UNIVERSITY OF CAPE COAST

COCOA FARMERS' WILLINGNESS TO PAY FOR IMPROVED EXTENSION SERVICE DELIVERY IN THE AGONA EAST DISTRICT OF THE CENTRAL REGION OF GHANA

GABRIEL ADDAE TWUM

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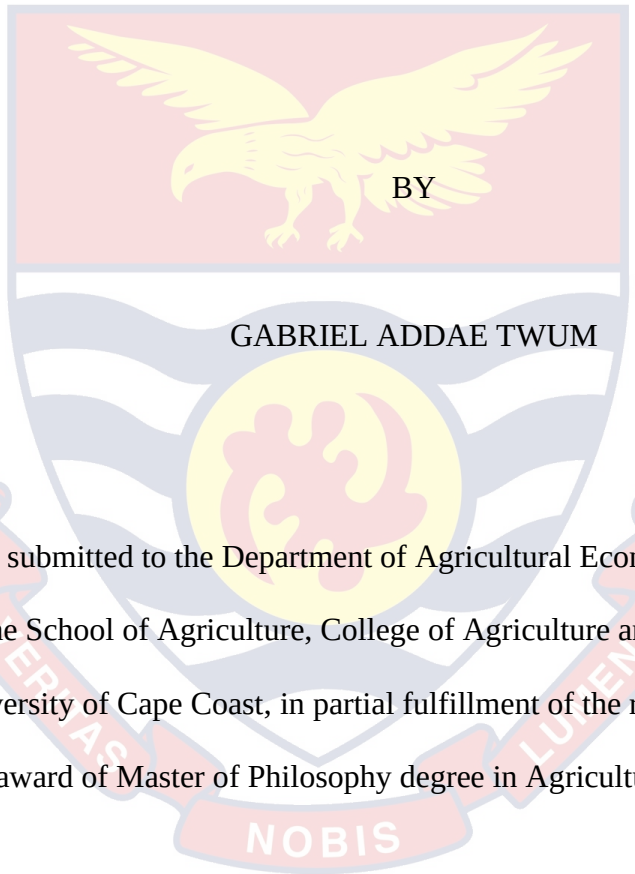

BY

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is a result of my own research and no part of it has been presented for a degree in this University or elsewhere.

Candidate's Signature…… Date……

Name: Gabriel Addae Twum

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature…… Date……

Name: Dr. Samuel Kwesi Ndzebah Dadzie

Co-Supervisor's Signature…… Date……..

Name: Dr. William Ghartey

ABSTRACT

Dissemination of farm relevant information to cocoa farmers though crucial is inadequate in the public extension service. The information-transfer gap could be reduced if information dissemination is prioritised in extension service delivery. This study thus examines cocoa farmers' willingness to pay for improved extension service in the Agona East District of the Central Region of Ghana.

A multi-stage sampling procedure was used to elicit information from 151 cocoa farmers. The data was analysed using descriptive statistics, SERVQUAL analysis model, conditional logit model, multivariate regression model and a standard logit model.

Evidence from the study indicated that farmers were consistently not satisfied with the quality of extension service being provided by the public sector and that frequent farm visits as well as easy access to farm advisory services were the most important attributes they preferred in an extension service package. They were therefore willing to pay more for improvement in these extension service attributes. The results also indicated that the Assurance and Empathy dimensions of an extension service, good agent-farmer relation and the increase in average yield of a cocoa farm were significant variables that determined farmers' choice of improved extension service delivery.

The study therefore recommends government and potential investors to critically pay attention to and improve frequency of agents' farm visits and farmers' access to farm advisory services in extension delivery services.

KEY WORDS

Attributes

Choice Experiment

Cocoa Farmers

Improved Extension Service Delivery

Service Quality

Willingness to Pay

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DEDICATION

To all the cocoa farmers in Agona East District who contributed their quota to make this work a success.

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LIST OF ABBREVIATIONS

CE: Choice Experiment

CEPPP: Cocoa Extension Public-Private Partnership

CIAT: Centro Internacional de Agricultura Tropical

CRIG: Cocoa Research Institute of Ghana

CSD: Cocoa Services Division

CSSVDCU: Cocoa Swollen Shoot Virus Disease Control Unit

CV: Contingent Valuation

DAES: Directorate of Agricultural Extension Services

DAO: District Agricultural Officer

DDA: District Director of Agriculture

FAO: Food and Agriculture Organisation of the United Nation

GTZ: German Technical Co-operation

ICCO: International Cocoa Organisation

MOFA: Ministry of Food and Agriculture

MWTP: Marginal Willingness to Pay

RAED: Regional Agricultural Extension Director

RAO: Regional Agricultural Officer

RDA: Regional Director of Agriculture

SERVQUAL: Service Quality

WTC: Willingness to choose

WTP: Willingness to pay

CHAPTER ONE

INTRODUCTION

Background to the Study

Cocoa production is of major importance to the economy of Ghana because it is the major export crop of the country accounting for about 50% of Agricultural exports and 9% of Gross Domestic Product (GDP) (Ai, E., Castro, V., Chen, V., Ortiz, M. & Tailor, A., 2012). It is the main source of livelihood for over 700,000 farm-families and their dependents (Kolavalli & Vigneri, 2011).

Ghana's cocoa sector however has over the years faced major challenges which has adversely contributed to the country losing her position as the leading producer of cocoa beans in the world. Whilst the average cocoa yield in Malaysia is 1800 kg/ha and 800 kg/ ha in Ivory Coast, it is only 360 kg/ha in Ghana (Anonymous, 1999). This has been attributed to a myriad of constraints including low producer prices, pests and diseases infestations, low soil fertility and poor extension support (see Baah, 2006; Ministry of Manpower, Youth and Employment, 2008).

Agricultural extension plays a vital role in the cultivation of cocoa by farmers in Ghana. Agricultural extension services are mainly provided by the government in many developing countries as is the case in Ghana. The government bears the total cost of providing the service; making the service free of charge to farmers. According to Van den Ban (1998), the government sponsors extension in order to promote the adoption of technologies that could

enhance food productivity and self-sufficiency, which is desirable for the farmers. Because of its contribution to the economy of Ghana, cocoa has its own assigned extension service delivery system which offers extension service to cocoa farmers and is controlled by the Cocoa Health and Extension Division of the Ghana Cocoa Board. The main aim is to improve cocoa by educating farmers to change from less productive traditional ways of operation to scientifically improved farming techniques.

The underlying factor that determines the survival of Agricultural extension is funding and has been posited to lead to other major challenges (Adedoyin, 2005). Funding ensures that major institutional structures and policies are implemented (Amoah, 2013); production challenges are addressed (Baah, 2006); there are adequate extension agents on the field and also better conditions of service for agents. Whereas there is a user fee attached to most public sector services such as water provision, roads, electricity, education and health, it has not been so for Agricultural extension for which the provider does not charge any fees. This has led to various arguments about user fees in public agricultural extension services (Budak, D. B., & Budak, F., 2010).

Research into the funding of the public extension service revealed that public extension service has faced challenges including inadequate budgetary allocation and employment freeze (Speranza, C. I., Kiteme, B. & Opondo, M., 2009). LEISA (2002) had already posited that national extension systems are in dire straits with resources being cut to a minimum. This resulted in the laying off of extension workers and staff turnover for opportunities elsewhere. Those who remained often lacked basics like transport and access to information for their work. Staff morale is, therefore, perpetually low. In seeking reasons for

the decrease in government support for agricultural extension, LEISA (2002) established that severe and repeated financial crises in most developing countries resulted in the shift in preference for private enterprise over government intervention.

Statement of the Problem

The Agona East district continues to contribute significantly to cocoa production in the Central Region and Ghana as a whole. The district constitutes one of the cocoa districts in the Central Region; meanwhile, increase in production has been obtained from increased land area cultivation and not yield per tree. This situation could be addressed through dissemination of information and technical skills to cocoa farmers through proper extension service delivery. This however has not been achieved because of inadequate extension support to farmers. The public extension service has faced challenges including inadequate budgetary allocation and employment freeze (Speranza *et al*., 2009).

There is an ongoing argument about user fees in public agricultural extension services (Budak *et al*., 2010). A user's fee is evident in other services such as health, education, road and water provision. This is not the case for agricultural extension services in Ghana for which the service provider has never charged fees. Jibowo (2001) has indicated that privatization and/or commercialization of extension could be advantageous in that it could promote greater access of farmers to extension agents and farm inputs since more extension agents would be employed while bureaucratic bottlenecks involved in mobilizing extension resources would be reduced. This extension service would therefore offer an improved version of the existing extension services by eliminating the current challenges in the extension service delivery system.

In a bid to promote farmers' participation in extension finance, various forms of payments for agricultural extension services by farmers have been instituted in some parts of the world (Rivera and Cary, 1997). In the Netherlands, for example, since the beginning of 1993, farmers had been made to pay for an increased share of the extension services by annual increments of 5% until their share reached 50% in 2003 (Shekara, 2004). The Swedish case is that of farmers' cooperatives and private commercial farms employing people to train them as consultants to serve their members.

It is obvious that agricultural extension finance through subsidized, shared cost or total privatization is a major policy issue that needs to be subjected to more debates, discussions, suggestions and adoption in Ghana. It is important, therefore, to empirically establish how farmers feel and whether they are willing to support the move to pay for cocoa extension services. In this case, the cocoa extension service should have attributes that offer farmers maximum utility and should also address the challenges of the current extension service being provided. Furthermore, the specified fee in this scenario must not exceed the ability to pay of the farmers; otherwise, there will either be no demand for extension services or users. As a cocoa district and a major contributor to the total cocoa production in Ghana; Agona East district was selected by the researcher to empirically determine cocoa farmers' willingness to pay for improved extension service delivery.

Purpose of the Study

This study wishes to assess the cocoa extension service in the Agona East District of the Central Region based on the experience of the cocoa farmers

and their willingness to pay for an extension service that has better attributes than the current one they are been provided.

Objectives for the Study

The general objective of the study seeks to determine willingness of cocoa farmers to pay for an improved cocoa extension service delivery.

The specific objectives of the study are;

1. To determine the state of the extension service delivery in the study area from farmers' perspective.
2. To evaluate the service quality of cocoa extension delivered to cocoa farmers and its determinants.
3. To determine farmers' preferred attributes of an improved cocoa extension service delivery
4. To assess farmers' willingness to pay for improved cocoa extension service delivery.
5. To determine factors that influence farmers' choice of improved extension service delivery.
6. To analyse farmers' perceived constraints to extension service delivery in the study area.

Research Questions

1. What is the state of extension service delivery in the study area?
2. Are farmers satisfied with the quality of extension service they receive?
3. What are farmers' most preferred attributes of an extension service provision?
4. How much on the average are farmers willing to pay for improved cocoa extension service delivery?

5. What are the factors that influence farmers' choice of improved extension service delivery?
6. What are cocoa farmers' major perceived constraints of extension service delivery in the study area?

Significance of the Study

This study seeks to look into the public extension service delivery in the Agona East District of the Central Region; its state, quality, constraints and ways it could be improved.

There are many researches that iterate the poor quality of service of the public sector. This study models an instrument to ascertain per the farmers' experience which specific aspects of the service rendered is of poor quality which would inform key stakeholders on the aspects to pay maximum attention. The study also presents extension attributes that are most preferred by farmers that the service should concentrate on in order to bring maximum satisfaction to the farmer. The study also models through a choice experiment, various scenarios involving combinations of farmers' preferred attributes with a price that they would prefer in an improved extension service package. This would inform the private sector on the best product design involving combinations farmers prefer and at what price they will be comfortable with, for the particular package.

Delimitations

The delimitations follow as;

1. The boundaries of the study covered only the Central region among all the cocoa growing regions of Ghana.

2. The study was further confined to the Agona East district of the Central Region and four communities around the district capital; Nsaba.

Limitations

The following are the limitations of the study;

1. The structured interview schedule was translated from English to Akan to the farmers, the answers could therefore be limited by farmers' understanding of the concepts of willingness to pay and choice experiments.
2. The study involved the assessment of the quality of service of the cocoa extension service from farmers' perspective, the answers were therefore subject to farmers' individual perception of the extension system.
3. Another major limitation of this study was inability of the researcher to get access to data on the actual number and details of cocoa farmers in the various sampled communities from COCOBOD.

Organisation of the Study

The study is organised into five chapters. Chapter one looks at the introduction which involves a background of the agricultural and cocoa production of Ghana and the agricultural extension concept. It continues with the problem statement, the objectives of the study, research questions and significance of the study. Review of literature, theoretical and conceptual frameworks of the study were tackled in chapter two. This chapter includes an overview of cocoa production in West Africa, production in the main cocoa growing countries in West Africa, the future of cocoa production in West Africa, constraints of the cocoa sector, agricultural extension service concept, service quality concept and willingness to pay concept. Chapter three defines

the population, sampling technique and data collection and models for empirical analysis. Presentation and discussion of results are captured in chapter four. Chapter five concludes the study and enlists methodological and policy implications of the willingness to pay as it relates to improved extension.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter presents the relevant reviewed literature. It touches on cocoa production in West Africa, the agricultural extension concept, willingness to pay concept and approaches, consumer preference models and finally the concept of service quality.

Overview of Cocoa Production in West Africa

In West Africa, cocoa is mainly grown by small holders who traditionally plant their cocoa at random using a low input cultivation system such as using the forest's soil fertility and cultivating under existing forest shade (GIZ, 2017). According to GIZ (2017) this simple method explains that some six million ha of the West African forest zone are planted with cocoa, which provides about 70 percent of the total world production.

Currently, Côte d'Ivoire and Ghana are the largest producers of cocoa in West Africa, followed by Nigeria and Cameroon (Wessel & Quist-Wessel, 2015). The total West African cocoa production increased from about 2,000,000 tons in 2000 to about 3,000,000 tons in 2010 and subsequent years (Table 1) (Lass, 2000; ICCO, 2014).

A research by Wessel and Quist-Wessel (2015) however revealed that average yields remain low because many farms are old and extensive cultivation methods are used. Farmers wishing to increase their cocoa output established new farms elsewhere in the forest zone which led to large-scale deforestation

both in Ghana and Côte d'Ivoire. Their study further suggested that at present, little land is available for the expansion of the cocoa area and a further increase in production has to come from an increase in yield of the existing mature trees and the replanting of old unproductive cocoa farms. Wessel and Quist-Wessel (2015) further found that the major causes of low yields and reduced productivity, especially those found in the two largest cocoa producing countries; Côte d'Ivoire and Ghana include high incidence impact of pests and diseases, old age of cocoa farms and lack of soil nutrients and as the options to improvements imply the use of costly external inputs, they suggested cocoa agroforestry as an alternative option to a high input approach.

Table 1-West Africa and world production of cocoa beans (thousand tons).

	1984-85	1989-90	1994-95	1999-2000	2004-05	2009-10	2010-11	2012-13	2013-14
Cameroon	120	125	107	120	130	205	229	225	210
Côte d'Ivoire	565	708	876	1300	1273	1242	1511	1449	1741
Ghana	175	295	304	440	586	632	1025	835	897
Nigeria	151	170	140	165	190	235	240	238	250
West Africa[a]	1011 (52)[b]	1298 (54)	1427 (60)	2025 (69)	2179 (70)	2314 (64)	3005 (70)	2747 (69)	3098 (71)
World	1944	2412	2368	2937	3289	3635	4312	3945	4365

Sources: 1984-2000, (Lass, 2000); 2004-2015, (ICCO, 2014)

a; West Africa: total production of Cameroon, Côte d'Ivoire, Ghana and Nigeria.

b; Between brackets: percentage of world cocoa production

Production in the Main Cocoa Growing Countries of West Africa

Nigeria

In Nigeria cocoa production has steadily grown from 165,000 tons in 1999-2000 to 250,000 tons in 2013-2014 (Table 1), mainly as a result of high grower prices and to a limited extent also to the government support as outlined in the 2011 Cocoa Transformation Action Plan (Nzeka, 2014). According to

FAOSTAT (2015) the cocoa area, production and yield are about 1,200,000 ha, 360,000 tons and 300 kg per ha respectively. FAOSTAT (2015) reported that yield improvement is constrained by the age of the farmers (most of them are over 60 years old), cocoa fields are old and there is an urgent need for replanting of old farms, a lack of proper farm management, low farm input use, inadequate supply and high costs of recommended chemicals, poor access roads to the major cocoa production areas and an inadequate extension service. The Cocoa Transformation Action Plan envisaged to improve this situation and to raise the production to 500,000 tons by 2015 (Wessel and Quist-Wessel, 2015).

Cameroon

Cocoa production has almost doubled in the last decade to about 220,000 tons in Cameroon (ICCO, 2014). Ngo Nkelle (2007) however indicated that the average yield remains low; about 300-400 kg per ha and outlined the main yield limiting factors as the age of the cocoa trees, an inadequate input supply system and climatic conditions. According to Ngo Nkelle (2007), high rainfall during the cropping season causes great yield losses in the shaded (agroforestry) cocoa farms due to the incidence of Phytophthora pod rot (black pod) disease which can only be controlled by very frequent spraying with copper fungicides. This is expensive and not totally effective, and in practice little fungicide is used (Alemagi *et al*; 2014). The high rainfall also causes post-harvest losses due to inadequate drying and storage facilities (Wessel & Quist-Wessel, 2015).

Côte d'Ivoire

In Côte d'Ivoire the annual production increased from 900,000 tons in 1995 to 1,500,000 tons in 2011 (ICCO, 2014). This increase is related to an expansion of the cocoa area which began in the 1970s when the cocoa

production shifted from the south-east to the south-west (Wessel & Quist-Wessel, 2015). This development is the outcome of land scarcity in the traditional production area, a government policy to stimulate cocoa growing as an export crop, the availability of large virgin forest areas and a large scale labour migration from the north (Hatloy *et al*; 2012).

Fountain and Hutz-Adam (2015) reported a spectacular cocoa production increase in the 2013-2014 season which they mainly attributed to a 40 percent increase in the farm gate price which prompted farmers to invest more time and inputs in their plantations and also mobilize all available resources to increase productivity. According to FAOSTAT (2015), the harvested area was about 2.5 million ha in 2012 and the yield has remained 500–600 kg per ha during the last 20 years with average cocoa farm sizes of 3 and 4 ha. The major constraints facing the cocoa sector have been found to include deforestation and land degradation, the widespread occurrence of pests and diseases, early ageing of unshaded trees, no access to credit and agricultural inputs, and lack of land ownership (Hatloy *et al*; 2012).

The high incidence of unshaded trees as a constraint to the cocoa sector has been recorded in the south-western part of the country where majority of upper Amazon cocoa hybrids grown were unshaded which has led to high tree mortality and declining yields (Ruf & Bini, 2012). To improve this situation and to stop further deforestation, the department of agriculture launched the Programme Quantité Qualité Croissance-2QC 2014-2023 to improve and intensify the existing farmers' coffee and cocoa production systems. This envisages that by 2023 a cocoa area of 800,000 ha (including 150,000 ha affected by swollen shoot disease) would have been replanted with improved

planting material and that about 1,000,000 ha of cocoa would have been rehabilitated by proper management and input use (Ministère de l'Agriculture République de Côte d'Ivoire, 2014). In addition, the Cocoa Fertilizer Initiative started a programme in 2012 to deliver fertilizers to 200,000 farmers by 2020 (IDH, 2015).

Ghana

Figures from ICCO (2014) and Lass (2000) detailed the cocoa production to have steadily risen from 300,000 tons in 1995 to 900,000 tons in 2014 in Ghana (Table 1). According to Asante-Poku and Angelucci (2013) the main factors that have contributed to the increase in Ghana's cocoa production are the extension support measures of the government-owned cocoa marketing board COCOBOD. They outlined the measures as including increases in farm gate prices, introduction of free pest and disease control programmes, the introduction of packages of hybrid seeds, fertilizers, insecticides and fungicides, improved marketing facilities, the repair of roads in cocoa growing areas and also the expansion of the cocoa growing area, especially in the Western Region. FAOSTAT (2015) thus reported that the resultant harvested area of cocoa increased from 1.0 million hectares in 1995 to 1.6 million hectares in 2010. The expansion nonetheless has led to large-scale deforestation.

Despite the massive expansion of the cultivated cocoa area, most reported cocoa farms are small; units of 2 hectares or less (Hainmueller *et al*; 2011). These farms have also not translated the increased land area into increased yield as the average yield of the majority of the farmers has remained low, about 400 kg per hectare because of inadequate management and input use even though there has been increase in the planting of potentially high-yielding

Amazon hybrids (Laven & Boomsma, 2012). Research to find other causes for the low average yield of Ghanaian cocoa farms exist (Laven & Boomsma, 2012; COCOBOD, 2015). COCOBOD (2015) found that another reason for the low average yield in Ghana is the age of many cocoa fields. COCOBOD therefore announced a National Cocoa Rehabilitation Programme providing about 20 million cocoa seedlings to farmers for free in 2012 and a rehabilitation and replanting scheme which includes the replanting of 20 percent of the existing cocoa farms in 2014 (COCOBOD, 2015).

The Future of Cocoa Production in West Africa

The International Cocoa Organization (ICCO) has forecasted a 10 percent increase in the world cocoa production and a 25 percent increase of the cocoa price in the next decade (ICCO, 2014). Based on the ICCO forecast, the total cocoa production will be about 4,700,000 tons in 2022-2023 with a supply deficit of 100,000 tons. ICCO therefore recommends a 10 percent increase in production in the next decade if West Africa wishes to maintain its present world market share. While in the past, expansion of the cocoa area contributed to an increase in production, at present more cocoa has to come from a higher yield per hectare (FAOSTAT, 2015). FAO has also demonstrated through on-farm trials that 50 to 100 percent higher yields are feasible with good maintenance and chemical inputs (FAO, 2005). Farmers however, are unable to make these investments in practical situations because they are trapped in a vicious cycle of inadequate financial means, low input use, high crop losses and low yields (Ruf & Bini, 2012). FAOSTAT data suggest that the most important factor in this cycle is the farm gate cocoa price thus an increase in price leads to higher yields (FAOSTAT, 2015). A marginal price increment therefore prompts

farmers to invest more time, energy and money in their cocoa farms so as to mobilize an apparently latent production capacity. FAOSTAT (2015) further indicated that other external factors that seem to affect farmers' production targets are access to loan and credit facilities, a reliable input and output delivery system and appropriate technical advice. To relieve these constraints, various large-scale rehabilitation and replanting projects are ongoing in Côte d'Ivoire and Ghana (ICCO, 2014; FAOSTAT, 2015). It is thought that, if farmers will get a fair share of the expected higher world cocoa price and can benefit from the government support schemes, the ICCO target of a 10 percent higher cocoa output from West Africa can be realized in the next decade (ICCO, 2014).

The cocoa industry has been committed to increasing yield and also improving farmers' revenue through cocoa certification (Laven & Boomsma, 2012). The industry seeks to achieve these objectives by promoting ecologically sound cultivation methods, higher yielding cocoa varieties and also training farmers on improved production methods (Laven & Boomsma, 2012). Laven and Boomsma (2012) however reported that Ghana COCOBOD does not consider certification as the way forward. Their findings showed that certification projects in Ghana had had little impact, most farmers did not belong to farmer organizations and could not be reached while the price received by certified farmers was often not significantly different from that received by non-certified farmers. A positive point though was that certification through its training programmes was associated with much higher yields (Paschall & Seville, 2012).

The West African position as a major contributor to the world cocoa market may also be challenged by climatic and population dynamics other than

the factors explained above. CIAT (2011) predicts a future climatic increase in temperature which will reduce the size of the current cocoa growing area in Ghana and in Côte d'Ivoire and thus force farmers to adapt their agronomic management to suit the new conditions. The climatic and population dynamics is likely to result in a greater demand for food and higher food prices thus causing a shift from cocoa to food crop growing and thus enforce the need to grow more cocoa on less land (UN, 2014) which therefore stresses on the need for farmers to have access to farm information and technology to boost their production through better extension provision.

Agricultural Extension Services System in Ghana

Although agricultural extension has roots as far back as 1800 BC, formal extension in most countries did not start until the late 1800s AD (Bne Saad, 1990). Ireland started its first modern extension service during the potato famine in 1845 (Swanson *et al*. 1997). The United States, Canada, France and Japan all had a formal form of extension for agriculturists during the late 1800s (True, 1928; Boulet n.d.).

The word extension derives from an educational development in England during the second half of the nineteenth century (Jones, 1982). Around the 1850s, discussions began in the two ancient universities of Oxford and Cambridge about how they could serve the educational needs of the rapidly growing populations in the industrial, urban area as well as near their homes (Jones, 1994). According to Jones, it was not until 1867 that a first practical attempt was made in what was designated as 'university extension' but the activity developed quickly to become a well-established movement before the end of the century. The dissemination of relevant information and advice to

farmers however has a long chequered history prior to the emergence of modern forms of agricultural extension in the nineteenth century (Jones, 1981).

Extension services in their formative stages were relatively small in scale and limited in the scope of their work and contact with farmers, and their organization was often somewhat haphazard even though based on legislation (FAO, 2017). They were organized predominantly either by central or local governments, or by agricultural colleges, usually in close association with experiment stations, or by farmers' organizations, or combinations of these parent bodies but as the century progressed, the organizations have matured in that changes have often occurred to their parent affiliations, government funding has become broader and the extension workers have become better trained and more professional (FAO, 2017).

Previously, agricultural extension organizations in developing countries mirrored the administrative traditions of the former colonial powers and like other agricultural support services, they were geared to production and marketing of export commodities which made crop-oriented extension programs common (Axinn & Throat, 1972). However, as noted by Antholt (1994), the scope of extension programs expanded in the fifties as the newly independent states of Asia and Africa sought to increase food production and to spread the benefits of improved farming techniques more widely by aiming at broad national and farming system coverage. The economic strategies of these pioneering years relied on heavy state intervention, import substitution and rapid industrialization and was basically fuelled by the proposition that farming productivity was held back not so much by technological and economic constraints but by farmer apathy, inadequate social arrangements and lack of

local leadership (Anandajayasekeram, 2008). Often, extension agents came to be viewed as the foot soldiers of 'nation building' campaigns aiming at multiple economic and social objectives (Anandajayasekeram, 2008).

