47.7	35	53.8	66	50.8
Secondary level	6	9.2	2	3.1	8	6.1
Tertiary	0	0	0	0.0	0	0.0
Total	65	100	65	100	130	100

Participants = 65   Non-participants = 65.

Source: Field Survey, 2007.

Average Farm Size between 2001 and 2006

Majority (74.2%) of households cultivated less than 1.2 ha. This indicates the subsistence nature of maize production in the area. Mean farm sizes of 1.12 and 1.10 hectares for participants and non-participants respectively confirms that average maize acreage in the study area has been small over the past six years (2001-2006). The small-scale nature makes agricultural mechanization very difficult. Results presented in Table 10 also depicts a unimodal distribution of farm sizes; ie large number of small household-operated farms with only a few large farms around this norm.

Table 10

Average of farm size (ha)

Farm size(ha)	Participants		Non-participants		Total	
	F	%	f	%	f	%
≤0.8	26	40.0	31	47.7	57	43.8
1.2	22	33.8	18	27.7	40	30.8
1.6	9	13.9	11	16.9	20	15.4
2.0	2	3.1	2	3.1	4	3.1
2.4	5	7.7	3	4.6	8	6.1
>2.5	1	1.5	0	0.0	1	0.8
Total	65	100	65	100	130	100
Mean (ha)	1.14		1.10		1.12	
SD	0.52		0.43		0.48	

Participants = 65   Non-participants = 65.

Source: Field Survey, 2007.

According to Timmer, et al. (1983), a country with a unimodal distribution of farm size has the potential to use agricultural development strategy to reduce poverty and at the same time increase food production. Only about 7 percent of households cultivate 2.4 hectares and more. This confirms the assertion by Timmer, et al. (1983), that an agricultural led strategy could be the best alternative to improved incomes, food security and therefore poverty alleviation in the study area with the observed pattern of farm size distribution.

Household Maize Output in tonnes per hectare between 2000 and 2006

Table 11 shows the per hectare maize yield in tonnes between 2000 and 2006. The result showed an increase in average maize yield from 1.18 tonnes per ha to about 2.0 tonnes per ha among participant households. The relatively high standard deviations (between 0.50 and 0.65 t/ha) indicate that the reported average yields were not consistent among participant households over the years. This is confirmed by the minimum and maximum average yields. For instance, in 2003 some participant households reported close to 4 tonnes per hectare of maize. There was however, no observed consistent increase in per hectare maize output among non-participant households. This observed increase in per-ha maize output among the participants could be attributed to the use of improved agronomic practices farmers acquired through participation in FCDP. In 2003 however, a general poor rainfall pattern in the area, resulted in more than a quarter (27.32%) drop in average yield of maize among participants and about 10.61 % reduction among non-participant households.

According to Morris, et al. (2001), average grain yields of maize are modest when expressed in per unit land area, averaging less than 2 t/ha. A similar observation was reported by ISSER (2004), in the State of the Ghanaian Economy in 2003. Reports from field trials conducted by MoFA indicated that yields of up to 5 tonnes per hectare are possible with the use of improved varieties and recommended practices (MoFA, 2003).

Table 11

Household Maize output in tones per between 2000 and 2006

Category of household	Year	f	Min (t/ha)	Max (t/ha)	Mean (t/ha)	Std. Deviation	%change in yield
Participants	2000	53	0.38	2.33	1.18	0.58	-
	2001	50	0.83	2.67	1.76	0.51	+49.15
	2002	55	0.94	3.33	1.83	0.53	+4.00
	2003	61	0.71	3.88	1.33	0.66	-27.32
	2004	62	0.58	2.75	1.76	0.52	+32.33
	2005	60	0.75	3.00	1.84	0.50	+4.55
	2006	65	0.54	3.13	1.97	0.59	+7.10
Non-participant	2000	64	0.35	2.31	1.10	0.71	-
	2001	29	0.50	2.50	1.24	0.48	+12.72
	2002	47	0.25	2.83	1.32	0.55	+4.83
	2003	60	0.31	3.08	1.18	0.90	-10.61
	2004	62	0.33	3.00	1.44	0.49	+22.03
	2005	63	0.21	3.00	1.56	0.50	+8.33
	2006	65	0.21	2.88	1.50	0.60	-3.85

Participants = 65,   non-participants = 65

Source: Field Survey, 2007.

Cropping System Practiced

Table 12 presents the frequencies and percentages of farmers based on cropping system practiced. Majority (74.6%) of the sampled farmers practiced mixed cropping. This consisted of 48 (78.3%) participants and 49 (75.5%) non-participants. Many farmers see mixed cropping as a form of insurance against total crop failure in the event of poor weather or outbreak of pest and diseases. Assefa, (2005), argues that the aim of mixed cropping is to maximise the positives as much as possible, using each crop to improve the overall outcome of the farming system. He mentions direct economic outcome such as increased income and chance to control some weeds and pests, as well as sustainability of the system.

Table 12

Type of cropping system practiced

Cropping system	Participant		Non-participants		Total	
	F	%	f	%	f	%
Mono-cropping	17	26.2	16	24.6	33	25.4
Mixed-cropping	48	73.8	49	75.5	97	74.6
Total	65	100	65	100	130	100

Participants = 65,　　Non-participants = 65.

Source: Field Survey, 2007.

Major crops cultivated by farmers

It can be observed from Table 13 that in addition to maize, majority of the sampled farmers (53%) made up of 37 and 32 participants and non-participants respectively, cultivated yam. Close to 37% of the sampled farmers also cultivated groundnut which is often seen as a cash crop that can be stored for some time as compared to yam and cassava. Tomato was among the common vegetables cultivated mainly during the dry season.

Table 13

Major Crops Cultivated by Category of Farmer

Type of crop	Participant		Non-participants		Total	
	F	%	f	%	f	%
Maize	65	100.0	65	100.0	130	100
Yam	37	56.9	32	49.2	69	53.1
Cassava	12	18.5	20	30.8	32	24.7
Cowpea	2	3.1	3	4.6	5	3.1
Groundnut	21	32.3	27	41.5	48	36.9
Tomato	4	6.2	3	4.6	7	5.4
Pepper	2	3.1	0	0	2	1.5
Okra	1	1.5	1	1.5	2	1.5
Plantain	2	3.1	2	3.1	4	3.1
Rice	1	1.5	0	0	1	0.8

Participants = 65   Non-participants = 65, Multiple response

Source: Field Survey, 2007.

Off-Farm Activities Engaged in by Farmers

Close to a quarter (25.4%) of the sampled farmers were engaged in off-farm activities, in addition to crop production, to earn more income. Charcoal/firewood business was the commonest among the sampled farmers consisting of 5 (7.8%) and 8 (12.3%) participants and non-participants respectively. Petty trading was, however, the most common off-farm activity engaged in by participants (9.2%) compared to 3.2% non-participants.

Table 14

Off-Farm Activities Engaged in by Responding Farmers

Activity	Participants		Non-participants		Total	
	F	%	f	%	f	%
Charcoal/firewood	5	7.8	8	12.3	13	10
Trading	6	9.2	2	3.2	8	6.2
Kente weaving	1	1.5	0	0	1	0.8
Paid job	4	6.2	5	7.8	9	6.9
Carpentry	2	3.1	0	0	2	1.5
Total	18	27.7	15	23.1	33	25.4

Participants = 65   Non-participants = 65

Source: Field Survey, 2007.

Relationship between demographic characteristics and income levels farmers

Objective one also intended to find the relationship between the demographic characteristics and income levels of farmers. Table 15 therefore, shows the correlation coefficients between some socio-economic variables and the outcome/ response variables. It could be observed that participation in the project (FCDP) had a statistically significant and moderate correlation with maize output (r = 0.266, p≤001. However, participation did not result in a significant correlation with incomes though the relationship was positive. This could be explained by the fact that the other factors such as price of maize, incomes from other crops, livestock as well as non-farm incomes might have influenced the statistical significance of the relationship between participation and non-participants with respect to total income. Some participants also reported that the short term nature of their loans always forced them to sell their maize early to avoid paying high interests. This might have had some influence on maize income. Indeed, gross margin calculations using on-farm trial data have shown that even in relatively favourable climatic conditions, growing maize is barely profitable due to the very low relative price of maize and high cost of fertilizer (Benson, 1997).

Level of education also had a significant and positive relationship with farm size and total income, though the correlation coefficients ranged from low (r= 0.211) to moderate (r=0.395). This could be explained by the fact that education might have influenced farmers' chances of engaging in non-farm

jobs/employment. Thus, total income correlated significantly and positively with education while income from maize showed no statistical significance.

Table 15

Correlation Coefficients of Demographic and Outcome Variables

Varia-ble	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.0	-0.15	-0.20**	0.194**	0.285*	0.008	0.266**	0.170	0.157
X_2		1.00	-0.268**	0.013	0.577**	0.361**	0.0.241**	0.304**	0.252**
X_3			1.00	-0.45*	-0.233*	-0.229	-0.187*	0.195*	0.140
X_4				1.00	0.117	0.211*	0.064	0.101	0.194
X_5					1.00	0.493**	0.354**	0.238**	0.285**
X_6						1.00	0.377**	0.393**	0.395**
X_7							1.00	0.785**	0.763**
X_8								1.00	0.932**
X_9									1.00

** Correlation is significant at 1% level (2-tailed)
* Correlation is significant at 5% level (2-tailed)
X_1= participation, X_2 =age, X_3 = sex, X_4 = level of education,
X_5 = household size, X_6 =farm size (ha), X_7 = maize output,
 X_8, income from maize and X_9 = total income.

Source: Field Survey, 2007.

In addition, household size correlated positively and significantly with farm size, total output of maize as well as income from maize, at 1% level. The significant relationship between household size and farm size confirms the assertion that, larger households have larger labour reserve due to contribution of

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family members compared to smaller household all other things being equal. Thus, the large farm size might have resulted in increased output and subsequently increased income. This is because farm size correlated positively and significantly with maize output with a coefficient of 0.377 and at 0.393 with maize income and at 0.395 with total income. All were significant at 1% level.

The correlation coefficient between farm size and maize output confirm the observation in the State of the Ghanaian Economy-- 2003 that, output of major Ghanaian crops continues to depend heavily on the area cultivated as the use of fertilizers and certified seeds remains very low (ISSER, 2004).

Ease of access to credit

Objective two examines the differences in socio-economic characteristics of households in the area in terms of scale of production (size of farm) and ease/difficulty of access to credit. Table 16 show the cross tabulation between participation in FCDP and farmers perception about ease or difficulty of access to credit. It was observed that 83 (68.6%) of respondents perceived access to credit from banks as difficult. It was further observed that of these, 34 were participants (41% of the total that perceived access to be difficult) and 49 were non-participants (59.0% of the total that perceived access to be difficult).

In all 38 respondents (31.4%) of the total reported having easy access to credit and of those that reported easy access, 31were participants (81.6%) and only 7 non-participants (18.4% of the total). This is because almost all participants were in groups which served as collateral for obtaining credit as compared to non-participants who were not in groups. Thus, though a lot of banks

are now prepared to offer micro-credit to farmers, small-scale food crop farmers still perceive this as being far from reality. A study by Nuryartono, et al. (2005), in Central Indonesia on credit access by farm households showed that under certain conditions, only 18.1% of the households were not credit constrained. Most households are credit constrained due to a lack of collateral.

Table 16

Ease of access to credit and participation in FCDP

Credit Source			Category of farmer		Total
			participant	Non-participant	
Banks	difficult	Count	34	49	83
		% within Banks	41.0%	59.0%	100.0%
		% within participation	52.3%	87.5%	68.6%
		% of Total	28.1%	40.5%	68.6%
	easy	Count	31	7	38
		% within Banks	81.6%	18.4%	100.0%
		% within participation	47.7%	12.5%	31.4%
		% of Total	25.6%	5.8%	31.4%
	Total	Count	65	56	121
		% within Banks	53.7%	46.3%	100.0%
		% within participation	100.0%	100.0%	100.0%
		% of Total	53.7%	46.3%	100.0%

N = 130, Participants = 65, Non-Participants = 65.
Source: Field Survey, 2007.

To ascertain whether these differences between participants and non-participants were significant a chi-square statistic was determined as shown in

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Table 17. The chi-square statistic (17.29) was observed to be highly significant (p ≤ 0.001). Consequently, the hypothesis that there is no significant difference between participants and non-participant in their ease or difficulty of access to credit has been disproved (rejected).

Table 17

Chi-Square Tests: Participation and Ease of Access to Credit

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.295(b)	1	.000
Continuity Correction(a)	15.700	1	.000
Likelihood Ratio	18.428	1	.000
Linear-by-Linear Association	17.152	1	.000
Phi coeff (φ)	0.378	1	0.000
N of Valid Cases	121		

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.59.
Source: Field Survey, 2007.