The structure of the original extension services varied. Many were state-funded, used itinerant extension agents, heavily relied on demonstrations and structures were top–down with information coming from the university or Ministry of Agriculture and filtering to the farmers through extension agents (Anandajayasekeram, 2008). Farmers were involved only to receive information; they did not pay for services nor give much input as to their needs (Swanson *et al*., 1997).

Boone (1989) agreed that developing country extension models are usually top–down structures and often located within the Ministry of Agriculture but was convinced that these extension models were not usually formally associated with universities and therefore had poor linkages with research.

Agricultural Extension Services delivery in Ghana has gone through transformation over time (Ekepi, 2009). Ekepi (2009) reported that historically, agricultural extension activities in Ghana were initiated in the nineteenth century by the early missionaries and foreign-owned companies involved in the production of export crops such as coffee, cocoa and rubber. Ghana adopted various extension approaches including extension under the farmers' cooperative movement and several donor-assisted projects such as the USAID funded project called Focus and Concentrate after independence (MoFA, 2002). These organizations provided both advice and inputs to the beneficiaries.

In the 1970s and 1980s, the departments of the Ministry of Food and Agriculture such as Crops, Animals and Fisheries as well as independent commodity boards and organizations including Cocoa Services Division of Cocoa Board (COCOBOD) provided extension services in the form of technology transfer and technical services provision to farmers using separate extension service models for their farmers (MoFA, 2002). Agricultural extension services were therefore fragmented among the various departments within the same Ministry. In 1987 however, MoFA established the Directorate of Agricultural Extension services (DAEs) to bring all splinter MoFA extension services under one umbrella (MoFA, 2002). Since the beginning of the 1990s, the DAES adopted the Training and Visit (T&V) extension system nationwide supported with World Bank funding through the National Agricultural Extension Project (NAEP), implemented between 1992 and 1999 to help improve the efficiency in the management and delivery of extension services, improve the relevance of technologies available to farmers and strengthen the technical departments of MoFA (MoFA, 2002).

The Ministry of Food and Agriculture has also experimented with various alternative extension approaches such as Participatory Technology Development and Extension (PTD&E), Farmer Field Schools (FFS), Market-Oriented Agriculture Programme (MOAP) as well as others in collaboration with development agencies like the German Technical Co-operation (GTZ) and the Food and Agriculture Organization (FAO) of the United Nations (UN) to enhance technology transfer and absorption by farmers and strengthen research-extension-farmer linkages (Ekepi, 2009). Currently, MoFA has laid down an organizational structure operating under Regional and District Agricultural

Extension Directorates which function directly with the Agricultural Extension Agents (AEAs) who transfer the technology to farmers for effective provision of extension services in the country (Annan, 2012).

Constraints of Extension Service Delivery

Speranza *et al* (2009) observed that during the last 15 years, the staffing and facilitation of public sector extension had declined mainly as a result of public employment freeze and reduced funding for operations and maintenance. In the public sector for example, the ratio of frontline extension worker to farmers is about 1:1000 compared to the desired level of 1:400 hence agricultural extension staff receive more requests than they can address (Speranza *et al*., 2009). In the absence of effective private sector operations to fill the vacuum, the situation has led to reduced spatial coverage, targeting and ineffectiveness of service delivery reflected by clientele complaints.

Annan (2012) argued that Governments fund extension by giving grants to groups, providing seedlings for planting, farmer education, demonstrations, field days and mobilizing staff but due to shortage of funding and reforms, extension services are no longer free as extension officers demand lunch and fuel from the farmers. While some farmers pay for these services with the understanding that the services are at least available, other farmers contend that extension services should be free of charge (Annan, 2012).

The capacity of the institutions or structures to follow up on knowledge-skill-action-behaviour change or adaptation is limited in the public sector (Teicher *et al*., 2002). There is no ability to respond to all farmers' needs adequately due to poor transport facilities, poor road infrastructure, large areas to cover, few or inadequate staff and congested schedule (Speranza *et al*., 2009).

The low extension agent-farmer ratio causes the extension agents to overwork (Annan, 2012).

Most reforms and interventions are also targeted towards large scale farms with little consideration for small holder farmers who are in the majority and who would also require guaranteed minimum returns on their investments if they churn out higher yields (Speranza *et al*., 2009).

Private Extension Concept

In the 21st century, agriculture remains fundamental to economic growth, poverty alleviation, improvement in rural livelihood and environmental sustainability (World Bank, 2005). To fulfill this mandate, agriculture has to advance beyond its present primitive state and adopt technological, organizational as well as institutional innovations to stimulate increased production/productivity and must be channeled through the extension delivery system which most often is largely a government establishment in most countries in Africa (Ozor *et al*., 2013).

There have been extensive debates worldwide which most often favour a pluralistic, demand-driven conception of extension as found in many developed countries to be adopted to redefine the role of the public sector in the provision of agricultural extension services (Ozor *et al*., 2013). This approach implies the promotion of public–private partnerships in providing adequate resources for extension and improving efficiency and effectiveness of the service (Ozor *et al*., 2013).

According to the Ministry of Agriculture-Kenya (2007), Privatization of extension services is the process of reducing the role of government and increasing the role of the private sector in extension service delivery. This

implies the public sector withdrawing from delivering extension services and allowing the private sector to take over in order to supplement and complement government efforts with the view of enhancing efficiency and competitiveness in provision of extension services.

Research institutes continue to generate relevant, appropriate and affordable technologies but the capacity of extension organizations to effectively transfer them to the farmers has been impaired by inadequate and uncertain funding (Okoro, 2000). Successful execution of agricultural extension mandate however is strongly dependent on adequate and timely funding (Shaibu *et al*; 1997), a deviation results in mass retrenchment of field extension workers, stagnation of both field and supervisory workers, low morale of staff, a wide gap between agricultural technology generation and technology adoption; resulting in decreased agricultural production (Ogunbameru, 2005).

The most challenging policy issue facing the agricultural extension service today is to secure a stable source of funding (Agwu, 2010). The need for improved and expanded extension activities has led to a number of strategies for changing the way extension services are delivered (Shaibu *et al*; 1997). These alternative patterns call for a change in the financing and delivery of public services with the idea of the users charge emerging as one of the most probable steps in the adjustment programmes (Okoro, 2000).

Apparently, the present socio-economic conditions of the farmer are such that they cannot afford private extension services (Annan, 2012). Thus, full commercialization of extension services is not possible at present since majority of farmers do not have the capital base to pay fully for extension services (Annan, 2012). It is on this basis that the need for participatory (cost

sharing) approach to financing agricultural extension services is advocated (Matata *et al.*; 2001, Rivera and Cary, 2002). According to World Bank (2005), in introducing various co-financing arrangements like producer-controlled levy on agricultural products, fee-for-service arrangements and cost sharing arrangement, only the large producers might be able to fully pay for services.

Consequently, scholars like Okoro (2000), Agwu (2010) have also advocated for various alternative funding systems such as cost sharing for agricultural extension service in Nigeria and other developing Nations. Cost sharing in agriculture involves government-farmer partnership in the funding of agricultural extensions service and technology delivery and has been described by Chukwuone *et al* (2006) as a tenable privatization policy towards providing adequate and stable funding for agricultural services.

Cost sharing presents certain benefits. According to Heemskerk and Weenek (2005), local cost sharing and co-financing arrangement are aimed at strengthening collaboration through joint responsibility by building on the comparative advantage of the stake holders. Also, as a participatory methodology, it will promote innovation ownership, increase adoption rate and acceptability of new technologies (Chukwuone *et al*; 2006). It provides the platform to enhance linkages between the various stakeholders such as the researchers, farmers, extension workers and the input producers (Agwu, 2010). Another benefit is that it has the advantage of promoting institutional pluralism, accountability to clientele and efficiency in operation (World Bank, 2005).

While willingness-to-pay is a function of attitudes, political sensitivities and social perceptions, ability-to-pay is a fact of social and economic conditions (Obasi & Eboh, 2002). Thus, cost sharing arrangement should be based on an

informed understanding of the peculiarities of the target people (Rivera & Cary, 2002). It is therefore imperative to know how much farmers would pay as their own part of the shared cost for extension services, considering their occupational and socioeconomic characteristics.

New paradigms that have been identified in the discussions of extension service financing advocate the participation of clients in direct funding of the service as one of the most sustainable alternatives (Ozor *et al*., 2007). Financial participation by clients may range from a very small percentage of cost sharing in services of public extension organizations or non-governmental organizations (NGOs) up to 100 per cent in extension services that are entirely privately funded and delivered (Katz, 2002). Katz (2002) noted that financial participation of clients is advocated for many reasons among which are for the reduction of public expenditures in extension; ensuring effective, demand-oriented, high-quality services, better adoption rates of new practices and accountability of service providers to clients which fosters empowerment and farmers' ownership of service and also improving the chance of financial sustainability of services.

Already, some evidence of payments by farmers for extension service has been documented. For example, in France, three-quarters of the operated extension budget is collected at the farm level through direct payments, contributions of agricultural organizations and other direct and indirect taxes on agricultural inputs and products (Ameur, 1994). Wilson (1991) discovered several models of payments by client farmers in Latin America. Keynan *et al*. (1997) reported on financial participation arrangements in Nicaragua. Katz (2002) observed that women in a remote village in Northern Viet Nam pay a

public veterinarian for regular visits in their village to vaccinate piglets. They negotiated payment in kind where out of every six piglets raised to a marketable age, the women agreed to give one piglet to the veterinarian as remuneration. This formula greatly motivated the officers who ensured that as many piglets survived in as many households as possible. The case also shows that poor people in remote areas can and are willing to pay for useful services, provided that payment is in an appropriate form and pattern (Katz, 2002).

Katz (2002) also reported that in Kyrgyzstan, farmers paid the extensionists for assistance in the preparation of a business plan if it resulted in the approval of their loan application. Field observations have also shown that livestock farmers in Nigeria do pay cash for veterinary services rendered to them (Agwu, 2010).

The advocates of commercialization and privatization of extension services believe that farmers should pay for the extension advice (Annan, 2012). However, there is genuine fear that the zeal for privatization would deprive small farmers from benefiting from the services because the small farmers either do not believe that the extension advice is worth paying for or they simply cannot afford to pay (Annan, 2012). Measures are also needed to protect the farmers from exploitation by the private sector (Qamar, 2005).

Extension Service Delivery in the Cocoa Sector

The MOFA Model of Extension

Until 1998, the Cocoa Services Division (CSD) of the Ghana Cocoa Board (COCOBOD) which is the government owned marketing board for cocoa had the mandate to provide cocoa extension services (COCOBOD, 1998). Extension for cocoa was however merged with the MOFA extension system in

2000 with the aim of providing a more cost-effective extension service to farmers (Amezah & Mensah, 2002). The reasons given for the merger clearly pointed out to the urgency to reduce COCOBOD's expenditure. A report from Masdar (1998) indicated that CSD was the largest divisional employer in COCOBOD and accounted for 3,375 staff and an expenditure of about 2.7% of FOB of cocoa sales. Masdar further estimated that each cocoa extension worker cost the cocoa farmer an amount of US$ 6,143 per year and that the merger would lead to a savings of about 20 billion cedis annually to government (COCOBOD, 1998). It became apparent that a similar costing of the benefits of extension was not done as the merger posed various challenges. It became obvious that MOFA was not cut-out for cocoa extension and thus had to build its capacity by organizing staff training programmes, linking up with the Cocoa Research Institute of Ghana (CRIG) and learning on the job but because of structural and resource differences, MOFA could not provide the same quality of cocoa extension as CSD under COCOBOD which led to mass farmer complaints of reduction in the regularity of extension visits to their farms (Amezah & Mensah, 2002).

Amezah and Mensah (2002) found that chief among the challenges of the merger was the difference in extension models used by the two entities. They reported that MOFA's extension for instance is organized in such a way that one AEA interacts with farmers on all major agricultural commodities. Therefore, cocoa farmers hardly received the same attention that they had when cocoa extension was delivered by CSD under COCOBOD. Secondly, MOFA was faced with the problems of fewer field staff and inadequate operational funds. According to Fiadjoe (1999), the AEA to farmer ratio under CSD was

1:127 versus 1:1500 for MOFA. Amezah and Mensah (2002) found that in 2001, only approximately 20% of the approved operational funds were eventually released by the Ministry of Finance to MoFA for operations.

The COCOBOD Model of Extension

Following serious concerns from farmers and other stakeholders for an effective and efficient extension system for cocoa farmers, the Public Private Partnership in Cocoa Extension, which is coordinated by the Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDCU) came into being in early 2010 (E-Agriculture, 2017).

The mission of CSSVD Control Unit is to control the spread of cocoa swollen shoot virus disease (and other diseases), assist farmers to replant their treated and rehabilitated farms with improved cocoa varieties as well as provide backup extension services to meet the technical needs of cocoa farmers in Ghana. As part of the mandate, the new cocoa extension was also launched in 2010 as the Cocoa Extension Public-Private Partnership (CEPPP). The new system operates under the principle of lean staff numbers who are professionally trained and highly qualified and motivated to provide cost-effective and efficient cocoa extension services to business-oriented farmers ready to demand services and be owners of cocoa extension (E-Agriculture, 2017).

The Objectives of CEPPP are;

1. To provide an efficient and cost-effective extension to cocoa farmers to increase their productivity, improve income and enhance their livelihood.
2. To assist farmers to acquire knowledge and skills to be able to adopt good agricultural practices (GAP)

3. To orientate and train cocoa farmers in basic farm economics for them to consider cocoa farming as a rewarding business
4. To educate and encourage farmers to own cocoa extension.
5. To encourage the youth to take to cocoa cultivation
6. To strengthen Farmer Group (FGs) to access inputs/credit.
7. To build the capacity of extension staff to deliver training to farmers.
8. To build capacities for effective monitoring and evaluation.

CEPPP is made up public and private partners. Ghana Cocoa Board and its subsidiaries; Cocoa Swollen Shoot Virus Control Unit (CSSVDCU), Cocoa Research Institute of Ghana (CRIG), Quality Control Co. Ltd (QCCL), Seed Production Unit (SPU) constitute the public sector. The private sector partners include Mondelez (Cadbury), Solidaridad (West Africa), World Cocoa Foundation /Cocoa Livelihoods Programme (WCF/CLP) and allied agencies, Armajaro Ghana Limited, Rainforest Alliance and Farmers (E-Agriculture, 2017).

These partners provide funds for recruitment, remuneration, and training of extension agents. They also jointly provide for training materials, publications and the cost of training farmers. GIZ-Sustainable Cocoa Business in collaboration with the other partners provide support in the training of farmers in Farmer Business School (E-Agriculture, 2017).

In the study area, these farmer Business schools are tutored by agents from the Cocoa Health and Extension Division (CHED) and are organized as a week-long training for farmers. These training sessions are organized on need to know basis because of financial and logistical constraints. The farmers call the agent when they need information or they face challenges. The Cocoa

District which spans from Kasoa (Awutu Senya East District) through to Odoben (which is in the political Agona-West District) has only seven (7) cocoa extension agents with three (3) from COCOBOD and four (4) from its private partners. This woefully disrupts effective dissemination of information and proper supervision of the activities of farmers by the extension agent.

Private Sector Extension in Cocoa

Privatized extension services are a key topic of discussion in Ghana. At the national level, the Directorate of Agricultural Extension Services is exploring the potential of private providers to serve Ghanaian farmers and lessen the burden on the public system (MoFA, n.d.).

There is a general trend to increase public sector service delivery efficiency through shedding off some of its agricultural services delivery to the private sector while maintaining the delivery of public good type of services (Smith, 2001). Some private sector extension funding and delivery exists in nucleus farmer out grower schemes and also commercial fruit farmers (Ntifo-Siaw 1999, Atengdem 1999). Also, most metro and municipal areas have a multitude of small-scale, private input dealers that serve farmers. Shops selling chemical fertilizers in particular can be observed in most districts. However, these actors do not provide education or training to farmers beyond advice regarding the application of inputs sold and are therefore excluded from the discussion of private extension (MoFA, 2002).

Some producer organizations, buyers, processing and export companies are involved in some form of private extension through the provision of extension services for specific agricultural commodities on cost recovery basis, where costs are recovered through service charges deducted from payments to

farmers at the time of sale (MoFA, 2002). This extension system tends to focus on high value crops like cocoa, cotton, oil palm, cashew, pineapple and vegetables. Non-Governmental Organizations in Ghana are increasingly involved in the funding and delivery of extension services where their services are often commodity focused and generally address the needs of specific client groups. NGOs complement the activities of the public extension services and work in partnership with the publicly funded extension agents (MoFA, 2002).

In Ghana, both Yara International and Wienco (Ghana) Ltd. are active providers of extension services to farmers. Yara Ghana is the largest fertilizer supplier in Ghana and partners with stakeholders throughout the agricultural value chain to provide education regarding its products (Yara Ghana, 2015). Yara Ghana uses farmers' forums to engage farmers, provides direct trainings to AEAs, utilizes Farm Radio to promote its products and usage details, and operates several demonstration sites with corresponding field days. Yara Ghana also provides product and usage information to the aforementioned small-scale input suppliers active in northern Ghana. Wienco (Ghana) Ltd. specializes in the importation of agrochemicals and supplies farmers with inputs designed to increase productivity of Ghanaian farmers. Wienco's model involves aggregating smallholder farmers into groups and providing inputs on credit (Wienco, n.d.).

As part of Wienco's commitment to improving productivity of smallholder farmers in Ghana, input packages are given to organized groups of Farmers in the form of credit facilities such as fertilizers and agrochemicals whereby repayment from the farmer groups is done after the harvest of their crops. This in effect goes a long way to help farmers who may not be financially

sound to have access to the needed inputs. This has led to the establishment of two major innovations in Ghana's Agriculture in recent times, namely: Cocoa Abrabopa Association (for cocoa farmers) and Masara N'arziki (for maize farmers) (Wienco, 2017). Subsequently, the two Associations have become two key partners of Wienco.

Cocoa Abrabopa association was established to afford the chance to cocoa farmers to be able to purchase their farming inputs using the credit scheme introduced by their sponsors (Wienco) to improve livelihood of farmers through increased productivity of their cocoa farms (Wienco, 2017). The provision of various agricultural inputs from Wienco, by these partners is a way of increasing productivity of farmers and therefore incomes. The Cocoa Abrabopa Association operates from Dunkwa-On-Offin in the Central Region with thousands of members in all cocoa growing areas in Ghana (Wienco, 2017). In 2009 membership of about 14,000 cultivated 3, 8187 acres of cocoa and increased to a membership of over 17,000 farmers with a total cultivated area of 45, 681 acres in 2010 (Wienco, 2017). Abrabopa is continually increasing membership and cultivated land in Central region and the Ashanti region.

The Center for Agriculture and Rural Development (CARD) in Tamale, Northern Region is also involved in private extension in Ghana. CARD operates as a domestic NGO but with a private sector component that funds its activities. The center forms farmers into Farmer-Based Organizations (FBOs), conducts workshops on grain production, and provides cashless microcredit in the form of inputs and seeds. Farmers then repay this investment with grain, which a

CARD subsidiary wholesales and sells to fund the organization, refresh the lending fund, and pay salaries.

However, considerable challenges are still cited that limit the potential of the private sector to address the larger goals of improved yields and enhanced livelihoods to smallholder farmers in Ghana (Annan, 2012). There is the need therefore to identify alternative ways to complement the efforts of the government in delivering cocoa extension. The Ministry needs to encourage the LBCs to undertake cocoa extension. The proposed EDF fund provides some possible alternatives through strengthening the capacities of private service providers, particularly the local buying companies (MoFA, 2002).

Willingness of Cocoa Farmers to Pay for Extension

Dissemination of information on elite agricultural technologies is a key intervention for increased productivity hence improved livelihood. An effective extension system continuously needs to be updated and fine-tuned by new information derived from research that is relevant to farmers' needs (Picciotto & Anderson, 1997). For years, extension services have been provided by governments to farmers without due consideration whether the recipient really requires the information provided, resulting to ineffective and inefficient information dissemination routines (Swanson *et al*., 1997). By farmers demanding for extension services, it is anticipated that relevant information on technologies will reach the desired target effectively and efficiently and will also result to increased utility, output and impact on poverty reduction (Kidd *et al*., 2000). Bernet *et al* (2001) suggested that, extension providers need income generating, potential improving and financially effective activities to attract them to the enterprise.

Over the past two decades, fundamental political, economic, and social changes have taken place in many developing countries as a result of liberalization, structural adjustment programs, and transition from centrally planned to market economies (IMF, 2008). Accordingly, agricultural research and extension services have been restructured to be provided either by the private sector or through improved public entities (Katz, 2002). The sustainability of the latter depends on resource availability, whereas provision by the private sector is very much a function of farmers' willingness to pay (Katz, 2002).

Agricultural research and extension systems in developing countries are confronted with the challenge of providing adequate educational and technical extension programs for all groups of farmers due to a significant decline of government expenditure in national budgets (Swanson & Samy, 2002). The international donor community has emphasized the importance of reorganizing the provision of agricultural technologies in developing countries through restructuring national agricultural research and extension services, supporting the promotion of agricultural services for markets, and promoting consumer-oriented agribusiness and Agri-food systems (IMF, 2008). Strategies implemented to support such restructuring vary from country to country. On one hand, this restructuring reflects effective demand on the part of actors in the Agri-food system. On the other hand, it depends on a country's supply factors, such as the cost and efficiency of services provided by both the public and private sectors (Swanson & Samy, 2002).

The rationale for private provision of agricultural services in developing countries is often based on a cost-recovery approach, which critically depends

on two factors: (1) how the extension system (public and private) provides advisory services to farmers' satisfaction; and (2) the financial sustainability of such systems (Rivera & Zijp, 2002). However, more research is required to assess the effectiveness of the cost-recovery approach by evaluating how much farmers are willing to pay for selected technologies and advisory services (Chapman & Tripp 2003; McFeeters 2004).

Structural adjustment and commitment to market based agricultural development has reduced the direct role of the state in providing services (Stringfellow *et al*., 1997). This implies that farmers must be in position to contribute to the provision of extension services where government may not fully meet their needs. However, it is not clear if the farmers are willing to pay for the extension services, the amount they are willing to pay and factors that will affect the willingness to pay.

Willingness to pay (WTP) is a research approach that involves the targeted clients for potential services in establishing the preferences of the services proposed and the value the respondents are ready to pay (Mwaura *et al*., 2010). At the highest level, literature classifies the different methods for estimating WTP into revealed and stated preference methods (Bateman *et al*., 2002; Kjaer, 2005). Revealed preference methods (RP) refer to the observation of preferences revealed by actual market behaviour and represents real-world evidence on the choices that individuals exercise (Bateman *et al*., 2002). Moreover, RP data provides valuable information for modelling choice behaviour as the choices reflect decisions that have actually been made (Bateman *et al*., 2002; Kjaer, 2005). Revealed preferences methods include Random utility/discrete choice and Hedonic pricing. In some cases, the

behaviour that is of interest to the analyst may not be observable or currently available and therefore it may be necessary to make judgements about potential impacts in the absence of real-world evidence on how individual consumers may respond (Bateman *et al*., 2002). Stated preference (SP) methods allow examination of such hypothetical situations, which are generated by some systematic and planned design process (Louviere *et al*., 2000). Stated preference methods include Contingent valuation (Open-ended and Dichotomous choice methodologies) and Choice modelling techniques (Pair comparisons, Contingent rating, Contingent ranking and Discrete choice (stated choice) experiment).

WTP for a service is the maximum amount an individual would be willing to spend on goods or services rather than do without it (Farber *et al*., 2002). WTP studies are widely used in assessment of markets, goods, services by planners, entrepreneurs and for environmental valuation (Mwaura *et al*., 2010). In agriculture, WTP studies have been used to evaluate demand and cost curves for extension services delivery through commercial agents (Nambiro & Omiti, 2007). Demand for extension services can also be evaluated through establishing the willingness to pay for the services among farmers.

Willingness to pay for agricultural services is influenced by a number of paradigms including the innovation-diffusion model (Makokha, *et al* 1999), economic constraints model (Pitt & Sumodiningrat, 1991) and the adopter's perception model (Adesina & Baidu-Forson 1995). Innovation-diffusion model may include factors the respondent may have been exposed to in relation to the extension services being targeted including duration, regularity of service, quality of the service and the effectiveness of its delivery. Attitude and

confidence toward using precision agricultural technologies, perceptions of benefit, farm size and farmers educational levels positively influenced the intention to accept precision agriculture technologies (Adrian *et al*., 2005).

Economic models generally focus on two determinants of WTP; income and the use of the good in question. When individuals consider paying for improved extension quality, their choices and responses to valuation questions are constrained by their (disposable) income (Hoevenagel, 1994). Accordingly, income should correlate to the amount of money respondents are willing to spend in order to obtain public goods, to have better service quality or to avert deterioration of public goods. Therefore, income is regularly included in stated preference surveys and is expected to have a positive effect on WTP (Carson, Flores, & Meade, 2001).

Whether people actually use the public good in question is another determinant closely related to the economic concept of value. Access to the particular public good by an individual causes the good to be of instrumental value to the user (Carson *et al*., 2001). People use goods because it increases their well-being. Therefore, there is a direct behavioral link between the use of a good and the individual's well-being (Ravald & Grönroos, 1996). This link is expressed by the concept of "use values." If an individual does not use the good in question, the only link between the good and the individual's well-being is the "knowledge" the individual has about the good and thus only considers the good to exist; an expression of "non-use value" of the individual. As the non-use value is expected to be weaker than a link based on direct use, it is assumed that users are willing to pay more than nonusers (Carson *et al*., 2001). This means that farmers who had access to extension service are most likely to be

willing to pay for the service than those who did not have access to extension service delivery.

Many economic studies report that the variables which affect farmers' access to information, and hence their perception formation (e.g. extension, education, media exposure, etc.), are typically used in economic models of the determinants of adoption decisions (Feder *et al*., 1985; Shakya & Flinn, 1985; Kebede *et al*., 1990; Poison and Spencer, 1991; Strauss *et al*., 1991). Economists investigating consumer demand have, however, accumulated considerable evidence showing that consumers generally have subjective preferences for characteristics of products and that their demand for products is significantly affected by their perceptions of the product's attributes (Jones, 1989; Lin & Milon, 1993). Lin and Milon (1993) using a double-hurdle model, found that commodity attributes and consumers' safety perceptions were significant in explaining decisions to consume and the frequency of consumption of shellfish in the USA. Similarly, Jones (1989) found, using Cragg's double-hurdle framework, that consumers' subjective perceptions influenced cigarette smoking decisions. In their study, Adesina and Zinnah (1993a) found that farmers' perceptions of the characteristics of modern rice varieties significantly affected adoption decisions in Sierra Leone. These studies therefore assert that the perception of a farmer on an intervention or service influences his/her decisions on the service or intervention. This reveals that assess to education, extension and media information has the ability to influence a farmers' willingness to pay or unwillingness to pay decision based on his/her perception of the extension service rendered.

Consumer Preference Models

There are many models that exist to estimate consumer preferences; multinomial logit model, conditional logit model, unconditional logit model, marginal logistic models and other mixed models but for the purpose of this study, this research limited itself to the review of the multinomial and conditional logit models.

Multinomial logistic regression is used to predict categorical placement in or the probability of category membership on a dependent variable based on multiple independent variables. The independent variables can be either dichotomous (i.e., binary) or continuous (i.e., interval or ratio in scale). Multinomial logistic regression is an extension of the binary logistic regression that allows for more than two categories of the outcome variable. The multinomial logistic regression, like the binary logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership.

Multinomial logistic regression does necessitate careful consideration of the sample size and examination for outlying cases. Like other data analysis procedures, initial data analysis should be thorough and include careful univariate, bivariate, and multivariate assessment. Specifically, multicollinearity should be evaluated with simple correlations among the independent variables. Also, multivariate diagnostics (i.e. standard multiple regression) can be used to assess for multivariate outliers and for the exclusion of outliers or influential cases. Sample size guidelines for multinomial logistic regression indicate a minimum of 10 cases per independent variable (Schwab, 2002).

Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. A more powerful alternative to multinomial logistic regression is discriminant function analysis which requires that these assumptions are met.

Indeed, multinomial logistic regression is used more frequently than discriminant function analysis because the analysis does not have such assumptions. Multinomial logistic regression does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). The assumption of independence can be tested with the Hausman-McFadden test. Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated and effect sizes will be greatly exaggerated.

Variable selection or model specification methods for multinomial logistic regression are similar to those used with standard multiple regression; for example, sequential or nested logistic regression analysis. These methods are used when one dependent variable is used as criteria for placement or choice on subsequent dependent variables (i.e., a decision or flow-chart).

Conditional logistic regression (Breslow & Day, 1980; Vittinghoff, Shiboski, Glidden, & McCulloch, 2005) refers to applying the logistic model to each of the stata individually. The coefficients of the predictors (of the logistic model) are conditionally modeled based on the membership of cases to a particular stata. The conditional logit model is used with alternative-invariant

and alternative-variant regressors. The probability that observation i will choose alternative j is;

$$p_{ij} = p(y_i = j) = \frac{\exp(\dot{x}_{ij}\beta + \dot{\omega}_i y_j)}{\sum_{k=1}^{m} \exp(\dot{x}_{ik}\beta + \dot{\omega}_i y_k)}$$

Where x_{ij} are alternative-specific regressors and ω_i are case-specific regressors. The conditional logit model has (j-1) sets of coefficients (y_j) (with one set being normalized to zero) for the case-specific regressors and only one set of coefficients (β) for the alternative specific regressors.

The probabilities for choosing each alternative sum up to 1. Coefficients for the alternative-invariant regressors y_j (similar treatment as the multinomial logit model). One set of coefficients for the alternative-invariant regressors is normalized to zero ($y_1 = 0$,) this is the base outcome. The rest of coefficients are interpreted in relation to this base category.

There are (j-1) sets of coefficients (corresponding to the number of alternatives minus 1 for the base). Coefficient interpretation for alternative j: in comparison to the base alternative, an increase in the independent variable makes the selection of alternative j more or less likely. Coefficients for the alternative-specific regressors (β). No normalization is needed. One set of coefficients across all alternatives. Coefficient interpretation: an increase in the price of one alternative decreases the probability of choosing that alternative and increases the probability of choosing other alternatives.

The marginal effect of an increase of a regressor on the probability of selecting alternative j is:

$$\partial p_{ij} / \partial x_{ik} = p_{ij}(\delta_{ijk} - p_{ik})\beta$$

where $\delta_{ijk} = 1$ if j=k and 0 otherwise.

There are *j* sets of marginal effects for both the alternative-specific and case-specific regressors. For each alternative-specific variable x_{ij}, there are *j*x*j* sets of marginal effects. The marginal effects of each variable on the different alternatives sum up to zero. Marginal effects interpretation; each unit increase in the independent variable increases the probability of selecting the *k*th alternative and decreases the probability of the other alternatives, by the marginal effect expressed as a percent.

Stated Preference Methodologies

When determining preferences for goods, different consumer preference approaches exist. The two main approaches widely used in valuation of both market and non-market goods are revealed preference and stated preference approaches (Bateman *et al*., 2002).

The approach used in valuation of goods in different hypothetical scenarios is the stated preference approach (MacKerron *et al*., 2009). This approach is predominant in assessments involving different social policy issues (Carson *et al*., 2001) and also valuation of environmental situations (Hanley *et al*., 2001; Birol *et al*., 2006). The stated preference methods express directly individuals' preferences for a simulated real-life choice situation (Bateman *et al*., 2002). The revealed methods, however, encompass data on actual observed consumer and market behavior (Kjaer, 2005).

Many economists question the accuracy of individuals' responses and the validity of results in stated preference methods because the scenarious are hypothetical in nature (Bateman *et al*., 2002; Kjaer, 2005). This was highlighted further in a research by Kemp *et al*., (2010) where there was a clear bias in the

stated behaviour of the consumers in comparison to the real purchase behavior as identified in the revealed preference section of the research.

A good survey design could help address this anomaly. It is true that in a choice experiment, the responses and results can be significantly influenced by the number of choice sets presented to the respondents (Hanley *et al*., 2001). Modelling is also important in this regard; a choice experiment or a ranking model could influence the results or output. Therefore, to ensure validity of results, it is prudent to compare estimates in willingness to pay studies with actual behaviour observed in other studies (Brown, 2003b). It is however important that the object of the study be available in the market place to form a basis for the comparison.

The use of both stated and revealed preference methods can be beneficial in consumer studies. The bias of the stated preference could be corrected by the revealed preference method whiles the flexibility of the stated preference approach could augment the limitations of the revealed approach as is postulated by the study of Adamowicz *et al*., (1998).

Studies that contradict the findings of Kemp *et al*., (2010) exist. For example, Kemp *et al*., (2010) in their study reported that the preferences stated by consumers were direct impressions of their actual observed market behaviour contrary to the findings of Maria (2006) who found a divergence of consumers' preferences from actual purchasing behaviour. Non-hypothetical scenarios have been found in studies like Chang *et al*. (2009) to give better estimates of real behaviour than hypothetical settings. Nevertheless, Brown (2003b) concluded that, stated preference studies offer a limit to choice sets available for an

individual and also the ability to examine and describe new products; a possibility not achievable in the observed preference methods.

The stated preference methods can further be classified under direct and indirect methods. The direct method includes techniques that offer estimates of monetary value. The indirect methods however only indicate consumer preferences. This is done using techniques such as ranking, rating and choice. It is out of these that the monetary valuations can be derived by further steps in the analysis (Brown 2003b). The stated preference methods have been classified into paired comparison, contingent valuation and attribute-based methods. Further classification that is in line with the categorization of Holmes and Adamowicz's (2003) include contingent ranking, contingent rating methods and choice experiment. The header of choice modelling techniques was however used by Hanley *et al*., (2001) and Bateman *et al*., (2002) to encompass the contingent ranking, contingent rating, paired comparison and choice experiment.

The combination of the direct and the indirect methods led to the categorization presented in Figure 1 which was adapted for this study from Bateman *et al*., (2002); where the stated preference approaches are distinguished into choice modelling (CM) and contingent valuation (CV) methods.

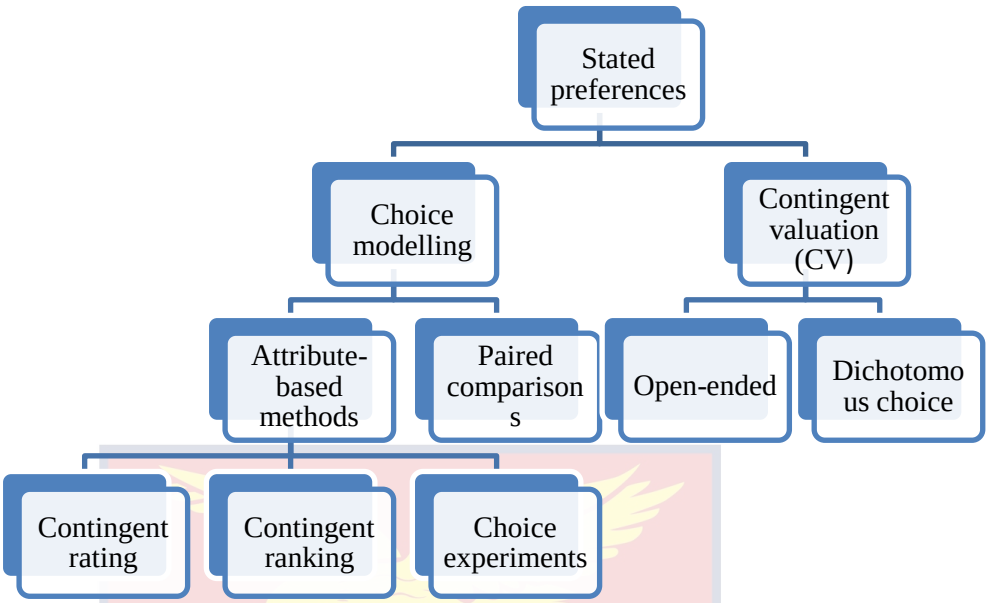


Figure 1: Stated Preference methodologies
Source: adapted from Bateman *et al*., (2002)

The primary target of a researcher using contingent valuation methods is to derive monetary valuations for a good of interest, whereas the objective of choice modelling methods seeks to either provide monetary estimations or preference order results according to Brown (2003b). In open-ended contingent valuation, the respondents are asked to directly declare their minimum willingness to accept or maximum willingness to pay for a change in their utility as opposed to their current situation (Hanley *et al*., 2001). This is not so in dichotomous-choice contingent valuation; where respondents are instead required to choose whether they would agree or reject a fixed price for a particular good (MacKerron *et al*., 2009).

The work of Hanley *et al*. (2001) has suggested that open-ended as well as dichotomous contingent valuation approaches significantly lead to different outcomes. This could be an indication that the respondents were tempted to take

"the easy road" option and consequently agreed to paying values suggested to them, even though on a personal level, they would have opted to pay lower values than suggested. Conversely, the open-ended contingent valuation method has been particularly found to give respondents a cognitive burden as they would have to go through the rigidity of providing their own answers to all questions. Neither of the two methods according to Hanley *et al*. (2001) conforms well to multi-faceted changes in the products of interest.

Choice modelling (or conjoint analysis) procedures partially address the afore-mentioned challenges. In a paired comparison, the respondent is required to choose the preferred product from two available options (Brown, 2003b), meanwhile, the attribute-based techniques model target group preferences for similar products that appear to differ in the levels of their common characteristics: they permit for the estimation of the preference order of the characteristics as well as utility computations such as the willingness to pay for various types of products. The last-mentioned is made possible by adding a price attribute to the attributes of the product of interest and estimation of the random utility function (Hanley *et al*., 2001; Brown, 2003b; Holmes & Adamowicz, 2003).

Attribute-Based Methods and the Choice Experiment

The attribute-based approaches could either be binary or multinomial; this means that respondents could be required to select between, rate or rank two or more items. The choice experiment particularly can be used in survey studies. Nonetheless, it can appropriately fit in field experiments as well as in laboratory settings.

A choice experiment comprises a number of choice sets with two or multiple alternative products that are presented to the respondent. The substitutes are mostly products that vary in the degree of their characteristics. For example, with regard to extension in this research; price, farm visit and access to farm advisory services could differ. A respondent is then requested to choose one of the substitute products or a plausible no-choice option. The no-choice option presents the customer with the freedom to choose not to buy any of the products introduced in the choice set which enhances the authenticity of the choice setting. In this regard, the customers are not forcefully made to choose any of the available options (Hanley *et al*., 2001; Vermeulen *et al*., 2008).

The afore-mentioned permits choice experiments to be in consonance with utility maximization theory, as well as the value measures and parameter estimates to conform to demand theory (Birol & Rayn, 2008). An individual respondent is presented with several choice sets detailing different combinations of non-identical alternatives. The choices decided on among the alternatives show respondents' relative inferred proclivity for those specific attributes in line with random utility theory. The mental burden confronting the individual as stated in Hanley *et al*. (2001), is the primary pitfall of attribute-based techniques, which is an indication of a possible rise in the stochastic error terms compared to contingent valuation. The elicitation of willingness to pay proves to be more challenging if the good being estimated is complex and foreign to the respective individual (Brown, 2003b). In such scenarios, learning effects, respondent fatigue and the use of rules of thumb in the responses could arise.

Complex choice options could also incite the choice of pleasing other than utility-maximizing options (Hanley *et al*., 2001). The challenge of hypothetical bias can be observed as being insignificant for choice experiments than CV methods (Bateman *et al*., 2002). Few studies have actually put this phenomenon to test, and so, Hanley *et al*., (2001) stated that the assertion can hardly be made; at least not absolutely. MacKerron *et al*. (2009) stated that, hypothetical prejudice also often arises when respondents are less knowledgeable or in cases where the monetary estimations are huge instead of small.

The respondents meanwhile could also answer tactically, which could result in a bias in the resulting coefficients (Brown, 2003b). As a result, they might in these circumstances try to inspire popular policies through the study; although, in actual fact, they might not be ready to pay such sums for goods aimed towards improved extension. Similarly, some respondents would attempt to respond in conformity with socially accepted behaviour and norms, and in such a manner divert their answers from their innate preferences.

The benefits of attribute-based methods and choice experiments comprises the possibility of obtaining an estimation for each attribute level as well as presenting a number of options to the respondent at the same time, so that the choice scenario is a replica of the one individuals face in real purchase scenarios (MacKerron *et al*., 2009). As attribute-based techniques are multi-faceted in that several attribute levels may be altered simultaneously, this produces a better all-encompassing list of preferences than CV techniques (Holmes & Adamowicz, 2003).

Moreover, because choice modelling techniques do not absolutely require monetary valuations and the willingness to pay estimates from respondents but are derived indirectly, a number of the problems of CV may be reduced. This could make the assignment easier for the respondents to comprehend (Bateman *et al*., 2002). Also, chances of taking "the easy way out" approach by readily accepting the option provided may be reduced (Hanley *et al*., 2001); and in so doing, drastically reducing the occurrence of hypothetical bias.

This research piece fundamentally adopts a Choice Modeling Approach used in assessing non-market products through obtaining people's stated preferences for discrete options in a hypothetical scenario. In this research, it was adopted to evaluate improved extension service attributes. As a stated preference technique, it is possible to derive respondents' preferences for a newer and better extension service that has qualities that do not currently exist in the extension service provision setting. A major contribution of this technique to this study is that, it can enable the researcher identify the specific attributes that are appreciated more by farmers as important components of an extension service setting.

Determinants of Farmers' Willingness to Pay

According to Aryal *et al*. (2009), farmers' willingness to pay for a given agricultural service is a function of knowledge, attitude and intention. As pointed out by Holden and Shiferaw (2002), estimation of WTP at the household level has both theoretical and empirical implications, because farm investment decisions depend on consumption as well as production parameters. Indeed,

market imperfections lead to non-separability between consumption and production decisions (Singh *et al*., 1986; De Janvry *et al*., 1991).

Most current strategies for economic development in Africa give increasing attention to the need for significant improvements in agricultural productivity in order to achieve GDP growth, food security, and poverty reduction goals (that is, the Millennium Development Goals and the New Partnership for Africa's Development). Much of the research on African agriculture demonstrates that farmers' failure to intensify agricultural production is a key component of inefficiency and lower productivity (Crawford *et al*., 2006).

Jayne *et al*. (2003) for example, reported that the high overall costs of supplying free fertilizer compared with farmers' willingness to pay (WTP) limits the size of the market and the use of fertilizer. Horna *et al*., (2005) interpreted the situation as being a result of inefficiencies in resource allocation that occurs when a service, such as extension, is provided free to farmers who might be able or willing to contribute in order to obtain appropriate services. Consequently, it is important to know how much farmers and consumers are willing to pay for agricultural extension service and what the determinants of households' WTP are in order to develop appropriate farmer friendly strategies.

Holloway and Ehui (2001), for example, looked at the impacts of extension on participation of dairy producers in Ethiopia's milk market and the amount that households would be willing to pay for the extension service. Based on the WTP estimates and the per-unit cost estimates of the extension visit, the authors found that privatization of extension services is a possibility in the context of milk market development. Asrat, Belay, and Hamito (2004)

examined the determinants of farmers' WTP for soil conservation practices in Ethiopia's southeastern highlands and reported that the majority of the farmers in the study area were less willing to pay cash. However, the farmers were willing to spend substantial amounts of labor and time on soil conservation.

Stoneman and Karshenas (1993) argued that economies of scale should be used as a criterion to decide whether to invest in new technology. They found that the decision to adopt new technologies came sooner for larger farms. However, farm size may not be as important for improved varieties of crop as it is for other technologies. Seed can be bought in small lots, and the initial investment required to try the seed is not large. Thus, there may be a higher propensity to adopt a new crop, even by smaller farms, than there is to adopt a new technology that requires a large capital outlay (McCorkle, 2007). Similarly, results from Asrat, Belay & Hamito (2004) on the determinants of farmers' WTP for soil conservation practices in the southeastern highlands of Ethiopia show that the size of non-crop land affects farmers' WTP negatively and significantly. This result is attributable to the fact that the economic impact of soil erosion on non-crop land is less than it is on crop land. Therefore, as more and more land is taken out of cultivation, farmers' desire to participate in soil conservation practices declines.

Similarly, tenure insecurity could be a reason for farm households to have low WTP (Holden & Shiferaw 2002). This hypothesis is supported by Asrat, Belay & Hamito (2004), who found that the size of rented-in farmland was found to have a negative and significant effect on farmers' WTP for soil conservation measures. The possible explanation is that in most cases, land renting contracts are short term, which may not encourage farmers who rent-in

land to undertake practices and investments in the land, because these investments pay back only in the long term.

A study that looked at irrigation adoption found that small farmers with more profit per unit of land than average were more likely to contribute to irrigation (Koundouri, Nauges & Tzouvelekas, 2006). This could be because the use of irrigation equipment is labor intensive and time consuming, so it is more appropriate for small farmers' intensive operations.

Another factor expected to have an influence on farmers' WTP for agricultural technologies is education. A higher level of education is expected to increase farmers' ability to get, process, and use information. Thus, education is hypothesized to have a positive role in the decision to pay for new agricultural innovations. This positive effect was found in several studies on farmers' WTP for sustained land productivity technologies in Ethiopia (Holden & Shiferaw 2002; Asrat, Belay, & Hamito 2004); extension visitation or other extension services in Uganda, Ethiopia, and Nigeria (Faye & Deininger 2005; Holloway & Ehui 2001; Oladele 2008); and input investment in Ethiopia, Kenya, Zambia, Madagascar, and Nigeria (Jayne *et al*. 2003; Minten, Randrianarisoa, & Barrett 2007).

Farm and non-farm income are also expected to have an impact on farmers' decision to invest in agricultural technologies. Non-farm income is expected to have a positive influence, given the assumption that diversification out of agriculture would enable households to earn income, thereby easing the liquidity constraint needed for new technology investments (Pender and Kerr 1998; Holden & Shiferaw 2002). On the other hand, poverty reduces a household's willingness and ability to invest in agricultural technologies

(Holden & Shiferaw 2002). Empirical studies have reported positive relationships between income and adoption of agricultural technologies (Ervin & Ervin 1982; Clay, Reardon & Kangasniemi, 1998; Holden & Shiferaw 2002; Faye & Deininger 2005).

With respect to family size, one can expect a larger family to have a higher probability of possible future benefits from new technology investments. Results from aforementioned studies indicate that households with more human capital are more likely to adopt new technologies that require more labor (Ulimwengu & Sanyal, 2011).

The impact of a farmer's age can be considered a combination of the effect of farming experience and planning horizon. Although longer experience has a positive effect, young farmers may have longer planning horizons and, hence, may be more likely to invest in agricultural technologies (Asrat, Belay & Hamito 2004; Faye & Deininger 2005; Holden & Shiferaw 2002).

The awareness level of the particular agricultural programme is hypothesized to have a positive effect on willingness to participate in agricultural programmes (Pender & Kerr 1998). Asrat, Belay & Hamito (2004) found that farmers who were aware of the available options for agricultural technology were more receptive to paying for these technologies.

The Service Quality Concept

The services industry plays a major role in driving the economy of any country as it involves both the private and public sectors in service provision (Wisniewski, 2001). The role of the public sector in the delivery of services is even more essential in developing countries like Ghana as majority of the services sector is controlled by the public sector.

Customer needs and expectations are changing when it comes to governmental services and their quality requirements as the customers get more exposed to service provision from the private sector and also as the customers' preferences change. The challenges associated with public sector services delivery is emphasized by Gowan *et al*., (2001) when they posited that, service provision is more complex in the public sector because it is not simply a matter of meeting expressed needs but of finding out unexpressed needs, setting priorities, allocating resources and publicly justifying and accounting for what has been done.

Public sector organizations have come under increasing pressure to deliver quality services (Randall & Senior, 1994) and improved efficiencies (Robinson & Robinson, 2003). It should be noted once again that service quality in most public sector organizations is to say the least unsatisfactory. According to Teicher *et al* (2002), service quality practices in public sector organizations is slow and is further exacerbated by difficulties in measuring outcomes, greater scrutiny from the public and press, a lack of freedom to account in an arbitrary fashion and requirement for decisions to be based on law. From the viewpoint of Gowan *et al* and Teicher *et al*, public sector organizations are inherently constrained in the delivery of quality services and this is further made worse by beaureaucratic systems, structures and processes which by all intents and purposes are meant to ensure accountability, transparency and efficiency.

Service quality is a concept that has aroused considerable interest and debate in research literature because of the difficulties in both defining it and measuring it with no overall consensus emerging on either (Wisniewski, 2001). There are a number of different "definitions" as to what is meant by service

quality. One that is commonly used defines service quality as the extent to which a service meets customers' needs or expectations (Lewis & Mitchell, 1990; Dotchin & Oakland, 1994a; Asubonteng *et al*., 1996; Wisniewski & Donnelly, 1996). Service quality is thus the difference between customer expectations of service and perceived service (Parasuraman *et al*., 1985). If expectations are greater than performance, then perceived quality is less than satisfactory and hence customer dissatisfaction occurs (Parasuraman *et al*., 1985; Lewis & Mitchell, 1990).

Always there exists an important question: why should service quality be measured? Measurement allows for comparison before and after changes, for the location of quality related problems and for the establishment of clear standards for service delivery. Edvardsen *et al*., (1994) stated that, in their experience, the starting point in developing quality in services is analysis and measurement.

While there have been efforts to study service quality, there has been no general agreement on the measurement of the concept. The majority of the work to date has attempted to use the SERVQUAL (Parasuraman *et al*., 1985; 1988) methodology in an effort to measure service quality (e.g. Brooks *et al*., 1999; Chaston, 1994; Edvardsson *et al*., 1997; Lings and Brooks, 1998; Reynoso and Moore, 1995; Young and Varble, 1997; Sahney *et al*., 2004).

Interest in the measurement of service quality is thus understandably high and the delivery of higher levels of service quality is the strategy that is increasingly being offered as a key to service provider's efforts to position themselves more effectively in the marketplace (cf. Brown and Swartz, 1989; Parasuraman, Zeithaml and Berry, 1988; Rudie and Wansley, 1985; Thompson,

Desouza & Gale, 1985). Despite its importance, the concept of service quality according to researchers seem to be an elusive and abstract construct that is difficult to define and measure (Brown and Swartz 1989; Carman 1990; Crosby 1979; Garvin 1983; Parasuraman, Zeithaml & Berry 1985, 1988; Rathmell 1966).

The conceptualization and measurement of the service quality construct has been dominated by the use of the SERVQUAL scale introduced by Parasuraman *et al*. (1988). Their measurement of service quality proposes a gap-based comparison of the expectations and performance perceptions of consumers. This measurement paradigm is similar to the disconfirmation model traditionally used to assess consumer satisfaction (Cronin & Taylor, 1992, 1994; Parasuraman *et al*., 1994). This suggests that the difference between consumers' expectations about the performance of a general class of service providers and their assessment of the actual performance of a specific firm within that class drives the perception of service quality. Few empirical evidence supports the relevance of the expectations-performance gap as the basis for measuring service quality (Carman 1990) but considerable literature adhere to the superiority of simple performance-based measures of service quality (cf. Bolton & Drew 1991 a,b; Churchill & Surprenant 1982; Mazis, Ahtola, & Klippel 1975; Woodruff, Cadotte & Jenkins 1983).