The Phi statistic of 0.378 out of a possible maximum value of 1 indicates a moderate association between ease of access to credit and participation in FCDP. This value is highly significant (p≤ 0.001) indicating that a value of this statistic could not have happened by chance. Thus, participation influenced farmers' perception of having easy access to credit from banks.

Savings Behaviour of Farmers

The results of analysis presented in Table 18 below compares the savings behaviour of participant and non-participant households. Thirty five out of 65 participant farmers compared to 14 out of 65 non-participants saved money with either a bank or susu collectors. In all 37.7% of sampled farmers constituting about 26.9% participants and 10.8% non-participants saved with either a bank or susu/loans company. Thus, a greater percentage (62.3%) of farmers reported they do not save with any financial institution.

Table 18

Saving Behaviour by Category of Farmer

Saving with a bank/susu	Participants		Non-participants		Total	
	f	% of total sample	F	% of total sample	f	%
Save with	35	26.9	14	10.8	49	37.7
Do not save with	30	23.1	51	39.2	81	62.3
Total	65	50.0	65	50.0	130	100

Source: Field Survey, 2007.

The reason for this difference in savings culture between the two groups could be attributed to the fact that maintaining a savings account with a branch of Agricultural Development Bank (ADB) or a rural bank in the locality was a required condition for obtaining the FCDP credit. The individual farmer was expected to make gradual payments of small deposits in the savings account. In discussing the role of savings mobilization in microcredit programmes, Rogg

(2000), maintains that most of the pioneering microcredit programmes in Asia relied on mandatory savings as a form of collateral and, more importantly, as a screening device for determining the financial discipline of potential borrowers. To indicate whether there was any link between participation in FCDP and savings behaviour, chi-square (χ^2) statistic was determined as shown in table 18 below.

Table 19

Chi-Square tests of savings behaviour and participation in FCDP.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.444	1	0.000
Likelihood Ratio	14.805	1	0.000
Linear-by-Linear Association	14.333	1	0.000
Phi-coefficient (φ)	0.33		0.000
N of Valid Cases	130		

$p \leq 0.001$

 Source: Field Survey, 2007.

At all levels the chi-square (χ^2) value of 14.44 was found to be statistically significant ($p \leq 0.001$) indicating the possible relationship between participation and saving in a financial institution. The value of Phi statistic in Table 19 also indicates a significant and moderate relationship ($\varphi = 0.33$, $p < 0.001$) between participation in FCDP and savings.

The main reason for farmers' inability to save is low income (Table 20). Most of the respondents who save indicated security and ease of access to credit as the main reasons for saving as shown in table 20. About 43% of participants and almost 17% of non-participant savers indicated that their money was most secured if saved with a financial institution while about 25% of participants and 15% of non-participants saved money with financial institution in order to get access to credit.

Table 20

Reasons for Inability/Ability to Save

Reasons	**Participants**		**Non-participants**	
	F	%	F	%
For inability to save in a bank				
Banks are too far away	-		2	3.1
Income is not enough	31	47.7	50	76.9
Reasons for saving in a bank				
Proximity of banks	7	10.8	2	3.1
Interest rate is attractive	2	3.1	-	-
For access to credit	16	24.6	10	15.4
Money is most secured that way	28	80	11	78.6
	(35)*		(14)*	
Out of habit	1	1.5	-	-
Other bank services	1	1.5	-	-

* Savers with financial institutions

Source: Field Survey, 2007.

It has been established that increased access to credit induces borrowers to shift their savings from livestock, jewelry and other assets with low or negative returns into deposit accounts with positive returns (Deaton, 1995). Participants who perceived credit access to be less difficult saved more. This is because, as a condition for obtaining credit, participants were required to open a savings account with a bank (mostly ADB).

The dashes (--) indicate non-response while the numbers in parentheses in Table 20 show the number of savers with financial institutions (banks/susu collectors).

Adoption and Use of Improved Maize Technologies

Objective three was to compare the level of adoption and use of recommended practices by farmers. Here, recommended practice in production implies the use of (1) high input maize technology (improved seed and fertilizer) and (2) improved management practices (weeding, plant spacing, etc).

Table 21 shows the use of various maize production technologies as indicated by farmers in the study areas. Thirty-three (33) farmers out of 130 farmers indicated their use of improved maize varieties. Out of this, 22 participants representing 33.8% and 11 non-participants (16.9%) used at least one improved maize variety (Mamaba or Obaatampa) the previous season. However, most farmers who used improved variety preferred Obaatampa to Mamaba. A greater number of farmers still preferred using seed from their own farms as opposed to the use of recommend improved varieties. From Table 21, eighty

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percent (80%) of farmers continue to use their own seed. This included those who recycled improved seed. This consisted of 75.4% participants and 84.6%non-participants.

Table 21

Pattern on Use of Recommended Practices

Practice	Participants		Non-participants		Total	
	f	%	f	%	F	%
Use of improved varieties	21	33.8	11	16.9	32	24.6
Zero tillage	51	78.5	48	73.5	99	76.1
Use of recommended spacing	63	96.9	55	84.6	118	90.8
Timely execution of cultural practices						
(fertilizer application and weeding)	64	98.5	55	84.6	119	91.5
Use of Mamaba	1	1.5	0	0	1	0.1
Use of Obaatampa	21	33.8	10	15.4	31	23.8
Use of farmer's own seed	49	75.4	55	84.6	104	80.0
Still prefer to use improved variety	30	46.2	19	29.2	49	37.7

Source: Field Survey, 2007.

Meanwhile other practices such as zero-tillage and recommended spacing were being practiced by farmers. A survey about labour saving technologies in Western Kenya by the FAO in 2002 revealed that one common response by households to minimize their farm power requirements was to adopt minimum or zero tillage systems and use cover crops and mulches to suppress weeds. In

contrast 49 (37.7%) of farmers made up of 46.2% participants and 29.2% non-participants reported that they still prefer to use improved variety but currently not necessarily using it for various reasons.

Reasons for use of improved maize variety

Farmers gave a number of reasons for their preference of improved variety over their own/local seeds. From results presented in Table 22, 74 (56.9%) of sampled farmers made up of 48 (73.8%) participants and 26 (40.0) non-participants indicated increased yield as the main reason for the use of improved maize variety. In addition 78 (60%) of farmers-consisting of 56 (86.1%) participants and 22 (33.8%) non-participants indicated early maturing as the reason for their preference Mamaba/Obaatampa.