Cronin and Taylor (1992) were the first to offer a theoretical justification for discarding the expectations portion of SERVQUAL in favor of just the performance measures included in the scale (i.e., what they termed SERVPERF). The term ‘‘performance-only measures’’ has thus come to refer to service quality measures that are based only on consumers' perceptions of

the performance of a service provider, as opposed to the difference (or gap) between the consumers' performance perceptions and their performance expectations.

Service quality has been described as a form of attitude, related but not equivalent to satisfaction that results from the comparison of expectations with performance (Bolton & Drew 1991a; Parasuraman, Zeithaml, & Berry 1988). Though researchers admit that the current measurement of consumers' perceptions of service quality closely conforms to the disconfirmation paradigm (Bitner 1990; Bolton & Drew 1991a), they also suggest that service quality and satisfaction are distinct constructs (Bitner 1990; Bolton & Drew, 1991a, b; Parasuraman, Zeithaml, & Berry 1988). The most common explanation of the difference between the two is that perceived service quality is a form of attitude, a long- run overall evaluation, whereas satisfaction is a transaction-specific measure (Bitner 1990; Bolton & Drew 1991a; Parasuraman, Zeithaml & Berry 1988).

Parasuraman, Zeithaml and Berry (1988) further suggest that the difference lies in the way disconfirmation is operationalized. They state that in measuring perceived service quality, the level of comparison is what a consumer should expect, whereas in measures of satisfaction the appropriate comparison is what a consumer would expect. However, such a differentiation appears to be inconsistent with Woodruff, Cadotte and Jenkins' (1983) suggestion that expectations should be based on experience norms- what consumers should expect from a given service provider given their experience with that specific type of service organization.

Parasuraman, Zeithaml, and Berry (1985, 1988) proposed initially that higher levels of perceived service quality resulted in increased consumer satisfaction but some evidence suggests that satisfaction is an antecedent of service quality (Bitner 1990; Bolton & Drew 1991a). Bolton and Drew (1991a) in a further study posited that service quality was analogous to an attitude and that service quality was a function of consumers' residual perception of the service's quality from a prior period and the customer's level of (dis)satisfaction with the current level of service performance. This suggests that satisfaction is a distinct construct that mediates prior perceptions of service quality to form the current perception of service quality. Bolton and Drew (1991a) indicate that this relation implies that the disconfirmation process, expectations and performance all should have a significant impact on consumers' current perceptions of service quality. Their results however indicated that perceived service quality is strongly affected by current performance and that the impact of disconfirmation is relatively weak and transitory.

Service Quality, Consumer Satisfaction and Purchasing Decisions

A major challenge in literature is the apparent difficulty in drawing the line of delineation between perceived service quality and attitude. This is indicated in the description in literature of service quality as "similar in many ways to an attitude" (Parasuraman, Zeithaml, & Berry (1988, p.15). Researchers have attempted to differentiate service quality from consumer satisfaction even while using the disconfirmation format to measure perceptions of service quality (cf. Bitner 1990; Carman 1990; Gronroos 1990; Hart, Heskett & Sasser, 1990; Parasuraman, Zeithaml & Berry 1988; Parasuraman, Zeithaml & Berry

1990). However, this approach is not consistent with the differentiation expressed between these constructs in the satisfaction and attitude literatures.

Oliver (1980) suggests that attitude is initially a function of expectations and subsequently a function of the prior attitude and the present level of satisfaction with a product or service. Purchase intentions then are considered initially to be a function of an individual's attitude toward a product or service but subject to modification due to the mediating effect on prior attitude of the satisfaction inherent in subsequent usages. Oliver thus suggests that consumers form an attitude about a service provider on the basis of their prior expectations about the performance of the firm and this attitude affects their intentions to purchase from that organization. This attitude then is modified by the level of (dis)satisfaction experienced by the consumer during subsequent encounters with the firm. The revised attitude becomes the relevant input for determining a consumer's current purchase intentions.

For arguments supporting service quality as an attitude, Oliver (1980) suggests that

1. In the absence of prior experience with a service provider, expectations initially define the level of perceived service quality
2. Upon the first experience with the service provider, the disconfirmation process leads to a revision in the initial level of the perceived service quality
3. Subsequent experiences with the service provider will lead to further disconfirmation which again modifies the level of perceived service quality

4. The redefined level of perceived service quality similarly modifies a consumer's purchase intentions toward that service provider.

Oliver (1980) further suggests that service quality and consumer satisfaction are distinct constructs but are related in that, satisfaction mediates the effect of prior-period perceptions of service quality to cause a revised service quality perception to be formed. Satisfaction thus rapidly becomes part of the revised perception of service quality. This logic is consistent with Bolton and Drew's (1991a) findings and also calls into question the use of the disconfirmation framework as the primary measure of service quality because disconfirmation appears only to mediate and not define consumers' perceptions of service quality and therefore lead to a purchase decision. Mazis *et al* (1975) suggested that the "adequacy-importance" form is the most efficient model to use if the objective is to predict behavioural intention or actual behavior. In the model, an individual's attitude is defined by the customer's importance-weighted evaluation of the performance of the specific dimensions of a product or service (Cohen, Fishbein & Ahtola, 1972). However experimental evidence suggests that the performance dimension alone predicts behavioral intentions and behavior at least as well as the complete model (Mazis, Ahtola & Klippel; 1975).

A study by Churchill and Surprenant (1982) also partially supports the efficacy of using only performance perceptions to measure service quality. They concluded that using the adequacy-importance model, the assimilation-contrast theory suggests that consumers may raise or lower their performance beliefs on the basis of how closely perceived performance approximates expected performance.

Measuring Service Quality

Akma Mohd Salleh *et al*., (2010) pointed out that measuring service quality is of greater importance in service organizations such as an agricultural extension organization, which has to be concerned with the quality of its services. That is because of the vital role of agricultural extension in the development of agriculture, rural poverty alleviation and enhancing food security. Besides that, the quality of agricultural extension services is one of the most important indicators of agricultural extension as a whole.

However, as Robinson (1999) concludes: "It is apparent that there is little consensus of opinion and much disagreement about how to measure service quality". The service quality measurement model that has been extensively applied is the SERVQUAL model developed by Parasuraman *et al*., (1985, 1986, 1988, 1991, 1994; Zeithaml *et al*., 1990). SERVQUAL as the most often used approach for measuring service quality has been to compare customers' expectations before a service encounter and their perceptions of the actual service delivered (Gronroos, 1982; Lewis & Booms, 1983; Parasuraman *et al*., 1985). The SERVQUAL instrument has been the predominant method used to measure consumers' perceptions of service quality.

The current measurement of perceived service quality can be traced to the research of Parasuraman, Zeithaml and Berry (1988). These authors originally identified 10 determinants of service quality based on a series of focused group sessions. They developed SERVQUAL in 1988, which recasts the 10 determinants into five specific components; tangibles, reliability, responsiveness, assurance and empathy as follows (van Iwaarden *et al*., 2003):

1. Tangibles: Physical facilities, equipment and appearance of personnel.

2. Reliability: Ability to perform the promised service dependably and accurately.
3. Responsiveness: Willingness to help customers and provide prompt service.
4. Assurance (including competence, courtesy, credibility and security): Knowledge and courtesy of employees and their ability to inspire trust and confidence.
5. Empathy (including access, communication, understanding the customer): Caring and individualized attention that the firm provides to its customers.

Based on their conceptualization of service quality, the original instrument was made up of 22-items. The data on these items were grouped under the five dimensions (Nyeck *et al*, 2002).

A lot of studies have been undertaken using the SERVQUAL because of its generic service applicability. It has been used in hospitals (Babakus & Mangold, 1992); hotels (Saleh & Rylan, 1992); travel and tourism (Fick & Ritchie, 1991; Armoo, 2000) a telecommunications company, two insurance companies and two banks (Parasuraman *et al*., 1991).

In this study, the researcher incorporates a slightly modified SERVQUAL instrument in a comprehensive questionnaire in exploring the relationship between service quality and the impact on client satisfaction in a public sector organization which offers free services and its influence on the willingness to pay for the service when provided by a private sector organization.

Model of Service Quality Gaps

There are seven major gaps in the service quality concept. The model is an extension of Parasuraman *et al*., (1985). According to the following explanation (ASI Quality Systems, 1992; Curry, 1999; Luk & Layton, 2002), the three important gaps, which are more associated with the external customers are Gap1, Gap 5 and Gap 6; since they have a direct relationship with customers.

1. **Gap 1: Customers' expectations versus management perceptions:** as a result of the lack of a marketing research orientation, inadequate upward communication and too many layers of management.
2. **Gap 2: Management perceptions versus service specifications:** as a result of inadequate commitment to service quality, a perception of unfeasibility, inadequate task standardisation and an absence of goal setting.
3. **Gap 3: Service specifications versus service delivery:** as a result of role ambiguity and conflict, poor employee-job fit and poor technology-job fit, inappropriate supervisory control systems, lack of perceived control and lack of teamwork.
4. **Gap 4: Service delivery versus external communication:** as a result of inadequate horizontal communications and propensity to over-promise.
5. **Gap 5: The discrepancy between customer expectations and their perceptions of the service delivered:** as a result of the influences exerted from the customer side and the shortfalls (gaps) on the part of the service provider. In this case, customer expectations are influenced

by the extent of personal needs, word of mouth recommendation and past service experiences.

6. **Gap 6: The discrepancy between customer expectations and employees' perceptions:** as a result of the differences in the understanding of customer expectations by front-line service providers.
7. **Gap 7: The discrepancy between employee's perceptions and management perceptions:** as a result of the differences in the understanding of customer expectations between managers and service providers.

The Perception Minus Expectation Gap Theory

Even though there exist many models of measuring service quality gaps, this study chose to adopt the perception minus expectation gap theory. Among the different definitions of service quality that measure the external perspective, the perception minus expectation gap theory given by Parasuraman et al., (PZB) (1985) seems particularly useful (Sachdev & Verma, 2004). It has been widely adopted by researchers examining service quality issues. They (PZB) define service quality in this context as the degree and direction of discrepancy between consumers' perceptions and expectations in terms of different but relatively important dimensions of service quality, which can affect their future behavior. Its measurement describes a continuum ranging from ideal quality to totally unacceptable quality with some point along the continuum representing satisfactory quality.

According to them (PZB), the position of a customer's perception of service quality on the continuum depends on the nature of the discrepancy between the expected service and service perceived by the client (Parasuraman

et al., 1985). When the expected is more than the actual, service quality is less than satisfactory. It will move towards totally unacceptable quality as the negative discrepancy between expected and perceived services increases. When expected is less than perceived, perceived service quality is more than satisfactory and will tend towards ideal quality with increased positive discrepancy between expected and perceived service. In the situation where expected is equal to perceived, service quality is satisfactory.

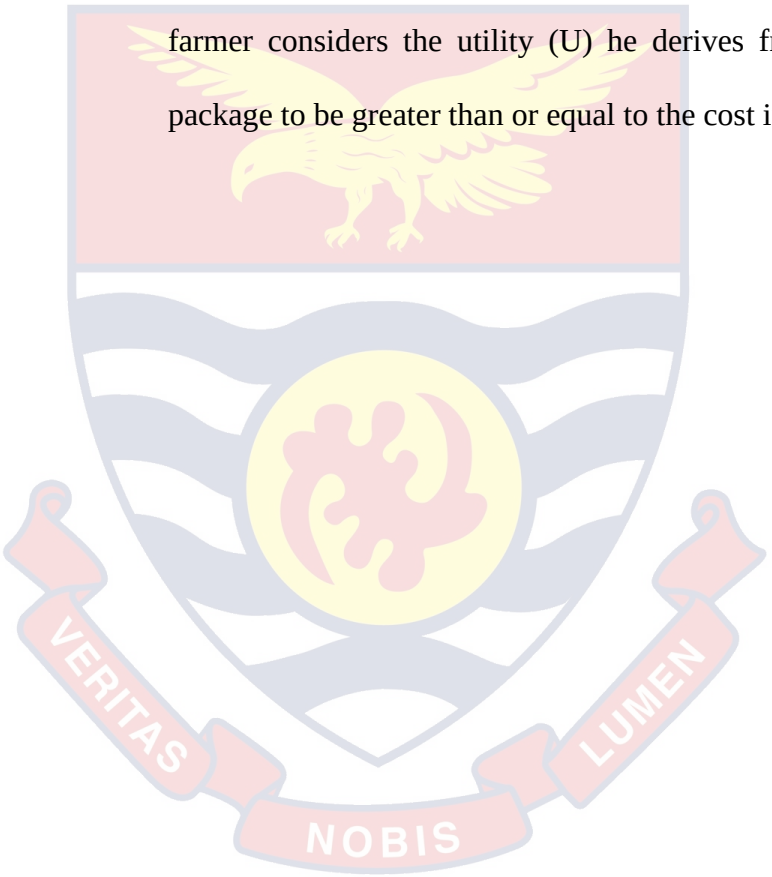
Conceptual Framework

A conceptual framework of the willingness to pay for private extension service delivery is presented in Figure 2.

Cocoa farmers in the study were faced with the decision to choose and pay for improved extension, or otherwise continue receiving inadequate extension service delivery from the already existent extension service. It can be deduced that the improved extension seeks to offer better extension service delivery at a fee. The probability of farmers choosing the improved extension is dependent on the attributes of the extension package they seek to provide which should be desirable to the farmers. Farmers on the other hand have experienced the already existent extension service. It must be noted that the probability of a farmer choosing a paid extension service over a free service would depend more or less on the state of the existing extension delivery, the quality of the extension service rendered to them, the constraints they face and the package of extension attributes delivered to them.

Assuming the two extension options are presented to a farmer, the following analysis can be made:

1. If a farmer chooses the improved extension service, then there is likelihood of the service having more of the farmer's desired attributes in the package.
2. If a farmer chooses the improved extension, then there is likelihood of dissatisfaction with the quality of service of the existing extension service delivery.
3. If a farmer accepts the improved extension service then the farmer considers the utility (U) he derives from the service package to be greater than or equal to the cost incurred.



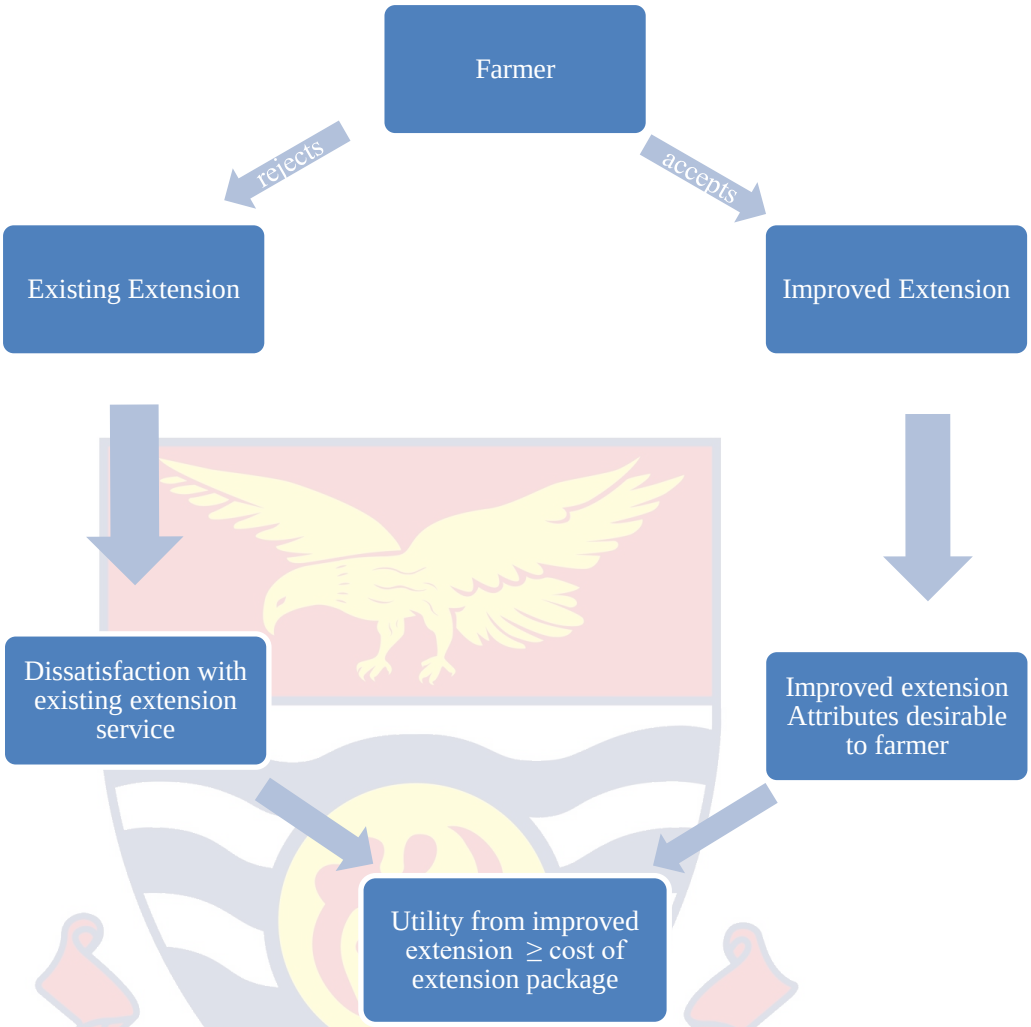


Figure 2: Conceptual framework of the study

Source: Author's construct

Analytical Framework

The various analytical basis of the specific objectives have been summarized in table 2.

Table 2 Analytical Framework of the Study

Variable	Definition	How Measured	Apriori sign
Service Quality	To examine the quality of extension service provided by the government extension service in the study area	Gap Analysis using SERVQUAL model; Positive gap denotes farmer satisfaction with service provided Negative gap connotes farmer dissatisfaction with extension service provided	-
Determinants of Quality of extension service provision	To examine factors affecting quality of Agricultural extension service provision	Multivariate OLS model	+
Improved extension service attributes	To define farmers' preferred attributes of an improved extension service system	Choice Experiment	+
Choice of improved extension service delivery	To elicit farmers choice of an improved extension service delivery and their marginal willingness to pay	Conditional logit model	+
Determinants of farmers' choice	To examine the factors that influence farmers' choice of an improved extension service system over the government extension service	Standard logit model	+
Constraints to extension service delivery	To evaluate farmers' perceived constraints to extension service delivery in the study area	Kendall's rank test	-

Source: Author's contruct, Twum (2018)

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter discusses the framework for data collection based on the research design, the population for the study as well as data collection, processing and analysis.

Research Design

This research used the cross-sectional survey design to explore and explain the conditions that influenced the willingness to pay by cocoa farmers in Agona East District when given the opportunity to access improved extension service delivery. A survey work describes one in which the researcher goes in to investigate a phenomenon using data collection tools. This design was adopted because it enables the researcher to go into the descriptive and exploratory details of the research and also allows a direct contact between the researcher and the respondent (Sebu, 2012). It is also a means of obtaining detailed and accurate information from the target group.

Study Area

The study was conducted in Agona East District. Agona East District is situated in the eastern corner of the Central Region within latitudes 5030" and 5050" N and between longitudes 0035" and 0055" W.

A very high proportion of households in the district are engaged in Agricultural activities (69.9%) with 61.6 percent of this proportion in the rural areas and 8.3 percent in the urban areas. The proportion of agricultural

households engaged in crop farming is 67.8 percent. The major crops grown are food crops (cassava, plantain, maize) and cash crops (cocoa, oil palm) (Ghana statistical service, 2014).

The Agona East District's Estimated Population now stands at 85,920 with about 21,021 households and a household size of 4. Female slightly dominating at an estimated population of 44,885 while the male population was estimated at 41,035 (source: 2010 population census). There are 134 communities in the district; 70 in Nsaba-Duakwa, 9 in Asafo, 42 in Kwanyako and 13 in Mankrong.

Figure 3: District map of Agona East

Source: Ghana Statistical Service, GIS

Population for the Study

The population specific to this study are cocoa farmers who engage in cocoa cultivation as their main source of livelihood. These farmers are assumed to have had access to extension service to be able to give substantial information based on their experience of the service rendered in the study area. The researcher limited the population to cocoa farmers in the Central Region and thus the Agona East district who fell within the broad definition of the study population. The population for the study was sourced from four communities around the District capital.

Sample Size Determination

A two-stage sampling technique was used in this study. Purposive sampling was used to select the Region, District and communities. Purposive sampling is the method of subjectively selecting sample units which are a direct representation of the target population in their characteristics (Frankfort-Nachmias & Nachmias, 1996).

The district and particularly communities were selected because of information of a pilot private extension project for cocoa farmers dubbed "fund for Rural Prosperity" funded by the Mastercard Foundation and supervised by Prepeez Technologies Limited in some communities in the District capital; Nsaba. These communities were Nanpong, Adarkrom, Ninta and Ofoase.

The next stage of the sampling process involved selection of farmers who participated in the study. The researcher could not obtain a proper list of cocoa farmers in the selected communities from COCOBOD extension directorate but a discussion between the researcher and the Prepeez Team revealed that the total number of cocoa farmers in the selected communities

were 200. According to Israel (1992), for a population size of 200 at a precision level of 5%, the required sample size is 134 respondents. This study however selected a total of 151 cocoa farmers for the study.

Data Collection Instruments

Primary data was used for this study. The data for the study was obtained from cocoa farmers through the administration of a structured interview involving a questionnaire, an App called Technology for Ghana Commercial Agriculture Development (Tech4GCAD) developed for MOFA to obtain the farm size and yield estimates of farms and also a choice experiment instrument.

The items in the instrument were mainly categorized according to the research objectives including the quality of extension service delivery, farmers' most preferred attributes of an improved extension service and socio-economic factors. The questionnaire was grouped into six sections, A-F. Section A was made up of items that drew information on the socioeconomic factors. Section B itemized questions on the state of the extension service delivery in the study area, Section C took information on farmers' perceptions on certain characteristics of the extension service, Section D was on farmers' knowledge of private extension service, Section E was an adapted SERVQUAL instrument to measure Service quality and Section F solicited information on farmers' marginal willingness to pay using a choice experiment.

Pretesting

Pre-testing of the interview schedule was done in Teacher Okai, a community close to the selected communities in the study area. The interview schedule was tested to determine likelihood of errors due to lack of proper understanding of questions by respondents as recommended by Silva and Thuler

(2008). A total number of 30 respondents were used for the pre-testing in Teacher Okai between 15th of April and 28th May 2016. The major challenge encountered was explaining the concept of the choice experiment and the selection of the choice sets.

The Choice Experiment Designed for the Study

The initial step in choice design seeks to establish the good to be estimated, outlining the attributes and the resultant levels (Blamey *et al.*, 2001). In this study, the researcher used a choice experiment technique to elicit farmers' preferences for a package of attributes in an improved cocoa extension service delivery scenario. In any choice profile, participants are provided a hypothetical environment, and then requested to choose from several alternative the alternative they would most-prefer in a choice set (Burton *et al.*, 2001). For this study, the cocoa farmers were presented with choice categories with distinct alternative extension delivery options depicted by a set of attributes that adopt different levels.

Attributes for agricultural goods can be identified through extension agents and researchers with requisite field experience, review of relevant literature, target group discussions and personalized individual interviews (Hall *et al.*, 2004; Coast & Horrocks 2007). This study asked farmers to rank their most preferred choice of attributes of an extension service based on the gaps in extension service quality they identified in the mainstream government extension service being provided to them. The attributes in this context refers to the best characteristics they would expect from an extension service delivery. The attributes were farm visits, mode of access to farm advisory services, proximity of agent, responsiveness of agent, good communication, good rapport

between agents and farmers, good form of transportation for agents, availability of efficient tools and equipment for agents and price.

It is prudent to follow some rules with respect to attributes in CE. Too many attributes may encourage the participants to apply a simple decision rule in which they base their response on a single or subset of attributes. In establishing attributes, it is also important to avoid conceptual overlap between two or more of the attributes, known as inter-attribute correlation, since it would prevent the accurate estimation of the main effect of a single attribute on the dependent variable. The mean score for each attribute was used in this study as the basis to select five attributes as the most important attributes for an extension service per the cocoa farmer which were; Frequency of farm visits by the extension agent, ease of access to relevant farm advisory services by the farmer, proximity of extension agent to farmer, the duration of time in which an agent would respond to the call of a farmer and price. The price attribute was included to help ascertain the value the farmers placed on each improved extension delivery service alternative. The attributes were so defined in the contexts above in order to ensure easy understanding of the concept by respondents.

For each attribute, attribute levels needed to be assigned. For the Agona East study, qualitative data was used to determine base levels that reflected the prevailing conditions for public sector extension. Additional levels were then established by the researchers' judgement that represented a reasonable improvement from the base. For ease of cognition, the study sought to establish no more than two levels for each attribute. For instance, according to MOFA standards, an agent is supposed to visit a farmer at least once every month, therefore a possible improved variation could involve "visit on request of

farmer" to the "one visit per month" base level. Two levels were also used for the proximity of the agent to the farmer namely; 'outside of operational area' as a base level and 'within operational area' as an improved variation. A net annual payment of '80 cedis' and '100 cedis' were used to reflect the amount prevailing in the private sector as subscription payment for extension service delivery.

The next stage in the design of the CE was to generate the hypothetical alternatives and to combine them to create choice sets. A full factorial design consists of all possible combinations of the levels of the attributes and permits estimation of main effects and interactions. A main effect refers to the direct independent effect on the choice variable of the difference in attribute levels (e.g. difference in price). An interaction effect is the effect on the choice variable obtained by varying two or more attribute levels together (e.g. difference in price combined with difference in proximity of agent). In most practical situations it is considered too cost-prohibitive and tedious to have respondents rate all possible combinations in a full factorial design (Kuhfeld 2005). In the context of this study, a design with five attributes each with two levels would for example, generate 32 possible combinations (2^5). Thus, a fractional factorial design was used to select possible combinations for the choice experiment.

In selecting a fractional factorial design, some properties must be considered. These are orthogonality, balance, minimal overlap and utility balance (Huber & Zwerina 1996; Kuhfeld 2005). In orthogonal fractional factorial designs, the parameter estimates in the linear model are uncorrelated, which means that the attributes of the design are statistically independent of each other (Hensher *et al.*, 2005; Kuhfeld 2005). A balanced design has each attribute level occurring equally often and this minimizes the variance in the

parameter estimates (Kuhfeld 2005). Fractional factorial designs that are both orthogonal and balanced are known as orthogonal arrays. The third property; minimal overlap, seeks to minimize the probability that an attribute level repeats itself in each choice set. Each attribute level is only meaningful in comparison to others within the choice set, or in other words no information is obtained on an attribute's value when its levels are the same across all alternatives within a choice set. Finally, Huber and Zwerina (1996) have argued for the importance of utility balance, which refers to balancing the utilities of the alternatives offered in the choice set.

The fractional factorial design was used to select 16 possible combinations and further used in designing 8 choice cards. To eliminate boredom, reduce complexities and also ensure efficiency in the study (Hanson *et al*., 2005), a pair-wise design was used in which a choice set with two alternative improved extension service options having combinations of different attribute levels were presented to farmers and they were asked to state their preferred option based on the scenarios presented on the pair. A total of 8 choice sets were used in the questionnaire. The selected attributes used in this research reflected a dichotomy between the inclusion of the attributes that are most important in the choice experiment and the rigidity of the task involved when making choices. The choice sets were designed with the attributes boldly written and each attribute level presented in a pictorial form to aid comprehension. Nonetheless, the attributes, levels and alternatives were explained in the local dialects (Twi and Fanti) by the researcher for farmers to actually understand the questionnaire and how to choose from the choice sets. The package of extension attributes adopted in this study is shown in Table 3.

Table 3; Package of Attributes and Respective Levels Used in the Study

Attributes	Descriptions	Attribute Levels	Coding
Frequency of farm visit	How frequent the extension agent visits the farmer	Visit on request One visit per month	Dummy
Farm Advisory service	Access to farm relevant information from actors in the extension service	Audio-visual Phone call	Dummy
Proximity of Agent	How close the agent resides with respect to the farmers	Within operational area Outside of operational area	Dummy
Response time	Duration in which agent responds to farmers' call to duty	Within 3 days Within a week	Dummy
Price	Price of extension package	80 cedis 100 cedis	Actual values

Source: Author's construct, Twum (2018)

Analysis of CE data typically involves regression models that have a dichotomous or polychotomous categorical dependent variable, such as a probit, logit, or multinominal logit specification. In this study, the dependent variable was dichotomous which was set to 1 for extension option A and 0 for extension option B. The conditional logit model was estimated within a maximum likelihood framework and hence cox regression was used to analyse the data in SPSS 21. The regression model is specified in terms of differences in attribute levels between the choices being analysed. Because respondents are asked to consider multiple choice pairs, it cannot be assumed that the error terms are independent and therefore panel data estimation techniques are required. The estimated parameters represent the marginal utility associated with a change in the attribute level in moving from one alternative to the other.

Theoretical framework on Choice Experiment Modeling

The choice experiment is a stated preference technique initially designed for research in transport and marketing (Louviere *et al*., 2001). In view of the fact that the choice experiment allows for simultaneous extraction of multi-attribute qualities (case and control; for instance, in an experiment setting), CE was more favourable for the purpose of this research than CV. Studies that support CE propose that, determination of the willingness-to-pay and/or willingness-to-accept is more indirect or inferred in CE than in CV therefore, the incidence of choreographed responses as well as protest bids by participants is checked (Yabe & Yoshida, 2006; Ahlheim & Neef, 2006). CE is also advantageous in revealing trade-offs that respondents make when selecting among alternative attributes or choices. Through eliciting the amount of money individuals would be willing to pay to effect a suggested change, it is possible to estimate the marginal value of changes per attribute. In many instances, such a technique may provide more realistic results than concentrating on a single change in the delivery of the whole product or service which is a characteristic found in most CV studies (Mogas *et al*., 2006).

The basis of choice experiment designs has to do with the combination of various attributes and their respective levels. For this reason, choice experiment is suitable for the design of multidimensional policy interventions, running a cost-benefit analysis of these policy interventions as well as maintaining the integrity and the use of non-market products (Bateman *et al*., 2002; Mogas *et al*., 2006; Hanley *et al*., 2007).

The benefits further include the adherence to Lancaster's approach to the consumer theory (Lusk & Schroeder 2004; Carlsson *et al*., 2007). Lancaster

opined that a particular good "in itself" does not necessarily bring utility to a consumer; which assumes a deviation from previous studies (see Thaler 1983, 1985; Lichtenstein *et al*., 1990; Dickson & Sawyer, 1990) that suggested that utility is derived from acquisition of a good of interest. He suggested rather that, goods have qualities and those qualities generate utility. Also, Lancaster extrapolated that goods can possess multiple characteristics which can be shared by other goods and that also, goods in aggregate can possess separate characteristics different from those pertaining to the other goods individually (Lancaster, 1966). With respect to this study, extension service which is the target good can be differentiated as a package with a group of attributes including farm visits, ease of access to farm advisory services, proximity of extension agent, responsiveness of agent and price.

Adopting Lancaster (1966), a cocoa farmer that is presented with a bundle of extension qualities will prefer the collection of attributes that promises him/her maximum utility as is subject to the individual's budget constraint. For choice experiments, an array of choice questions that are characterized by individual attributes, attribute levels and prices are often presented to participants to evaluate their respective utilities (Lusk & Norwood, 2005). This study involves a good that has bundles of attributes and attribute levels as a package. The selection of a particular bundle by a cocoa farmer would be based on the individual farmer's utility associated with the overall improved extension service and also the utility associated with the attributes and attribute levels of the improved extension service as a package subject to the individual's behavior.

Lancaster proposes that the Random Utility Theory (RUT) offers a strong foundation for combining behaviour with economic analysis in choice experiment. This study agrees with that proposition and thus uses the random utility theory in context to value the choices of the cocoa farmers based on their behaviour. According to RUT, the utility of a choice is composed of a deterministic component *V* and an error component ε, which is independent of the deterministic part and follows a predetermined distribution. This error component implies that predictions cannot be made with certainty. Choices made between alternatives will be a function of the probability that the utility associated with a particular option *j* is higher than those for other alternatives (Hensher *et al*., 2005). The relationship between utility and attributes is linear in the parameters and variables function, and that the error terms are identically and independently distributed with a Generalized Extreme Value distribution.

The random utility theory operates on the basic assumption that individuals act rationally; choosing among given alternatives the option that offers the highest utility. As a consequence, the probability of choosing a given alternative will be higher if the utility provided by such alternative is the highest among the different choices.

Thus, one can represent an individual *i* utility associated with the choice of an alternative *j* as,

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (1)$$

Such that V_{ij} is the indirect utility function influenced by the attributes of the good and ε_{ij} is a random error component, implying from the researcher's perspective, that the true utility remains unobservable. From the consumer's perspective also, the process of maximization of utility consists of selecting an

option that yields the highest utility. Thus, if the i^{th} consumer selects type j, then U_{ij} is the highest utility obtainable from among the J possible choices. Hence, the statistical model of the probability that alternative j is chosen by individual i is given by

$$prob_{ij} = prob(U_{ij} > U_{ia}) = prob(\varepsilon_{ij} - \varepsilon_{ia} > \hat{U}_{ia} - \hat{U}_{ij}; a = 1,2, \ldots . j, a \neq j) \quad (2)$$

Where $\hat{U}_{ij} = X_{ij}\beta$

Maddala (2001) shows that when the residuals are independently and identically distributed following a Type I Extreme Value distribution (Gumbel distribution), such as:

$$F(\varepsilon_{ij}) = e^{(-e^{-\varepsilon_{ij}})} \quad (3)$$

Then it follows that the difference in error terms, displayed in equation (2), has a logistic distribution. Therefore, a multinomial (conditional) logit model can represent the i^{th} consumer's probability of selecting the j^{th} extension choice:

$$prob(y_i = j) = \frac{e^{x_{ij}\beta}}{\sum_{j=1}^{j} e^{x_{ij}\beta}} \quad for\, j=1,\ldots J \quad (4)$$

where β refers to parameters that weight exogenous variables in determining the utility (Boxall & Adamowicz, 2002; Adamowicz *et al*., 1998).; and X_{ij} is a row vector of exogenous variable values corresponding to the extension characteristics, and the probability of the choice of the i^{th} farmer.

The log likelihood of the multinomial conditional logit is given by:

$$L = \prod_{i=1}^{n} \prod_{j=1}^{J} prob(y_i = j)^{y_{ij}} \quad (5)$$

where $y_{ij} = 1$ if alternative j is chosen by the i^{th} individual, and zero otherwise

Data collection Procedures

The instrument was fine-tuned after the pretest and was administered in the selected communities by the researcher. First of all, the chief and 'chief farmers' in the various communities were contacted and the researcher introduced himself as well as the purpose of his visit to the area and sought for permission to work with the community members. A day was set where the researcher was introduced to the whole community and was allowed to explain his purpose to the community and to seek their cooperation. Farmers were introduced to the researcher by a chief farmer.

Thereafter, farmers were visited and followed to their respective farms and then the instrument is administered at the farm by the help of the chief farmer. After one session, the researcher was introduced to another farmer to be interviewed and it continued till he closed. The researcher worked from early in the morning till 4pm in the evening. The items in the instrument were explained in the local languages (Fanti and Twi) and responses translated to English language for easy use by the researcher during data processing, analysis and interpretation. The local dialect helped the researcher to facilitate the responses from the farmers.

The survey was done between June and November 2016. The data were collected four days in a week excluding weekends because most communities had taboo non-farm days which were Tuesdays for some communities and Wednesdays for others. The data collection was hectic because it involved following each individual farmer to his/her farm in order to get relevant information.

Data Processing and Analysis

Descriptive Analysis

Descriptive statistics such as frequencies and percentages, means and standard deviations as well as coefficient of variations were computed to summarise the data for easy description. These statistics were used to describe the socioeconomic characteristics of the respondents, farmers' experience of the state of the extension service delivery in the study area, farmers' knowledge and understanding of the need to pay for improved extension service. Gap analysis was also used for the quality of extension service delivery. The results were presented in tables, pie charts and bar charts.

The computation of the descriptive statistics and the presentation of the results using tables and various figures were done with the help of Statistical Package for Social Sciences (SPSS) version 21 and Microsoft Excel spreadsheet.

Empirical specification for the conditional logit model

The conditional logit approach is predicated on the assumptions that the alternative an individual chooses is preferred to all other alternatives available to him and that his preferences can be expressed in the form of a function defined over the attributes of alternatives.

Formally, let C_i be the set of mutually exclusive alternatives available to the ith cocoa farmer; let X_i be his characteristics; let X_{ij} be the jth alternative's attributes with respect to him; and let $U_i(X_{ij})$ be a scalar-valued measure of his preference for the jth alternative. The cocoa farmer is assumed to choose the jth alternative if and only if $U_i(X_{ij}) \geq U_i(X_{ik})$ for all k in C_i. If differences among individual farmers' preferences for a given set of attributes have a

random component ε_{ij}, the ith cocoa farmer's preference for the jth alternative can be written $U(X_{ij}, \varepsilon_{ij})$.

For reasons of tr actability, let's assume that U is linear in parameters with an additive disturbance;

$$U(X_{ij}, \varepsilon_{ij}) = V(X_{ij}) \cdot \theta + \varepsilon_{ij}, \quad (1)$$

Where V is a vector valued function, θ is the vector of parameters to be estimated, and ε_{ij} is a scalar random variable. The choice of alternative j implies:

$$V(X_{ij}), \cdot \theta + \varepsilon_{ij} \geq V(X_{ik}) \cdot \theta + \varepsilon_{ik}, \qquad for\ all\ k, \varepsilon, C_i$$

Or equivalently,

$$\left(V(X_{ij}) - V(X_{ik})\right) \cdot \theta \geq \varepsilon_{ik} - \varepsilon_{ij}, \qquad for\ all\ k, \varepsilon, C_i \quad (2)$$

In order to estimate the parameters of (2), it is necessary to specify the joint probability distribution of the ε_{ij}. A probability distribution that leads to a tractable likelihood function is the Weibull distribution:

$$Prob(\varepsilon \leq T) = e^{-\alpha e^{-\beta T}}, \alpha > 0, \beta > 0$$

If ε_{ij} and ε_{ik} are independent and identically distributed with this distribution, it can be shown that

$$Prob(j\ chosen\ from\ C_i)$$

$$= Prob\left(\varepsilon_{ik} - \varepsilon_{ij} \leq \left(V(X_{ij}) - V(X_{ik})\right) \cdot \theta, \quad for\ all\ k, \varepsilon, C_i\right.$$

$$= \frac{1}{1 + \sum k \varepsilon C_i, k \neq j \ \exp\left(-\beta(V(X_{ij}) - V(X_{ik})) \cdot \theta\right)} \quad (3)$$

The likelihood of the observed choices made by a set of n cocoa farmers is

$$L(\beta, \theta) = \prod_{i=1}^{n} \qquad Prob(j_i\ chosen\ from\ C_i), \quad (4)$$

Where j_i is the ith cocoa farmers'choice.

For the purpose of this study, a price attribute was introduced. This was introduced to specify the cocoa farmer's preferred price for an alternative. It is assumed that the farmer chose the jth alternative if $U_i(X_{ij}, P_{ij}) \geq U_i(X_{ik}, P_{ik})$ for all k in C_i.

Expressing equation (1) in linear form;

$$U_{ij} = X_{ij}\beta_x + \varepsilon_{ij} \quad (5)$$

Introducing the price attribute to equation (5)

Thus $U_{ij} = X_{ij}\beta_x + \beta_p P_{ij} + \varepsilon_{ij}$ (6)

The model described in (6) was generated considering the attribute levels and the responses to the choice experiment survey.

The actual model estimated is specified as:

$$U_{ij} = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_p P_{ij} + \varepsilon_{ij}$$

$$U_{ij} = \beta_1 X_{(frequency\ of\ farm\ visit)} + \beta_2 X_{(farm\ advisory\ service)} + \beta_3 X_{(proximity\ of\ agent)} + \beta_4 X_{(response\ time)} + \beta_p P_{ij} + \varepsilon_{ij}$$

$$U_{ij} = \beta_1 X_{(frequency\ of\ farm\ visit)} + \beta_2 X_{(farm\ advisory\ service)} + \beta_3 X_{(proximity\ of\ agent)} + \beta_4 X_{(response\ time)} + \beta_5 X_{(price)} + \varepsilon_{ij}$$

The components of this equation are as follows:

1. U_{ij} is the estimated utility based on the cocoa farmers' choice;
2. $\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_p P_{ij} + \varepsilon_{ij}$ is the conditional logit equation for the independent variables in the model, where
   a. $\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_p P_{ij}$ is the value of each independent variable X_{ij} weighted by its respective beta coefficient (β). Beta coefficients give the slope of the regression line or how

much the outcome increases for each 1-unit increase in the value of the independent variable. The larger the beta coefficient, the more strongly its corresponding independent variable contributes to the outcome.

b. P_{ij} is the price attribute for alternative *j*.

c. ε_{ij} is a scalar random variable

Estimating Willingness to pay for extension attributes used in the model

The marginal willingness to pay for improved extension service was estimated following Enneking (2004). He opined that the ratio of two coefficients described in a linear conditional logit model defines the willingness of a respondent to trade off one attribute against another. This ratio corresponds to the willingness-to-pay (WTP) for a quality changed attribute, if the attribute in the denominator is a monetary variable. The mean WTP for each attribute was therefore estimated as $\frac{-\beta_{attribute}}{\beta_{price}}$ which the price change is associated with a unit increase in a given attribute.

Standard Logit Model

In selecting independent variables conducting logistic regression, some basic assumptions must always be met. The first assumption is independence of errors, whereby all sample group outcomes are separate from each other (i.e., there are no duplicate responses). Repeated measures or other correlated outcomes will result in similarly correlated errors thus violating the assumption.

A second assumption is linearity in the logit for any continuous independent variables (e.g., age); there should be a linear relationship between these variables and their respective logit-transformed outcomes. There are different ways to check this assumption, with a typical method being to create a statistical

term representing the interaction between each continuous independent variable and its natural logarithm. If any of these terms is statistically significant, the assumption is violated (Tabachnick & Fidell, 2007; Hosmer & Lemeshow, 2000). Solutions include dummy coding the independent variable, (Hosmer & Lemeshow, 2000) or statistically transforming it into a different scale.

A third assumption is the absence of multicollinearity, or redundancy, among independent variables (e.g., since weight and body mass index [BMI] are correlated, both should not be included in the same model). A logistic regression model with highly correlated independent variables will usually result in large standard errors for the estimated beta coefficients (or slopes) of these variables (Tabachnick & Fidell, 2007; Hosmer & Lemeshow, 2000). The usual solution is to eliminate one or more redundant variables (Tabachnick & Fidell, 2007).

A final assumption is lack of strongly influential outliers, whereby a sample member's predicted outcome may be vastly different from his or her actual outcome. If there are too many such outliers, the model's overall accuracy could be compromised. Detection of outliers occurs by looking at residuals (i.e., the difference between predicted and actual outcomes) with accompanying diagnostic statistics and graphs (Tabachnick & Fidell, 2007; Hosmer & Lemeshow, 2000). One would then compare the overall model fit and estimated beta coefficients with versus without the outlier cases. Depending on the magnitude of change, one could either retain outliers whose effect is not dramatic (Hosmer & Lemeshow, 2000) or eliminate outliers with particularly strong influence on the model (Tabachnick & Fidell, 2007; Hosmer & Lemeshow, 2000).

A standard Logit model was used to investigate the determinants of cocoa farmers' choice for improved extension service. It was used in the study to predict the relative influence of a variable on a farmers' choice for improved extension service delivery. The logistic regression model was used to describe the relationship between a binary or dichotomous dependent variable and a set of independent or explanatory variables (Al-Karablieh *et al*., 2009). The dependent variable is the probability that the resulting outcome is equal to 1. The model involves a dependent variable (Y) and a set of explanatory /independent variables (X_i) that might influence the final probability Pi (π). These explanatory variables can be thought of as been in a k vector X_i. The value of Y has binary response variables which denotes the categories 1 and 0. It uses the generic term "success" and "failure" for the two outcomes. In this context, Y =1, (success) where the farmer chooses improved extension service delivery and Y = 0 (failure) where the farmer rejects improved extension service delivery. Improved extension service delivery in this context refers to a better extension service provision that addresses the challenges of the farmer and provides farmers' most preferred extension attributes as a package at a cost.

The empirical model that expresses farmers' choice of an improved extension service delivery is given as

$$Z_i = \left(\frac{P_i}{1-P_i}\right) = b_0 + b_1 X_1 + U \quad (1)$$

Where

P = probability function of factors that would influence a farmer to choose an improved extension service delivery.

X_1 = Factors related to farmers

For this study, the precise equation is given as;

$$Y = b_0 + b_1X_1 + b_2X_2 \ldots\ldots\ldots + b_nX_n + U \quad (2)$$

$$Y = b_0 + b_1X_{Reliability} + b_2X_{responsiveness} + b_3X_{Assurance} + b_4X_{Empathy} + b_5X_{Tangibles} + b_6X_{Good\ agent-farmer\ relation} + b_7X_{Educational\ level} + b_8X_{Farm\ size} + b_9X_{Yield} + U \quad (3)$$

Where;

Y=1 if farmer chooses improved extension service delivery

Y= 0 if farmer rejects improved extension service delivery

X_1= Reliability of public extension service

X_2= Responsiveness of public extension service

X_3= Assurance of public extension service

X_4= Empathy of public extension service

X_5= Tangibles of public extension service

X_6= Good agent-farmer relation

X_7= Educational level of farmer

X_8= Farm size

X_9= Yield/yr of farmer

U= disturbance term

b_0= slope parameter to be estimated

b_1.....b_n= Coefficients of the model

Variables such as age, sex and farming experience were removed from the model because they did not have any influence on the dependent variable.

Multivariate OLS regression

Multiple linear regression analysis makes several key assumptions:

- There must be a linear relationship between the outcome variable and the independent variables. Scatterplots can show whether there is a linear or curvilinear relationship.
- Multivariate Normality-Multiple regression assumes that the residuals are normally distributed.
- No Multicollinearity-Multiple regression assumes that the independent variables are not highly correlated with each other. This assumption is tested using Variance Inflation Factor (VIF) values.
- Homoscedasticity-This assumption states that the variance of error terms are similar across the values of the independent variables. A plot of standardized residuals versus predicted values can show whether points are equally distributed across all values of the independent variables.

The regression analysis is used to predict the value of one or more responses from a set of predictors. The predictors can be continuous, categorical or a mixture of both.

For a set of *n* predictors $X_1, X_2, \ldots\ldots, X_n$ related to a response variable *Y*, the linear regression model for the *ith* sample unit has the form;

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \cdots + \beta_n X_{in} + \varepsilon_i \quad (1)$$

$$Y_i = X_i\beta + U_i$$

Where ε is an error term

β_0 is the intercept

$E(\varepsilon_n)= 0$, $Var(\varepsilon_n)= \sigma^2$, $Cov(\varepsilon_n, \varepsilon_k) = 0 \; \forall \; n \neq i$

Extending the regression model to a situation where we have p responses Y_1, Y_2,…., Y_p and the same set of predictors $X_1, X_2, \ldots\ldots, X_n$ on each sample unit, each response follows its own regression model as specified below;

$$Y_1 = \beta_{01} + \beta_{11}X_1 + \beta_{22}X_2 + \cdots + \beta_{n1}X_n + \varepsilon_1$$

$$Y_2 = \beta_{02} + \beta_{12}X_1 + \beta_{22}X_2 + \cdots + \beta_{n2}X_n + \varepsilon_2$$

$$\vdots \qquad \vdots$$

$$Y_p = \beta_{0p} + \beta_{1p}X_1 + \beta_{2p}X_2 + \cdots + \beta_{np}X_n + \varepsilon_p$$

$$\varepsilon_p = Y_p - \widehat{Y_p}$$

$\varepsilon = (\varepsilon_1, \varepsilon_2, \ldots\ldots, \varepsilon_p)^{\iota}$ has expectation 0 and variance matrix $\sum p \times p$. The errors associated with different responses on the same sample unit may have different variances and may be correlated.

In this context, the multivariate linear regression was used to determine the factors that influenced the various dimensions of service quality with respect to extension service provision and is defined by Y_1-Y_5 below;

Y_1= Responsiveness of extension service

Y_2 = Reliability of extension service

Y_3 = Empathy of extension service

Y_4 = Tangibles of extension service

Y_5 = Assurance of extension service

As explained by $X_1 \ldots\ldots X_n$ where;

X_1= Frequent farm visits by extension agent

X_2= Responsiveness of agent

X_3= Ease of access to farm advisory services

X_4= good agent-farmer relation

X_5= satisfaction with agent's visit

X_6= availability of efficient tools

X_7= good transportation for agents

And also;

β_1 ... ... β_n= model parameters

In the study, service quality was measured by conducting a gap analysis of the extension services rendered by the government extension service as measured by the SERVQUAL instrument proposed by Parasuraman *et al*., (1988). The five dimensions of the SERVQUAL instrument were used as a basis to compare the farmers' experience of the government extension service and a farmer's preferred most efficient extension service system. Scores were assigned to the performance of the government extension service system as experienced by the farmer and also the expected performance of an efficient extension system as measured by the SERVQUAL instrument. The mean expectation scores were subtracted from the mean experience scores to give the mean gap score for the quality of extension service provided in the study area. A negative gap score indicated poor quality whereas a positive gap score was indicative of farmer satisfaction with the quality of extension service provided.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter presents the empirical results and analytical findings on the willingness to pay for improved extension service study.

Socio-Economic Indicators of Respondents

To be able to better understand the personal and household dynamics that influence the respondents' classification of quality in service provision, their choice and preference of attributes of an improved extension service and their perceived constraint to the extension service they receive, it was imperative to obtain data on their socio-economic indicators.

The socio-economic indicators of the respondents that were investigated in the research included sex of respondent, age, marital status and highest academic qualification. The results on the socioeconomic characteristics were presented in frequencies and percentages as is presented in Table 4 and 5below.

Table 4: Distribution of respondents according to socioeconomic characteristics

Characteristics	Frequency	Farmers (%)	Mean
Name of community			
Adarkrom	17	11.3	
Nanpong	53	35.1	
Ninta	51	33.8	
Ofoase	30	19.9	
Sex			
Male	111	73.5	
Female	40	26.5	
Marital status			
Single	8	5.3	
Married	116	76.8	
Widowed	21	13.9	
Divorced	6	4	
Educational level			
No formal education	58	38.4	
Primary	73	48.3	
Secondary	20	13.2	
Right to farm			
Land owner	12	7.9	
Abunu/Sharecropping	139	92.1	
Other occupation			
Government worker	9	6	
Clergy	2	1.3	
Self-employed	39	25.8	
Non	101	66.9	
Main source of information			
Television	15	9.9	
Radio	38	25.2	
Friends	98	64.9	

Source: Field survey, Twum (2017), **(N=151)**

Table 5: Distribution of respondents according to Socioeconomic Characteristics Continued.

Variables	Minimum	Maximum	Mean	Std. Deviation
Age	24.00	82.00	49.8146	14.30730
Family size	1.00	21.00	7.0662	3.80117
Farm size (acres)	0.21	19.87	2.4947	2.77957
Years of farming	1.00	40.00	10.1391	7.57631
Daily budget	5.00	50.00	14.8609	8.78107
Bags of cocoa harvested/yr	1.00	80.00	17.0695	15.28802
Labour used/year	1.00	4.00	1.2053	.50752

Source: Field survey, Twum (2017)

Table 5 shows that, majority of the respondents were males representing 73.5% of the sampled respondents while the proportion of females were 26.5%. This indicates that more males are involved in cocoa production in the study area than females. This finding may be related to the cultural dynamics of most households in Africa where the man is seen as the forbearer of the home and hence needs to work to provide for the essential needs of the household. Females however may work but are most often involved in vegetable cultivation. This is in consonance with the findings of Duncan and Brants (2004) who reported that males are most likely to indulge in cash crop production like cocoa than females who normally indulge in food crop production.