Table 22

Reasons for Using Improved Maize Varieties

Reasons for using improved maize varieties	Participants		Non-participants		Total	
	f	%	F	%	F	%
Increased crop yield	48	73.8	26	40.0	74	56.9
Availability of supporting inputs (fertilizer)	34	52.3	-	-	34	26.2
Better grain quality	37	56.9	14	21.5	51	39.2
Grain stores better	4	6.2	2	3.1	6	4.6
Early maturing	56	86.1	22	33.8	78	60.0
Drought resistant	40	61.5	19	29.2	59	45.4

Multiple Response table
Source: Field Survey, 2007.

Reasons for not Using Improved Maize Varieties

Most farmers stated cost of improved seeds and fertilizer as the main reason for their inability to use them. As presented in Table 23, up to 80.8% of farmers reported they did not use improved maize variety because it was expensive. Only 16% of farmers reported that seeds were not always available. In addition, 45% of farmers in the study area reported that improved maize was more drought resistant as compared to only 16.0% of farmers who said it was less resistant to drought. Most farmers also said they only use improved seed if they have money to buy fertilizer to apply as the improved maize will usually not perform well if the farmer is not able to apply fertilizer.

Table 23

Reasons for not using improved maize varieties

Reasons for not using improved maize varieties	Participants		Non-participants		Total	
	F	%	f	%	F	%
Non availability of seeds	13	20.0	8	12.3	21	16.2
Inadequate knowledge	21	32.3	16	21.5	37	28.5
Seeds and fertilizer are expensive	50	76.9	55	84.6	105	80.8
Poor quality seeds	28	43.1	23	35.4	51	39.2
Disease and pests problems	14	21.5	16	24.6	30	23.1
Less drought resistant	8	12.3	14	21.5	22	16.9

Multiple Response table

Source: Field Survey, 2007.

A research to compare the yield and profitability in high and low-input maize programmes in Mozambique in 1997/98 found that late delivery of

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improved seed and fertilizer led to delayed planting and subsequently unstable yield compared to low-input traditional methods. This made improved maize technology riskier and reduced farmer incentives to manage their farms, (Ministry of Agriculture and Rural Development Mozambique, 2000). The report therefore suggested the need to adjust agronomic recommendations according to farmers' ability to bear risk. Subsidizing fertilizer and its timely delivery in particular could go a long way to improve farmers' ability to acquire and use improved varieties and new innovations.

Mann-Whitney independent Sample Test Analysis

The Mann-Whitney-Test results shown in Table 24 were used to determine whether any significant difference existed between the proportions of participants and non-participants with regards to the use of improved maize technologies. The results in Table 24 showed that a significant difference ($p \leq 0.05$) existed between participants and non-participants with respect to the use of Obaatampa seed as well as continued preference by farmers for improved seed maize. Both were significant at z-scores of -2.25 and -2.0 respectively. Both groups of farmers however, showed similarity in their responses on the use of own seed and zero-tillage practices.

According to Field (2002), the Mann-Whitney-Test is useful non-parametric statistic for testing differences between means of proportions when there are two conditions and different subjects have been used in each condition; in this case participants and non-participants.

Table 24

Mann-Whitney Independent Sample Mean Tests Analysis between

Participants and Non-Participants

Practice	Test statistic		Sig(2-tailed)
	Mann-Whitney U	Z-score	
Use of improved varieties	1950.0	-1.93	0.050
Zero tillage	1994.0	-.141	0.888
Use of recommended spacing	1849.5	-1.80	0.072
Timely execution of cultural practices (fertilizer application and weeding)	1818.5	-2.25	0.024
Use of Mamaba	2080.0	-1.00	0.317
Use of Obaatampa	1755.0	-2.25	0.024
Use of farmer's own seed	1917.5	-1.31	0.190
Still prefer to use improved variety	1755.0	-1.98	0.047

$p \leq 0.05$
Source: Field Survey, 2007

Impact of maize production technologies on time spent on cultural activities

Table 25 indicates farmers' perceptions about the project on the time spent on some cultural activities in maize production. Majority of farmers (76.9% of participants and 69.2% of non-participants) saw a reduction in the time spent on land preparation since they started using weedicides.

In addition, 81.5% of participants and 72.3% of non-participants said the time spent on weed control also reduced. However, time required to plant maize increased. From Table 25, 67.7% of participants and 56.7% of non-participants

indicated an increase in the time required to plant maize. This is because, in order to achieve the recommended plant population per hectare, closer spacing is required and planting should be done in rows using garden-lines.

Table 25

Perceptions of farmers on the time spent on cultural

Activity	Participants						Non-Participants					
	Decreased		Same		Increased		Decreased		Same		Increased	
	f	%	f	%	F	%	f	%	f	%	f	%
Land preparation	50	76.9	9	13.8	6	9.2	45	69.2	11	16.9	9	13.8
Planting	6	13.8	12	18.5	44	67.7	7	10.8	20	30.8	37	56.9
Weed control	53	81.5	6	9.2	6	9.2	47	72.3	9	13.8	9	13.8
Fertilizer application	27	41.5	10	15.4	28	43.1	19	29.2	18	27.7	28	43.1
Harvesting	22	33.8	8	12.3	35	53.8	14	21.5	21	32.3	30	46.1

Participants = 65, Non-participants = 65

Source: Field Survey, 2007

Annual Income structure of respondents

Objective four aimed at assessing and comparing the standard of living of participants and non-participant farmers in terms of income levels. Incomes were computed by using crop outputs and their corresponding market prices. Non-farm or other incomes were estimated from the respondents' remittances or other

sources. Table 26 shows the annual mean income structure of the respondents. It could be observed that mean income from maize output among participants exceeded that of non-participants, the minimum and maximum incomes from maize indicates that some non-participant farmers really had more income from the maize than participants. This situation could be attributed to fact that some participants reported that they had to sell their maize earlier to be able to pay off their loans. Mean income from other crops among non-participants however exceeded that of participants. This observation could be attributed to concentration of resources by participants in maize production activities as compared to their non-participant counterparts.