The study further revealed that 76.8% of the respondents were married, 13.9% were widowed, 5.3% were single and 4% were divorced. A high married population may be indicative of more mouths to feed and may be a predictor of increased cultivation which was also reported by Danso-Abbeam (2010) in his study of cocoa production in Ghana.

The mean age of the respondents was about 50 years with a minimum age of 24 and a maximum of 82. The respondents can be classified as middle-

aged according to the classification of Horng, Lee & Chen (2001). This indicates that most of the cocoa farmers in the study area are older, more experienced and may have some accumulated income to finance their activities as is also reported by Baffoe-Asare, Danquah & Annor-Frimpong (2013).

Education is crucial in decision making and ensures better use of information by an individual (Rutten *et al*; 2013), most of the respondents interviewed had had access to only primary form of education (48.3%) while 38.4% had no formal education. This suggests that most of the respondents had low formal education and thus relied on indigenous passed-on knowledge, their experience and peer information. This means that most of their decisions may not be done according to proven scientific facts but based on their experience or what their peers tell them.

According to Alam *et al*., (2011), other occupation reduces the quality of labour inputs and efforts directed into agricultural ventures which may affect yield. The findings of the study indicate that most of the respondents (66.9%) relied only on cocoa production for their livelihood. About 25.8% were self-employed; engaging in other activities like trading, driving and other forms of artisanry to provide extra income, 6% were government workers and 1.3% were part of the clergy (see Table 4). The finding indicated that most of the population depended on cocoa production and were in the position to be affected by the quality of extension service being provided.

The respondents' right to the land they farmed on was grouped under land owner and Abunu/Sharecropping. The sharecroppers recorded 139 in number making up 92.1% whiles the land owners were 12 in number making up 7.9% of the sampled respondents. In Ghana, acquisition of land is normally

based on inheritance and lease (where the lessee must make a substantial payment before acquiring the land). Lack of land ownership is one of the major constraints to cocoa production in West Africa (Hatloy *et al*., 2012). The findings of this study suggest that because most of the respondents do not own the land they farm on, they would have to make the decision to "choose" or "not to choose" an improved extension service delivery in consultation with the land owners.

Results on the main source of information for the respondents show that 64.9% of the respondents depend on their friends for information. About 25.2% also reported to depend on radio whiles 9.9% of the cocoa farmers in the study depend on Television as their main source of information.

From the Table 4.2, the results suggest that the average farm size of the respondents is 2.494 acres with a minimum farm size of 0.212 acres and a maximum of 19.86 acres of cocoa. Though the average cultivated area falls within the reported findings of Anim-Kwapong and Frimpong (2005) who stated that most cocoa farms in Ghana are small acre farms ranging between less than an acre to 10 acres there are farms with sizes that fall beyond their classification. The apparent increase in farm size may be an indication of increased cultivated farm area since their research in 2005.

The size of a farm household to a large extent may influence the size of cultivated land, production activities and the yield from the farm. The average size of the respondents' families was about 7 with a minimum family size of 1 and maximum of 21. ICCO (2014) reported that if Ghanaian cocoa farmers could invest more efforts into production and increased yield, there is assurance of overall increased higher output from West Africa and hence increased

revenue from the cocoa sector. Farmers understand that more hands are needed on the farm to achieve higher production targets and increased yield of cocoa and is also explained by the engagement of casual workers in the range of 1-3 by 82.8% of the respondents.

To determine the income status of the farmers, their daily budget expenditure was requested. The respondents reported that they spent an average of 14.86 cedis daily on their household expenditure. They spent between 5 and 50 cedis daily on their households. This is an indication that these farmers are low-income farmers.

The number of bags of cocoa harvested by the respondent in a year as requested in the administered questionnaire depicted that an average yield of 17 bags of cocoa was obtained per annum per acre. This finding is not in line with the research of Laven and Boomsma (2012) who reported that the average yield of the majority of farmers in Ghana has remained low, about 400 kg per ha of cocoa field which translates to about 6.25 bags (1 bag=64kg) of cocoa per 2.47 acres (1ha=2.471 acres) per season. Their finding assumes that farmers in Ghana harvest approximately 2.5 bags/season and about 5 bags/annum per acre of cocoa farm which is not representative of the findings of this study. The disagreement between Laven and Boomsma (2012) and this study may be because of the differences in the cocoa production area and the modes of measurement. The higher average yields of the farmers in this study may be attributed to the provision of free fertilisers by COCOBOD to farmers, the soil, the prevailing climate and higher average yield per cocoa of the area under study.

Preview of the state of the extension service in the study area

The main purpose of this section was to find per the farmer's experience the state of the extension delivery in the area. Extension service is mandated to offer technical information to the farmer and hence the condition of the extension delivery system would determine the level of technical knowledge available to the farmer. The result was presented with frequencies, percentages and means from the cluster analysis. The study found that all the respondents in the study had had access to extension visit from an agent.

Frequency of farm visits by the Government Extension Agents in the study area

About 92.1% of the respondents reported that they receive visits once in 3 months whiles 7.9% responded that they received visits from agents once in about 6 months (see Figure 4). This occurrence appears to be in sharp contrast with the regulations of MOFA for extension officers' visit to farmers' farms. The officers are mandated to visit a farmer at least once in a month (see MoFA, 2002). This phenomenon has also been observed by other researchers like Amezah and Mensah (2002) who found that farmers usually complained about a reduction in the regularity of extension visits to their cocoa farms. The inadequate access to technical information from extension agents implies that farmers in the study area would resort to learning from each other.

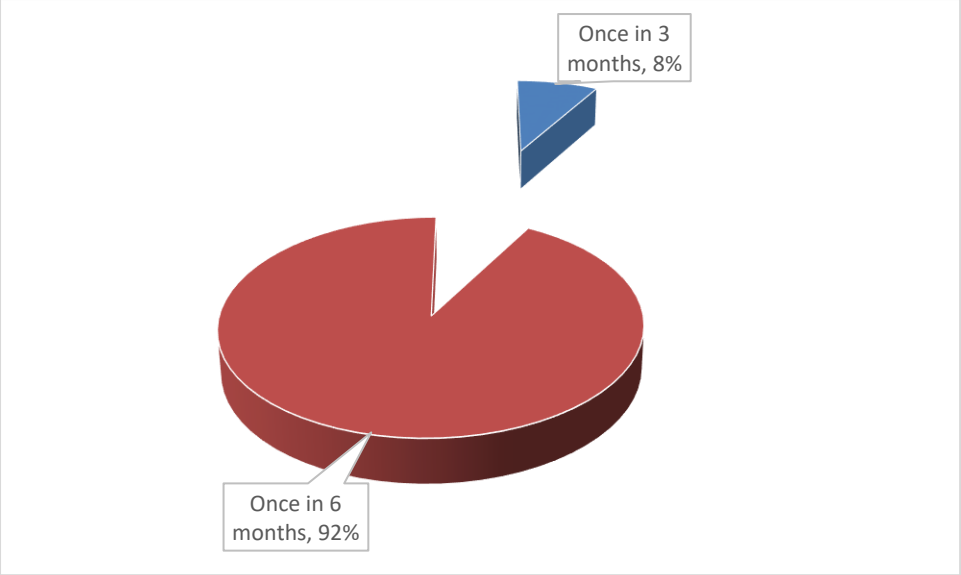


Figure 4: Farmers' response to the frequency of farm visits by the agricultural extension officer

Source; Field data, 2017

Farmers' perception of extension service delivery in Ghana

The respondents were asked based on their experience to rank the general extension service delivery in Ghana on a scale of 1(below satisfactory) to 7 (above satisfactory).

A two-way cluster analysis was conducted and two significantly different means 3.23 and 1.56 were obtained (refer to Table 5). The cluster analysis showed that 61(40.4%) of the farmers reported the mean assessment of 3.23 whiles 90 (59.6%) reported a mean assessment of 1.56 (see Table 5). Both clusters showed that the farmers perceived the extension service delivery in Ghana to be unsatisfactory. This indicates that the farmers were not satisfied with extension service delivery in Ghana. This means that services of the extension services did not meet the expectations of farmers and hence needed improvements.

Table 6: Classification of Farmers based on their Perception of Extension Service Delivery in Ghana

Variable	Cluster 1	Cluster 2	F	Sig
Current perception of extension delivery in Ghana	3.23[a] (61)[b]	1.56[a] (90)[b]	459.869	.000

a=mean, b=frequency of respondents;

Source: Field survey, Twum (2017).

Farmers' satisfaction with extension visits

Farmers were required to rate their satisfaction with the visits they receive from the extension agent on a scale of 1(definitely dissatisfied) to 7 (to definitely satisfied). A two-way cluster analysis was conducted and two significantly different means 3.30 and 1.67 were obtained (see Table 7).

About 73 (48.35%) of the respondents clustered around the mean of 3.3 and a further 78 (51.65%) clustered around the mean of 1.67 which was indicative of farmers dissatisfaction with visits from extension agents (see Table 7).

Table 7: Classification of farmers based on their satisfaction with visits by extension agents in the Agona East District.

Variable	Cluster 1	Cluster 2	F	Sig.
satisfaction with visits	3.30[a] (73)[b]	1.67[a] (78)[b]	459.108	.000

a = mean cluster, b= frequency of respondents

Source: Field Survey, Twum (2017)

The findings of the study indicated that farmers generally perceived extension service delivery in Ghana to be unsatisfactory (see Table 6). This finding was further buttressed when farmers reported a dissatisfaction with the extension service they were receiving individually in the district (see Table7).

Interactions with the farmers revealed that most of them were willing to receive an extension service delivery that addresses their needs and would be willing to take the responsibility of paying for a better service package if the need arises. This finding is consistent with Annan (2012) who reported that most Ghanaian cocoa farmers find the visits they receive from extension agents to be inadequate and were willing to support agents financially in order to motivate them to work efficiently.

Farmers' Awareness on Private Extension

Mcbride and Daberkow (2003) reported that awareness of an innovation was crucial in the likelihood of adopting that innovation. Thus, the more farmers are exposed to the benefits of an agricultural innovation the higher the likelihood of adopting that innovation. For this reason, respondents were asked whether they were aware of the existence of private extension service. Majority (62.3%) affirmed that they had prior knowledge of private extension while 37.7% of the respondents had no prior knowledge of private extension service (see Table 8).

Most private extension agencies lay down a flexible payment plan for the extension services they render. Payments may be done in cash or in cocoa beans. The payments may be done through monthly cash payments or accessed on credit and paid at the end of the year. About 10% of the farmers were comfortable with the monthly payments while majority (74%) preferred having the service on credit and paying at the end of the year with either cash or cocoa beans (see Table 8).

Table 8: Farmers' knowledge and Understanding of the need to pay for Private Extension

Variable	Frequency (n=151)	Percentage (%)
Awareness of Private Extension Service		
Yes	94	62.3
No	57	37.7
Willingness to receive Private Extension Service		
Yes	151	100
Willingness to pay for services accessed through private extension?		
Yes	127	84.1
No	24	15.9
How often are you willing to pay for private extension?		
Yearly	112	74.2
Monthly	15	9.9
Not at all	24	15.9
How would you like to pay?		
Monthly cash payments	15	9.9
Access service on credit and pay at the end of the year	112	74.2

Source: Field Survey, Twum (2017)

Evaluation of Quality of Extension Service Delivery from the Perspective of the Cocoa Farmers

The objective of this analysis was to ascertain the gaps in expectations and actual experience of the quality of the extension service delivery in the study area based on the perspective of the cocoa farmers. The mean scores and standard deviations (SD) for all the experience and expectation scores based on

the SERVQUAL items including the gap scores are presented in Table 8. The grand mean scores on the basis of their experiences, expectations and gaps for the Responsiveness, Reliability, Tangibility, Empathy and Assurance dimensions are also presented. The gaps help to understand current service quality. The scores are based on a five-point Likert scale ranging from 1(Strongly disagree) to 5 (Strongly agree). The gap mean is defined as the difference between what farmers experience and their expectation (Sachdev & Verma, 2004). A negative gap signifies that farmers perceived that the extension service delivery did not meet their expectations. A positive mean indicates farmers perceived the extension service to have exceeded their expectations (Parasuraman *et al*., 1985).

From the results in Table 8, the scores show that the cocoa farmers' expectations were consistently higher than what they felt they received for all the five dimensions resulting in negative service quality gaps. This is an indication that there is the need for improvement in all service quality dimensions of the cocoa extension service delivery. It is observed from Table 8 that the gap score for Responsiveness (-2.62) was higher than the other dimensions followed by Reliability (-2.37), Tangibles (-2.32), Empathy (-2.08) and Assurance (-1.38).

Reliability

The Reliability dimension of the SERVQUAL model is structured to determine the organization's ability to perform the particular service dependably and accurately. The various items listed under Reliability is used to solicit the respondent's response based on their experience of the quality of service provided to them.

A service quality gap of **-2.37** was recorded for Reliability. This is because the mean experience value of **2.11** was less than the mean expectation value of **4.48** (see Table 8). This could be an indication that farmers were not impressed with the fact that some promised deadlines were missed and also some of the services rendered to them were unsatisfactory. Annan (2012) confirms this finding when he observed that the government extension service is unable to meet deadlines and provide services at required time periods due to problems with funding and reforms.

Responsiveness

In the case of responsiveness, the service quality gap was **-2.62** (see Table 8), which meant that the service the farmers experienced did not meet the expected quality. This indicates that the farmers were highly dissatisfied with the responsiveness of the extension service. This can be explained by the fact that services were not promptly delivered, agents were not willing to offer support to farmers and the service did not expedite their activities to attend to the needs of farmers.

Assurance

A gap score of (**-1.38**) was recorded for the Assurance dimension in Table 8 which indicates that the farmers were not satisfied with the performance of the government extension service on the Assurance measure. Assurance refers to knowledge and courtesy of employees and their ability to inspire trust and confidence in the organization. The poor service quality indicates that the agents failed to demonstrate actions of confidentiality, expertise and competence to the farmers.

Empathy

From Table 9, a mean Empathy gap score of (**-2.08**) indicated that the government extension service performed poorly in the ability to model care and also give individual (personalized) attention to farmers. This result show that the agents failed to prioritize the relationship they had with the farmer and hence the farmers were dissatisfied with the quality of service rendered. This confirms the research of Speranza *et al* (2009) who found that the high agent-farmer ratio does not permit agents to commit to solving an individual farmer's problems because of the huge responsibility of solving multiple problems at the same time.

Tangibles

From Table 9, service quality gap of **-2.32** was recorded for Tangibility. This is because the mean experience value of **2.27** was less than the mean expectation value of **4.48**. This could be an indication that farmers were not impressed with the level, quality and visual appeal of working tools and equipment of the extension service.

Table 9: Gap Mean Difference between Farmers' Expectations and Actual Experience of the Quality of Extension Service

DESCRIPTION OF ITEMS	Mean Expectation scores (E)		Mean Experience (Perception) scores		Gap scores(Experience-Expectation)	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
RELIABILITY	**4.48**	**0.534**	**2.11**	**0.688**	**-2.37**	**0.832**
When the organisation promises to do something by a certain time, they do so	4.23	0.678	1.65	0.645	-2.58	0.941
The agents show sincere interest on solving farmers' problems	4.52	0.501	2.2	1.039	-2.32	1.134
The institution is dependable	4.52	0.501	1.48	0.54	-3.03	0.668
They provide services at the time required/promised	4.59	0.494	1.58	0.616	-3.01	0.739
The organisation provides correct/accurate information to their farmers	4.58	0.495	3.64	0.604	-0.94	0.676
RESPONSIVENESS	**4.42**	**0.483**	**1.80**	**0.69**	**-2.62**	**0.861**
The extension agents provide prompt services to their farmers	4.57	0.497	1.7	0.641	-2.87	0.78
The organisation is willing to help farmers	4.39	0.49	2.02	0.761	-2.37	0.949
The agents are never too busy to respond to farmers' request	4.3	0.462	1.68	0.669	-2.63	0.853
ASSURANCE	**4.17**	**0.536**	**2.78**	**0.823**	**-1.38**	**0.947**
Farmers have confidence in the organization	4.38	0.486	2.79	0.843	-1.58	0.875
The institution can be trusted by farmers	3.61	0.84	4.05	0.827	0.44	1.289
The agents are consistently courteous to farmers	4.36	0.483	2.11	0.918	-2.26	0.955
The agents get adequate support from the institution	4.22	0.415	1.67	0.619	-2.55	0.737

Table 9 Cont'D

The agents have the required knowledge to answer farmers' questions	4.29	0.456	3.3	0.909	-0.99	0.879
EMPATHY	**4.16**	**0.534**	**2.08**	**0.808**	**-2.08**	**1.086**
The organisation gives individual attention to farmers	4.26	0.439	2.04	0.72	-2.22	0.816
The organisation has farmers' interest at heart	3.85	0.859	2.4	1.144	-1.46	1.832
The agents understand the specific needs of farmers	4.07	0.418	2.31	0.834	-1.76	1.005
The organisation has working hours convenient to farmers	4.46	0.5	1.57	0.536	-2.89	0.694
TANGIBLES	**4.48**	**0.497**	**2.27**	**0.525**	**-2.32**	**0.699**
The organisation has up-to-date equipment	4.47	0.501	1.6	0.519	-2.87	0.676
The working tools are visually appealing and in good shape	4.56	0.498	1.56	0.524	-3	0.693
The agents are well dressed and appear neat	4.41	0.494	3.65	0.532	-0.76	0.619

Mean (E) scores for all five Dimensions= 4.342; SD= 0.516, Mean (P) scores for all five Dimensions=2.08; SD=0.706,
Source: Field Survey, Twum (2017)

Factors that influence the quality of extension service provision as perceived by cocoa farmers

Table 10: Multivariate Regression Results Showing Factors Affecting Farmers' Assessment of the Quality of Agricultural Extension Service Provision

Dependent Variable	Parameter	β	Std. Error	T	Sig.
Reliability of extension service delivery	Intercept	-3.825	2.522	-1.516	.132
	Age	-.005	.003	-1.525	.130
	Educational Level	.106	.050	2.133	.035**
	Gender	.059	.096	.618	.538
	Frequent Farm visits	-.179	.177	-1.009	.315
	Responsiveness of agent to farmers' call	-.010	.103	-.102	.919
	Good Transportation for agents	.117	.128	.915	.362
	Satisfaction with agent visits	.024	.037	.665	.507
	Good agent-farmer relations	.020	.100	.202	.840
	Willingness to accept improved extension	-.190	.093	-2.049	.042**
	Availability of efficient Tools	.110	.122	.903	.368
	Access to Farm advisory service	.009	.105	.087	.930
Responsiveness of extension service delivery	Intercept	-3.871	2.964	-1.306	.194
	Age	.006	.004	1.424	.157
	Educational Level	.012	.059	.200	.842
	Gender	-.083	.115	-.723	.471
	Frequent Farm visits	-.156	.208	-.747	.456
	Responsiveness of agent to farmers' call	-.040	.121	-.335	.738
	Good Transportation for agents	.040	.150	.269	.789
	Satisfaction with agent visits	-.061	.043	-1.410	.161
	Good agent-farmer relations	.035	.118	.294	.770
	Willingness to accept improved extension	.058	.109	.530	.597
	Availability of efficient Tools	.161	.143	1.122	.264
	Access to Farm advisory service	-.062	.123	-.504	.615
Assurance of extension service delivery	Intercept	-1.707	2.792	-.611	.542
	Age	.004	.004	.893	.374
	Educational Level	-.049	.058	-.844	.400
	Gender	.215	.112	1.928	.056*

Table 10 Cont'D

	Frequent Farm visits	.056	.196	.287	.774
	Responsiveness of agent to farmers' call	.202	.114	1.776	.078*
	Good Transportation for agents	.038	.141	.271	.787
	Satisfaction with agent visits	.044	.041	1.075	.284
	Good agent-farmer relations	-.065	.111	-.585	.560
	Willingness to accept improved extension	.062	.103	.609	.543
	Availability of efficient Tools	-.100	.135	-.742	.459
	Access to Farm advisory service	.197	.116	1.698	.092*
Empathy of extension service delivery	Intercept	-13.29	3.714	-3.581	.000
	Age	.003	.005	.604	.547
	Educational Level	-.031	.076	-.413	.680
	Gender	-.059	.147	-.400	.690
	Frequent Farm visits	.528	.261	2.024	.045**
	Responsiveness of agent to farmers' call	.370	.151	2.448	.016**
	Good Transportation for agents	.445	.188	2.365	.019**
	Satisfaction with agent visits	-.036	.054	-.665	.507
	Good agent-farmer relations	.483	.147	3.275	.001***
	Willingness to accept improved extension	-.142	.136	-1.041	.300
	Availability of efficient Tools	.387	.179	2.158	.033**
	Access to Farm advisory service	.359	.154	2.328	.021**
Tangibles of extension service delivery	Intercept	-2.635	2.338	-1.127	.262
	Age	.004	.003	1.221	.224
	Educational Level	.092	.046	1.985	.049**
	Gender	.068	.090	.756	.451
	Frequent Farm visits	-.037	.164	-.228	.820
	Responsiveness of agent to farmers' call	-.011	.095	-.121	.904
	Good Transportation for agents	-.002	.118	-.020	.984
	Satisfaction with agent visits	-.020	.034	-.578	.564
	Good agent-farmer relations	-.018	.093	-.190	.850
	Willingness to accept improved extension	.039	.086	.458	.647
	Availability of efficient Tools	.081	.113	.715	.476
	Access to Farm advisory service	-.007	.097	-.067	.947

*,** and *** denotes significance at 10%, 5% and 1% levels respectively;

Source: Field Survey, Twum (2017)

This research modelled the gaps (which were negative for all the dimensions) from the service quality assessment as against the various variables that influenced farmers' assessment of the quality in service of the extension provided.

Reliability of the Extension service

The reliability of the extension service was influenced by education and farmers' willingness to accept improved extension service and were significant at 5% level (see Table 10). Education positively affects perception and influences assessment in decision making (Rutten *et al*., 2010). In this case, an educated farmer has a better assessment of the services rendered and could better judge the services as poor or of good quality. Furthermore, farmers are willing to accept improvement in an already reliable extension service provision in order to increase their utility. A farmer thus may reject the services of an extension service and would not call for improvement in services rendered if the farmer deems the service to be unreliable.

Responsiveness of the Extension service

None of the variables were statistically significant in explaining the responsiveness of an extension service system (refer to Table 10).

Assurance of Extension service

The results from Table 10 indicated that at 10% level; gender, the responsiveness of the agent and farmers' mode of access to farm advisory services from the extension service influenced the Assurance of the extension service. The gender of a farmer determined how the farmer rated the service as credible or

competent. In this study, the agent's responsiveness and a farmer's access to farm advisory were attributes that were delivered in less quantity to the farmers.

This indicates that with reference to service quality, a service that scores high on the assurance scale has agents who are more responsive to farmers' requests whiles also extending farm advisory services innovatively to farmers.

Empathy of Extension service

Table 10 shows that frequent farm visits by extension agents, responsiveness of agents to the call of farmers, good form of transportation for agents, good agent-farmer relations, availability of efficient tools to aid in the work of agents and farmers' access to farm advisory services from the extension service had strong influence on the empathy of the extension service. These indicators were in short supply in the current extension service rendered which influenced farmers' desire for priority to be given to these attributes (see table 11).

The results in Table 10 also shows that a good agent-farmer relation was highly significant at 1% level. An agent's ability to build a cordial relationship with the farmer is translated by the farmer as an act of care. An extension service that has agents with more of this attribute is empathetic.

The results also show that a good mode of transportation and availability of efficient tools for work by the agent, in this case a good motorbike and working gadgets in a farmers' view could increase his/her chances of receiving prompt attention from the agent. Hence it influenced the quality of service and was significant at 5% level (see Table 10). An extension service that offers quality

service provides its agents with the needed tools and equipment to facilitate their work.

Furthermore, frequent visits from the agent influenced the extension service as more empathetic at 5% level (refer to Table 10). The more the agent visited their farm, the higher the likelihood that farmers would perceive the agent to be interested in their affairs. From this, it can be deduced that an effective and efficient service is one that is interested in the affairs of its farmers and shows that by ensuring agents frequently visit farmers' farms.

Empathy of the service was also influenced by the responsiveness of the agent and farmers' ease of access to farm advisory service at 5% level (see Table 10). The more responsive the agent is to the needs of the farmers and the readiness of the service to make available farm relevant information that would address the challenges of the farmers, the more likely the farmers would perceive the service as giving them attention. A quality service puts priority on these attributes.

Tangibility of the Extension service

Education influenced a farmers' assessment of the service as having the right tools and equipment to execute its mandate at 5% (see Table 10). Access to relevant information exposes an individual to better techniques and innovations (Rutten *et al*., 2010) which helps a farmer in this case to judge the services rendered to be of good quality or not.

Cocoa Farmers' Preferred Attributes of an Improved Extension Service Delivery

Before investigating the willingness of cocoa farmers to pay for extension service delivery, the study sought to determine their most preferred attributes that make up the extension service package they will be willing to pay for. If the extension service package is made up of farmers' most preferred attributes, the likelihood of paying for such a service would increase. The farmers were asked to rank the attributes of an extension service from 1 (most important) to 8 (least important). In this finding, the mean importance is reported with the values of 1 for most important to 8 for least important. Hence a lower mean signifies more importance. The farmers ranked Farm visits (mean; 1.11) as the most important attribute of a preferred extension service (see Table 11). Farm visit was important to farmers because they felt that the more agents visited their farms, the more likelihood that they might have access to relevant solutions to their farm challenges and also have expert recommendations on better practices to improve their production. Many studies have also iterated the importance of agent's visit to farmers (see Baah, 2006; COCOBOD, 2005).

The farmers further ranked access to farm advisory service from stakeholders (extension service, research institution and experts in the industry) (mean; 2.44) to aid in their production as second most important (refer to Table 11). This choice intimates that farmers felt they were deficient in current and relevant information concerning cocoa production but they also felt a divide between them

and experts in the field of cocoa production. This further goes to buttress their choice of increased farm visits by agents as most important to them.

The third most preferred attribute was responsiveness of agents (2.50) to their calls for information and attention. The farmers ranked good form of transportation for agents (mean; 7.03) as 7th and availability of efficient tools and equipment (mean; 7.86) as 8th respectively in their consideration as important for an extension service delivery. This proposes that the farmers were not as interested in the tools and equipment of the agents as in the service they rendered to them.

To determine whether or not cocoa farmers could differentiate between these attributes, a Kendall's coefficient of concordance was applied. The Kendall's coefficient of concordance (W) for the rankings of extension attributes is 0.979. This shows that the degree of agreement on a scale of zero to one is 0.979. The degree of unanimity as measured by the W-statistic is about 98% since the ranking is 0 for random ranking and 1 is for perfectly unanimous ranking. Thus, there is high level of agreement among respondents with the rankings of the attributes provided. The asymptotic distribution gave a significance level of 0.00 which is highly significant. Thus, the null hypothesis (the rankings disagree) is rejected and the alternate hypothesis (the rankings agree) is accepted. Accordingly, cocoa farmers in the study area can therefore be said to agree that the most important attributes of an extension service prioritizes in order of importance; farm visits, farm advisory services and responsiveness of extension agents. It follows that good communication, good form of transport for agents and availability of tools and equipment were observed as the least important attributes.

Table 11: Farmers' Preferred Attributes of an Improved Extension Service Delivery

Attributes	Sum	Mean	Std. Deviation	Rank
Farm visits	167	1.1060	.30881	1st
Farm Advisory services	368	2.4371	.57244	2nd
Responsiveness of Agents	378	2.5033	.73823	3rd
Proximity of Agent	614	4.0662	.31977	4th
Good communication	750	4.9669	.37269	5th
Good rapport between agents and farmers	910	6.0265	.52848	6th
Good form of Transport for agents	1062	7.0331	.39017	7th
Availability of efficient tools and equipment	1187	7.8609	.40066	8th
Kendall's Coefficient of Concordance				
N	151			
Kendall's W[a]	.958			
Chi-Square	1012.297			
Df	7			
Asymp. Sig.	.000			

Source: Field Survey, Twum (2017)

Farmers' Willingness to Pay for Cocoa Extension Service

This section discusses the conditional logit estimates and also the willingness to pay estimates of the study.

Marginal Willingness to Pay Estimates for Cocoa Extension Service

Table 12 indicates that the attribute with the highest MWTP is farm visit with an average estimate of 14.50. This indicates that farmers were likely to pay GH¢14.50 more per annum for an extension service that places priority on frequent farm visits. This result is consistent with farmers' preference for Farm visits as the

highest preferred attribute of an improved extension service delivery system (see Table 11). It is further supported by previous empirical findings that concluded that because farm visit was an important attribute to farmers, they often laid down payment plans to pay more for farm visits to ensure extensionists frequently visited them (See Wilson 1991 & Ameur 1994).

Farm Advisory services was the second significant attribute evident in Table 12 which farmers perceived would give them increased utility with a WTP estimate of 1.20. This indicates that farmers will be willing to pay GH¢1.20 more per annum for an improved extension service with emphasis on Farm Advisory services. Katz (2002) also found out in Kyrgystan that, farmers were willing to pay for farm advisory service with the assurance that they would experience increased yield. This could be an indication that farmers realized that their years of experience and also recommendations from their colleagues was not yielding maximum returns. They were ready to pay experts to attend to their farms in order to access relevant information and also obtain technical information that could help boost their cocoa production.

The proximity of agent and responsiveness of the agent were not significant in estimating the willingness to pay of farmers for attributes of an improved extension service delivery.

Table 12: Farmers' MWTP Estimates for Improved Extension Service Delivery

Attributes	B	SE	Sig.	Marginal WTP
Visit	-4.479	.582	.000***	14.495
Advisory	-.373	.100	.000***	1.207
Proximity	-.064	.094	.500	0.207
Response	.119	.084	.155	0.385
Price	-.309	.085	.000***	

***denotes significance at 1% level;
Source: Field Survey, Twum (2017)

Determinants of farmers' choice of improved extension service delivery

The study sought to determine the variables that influenced farmers' choice of an improved extension service and also pay for it. Improved extension service refers to an extension service package that prioritizes the information needs of farmers by ensuring frequent farm visits by agents, farmers' access to relevant technical advisory services as well as better farmer-extension service relations whiles ensuring maximum returns from the cocoa production at a cost.

The results in Table 13 show that Assurance of the public extension service, Empathy of the public extension service, good agent-farmer relation and the yield of a farmer's farm influenced the choice and payment for improved extension service delivery.

The Assurance and Empathy measure of service quality of the public extension service had a negative relationship with farmers' choice and payment for improved extension service (see Table 13). This indicates that a poor quality in public extension service rendered stimulates farmers' desire for better extension service and hence improved extension service delivery.

From the results in Table 13, it can be noted that good agent-farmer relation had a significant and positive relationship with farmers' choice of improved extension delivery. This is consistent with the results on the quality of the public extension service where the public service had consistent negative gaps for items under farmer-agent relationships (see Table 9). This indicates that farmers are more likely to choose and pay for an extension service that places priority on good agent-farmer relations. Teicher *et al*., (2002) and Gowan *et al*., (2001) have reported that interpersonal relations with clients and customers of public organisations is generally lacking. According to them, public organisations generally do not seek to address the needs of clients but seek to address some laid down targets and then try to justify the reasons for concentrating on those targets.

The results from Table 13 further show that the yield of a farmers' farm had a negative influence on farmers' choice of improved extension service at 10% significance level. This suggests that as a farmers' yield increases, the likelihood of choosing and paying for an improved extension service would decrease. This may indicate that a farmer who was seeing marginal increase in yield is not likely to pay for improvement in extension service delivery. This finding is contrary to the findings of Koundouri, Nauges & Tzouvelekas (2006) who reported that farmers that experience marginal increase in yield were more likely to choose improved extension interventions. The finding of this research however suggests some level of averseness from the cocoa farmer already experiencing marginal increase in production because they were comfortable with their current production output.

Table 13: Factors that Influence Farmers' Choice of Improved Extension Service

Variable	B	S.E.	Wald	Sig.
Constant	-4.486	5.128	.765	.382
Reliability of public extension service	.941	.681	1.910	.167
Responsiveness of public extension service	.229	.551	.173	.678
Assurance of public extension service	-1.831	.628	8.494	.004***
Empathy of public extension service	-1.003	.445	5.093	.024**
Tangibles of public extension service	.996	.794	1.572	.210
Good agent-farmer relation	1.488	.703	4.486	.034**
Education			2.330	.312
No formal education	-1.650	1.247	1.752	.186
Primary level	-1.053	1.232	.730	.393
Farm size	.245	.206	1.405	.236
Yield/yr	-.070	.037	3.617	.057*

*,** and *** denotes significance at 10%, 5% and 1% levels respectively;
Source: Field survey, Twum (2017)

Cocoa Farmers' Perceived Constraints to Extension Service Delivery

The various constraints to agricultural extension service as perceived by cocoa farmers in the study area are presented in the Table 14. The farmers were asked to rank their perceived constraints based on a 1(most pressing constraint) to 10 (least pressing constraint) scale.

Table 14: Farmers' Perceived Constraints to Extension Service Delivery

Constraints	Sum	Mean	Std. Deviation	Rank
Wide agent-farmer ratio	172	1.1391	.34717	1st
Inadequate interactions between farmers and key actors in extension	215	1.4238	.49581	2nd
Poor linkages between researchers-agents-farmers	334	2.2119	.41003	3rd
Ineffective communication	341	2.2583	.43914	4th
Lack of training of farmers	346	2.2914	.45592	5th
Inadequate funding for Government projects	388	2.5695	.66843	6th
Lack of commitment of extension agents	541	3.5828	.66691	7th
Low supervision by extension agents	553	3.6623	.80736	8th
Low competency of agents	654	4.3311	.47218	9th
Lack of Transportation for Agents	657	4.3510	.47887	10th
Kendall's Coefficient of Concordance				
N	151			
Kendall's W[a]	.882			
Chi-Square	1198.217			
Df	9			
Asymp. Sig.	.000			

Source: Field survey, Twum (2017)

The farmers indicated that the wide Agent-farmer ratio (mean rank of 1.14) was their perceived most pressing constraint to cocoa extension service delivery which is consistent with the findings of Speranza *et al*., (2009). They reported that the ratio of frontline extension worker to farmers in the public sector extension service delivery is about 1:1000 compared to the desired level of 1:400 hence agricultural extension staff receive more requests than they can address which has led to reduced spatial coverage, targeting and ineffectiveness of service delivery

reflected by clientele complaints. This buttresses the ranking by cocoa farmers in the study area who felt that the low agent-farmer ratio affected the extension service they received and the frequency of contact with the extension agent. The cocoa farmers further indicated that inadequate interactions between farmers and key actors in the extension service (mean rank; 1.42) also constrained effective extension service delivery in the area. This phenomenon was also reported by Annan (2012), who found that the capacity of the institutions or structures to follow up on knowledge-skill-action-behaviour change or adaptation is limited in the public sector. He posited that there is difficulty in responding to all farmers' needs adequately due to poor transport facilities, poor road infrastructure, large areas to cover, few or inadequate staff, lack of enough facilitation and congested schedule. There is also low staff-farmer ratio which affects the staff to overwork. This suggests that farmers perceived that insufficient interactions between them and officials of the extension service did not allow them to present their views and challenges to the extension management and hence they felt left-out in decisions which more or less affected them. The next imminent perceived constraint was linkages between researchers-agent-farmer with a mean rank of 2.21 (refer to Table 14). This finding is consistent with Okoro (2000) and Shaibu *et al*., (1997) who indicated that, while research institutes continue to generate relevant, appropriate and affordable technologies, the capacity of extension organizations to effectively transfer them to the farmers has been impaired by inadequate and uncertain funding and that successful execution of agricultural extension mandate is strongly dependent on adequate and timely funding of this mandate.

The first five rated constraints are closely linked to interactions between farmers and stakeholders (see Table 14). This suggests that farmers perceive a gap between them and key stakeholders in the extension fraternity. Competency of extension agents (4.33) and Transportation for agents (4.35) were the 9th and 10th ranked constraints respectively as perceived by cocoa farmers in the study area. This indicates that farmers trusted the intellectual ability of agents to provide them with farm relevant information that could address their challenges and were also least concerned about how the agents were transported in order to render service to them in their various communities.

The Kendall's coefficient of concordance was applied to ascertain whether or not cocoa farmers in the study could differentiate between the various extension constraints. The Kendall's coefficient of concordance (W) as shown in the table is 0.882. This means the degree of agreement on a 0 to 1 scale is 0.882. The degree of unanimity therefore is about 88% as measured by the W-statistic which signifies to a large extent agreement among respondent on the rankings of the extension constraints. The asymptotic significance level of 0.000 reveals that the alternate hypothesis (rankings agree) is accepted. Thus, cocoa farmers in the study area agree that the most pressing extension constraints are linked first to agent-farmer ratio, secondly to interactions between farmers and key actors in the extension service, followed by linkages between researchers-agents-farmers and training of farmers with transportation and competency of extension agents ranked least as the most pressing constraints respectively.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This Chapter summarises the study, makes conclusions and presents recommendations.

Summary

Agricultural extension provides the avenue for proper information dissemination to the cocoa farmer to enhance production and increase the revenue contribution of the cocoa sector to the National GDP.

Extension service delivery in Ghana, especially in the cocoa sector has experienced a lot of challenges which short changes the smooth flow of information and technical know-how to the cocoa farmer. Reduced extension visits to farmers, wide extension agent-farmer ratio and logistical insufficiencies are just a few of the challenges facing the sector. There is the need to improve on the current extension service delivery in the cocoa sector to address these challenges.

This study sought to empirically determine the willingness of cocoa farmers in Agona East District to pay for improved extension service delivery. A Cross-sectional survey design, Econometric models and descriptive analysis were used in this study.

Primary data on the cocoa farmers was obtained to present the socioeconomic parameters of the respondents in the study. 151 respondents were

used in the research. A two-stage sampling technique was used in this study to select the respondents. Purposive sampling techniques was used in selecting the Region, District and communities. Random sampling was used in selecting the farmers who were interviewed from each community and hence made up the sample size.

The socioeconomic characteristics of the respondents revealed that cocoa farming in Agona East district is dominated by married males (73.5%) with a mean age of 50 years, who farmed on an average 2.5-acre land and had a farm experience of 10.14 years. The farmers mostly engaged in the Abunu/Sharecropping land tenure system. About 48.3% of the respondents had received primary education and a further 38.4% had no formal education.

Cocoa farmers in Agona East district reported that even though they had received visits from an extension agent, they were inadequate. A cluster analysis further showed that the respondents were dissatisfied with the extension service delivery in the study area.

A confirmatory service quality assessment of the Government extension service showed that the extension service delivery in the study area was below farmers' expectation of an efficient extension service delivery and hence their call for an improved service delivery probably from a private extension service.

The study revealed that most of the farmers in the study area had heard of private extension. Their main sources of information were other farmers, radio and Television.

Respondents in the study were asked to indicate their most preferred attributes of an improved extension service through ranking. The results indicated that Farm visits, farm advisory service from stakeholders and more responsive agents were their most preferred attributes in an improved extension package.

A conditional logit estimation confirmed that farm visits and farm advisory service were significantly important to farmers and hence they were willing to pay GH¢14.50 and GH¢1.20 more respectively for an extension package that prioritizes these attributes.

Empirical results further showed that the Assurance and Empathy measure of the quality of public extension service, good agent-farmer relation and the average yield of a farmers' farm were significant determinants of farmers' choice of improved extension service delivery.

The farmers also indicated that the wide Agent-farmer ratio, inadequate interactions between farmers and key actors in the extension service and poor linkages between researchers-agents-farmers were the three most pressing constraints to cocoa extension service delivery in Agona East district.

Conclusions

From the findings of the study, these conclusions are drawn;

1. The study revealed that cocoa farmers in the study area were not receiving adequate extension service delivery from the Government extension service. The farmers were therefore willing to have improvement in the extension service they were receiving.

2. A service quality analysis revealed that the farmers perceived the extension service they were receiving to be of poor quality and hence they were dissatisfied with the service.
3. Frequent Farm visits by an extension agent and access to farm advisory services were ranked high as farmers' preferred attributes of an improved extension service and the farmers were willing to pay GH¢14.50 and GH¢1.20 more per annum respectively for these attributes as key components of an improved extension service delivery system.
4. Empathy of the public extension service, Assurance of the public extension service, good agent-farmer relation and yield of farmer significantly influenced farmers' choice of improved extension service delivery.
5. Wide Agent-farmer ratio was perceived by farmers as the most pressing constraint to cocoa extension service delivery because it affected the extension service they received and the frequency of contact with the extension agent.

Recommendations

Based on the study findings, the following recommendations are made;

1. This study recommends that COCOBOD sets up service quality models for periodic assessment of extension agents in cocoa extension delivery to measure the quality and efficiency of services rendered to farmers.
2. Farmers were basically dissatisfied with the service they were receiving from extension agents. COCOBOD could go into public-private

arrangements with more private extension agencies to train extension agents and also employ more agents to reduce the farmer-agent deficit.

3. Frequent farm visits consistently emerged as an attribute of major importance to the cocoa farmer and hence their willingness to pay for an extension service with improvement in such attribute as part of the extension service package. Improved extension service models with emphasis on frequent farm visits by extension agents as well as farmers' easy access to farm advisory services as packages would be patronized by farmers. This is an incentive for private investors to go into paid cocoa extension services.

REFERENCES

Adamowicz, W. L., Boxall, P. C., Williams, M., & Louviere, J. (1998). "Stated Preference Approaches for Measuring Passive Use Values: Choice Experiments and Contingent Valuation". *American Journal of Agricultural Economics, 80*: 64-75.

Adedoyin, S. F. (2005). *Agricultural extension in Nigeria*. Agricultural Extension Society of Nigeria.

Adesina, A. A. & Baidu-Forson, J. (1995). "Farmers' perception and adoption on new agricultural technology: evidence from analysis in Burkina Faso and Guinea, West Africa". *Agricultural Economics 13*, 1-9.

Adesina, A. A. & Zinnah, M. M., (1993a). "Technology characteristics, farmer perceptions and adoption decisions: a tobit model application in Sierra Leone". *Agric. Econ., 9*:297-311.

Adrian, A. M., Norwood, S. H., & Mask, P. L. (2005). Producers' perceptions and attitudes toward precision agriculture technologies. *Computers and electronics in agriculture, 48*(3), 256-271.

Agwu, A. E. (2010). "Costs Sharing as Alternative to financing Agricultural Technology Transfer in Nigeria: *a seminar presented at the Faculty of Agriculture",* Kogi State University, Anyigba.

Ahlheim, M. & Neef, A. (2006). "Payments for environmental services, tenure security and environmental valuation: concepts and policies towards a better environment". *Quarterly Journal of International Agriculture 45*(4):303–318.

Ai, E., Castro, V., Chen, V., Ortiz, M. & Tailor, A., (2012). Proposal for Enabling Investment in Cocoa Processing Plants in Ghana. Viewed on 18 April 2017, Available at https://yvonnechen portfolio. files. Word press.com /2016 /01 /ghana-cocoa -processing -plant -investment -concept -note-april-2012.pdf

Akma Mohd Salleh, N., Jusoh, R., & Ruhana Isa, C. (2010). Relationship between information systems sophistication and performance measurement. *Industrial Management & Data Systems*, *110*(7), 993-1017.

Alam, M., Siwar, C., Talib, B., & Toriman, M. (2011). The relationships between the socioeconomic profile of farmers and paddy productivity in North-West Selangor, Malaysia. *Alam, MM, Siwar, C., Talib, B., and Mohd Ekhwan*, 161-173.

Alemagi D., Duguma L., Minang P. A., Feudjio M., Nkeumoe F. & Tchoundjeu Z., (2014). Intensification of cocoa agroforestry systems as a REDD+ strategy in Cameroon: hurdles, motivations, and challenges, *International Journal of Agricultural Sustainability*.

Al-Karablieh, E. K., Al-Rimawi, A. S., & Hunaiti, D. A. (2009). Logit models for identifying the factors that influence the adoption of barley production technologies in low rainfall areas. *Jordan Journal of Agricultural Sciences*, *5*(3), 251-265.

Ameur, C. (1994). "Agricultural Extension: A step beyond next step". *World Bank Technical Paper No. 247*, Washington D.C.

Amezah, K., and Mensah, A., (2002). "The Effect of Reforms in the Cocoa Sector on Cocoa Extension." GTZ Consultancy Report for the Directorate of

Agricultural Extension Services (DAES). Accra, Ghana: Ministry of Food and Agriculture (MOFA).

Amoah, S. K. (2013). "Factors Affecting Cocoa Production in Upper Denkyira West District". Mphil thesis, Department of Mathematics, Kwame Nkrumah University of Science and Technology, Ghana.

Anandajayasekeram, P. (2008). *Concepts and practices in agricultural extension in developing countries: A source book*. ILRI (aka ILCA and ILRAD).

Anim-Kwapong, G. J., & Frimpong, E. B. (2005). Vulnerability of agriculture to climate change-impact of climate change on cocoa production. Cocoa Research Institute of Ghana.

Annan, F. (2012). The role of Agricultural Extension Services in Agricultural Transformation for Rural Poverty Reduction: a situational study in the Ashanti Region (Doctoral dissertation).

Anonymous, (1999). Ghana Cocoa Sector Development Strategy. Unpublished government policy document, Ministry of Finance, Accra, 94 pp.

Antholt, C. H. (1994). *Getting ready for the twenty-first century: Technical change and institutional modernization in agriculture* (Vol. 217). World Bank Publications.

Armoo, A. K. (2000). Service Quality in Ghana's Tourism and Hospitality Industry: A comparative study of the Perceptions of Hotel Guests and Service Providers in the Central Region. Department of Geography and Tourism, University of Cape Coast, Cape Coast.

Aryal, K. P., Chaudhary, P., Pandit, S., & Sharma, G. (2009). Consumers' willingness to pay for organic products: a case from Kathmandu valley. *Journal of Agriculture and Environment*, *10*, 15-26.

Asante-Poku, A., & Angelucci, F. (2013). "Analysis of incentives and disincentives for cocoa in Ghana", *Technical note series, Monitoring African Food and Agricultural Policies project, (MAFAB)*, FAO, Rome, pp. 35.

ASI Quality Systems (1992), *Quality function deployment – Practitioner workshop*, American Supplier Institute Inc., USA.

Asrat, P., Belay, K., & Hamito, D. (2004). Determinants of farmers' willingness to pay for soil conservation practices in the southeastern highlands of Ethiopia. *Land Degradation & Development*, *15*(4), 423-438.

Asubonteng, P., McCleary, K. J. & Swan, J. E. (1996), "SERVQUAL revisited: a critical review of service quality", *Journal of Services Marketing*, Vol. 10, No. 6, pp. 62-81.

Atengdem (1999), Agricultural Extension Concepts in Ghana: Contract Extension by Private Companies: Cotton Companies and Fruit Exporters, GTZ consultancy report for the Directorate of Agricultural Extension Services (DAES), Ministry of Food and Agriculture (MOFA), Accra, Ghana.

Axinn, G. H., & Throat, S. (1972). *Modernizing World Agriculture: A comparative study of agricultural extension education Systems* (No. 630.715 AXI. CIMMYT.).

Baah, F. (2006). Cocoa cultivation in Ghana: an analysis of farmers' information and knowledge systems and attitudes. PhD thesis, Institute for International Development and Applied Economics, University of Reading, UK, 292pp.

Babakus, E., & Mangold, W. G. (1992). Adapting the SERVQUAL scale to hospital services: an empirical investigation. *Health services research*, *26*(6), 767.

Baffoe-Asare, R., Danquah, J. A., & Annor-Frimpong, F. (2013). Socioeconomic factors influencing adoption of CODAPEC and cocoa high-tech technologies among small holder farmers in Central Region of Ghana. *Journal of Experimental Agriculture International*, 277-292.

Bateman, I. J., Carson, R. T., Day, B., Hanemann, W. M., Hanley, N., Hett, T., Lee, M. J., Loomes, G., Mourato, S., Ozdemiroglu, E. & Pearce W. (2002). *Economic valuation with stated preference technique. A Manual. Edward Elgar*. United Kingdom.

Bernet, M., Zattin, M., Garver, J. I., Brandon, M. T., & Vance, J. A. (2001). Steady-state exhumation of the European Alps. *Geology*, *29*(1), 35-38.

Birol, E. & Rayn, E. V. (2008). Estimating Mexican Farmers' Valuation of Milpa Diversity and Genetically Modified Maize: A Choice Experiment Approach.

Birol, E., Karousakis, K., & Koundouri, P. (2006). Using economic valuation techniques to inform water resources management: A survey and critical appraisal of available techniques and an application. *Science of the total environment*, *365*(1-3), 105-122.

Bitner, M.J., (1990) "Evaluation of Service Encounters: The Effects of Physical Surroundings and Employee Responses," Journal of Marketing, 54 (April), 69-82.

Blamey, R., Louviere, J. J., & Bennett, J. (2001). Choice Set Design. *The choice modelling approach to environmental valuation*, 133.

Bne Saad, M. H. A. Al-h. (1990). *An analysis of the needs and problems of Iraqi farm women: Implications for agricultural extension services.* Unpublished doctoral thesis, University College, Dublin.

Bolton, R. N., & Drew, J. H. (1991a). A longitudinal analysis of the impact of service changes on customer attitudes. *The Journal of Marketing*, 1-9.

Bolton, R. N., & Drew, J. H. (1991b). A multistage model of customers' assessments of service quality and value. *Journal of consumer research*, *17*(4), 375-384.

Boone, E. J. (1989). Philosophical foundations of extension. *Foundations and changing practices in extension*, 1-9.

Boulet, M. (n.d.). Un type original d'enseignant: Le professeur departmental d'agriculture. Unpublished paper.

Boxall, P. C. & Adamowicz, W. L. (2002). Understanding Heterogeneous Preferences in Random Utility Models: A Latent Class Approach. *Environmental and Resource Economics*, 23, 421- 446.

Breslow, N. E., & Day, N. E. (1980). Statistical Methods in Cancer Research. Lyon, UK: International Agency for Research on Cancer.

Brooks, R. F., Lings, I. N., & Botschen, M. A. (1999). Internal marketing and customer driven wavefronts. *Service Industries Journal, 19*(4), 49-67.

Brown, C. (2003b). Introduction to stated preference methods. *In Bateman (Ed.) 2003, A primer on non-market valuation - the economics of non-market goods and resources, Kluwer Academic Publishers, Chapter 4*, 99-110.

Brown, S. W., & Swartz, T. A. (1989). A gap analysis of professional service quality. *The Journal of Marketing*, 92-98.

Budak, D. B., & Budak, F. (2010). Livestock producers needs and willingness to pay for extension services in Adana province of Turkey. *African Journal of Agricultural Research, 5*(11), 1187-1190.

Burton, M., Rigby D, Young T., & James S. (2001), "Consumer Attitudes to Genetically Modified Organisms in Food in the UK*", European Review of Agricultural Economics*, 28 (4), 479-498.

Carlsson, F., Frykblom, P. & Lagerkvist, C. (2007). "Preferences with and without prices: does the price attribute affect behavior in stated preference surveys?" *Environmental and Resource Economics*, 38(2), 155-164.