Table 26

Annual Income Structure of Respondents

Category	Income Source	F	Min GH¢	Max GH¢	Mean GH ¢	S.D
participant	Income from maize	65	40.00	1000.00	458.83	213.93
	Income (other crops)	48	37.50	1400.00	332.00	304.89
	Income (livestock)	26	25.00	400.00	125.92	105.61
	Non-farm income	18	20.00	350.00	107.50	97.50
	Total	65	40.00	3400.00	793.10	498.28
Non-participant	Income from maize	65	75.00	1125.00	356.38	271.80
	Income (other crops)	48	28.00	1470.00	395.17	396.01
	Income (livestock)	35	9.00	370.00	93.87	127.25
	Non-farm income	15	21.00	400.00	110.00	75.30
	Total	65	75.00	2957.00	760.53	569.15

Source: Field Survey, 2007

Income Distribution: Lorenz Curves and the Gini Coefficients

It was assumed that participation in the FCDP will lead to differences in income distribution as a result of improvement in maize income among participants. Figures 4 and 5 show the Lorenz curves and the Gini coefficients of participant and non-participant households respectively. In all cases, the shapes of the curves follow a similar pattern. Using the gini-mean-difference (GMD), (Equation 5), the gini coefficients of 0.168 and 0.170 for participants and non-participant respectively were determined. In both cases, there was a tendency towards greater income equality among households in the study area. The Gini coefficient is a ratio of values between 0 and 1. A coefficient of 0 indicates perfect income equality while 1 indicates perfect income inequality.

The numerator is the area between the Lorenz curve of the distribution and the uniform (perfect) distribution line (A). The shape of the Lorenz curve indicates the degree of inequality in income distribution. The further the curve bends away from the 45^0 line, the greater is the inequality of income distribution. The denominator is the area under the uniform distribution line (A + B). Here, 0 corresponds to perfect income equality (i.e. everyone has the same income) and 1 corresponds to perfect income inequality (i.e. one person has all the income, while everyone else has zero income). Thus, income among the two groups showed a fairly distributed pattern. This situation could be attributed to the fact that, within the extended family system which is still prevalent in Ghana especially in the rural areas, each member is the other's keeper.
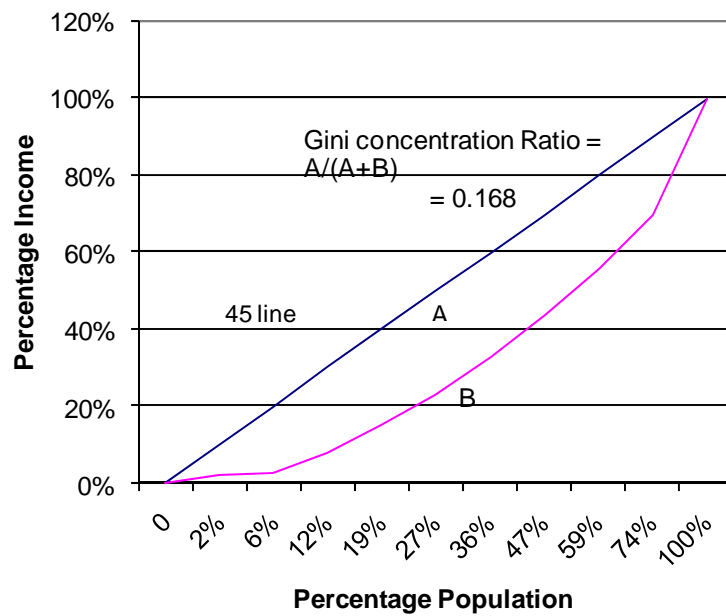
Figure 4: Lorenz Curve showing income distribution among participants

Source: Field Survey, 2007
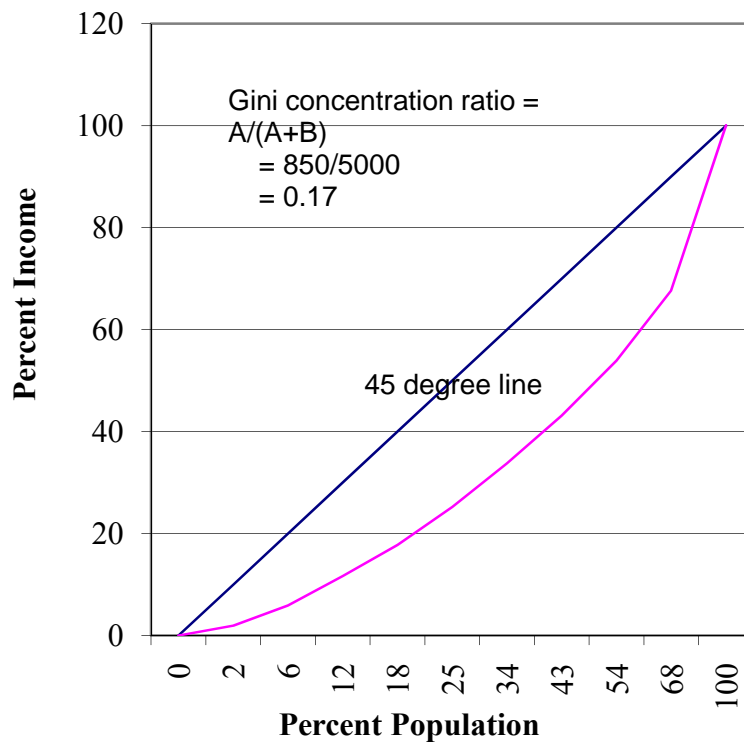
Figure 5: Lorenz Curve showing income distribution among Non-participants

Source: Field Survey, 2007

Food Insecurity Coping Indices of Participants and Non-Participants

The results in Table 27 indicated the mean coping indices of households in the face of insecurity. The coping index was used as a proxy in determining the food security situation of households. Higher values indicated the use of severer coping measures, implying the presence of food insecurity (Hoddinott, 1999).

Table 27

Food Insecurity Coping Indices of Participants and Non-Participants

Strategy (S)	Weight (f)	Participants		Non-participants	
		Sk mean	Sf	Sk mean	Sf
Has the household consumed less preferred foods?	1	1.88 (0.86)	1.88	3.12 (1.12)	3.12
Have you reduced the quantity of food served to men in this household	1	1.32 (0.73)	1.32	3.34 (1.18)	3.34
Have you reduced your own consumption of food?	1	1.28 (0.67)	1.28	3.30 (1.1)	3.11
Have you reduced the quantity of food served to children in this household the last seven days?	1	1.26 (0.92)	1.26	2.02 (0.96)	2.02
Have members from this household skipped meals in the last seven days?	2	1.42 (0.81)	2.84	3.09 (1.10)	6.18
Have members of this household skipped meals for a whole day?	3	1.35 (0.86)	4.05	3.63 (1.07)	10.89
Coping index (CI)		8.51		18.5	
Mean		1.42 (0.23)		3.08 (1.09)	5.96
SD					

Scale (k): 1= Never, 2= rarely, 3 = from time to time, 4= often.
Weight (f) = 1 for strategy one to four, 2 for strategy five and 3 for strategy six.

Figures in parenthesis refer to standard deviations

Source: Field Survey, 2007.

The results in Table 27 showed that participant households rarely used sever coping measures, with an index of 8.51 compared to 18.5 for non-participants (computed using equation 4). The mean values of 1. 42 (0.23) showed that participants never or rarely used sever coping measures. Also, the value of 3.08 (1.09) indicated that, from time to time non-participant households reported using severer strategies. The high standard deviation of 1.09 indicated households were not consistent in their responses.

Analysis of the effect of the project on and maize output and food security

Objective five intended analyzing the effect of the project on maize output and food insecurity coping strategy of farmers in the district.

Effect on Maize output

Table 28 shows the OLS regression on maize output as the dependent variable. Three variables namely, farm size (X_3), participation (X_5) and ease of access to credit (X_4) were observed as the best predictors of maize output. From the R-square values it could be said that about 2.6% of the change in maize output was attributed to change in the households' perception about ease of access to credit. Also, 4.2% and 41.7% of the changes in maize output observed could be attributed to participation in FCDP and farm size respectively. An observation made by ISSER 2004) indicated that increases in output in most Ghanaian farms were due to expansion in farm size. According to World Bank (2003), national

maize output grew 2.5 times and most of the production increases came from area expansions.

Table 28

Effect on Maize output

Predictor variable	Step entry	Beta	R^2	Adjust- R^2-	R^2- Change	S.E.E	F.reg.	F. Sig
constant	1	15.048				4.701		0.002
X3	1	0.646	0.417	0.412	0.417	6.42	91.50***	0.000
X5	2	0.205	0.459	0.451	0.042	6.21	53.88***	0.000
X4	3	0.176	0.485	0.473	0.026	6.08	39.63***	0.000

*** Significant at 0.001 level

Maize output (Qh) = $15.048 + 0.646X_3 + 0.176X_4 + 0.204X_5$ ……………… 6

X_3 = Farm size (ha), X_4 = ease/difficulty of access to credit, X_5 = dummy variable indicating participation in FCDP (1=participation and 0 = non-participation),

Effect on food security

The results shown in Table 29 indicates that three variables namely, household size, participation in FCDP and total income of the household were the best predictors of the coping index which was used as a proxy measure of food security. While household size had a positive effect on the coping index as indicated by the beta value (0.201, ie high food insecurity), participation in FCDP (X_5) and total income of the household (X_y) had negative beta values (-0.265 and

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-0.285 respectively. Table 29 suggests that 52.0%, 29.1% and 7.0% of the changes in the dependent variable (coping index, CI) could respectively be attributed to changes in the in household size, participation and household income.

According to FAO (2000), it is when the household's overall income is sufficiently high to afford non-staple foods that the household truly enjoys food security and adequate nutritional status. The negative beta values of the variables X_5 and X_y indicates that both participation and household income had decreasing effects on the coping index of the household and therefore positively influence food security.

Table 29

Effect on food security

Predictor	Step entry	Beta	R^2	Adjust- R^2-	R^2- Change	S.E.E	F.reg.	F. Sig
Constant	1	2.240				1.980		0.031
X_2		0.201	0.590	0.520	0.520	0.111	7.96***	0.006
X_5	2	-0.265	0.871	0.810	0.291	0.026	6.92***	0.001
X_y	3	-0.285	0.882	0.880	0.070	0.221	9.35**	0.002

*** Significant at 0.001 level, N = 130

CI= 2.240 + 0.201X_2 - 0.265X_5 -0.285X_y ………………………… 7
X_2 = household size, X_5 = participation in FCDP, X_y = household income
Source: Field Survey, 2007.

Test for differences between participants and non-participants of FCDP

Table 30 shows the independent sample t-test between participants and non-participants with respect to maize output, income from maize, total income and food security index. In all cases, alpha was set at 0.05 level and the degree of freedom of 128. In addition, the Levene's Test for Equality of Variances did not show significance with respect to all variables. Hence equal variances were assumed for all t-statistics.

Table 30

T-Test of Differences in outcome variables between participants and non-participants

Indicator variable	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference
Revenue from maize	.449	.504	1.948	128	.054	84.33
Total income	.646	.423	1.803	128	.074	85.19
Average maize output	.189	.665	2.626**	128	.010	3.773
Copping index	.024	.877	-2.564**	128	.012	-2.215

* Significant at 5% level, ** significant at 1% level,   Equal variance assumed

Source: Field Survey, 2007.

From Table 30, two variables namely average maize output and coping index were observed to be statistically significant (t = 2.623, p ≤ 0.010 for maize output and t= 2.564, p ≤ 0.012 for coping index). Although there were differences between participants and non-participants with respect to incomes, these were not statistically significant. This could be attributed to the fact that extra incomes from maize earned by participants could have been used in ensuring food security.

Conclusion

Among the demographic characteristics of farmers, participation in the FCDP moderately and positively correlated with average maize output at the 0.01 alpha level, though participation did not correlate significantly with income. There was also a significant difference in access to credit between participants and non-participants although both categories of farmers perceived credit as difficult to access. There were statistical significant differences between the proportions of participants and non-participants with regard to the use of improved maize agronomic practices. There was a tendency towards income equality among sampled farmers as shown by the Lorenz curves and Gini concentration ratios of 0.170 and 0.168 for participants and non-participants respectively.

Participation in FCDP, average farm size and ease of access to credit were observed to be the best predictors of maize output with R-square change values of 0.042, 0.417and 0.026, and respectively. Meanwhile, participation in FCDP,

income of the household and household size were the only variables which significantly explained changes in household coping index.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The study examined the impact of the Food Crop Development Project on the socioeconomic lives of small-scale maize farmers in the Ejura-Sekyedumase District. In this chapter an attempt is made to summarise the main and relevant issues in the study and draw conclusions from them. Recommendations as well as suggested areas for future research are also outlined in this chapter.

Summary of Findings

1. Participation in FCDP had a positive and significant but moderate relationship ($r = 0.266$, $p \leq 0.001$) with maize output. However, participation in the FCDP had no significant relationship with total farm incomes.

2. It was observed that 83 (68.6%) of respondents perceived access to credit from banks as difficult. Out of 38 respondents (31.4%) reported having easy access to credit, 31 (81.6%) were participants and only 7(18.4%) were non-participants. A chi-square (χ^2) statistic of 17.29 was observed

to be highly significant, indicating the possible relationship between participation and perception of ease of access to credit.

3. Seventy six point one percent (76.1%) reported that the adoption of zero-tillage to prepare the land for sowing and to control weeds in maize. 77% of participants and 69% of non-participants observed a reduction in the time spent on land preparation.

4. Mean income from maize output among participants exceeded that of non-participants (GH¢ 458.83 and GH¢ 356.38). However, mean income from other crops among participants was less than that of non-participants (GH¢ 332.00 and GH¢ 395.57). There was a tendency towards equal income distribution among both participant and non-participant farmers with Gini indices of 0.169 and 0.170 respectively.

5. Participation in FCDP, farm size and ease of access to credit were the main predictors of maize output. In addition, participation, household income and household size were the only variables which significantly explained changes in household coping index at 0.05 significance level.

Conclusions

The study focused on the impact of the Food Crop Development Project on the socioeconomic livelihoods of small scale maize farmers in the Ejura-Sekyedumase District. Based on the results the study concludes that:

1. Participation in FCDP had a positive and significant but moderate relationship with maize output.

2. The findings also revealed that despite the fact that both groups perceived access to credit as difficult, a chi-square test showed that there was a significant relationship between participation and households' perception of ease of credit access. In addition, there was a statistically significant difference between participants and non-participants with respect to savings behaviour. This could be due to linkage of opening a savings account with a rural bank as prerequisite for obtaining the FCDP credit.

3. With the implementation of the Food Crop Development Project, a greater proportion of sampled farmers in the study area reported they use zero-tillage mainly the use of weedicides, to prepare the land and to control weeds in maize which helps to save labour.

4. Contrary to the expectation that most farmers will adopt improved maize varieties to increase yield, the survey revealed that, majority of farmers still prefer local maize varieties due to high cost of seeds and fertilizers. More participants than non-participants were observed to use improved varieties.

5. Participation in FCDP, farm size and ease of access to credit were observed to be the main predictors of maize output. It was also observed that participation and household income had a negative effect on food insecurity coping index which implied that, participants felt more secured in terms of food security compared to non-participant. However, larger households felt more food insecure than smaller

households since household size had a positive effect on the coping index of the households.

Recommendations

On the basis of the findings from the study, the following recommendations were made:

Strengthening farmer groups will serve as collateral for farmers to obtain loans from banks and therefore improve their access to credit. Increasing the loan repayment period by banks would also enable farmers to hold their produce in storage until maize price improves. Promoting flexibility in the type of collateral demanded by banks/financial institutions will also improve farmers' access to credit.

The results showed a significant relationship between participation and saving in a financial institution. An increase in groups' savings should be encouraged as savings has been found to be closely linked with ease of access to credit and consequently ability to adopt and use innovations. Improvement in savings will also ensure the sustainability of the project and help achieve the project goal of making the farmers self-sufficient in the acquisition of production resources.

Constraints to rapid diffusion of a new technology may arise from sources such as low level of education, lack of credit, small farm size and unstable supply of complementary inputs such as seeds and fertilizer. Removing these constraints through appropriate policy instruments could improve adoption of these

innovations and increase agricultural productivity. Encouraging more educated people to go into food crop production could also enhance adoption of new technologies (Yifu-Lin, 1991 and Fane, 1975). Thus, to attain the full benefit from future adoption and use of modern technologies, there is the need to invest in farmers' education since a greater percentage of farmers in the study area were illiterate.

The study observed a moderate relationship between the intervention and maize output. However, the rush to pay off the credit made some farmers to sell their produce at relatively low prices. Hence, there was no significant relationship between participation and maize income. It is therefore recommended that any policy aimed at improving farm incomes should consider the effect of output prices. For instance, offering small-scale maize farmers a pre-arranged contract for sale of their produce will create a guaranteed market for their produce during the initial intervention period; and this can reinforce the stimulus among farmers.

The research results showed that participation and income had a negative effect on food insecurity coping index while household size had a positive impact on the index. By implication, participation improved food security through a reduction in the coping index. Also, improving farm incomes will also reduce insecurity coping index and therefore improve food security. Also, larger households were reported to be worse off in terms of food security. Thus, maintaining smaller households can help reduce a household's vulnerability to food insecurity. This could be achieved through effective family planning education.

Suggested areas for further study

The following areas for further research come to light from this study:

1. An investigation into the relationship between household-level dietary diversity and socioeconomic factors and food security. Dietary diversity indicates the sum of the number of different foods consumed by an individual over a specified time period. Such a study will help confirm or reject the assertion that as households become better-off, they consume a wider variety of foods. It will also help answer the question as to whether or not there exist an association between dietary diversity and nutrient adequacy.

2. Socio-demographic characteristics of small-holder farmers which determine adoption of agricultural technologies. Such a study will look at the factors which small-holder farmers will consider most important; including insurance and access to credit.

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INTERVIEW SCHEDULE FOR FARM HOUSEHOLDS

INTERVIEW SCHEDULE ON THE IMPACT OF THE FCDP ON FOOD SECURITY AND SOCIO-ECONOMIC LIVELIHOODS OF MAIZE FARMERS

This interview schedule is designed to elicit information for the purpose of thesis writing at the University of Cape Coast. The purpose of the study is purely academic and does not in any way attempt to invade your privacy. You are assured that all the information supplied will be treated confidentially. Kindly respond as honestly and completely as possible.

Thank you very much.

Name of Enumerator: …………………..   Date ……………………..

Code Number of Respondent_____
Town/Village_____

PART ONE: Demographic Characteristics of Respondents

Please provide responses which best describe your situation. Tick (√) in the boxes or write on the spaces provided below.

1. (a) Category of farmer. 1. [   ] Participant. 2. [   ] Non-participant.

    (b) If participant, state name of group. ………………………….

2. Age at last birthday (years)_____

3. Sex   1. male [   ] 2. female [   ].

4.   Marital status

    1. [   ] Single   2. [   ] Married   3. [   ] Separated   4. [   ] Widowed

5. Number of dependants in household? _____

6. Level of education

    1. [ ] No formal education   2. [ ] Basic Level(up to JSS/middle school)

    3. [ ] Secondary Level/SSS   4. [ ] Tertiary level

7. What is your major crop cultivated?

    1. [ ] Maize Production 2.[ ] Yam Production. 3. [ ] Cowpea (beans) production. 4. Other (specify) _____

8. Farm size. …………………………….

9. Experience in farming _____ years.

10. Currently, what type of cropping system do you practice?

    1. Mono-cropping [ ]
    2. Mixed-cropping [ ]
    3. Other (specify) _____

Part two: Household Economic Activities

11. Farm income
(A) From Crops

Crop	Output(bags/kg)	Qty consumed	Quantity sold	Price per unit
1. Maize				
2. Yam				
3. Cassava				
4. cowpea				
5. Other (specify)				

B: From livestock

Type of animals	Quantity(number)	Price per unit
1. Poultry		
2. Sheep/Goats		
3. Pigs		
4. Cattle		
5. Other (specify)		

12. Please State the amount you earn from the non-farming activities. State the type of activity. (i) Income:…………………………… (ii) Activity: …………………………..

13. Spending pattern of Household
(a) Education
1. Number of children. ……………
2. Average fees paid per child ………………..
3. Average expenditure on uniform. ……………….
4. Average pocket money per day. …………………….
5. Average cost of T and T per day…………………….

(b) **Social activities**	Average amount spent/month	**(d)Fuel/Energy**	Average amount spent/month
1 Funeral		Kerosene	
2. Wedding		2. Charcoal	
3. Out-dooring		3. Fuel wood	
4. Festival		4. Gas	
5. Others(specify) ……………………..		5. Others(specify….	
(c)Utility		**(e)Other Expenditure**	
1. Electricity		1. Food	
2. Water		2. Health	
3. telephone		3. T & T	
		4. others ……………..	

Part three: Access to Financial Services
A. Savings
16. Do you save money in a bank or savings and loans company/Susu collector?   1. [   ] Yes   2. [   ] No.

17. If No to Question 16, why not?

1. [   ] Do not know of any bank

2. [   ] Banks are too far away

3. [   ] Income is not enough for me to save

4. [   ] Too much formality

5. [   ] Deposit rate is too low

6. [   ] Banks are usually uninterested in small deposits

7. Other reasons (specify) …………………………………………..

18. If yes to question 16, why do you choose this option?

1. [   ] because of proximity
2. [   ] Interest rate is attractive
3. [   ] Gives me easier access to credit
4. [   ] Money is most secured that way
5. [   ] Out of habit/no special reason
6. [   ] Other bank services are attractive
7. Other reason (specify) ……………………………

19. Apart from cash, in what forms do you often keep your savings?

1. Gold [   ] 2. Landed property [   ] 3. other ………………………

20. Has your level of savings over the past six years , 1. Remained the same [   ]
2. Become better [   ] 3. become worse [   ]?

B. Credit

21. State how easy or difficult is it for you to obtain credit from the following sources:

A). Family and friends: 1. very difficult [   ] 2. difficult [   ] 3. easy [   ] 4. very easy [   ]

B). Money Lenders and Co-operatives: 1. very difficult [   ] 2. difficult [   ] 3. easy [   ] 4. very easy [   ]

C). Banks: 1. very difficult [   ] 2. difficult [   ] 3. easy [   ] 4. very easy [   ]

D). Financial NGO's: 1. very difficult [   ] 2. difficult [   ] 3. easy [   ] 4. very easy [   ]

22. My ability to access credit and production inputs over the past six years has:

1. Remained the same [   ] 2. become better [   ] 2. become worse [   ]

23. Suggest ways that could improve or enhance farmers' access to credit in your community.

_____

_____

Part four: Effect on maize output

24. Tell me your farm size and the quantity of maize you harvested in the years indicated below.

Year	Farm size	Output (bags)
2000		
2001		
2002		
2003		
2004		
2005		
2006		

Part Five: Effect on the use of maize production technology

(A) Use of improved production technology

25.(a) Do you use the maize production technologies introduced by FCDP?
     1. yes [ ] 2. no [ ]

25 (b)Which of the following maize production technologies do you currently use?

    1. [   ] Use of improved varieties (Obaatampa or Mamaba)
    2. [   ] Zero tillage
    3. [   ] Row planting at recommended spacing
    4. [   ] Timely execution of field activities (fertilizer application, etc.)

26. If 'No' to Question 25 (a) give details of your maize production practice
    [Please state]
    1. Land preparation _____
    2. Planting material (seed)_____
    3. Method of weed control _____
    4. Method of maintaining soil fertility _____

27. Indicate which maize variety you sowed in the last two seasons
    1. Mamaba [   ]
    2. Obatamba[   ]
    3. Own seed [   ]
    4. Other ……………………….

28. Do you still use the improved maize variety? 1 [   ] Yes 2 [   ] No.

29. What are your reasons for growing the variety you using now?

1. Increased income/ Increased crop yield	
2. Availability of production input	
3. Better quality grain	
4. Stores better	
5. Early maturing	
6. Drought resistant	

30. What are your reasons for not growing the improved variety?

1. Unavailability of the seed	
2. Lack of knowledge	
3. Lack of funds/ Seeds are expensive	
4. Poor quality grain/ Poor storage ability	
5. More disease and pest problems	
6. Less resistant to drought	

(B) Amount of Time Spent on Farming activities

31. Please indicate whether the amount of time you spend on your farming activities has *increased*, *decreased* or remained the *same* since 2001 to date.

Activity	Time spent		
	Increased	Decreased	Same
1. Land preparation			
2. Sowing			
3. Weeding			
4. Fertilizer application			
5. Harvesting			

Part six: State of household food security
In the last seven days:

33. Has the household consumed less preferred foods?

　　　　1. Never [ ] 2. Rarely [ ] 3. From time to time [ ] 4. Often [ ]

34. Have you reduced the quantity of food served to men in this household?

　　　　1. Never [ ] 2. Rarely [ ] 3. From time to time [ ] 4. Often [ ]

35. Have you reduced your own consumption of food?

　　　　1. Never [ ] 2. Rarely [ ] 3. From time to time [ ] 4. Often [ ]

36. Have you reduced the quantity of food served to children in this household the last seven days? 1. Never [ ] 2. Rarely [ ] 3. From time to time [ ] 4. Often [ ]

37. Have members from this household skipped meals in the last seven days?

   1. Never [ ] 2. Rarely [ ] 3. From time to time [ ] 4. Often [ ]

38. Have members of this household skipped meals for a whole day?

   1. Never [ ]   2. Rarely [ ] 3. From time to time [ ] 4. Often [ ]

Thanks for your time and co-operation.