Carman, J.M. (1990), Consumer Perceptions of Service Quality: An Assessment of The SERVQUAL dimensions", Journal of Retailing, Vol.66 pp 33-55

Carson, R. T., Flores, N. E., & Meade, N. F. (2001). "Contingent valuation: Controversies and evidence". *Environmental and Resource Economics*, 19, 173-210.

Chang, A., Lusk, J. L., & Norwood, F. B. (2009). How closely do hypothetical surveys and laboratory experiments predict field behavior? *American Journal of Agricultural Economics*, Vol. 91 (2): 518-534.

Chapman, R., & Tripp R. (2003). Changing Incentives for Agricultural Extension: A Review of Privatized Extension in Practice. *Agricultural Research and Extension Network Paper* No.132. London: UK Department for International Development (DFID).

Chaston, I. (1994), "Internal customer management and service gaps within the UK manufacturing sector", *International Journal of Operations and Production*, Vol. 14, No. 9, pp. 45-56.

Chaston, I. (1994). Rebuilding small business confidence by identifying and closing service gaps in the bank/SME client relationship. *International Small Business Journal*, *13*(1), 54-62.

Chukwuone, A. N., Agwu A. E. & Ozor N. (2006). Constraints and Strategy towards Effective Cost sharing of Agricultural Technology Delivery in Nigeria: Perception of Farmers and Agricultural Personnel. *Journal of international Agriculture and Extension*, 13 (1), 29- 41

Churchill, G. A. and Suprenant, C. (1982), An Investigation into the Determinants of Customer Satisfaction, Journal of Marketing Research, Vol.19, pp 491-504.

CIAT (2011). Predicting the impact of climatic change on the cocoa-growing regions in Ghana and Côte d'Ivoire, *Centro Internacional de Agricultura Tropical*, Cali, pp. 35

Clay, D., Reardon, T., & Kangasniemi, J. (1998). Sustainable intensification in the highland tropics: Rwandan farmers' investments in land conservation and soil fertility. *Economic development and cultural change*, *46*(2), 351-377.

Coast, J., & Horrocks, S. (2007). Developing attributes and levels for discrete choice experiments using qualitative methods. *Journal of health services research & policy*, *12*(1), 25-30.

COCOBOD (2005). A report on the review of cocoa extension under the Ministry of Food and Agriculture (MOFA). *Ghana Cocoa Board (COCOBOD*), Accra, pp.25.

COCOBOD (2015). "COCOBOD to rehabilitate aging farms". Available at http://citifmonline.com/2014/10/27, accessed May 26, 2015.

Cohen, J. B., Fishbein, M., & Ahtola, O. T. (1972). The nature and uses of expectancy-value models in consumer attitude research. *Journal of Marketing Research*, *9*(4), 456-460.

Crawford, E. W., Jayne, T. S., & Kelly, V. A. (2006). *Alternative approaches for promoting fertilizer use in Africa*. Washington, DC: Agriculture & Rural Development Department, World Bank.

Cronin Jr, J. J., & Taylor, S. A. (1992). Measuring service quality: a reexamination and extension. *The journal of marketing*, 55-68.

Cronin Jr, J. J., & Taylor, S. A. (1994). SERVPERF versus SERVQUAL: reconciling performance-based and perceptions-minus-expectations measurement of service quality. *The Journal of Marketing*, 125-131.

Crosby, P. B., & Free, Q. I. (1979). The art of making quality certain. *New York: New American Library, 17*.

Curry, A. (1999). Innovation in public service management. *Managing Service Quality: An International Journal, 9*(3), 180-190.

Danso-Abbeam, G. (2010). Empirical analysis of productivity and resourceuse-efficiency in Ghana's Cocoa industry: Evidence from Bibiani-Anhiawso-Bekwai district. *Unpublished Maters Thesis). Kwame Nkrumah University of Science and Technology, KNUST, Kumasi, Ghana*.

De Janvry, A., Fafchamps, M., & Sadoulet, E. (1991). Peasant household behaviour with missing markets: some paradoxes explained. *The Economic Journal, 101*(409), 1400-1417.

Dickson, Peter R. and Alan G. Sawyer (1990). "The Price Knowledge and Search of Supermarket Shoppers," Journal of Marketing, 54 (July), 42-53

Dotchin. J. A. and Oakland J.S (1994), "Total Quality Management in Services Part 2: Service Quality," International Journal of Quality and Reliability Management, 11(3), 27-42.

Duncan, B. A., & Brants, C. (2004). Access to and control over land from a gender perspective. *FAO Economic and Social Department, FAO Corporate Document Repository*.

E-Agriculture (2017). Available at https://www.e-agriculture.gov .gh /index .php/cocoa-sub-sector/cocoa-health-and-extension-division.

Edvardsson, B., Larsson, G. and Setterlind, S. (1997), "Internal service quality and the psychological work environment: an empirical analysis of conceptual interrelatedness", *Service Industries Journal*, Vol. 17, No. 2, pp. 252-63.

Ekepi, G. K. (2009). Report on a Comparative Study on Large Scale Extension Methods Used in Ghana. Tamale, AFRICAN UNION/SAFGRAD.

Enneking, U. (2004). Willingness-to-pay for safety improvements in the German meat sector: the case of the Q&S label. In: European Review of Agricultural Economics, 31 (2): 205-223.

Ervin, C. A., & Ervin, D. E. (1982). Factors affecting the use of soil conservation practices: hypotheses, evidence, and policy implications. *Land economics*, *58*(3), 277-292.

FAO (2005). Fertilizer use by crop in Ghana, FAO, Rome, pp. 53.

FAO (2017). The history, development, and future of agricultural extension. Available at: http://www.fao.org/docrep/W5830E/w5830e03.htm, accessed October 11, 2017.

FAOSTAT (2015). The agricultural production. Available at: http://faostat3 .fao.org /download/Q/*/E.

Farber, S. C., Costanza, R., & Wilson, M. A. (2002). Economic and ecological concepts for valuing ecosystem services. *Ecological economics*, *41*(3), 375-392.

Faye, I., & Deininger, K. W. (2005). Do new delivery systems improve extension access? Evidence from rural Uganda. In *2005 Annual meeting, July 24-27, Providence, RI* (No. 19405). American Agricultural Economics

Association (New Name 2008: Agricultural and Applied Economics Association).

Feder, G., Just, R. E. & Zilberman, D., (1985). Adoption of agricultural innovations in developing countries: a survey. *Econ. Dev. Cult. Change*, 33: 255-297.

Festinger, L. (1957). A Theory of Cognitive dissonance. Stanford, CA: *Stanford University Press.*

Fiadjoe (1999), Agricultural Extension Concepts in Ghana: Extension byNon-Governmental Organizations (NGOs), GTZ consultancy report for the Directorate of Agricultural Extension Services (DAES), Ministry of Food and Agriculture (MOFA), Accra, Ghana

Fick, G. R., & Brent Ritchie, J. R. (1991). Measuring service quality in the travel and tourism industry. *Journal of Travel Research*, *30*(2), 2-9.

Fountain, A. C., & Hütz-Adams, F. (2015). Cocoa Barometer 2015. USA edition, 56 pp.

Frankfort-Nachmias, C., & Nachmias, D. (1996). Index construction and scaling methods. *Frankfort-Nachmias C., Nachmias D., Research methods in the social sciences, St Martin's Press, London*.

Garvin, D. A. (1983), "Quality on the Line". *Harvard Business Review*, *61*(5).

Ghana Cocoa Board (1998). Report on the Seminar on the future of the Cocoa Industry, Akosombo, 13-15 May 1998.

Ghana. Statistical Service. (2014). *2010 Population and Housing Census Report*. Ghana Statistical Service.

GIZ (2017). Sustainable Smallholder Agribusiness in Western and Central Africa. Available at: *https://www.giz.de/ en /worldwide /16002 .html*, accessed October 9, 2017.

Gowan M., Seymour, J., Ibarreche, S. and Lackey, C., (2001) Service quality in public agency: same expectations but different perceptions by employees, managers and customers" Journal of Quality Management, Vol. 6. P. 275-291.

Gronroos, C. (1982). An applied service marketing theory. *European journal of marketing*, *16*(7), 30-41.

Gronroos, C. (1990). Relationship approach to marketing in service contexts: The marketing and organizational behavior interface. *Journal of business research*, *20*(1), 3-11.

Hainmueller, M., Hiscox, M. J. & Tampe, M. (2011) Sustainable development for cocoa farmers in Ghana, Baseline Survey: Preliminary Report, *MIT and Harvard University*, USA, pp. 67.

Hall, J., Viney, R., Haas, M., & Louviere, J. (2004). Using stated preference discrete choice modeling to evaluate health care programs. *Journal of Business research*, *57*(9), 1026-1032.

Hanley, N., Mourato, V. & Wright, R. E, (2001). Choice modelling approaches: a superior alternative for environmental valuation? *Journal of Economic Surveys*, 15 (3),pp 435 – 462

Hanson, K., McPake, B., Nakamba, P., & Archard, L. (2005). Preferences for hospital quality in Zambia: results from a discrete choice experiment. *Health economics*, *14*(7), 687-701.

Hart, C. W., Heskett, J. L., & Sasser, J. W. (1990). The profitable art of service recovery. *Harvard business review*, *68*(4), 148-156.

Hatloy, A., Kebede, T. A., Adeba, P. J. & Elvis, C. (2012). "Towards Côte d'Ivoire Sustainable Cocoa Initiative", *Baseline Study Report, Fafo Institute for Applied International Studies*, Oslo, pp. 57.

Heemskerk, W. & Weenek, B. (2005). Stake holder Driven Funding Mechanism for Agricultural Innovation. Case study off sub-Saharan Africa. *Development policy and practice bulletin*. Royal tropical institute, Armsterdam.

Hensher, D. A., Rose, J. M., & Greene, W. H. (2005). *Applied choice analysis: a primer*. Cambridge University Press.

Hoevenagel, R. (1994). An assessment of the contingent valuation method. In Valuing the environment: Methodological and measurement issues (pp. 195-227). Springer Netherlands.

Holden, S. T. & Shiferaw, B. (2002). "Poverty and Land Degradation: Peasants' Willingness to Pay to Sustain Land Productivity." In the Adoption of Natural Resource Management Practices: Improving Sustainable Agricultural Production in Sub-Saharan Africa, edited by. C. B. Barrett, F. M. Place, and A. A. Aboud, 91–102. New York: *CABI Publishing*.

Holloway, G. J. & Ehui, S. K. (2001). "Demand, Supply, and Willingness-to-Pay for Extension Services in an Emerging-Market Setting." American Journal of Agricultural Economics 83: 764–768.

Holmes, E., & Adamowicz, W. R. (2003). Attribute-based methods, in Bateman (Ed.), 2003. *A primer on nonmarket valuation - the economics of non-market goods and resources, Kluwer Academic Publishers, Chapter 4*, 99-110.

Horna, J. D., Smale, M. & Oppen, M. V. (2005). Farmers' Willingness to Pay for Seed Related Information: Rice Varieties in Nigeria and Benin. *Environment and Production Technology Division Discussion Paper 142*. Washington, DC: International Food Policy Research Institute.

Horng, W. B., Lee, C. P., & Chen, C. W. (2001). Classification of age groups based on facial features. *淡江理工學刊*, *4*(3), 183-192.

Hosmer, D. W., & Lemeshow, S. (2000). Applied Logistic Regression., 2nd edn. (Wiley: New York.). *NY, USA*.

Huber, J., & Zwerina, K. (1996). The importance of utility balance in efficient choice designs. *Journal of Marketing research*, 307-317.

ICCO (2014). The world cocoa economy: current status, challenges and prospects, *Presentation at Multi-year expert meeting on commodities and development 9-10 April 2014*. Available at: http://unctad.org /meetings /en /Presentation /SUC/MEM2014/09042014/ ICCO.pdf.

IDH (2015). The sustainable trade initiative, Cocoa Fertilizer Initiative, Restoring soil fertility in West Africa for a rejuvenated and economically viable cocoa sector, Available at: *http://www.idhsustainabletrade.com/Fertilizer*.

IMF (2008). Globalization: A Brief Overview. Available at https://www.imf.org /external/np/exr/ib/2008/053008.htm. Accessed on 13th October 2017.

Israel, G. D. (1992). Determining sample size.

Jayne, T. S., Govereh, J., Wanzala, M., & Demeke, M. (2003). Fertilizer market development: a comparative analysis of Ethiopia, Kenya, and Zambia. *Food policy*, *28*(4), 293-316.

Jibowo, A. A. (2001). Strengthening and Survival of the Agricultural Extension Enterprise: The Issues of Privatization and Commercialization. Presidential Address in Proceedings of Agricultural Extension Society of Nigeria, pp. 1 – 5.

Jones, A. M. (1989). A double-hurdle model of cigarette consumption. J. Appl. Econometrics, 4: 23-29.

Jones, G. E. (1981). The origins of agricultural advisory services in the nineteenth century. *Social Biology and Human Affairs, 46* (*2*), 89-106.

Jones, G. E. (1982). The Clarendon letter. In G. E. Jones and M. J. Rolls (Eds.), *Progress in rural extension and community development: Vol. 1. Extension and relative advantage in rural development* (p. 11-19). Chichester: John Wiley & Sons.

Jones, G. E. (1994). Agricultural advisory work in England and Wales: The beginnings. *Agricultural Progress, 69,* 55-69, *Journal d'Agriculture Pratique* (1874). 38th year, vol. 2.

Katz, E. (2002). Innovative Approaches to Financing Extension for Agriculture and Natural Resource Management: Conceptual Considerations and Analysis of Experience. LBL, *Swiss Center for Agricultural Extension: Switzerland*, 135.

Kebede, Y., Gunjal, K. & Coffin, G., (1990). Adoption of new technologies in Ethiopian agriculture: the case of Teguelet-Bulga District, Shoa Province. Agric. Econ., 4: pp 27-43.

Kemp, K., Insch, A., Holdsworth, D. K., & Knight, J. G. (2010). Food miles: Do UK consumers actually care? *Food Policy*, *35*(6), 504-513.

Keynan G., Olin, M. & Dinar, A. (1997). Co-financed public extension in Nicaragua. *The World Bank Research Observer* 12(2): 225–248.

Kidd, A. D., Lamers, J. P., Ficarelli, P. P. & Hoffmann, V. (2000). Privatising agricultural extension: caveat emptor. *Journal of Rural Studies 16,* 95-102

Kjaer, T. (2005). *A review of the discrete choice experiment-with emphasis on its application in health care*. Denmark: Syddansk Universitet.

Kolavalli, S., & Vigneri, M. (2011). Cocoa in Ghana: Shaping the success of an economy. *Yes, Africa can: Success stories from a dynamic continent*, 201-218.

Koundouri, P., Nauges, C., & Tzouvelekas, V. (2006). Technology adoption under production uncertainty: theory and application to irrigation technology. *American Journal of Agricultural Economics*, *88*(3), 657-670.

Kuhfeld, W. F. (2005). Marketing research methods in SAS. *Experimental Design, Choice, Conjoint, and Graphical Techniques. Cary, NC, SAS-Institute TS-722*.

Lancaster, K. J. (1966). "A new approach to consumer theory". *Journal of political economy*, 74(2).

Lass R. A. (Ed.), (2000). Review of production and consumption, *Cocoa Growers' Bulletin*, 40, Cadbury Ltd, Birmingham, 1988, 45 (1992), 49 (1995), 52 (2000).

Laven, A., & Boomsma, M. (2012). "Incentives for sustainable cocoa production in Ghana", *Royal Tropical Institute*, Amsterdam, pp. 49

LEISA (2002). Changing Information Flows. An Editorial, Low External Input and Sustainable Agriculture Magazine 18(2):4-5.

Lewis, B. R. and Mitchell, V. W. (1990) "Defining and Measuring the Quality of Customer Service", Marketing Intelligence and Planning, 8 (6), 11 – 17.

Lewis, B. R. and Mitchell, V. W. (1990), "Dimensions of Service Quality: A Study in Istanbul," Managing Service Quality, Vol.5, No.6, pp 39-43.

Lewis, R. C., & Booms, B. H. (1983). The marketing aspects of service quality. *Emerging perspectives on services marketing*, *65*(4), 99-107.

Lichtenstein, Donald R., Richard G. Netemeyer, and Scot Burton (1990), "Distinguishing Coupon Proneness from Value Consciousness: An

Acquisition-Transaction Utility Theory Perspective," Journal of Marketing, 54 (July), 54-67.

Lin, C. T. J. & Milon, J. W. (1993). Attribute and safety perceptions in a double-hurdle model of shellfish consumption. *Am. J. Agric. Econ.*, 75: 724-729.

Lings, I. N. and Brooks, R. F. (1998), "Implementing and measuring the effectiveness of internal marketing", *Journal of Marketing Management*, Vol. 14, pp. 325-51.

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: analysis and applications*. Cambridge university press.

Louviere, J., Hensher, D. & Swait, J. (2001). Stated Choice Methods – Analysis and Application. Cambridge, UK: *Cambridge University Press*.

Luk, S. T., & Layton, R. (2002). Perception Gaps in customer expectations: Managers versus service providers and customers. *Service Industries Journal*, *22*(2), 109-128.

Lusk, J. L. & Schroeder, T. C. (2004). "Are Choice Experiments Incentive Compatible? A Test with Quality Differentiated Beef Steaks", *American Journal of Agricultural Economics*, 86 (2): 467-482.

Lusk, J. L., & Norwood, F. B. (2005). "Effect of Experimental Design on Choice-Based Conjoint Valuation Estimates". *American Journal of Agricultural. Economics*, 8: 7771– 785.

MacKerron, G. J., Egerton, C., Gaskell, C., Parpia, A., & Mourato, S. (2009). Willingness to pay for carbon offset certification and co-benefits among (high-) flying young adults in the UK. *Energy policy*, *37*(4), 1372-1381.

Maddala, G. S. (2001). *Introduction to Econometrics. Third edition*. Saddle River, *N.J.: Prentice Hall.*

Makokha, M. O., Maritim, H. K., Okalebo, J. R. & Iruria, D. M., (1999). Farmers' perceptions and adoption of soil management technologies in western Kenya, *African Crop Science Journal 7*, pp 549-558

Maria, G. A (2006). Public perception of farm animal welfare in Spain, *Livestock Science, Vol. 103*, 250-256.

Masdar Consult (1998), Socioeconomic Study of Cocoa Farmers. COCOBOD, Accra

Matata, J., Anadajayakera, P., Kiriro, T. N., Wandera, J. & Dixon, W. J. (2001). Farming System Approach to Technology Development and Transfer. *FARMESA*. Harare.

Mazis, M. B., Ahtola, O. T., & Klippel, R. E. (1975). A comparison of four multi-attribute models in the prediction of consumer attitudes. *Journal of Consumer Research*, *2*(1), 38-52.

McBride, W. D., & Daberkow, S. G. (2003). Information and the adoption of precision farming technologies. *Journal of Agribusiness*, *21*(1), 21-38.

McCorkle, B. (2007). Demographic influences on willingness to pay for cold tolerance technology. *American journal of agricultural economics*, *89*(5), 1315-1323.

McFeeters, D. (2004). "The Art of Entrepreneurship in an Extension Unit." *Paper presented at the annual meeting of American Agricultural Economist Association*, Denver, CO, US, August 1–4.

Ministère de l'Agriculture République de Côte d'Ivoire, (2014) Programme Quantité-Qualité-Croissance « 2QC » 2014 - 2023, Résumé, 2014, 17pp. http://www.conseilcafecacao.ci/docs/PROGRAMME 2QC 2014-2023.pdf.

Ministry of Agriculture (2007). *National Agricultural Extension Policy Implementation Framework.* Nairobi, FAO.

Ministry of Food and Agriculture [MoFA]. (n.d.). The Ministry of Food and Agriculture, Ghana. Avaiable on the MoFA website: http://mofa.gov.gh/site/

Ministry of Manpower, Youth and Employment (2008). Labour survey of cocoa farming households in Ghana. Accra: National Programme for the Elimination of Worst Forms of Child Labour in Cocoa, Ghana Cocoa Board.

Minten, B., Randrianarisoa, J. C., & Barrett, C. B. (2007). Productivity in Malagasy rice systems: wealth-differentiated constraints and priorities. *Agricultural Economics*, *37*, 225-237.

MoFA (2002). Agricultural Extension Development Fund (AEDF). Accra, Prepared for Directorate of Agricultural Extension Services.

MoFA (2007). Food and Agriculture Sector Development Policy: FASDEP II. Accra, *Statistical, Research and Information Directorate.*

MoFA. (2016). Agriculture in Ghana: Facts and Figures (2015) (1st ed.). Accra: Ministry of Food and Agriculture. Retrieved from http://mofa.gov.gh/site/

Mogas, J., Riera, P. & Bennet, J. (2006). A comparison of contingent valuation and choice modelling with second order interactions. *Journal of Forest Economics*, 12(1):5–30.

Mwaura, F., Muwanika, F. R., & Okoboi, G. (2010). Willingness to pay for extension services in Uganda among farmers involved in crop and animal husbandry. In *Contributed Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa*.

Nambiro, E., & Omiti, J. M. (2007). Access to, and willingness to pay for, agricultural extension in Western Kenya. *Decentralization and the social economics of development: lessons from Kenya*, 84-96.

Ngo Nkelle V. (2007). The sustainability of Cameroon cocoa economy, *Presentation at the ICCO roundtable for a sustainable cocoa economy, 2007*, p.8, Available at: http://www.icco.org /sites /www. Roundtab lecocoa.org/documents/3%20Mr.%20Ngo%20Nkelle%20Victor%20____-%20Cameroon.pdf.

Ntifo-Siaw (1999), Agricultural Extension Concepts in Ghana: Extension delivery through nucleus farm out-grower schemes by the public sector and private companies, GTZ consultancy report for the Directorate of Agricultural Extension Services (DAES), Ministry of Food and Agriculture (MOFA), Accra, Ghana.

Nyeck, S., Morales, M., Ladhari, R., & Pons, F. (2002). 10 years of service quality measurement: reviewing the use of the SERVQUAL instrument. *The bi-annual academic publication of Universidad ESAN*, *7*(13).

Nzeka, U. M. (2014). Nigeria hikes target on cocoa production, *USDA Foreign Service Gain Report*, Lagos, pp. 8.

Obasi, I. N. & Eboh, E. C (2002). Cost sharing Crises in Nigerian Universities: Policy Lessons from an empirical study. *An Essay Submitted to the Secretary-General, Association of African Universities, under the 2nd Phase of the Programme of Research on Higher Education Policy and Management*. 1-40

Ogunbameru, B. O, (2005). Funding Agricultural extension services in Nigeria: Adedoyin S.F (ed), *Agricultural extension society of Nigeria, ARMTI ILORIN*, pp 177-181

Okoro, F. (2000). Sustaining Agricultural Extension Services through Private Participation. *Industrial enterprises Ltd,* Owerri, pp: 98

Oladele, O. I. (2008). "Factors Determining Farmers' Willingness to Pay for Extension Services in Oyo State, Nigeria." *Agricultura Tropica et Subtropica 41 (4),* 165-170.

Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of marketing research*, 460-469.

Ozor, N., Agwu A. E., Chukwuone N. A., Madukwe M. C. & Garforth, C. J. (2007). Cost-sharing of agricultural technology transfer in Nigeria: perceptions of

farmers and extension professionals. *The Journal of Agricultural Education and Extension,* 13(1), 23–37.

Ozor, N., Garforth, C. J., & Madukwe, M. C. (2013). Farmers' Willingness to Pay for Agricultural Extension Service: Evidence from Nigeria. *Journal of International development,* 25(3), 382-392.

Parasuraman, A., Berry, L.L. and Zeithaml, V.A. (1990), "Guidelines for Conduction Service Quality Research", Marketing Research, 1990, 2(4): 34-44

Parasuraman, A., Berry, L.L. and Zeithaml, V.A. (1991), Refinement and Reassessment of the SERVQUAL Scale", Journal of Retailing, 1991, 67(4): 420-450.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985)," A conceptual Model of Service Quality and its implications for Future Research, "Journal of Marketing, Vol 49, pp 41 -50.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988) "SERVQUAL: A Multiple Item Scale for Measuring Customer Perceptions of Service Quality," Journal of Retailing, Vol.64, pp 12 – 40.

Parasuraman. A., Zeithaml, V.A., and Berry, L.L. (1994), "Moving forward in service quality research: Measuring different levels of customer expectations, comparing alternative scales and examining the performance – behavioural intentions link," Marketing Science Institute Working Paper, Report No. 94-14, September, 1994.

Paschall, M. & Seville, D. (2012). Certified cocoa: Scaling up farmer participation in West Africa, *International Institute for Environment and Development/Sustainable Food Lab*, 2012, pp. 28.

Pender, J. L., & Kerr, J. M. (1998). Determinants of farmers' indigenous soil and water conservation investments in semi-arid India. *Agricultural Economics*, *19*(1-2), 113-125.

Picciotto, R. & Anderson, J. R. (1997). Reconsidering Agricultural Extension World Bank Res Obs.12: 249-259

Pitt, M., & Sumodiningrat, G. (1991). "Risk, Schooling and the Choice of Seed Technology in Developing Countries: A Meta-profit Function Approach," International Economic Review, 32: (2) 457- 473.

Poison, R. A. & Spencer, D. S. C. (1991). The technology adoption process in subsistence agriculture: The case of cassava in South Western Nigeria. Agric. Syst., 36: 65-77.

Qamar, M. K. (2005). Modernizing national agricultural extension systems: a practical guide for policy-makers of developing countries.

Randall, L. and Senior M. (1994), "A model for achieving quality in hospital hotel services", International Journal of Contemporary Hospital Management, Vol. 6 P. 68-74.

Rathmell, J. M. (1966). What is meant by services? *The Journal of Marketing*, 32-36.

Ravald, A., & Grönroos, C. (1996). The value concept and relationship marketing. *European journal of marketing*, *30*(2), 19-30.

Reynoso, J., & Moore, B. (1995). Towards the measurement of internal service quality. *International Journal of Service Industry Management*, *6*(3),64-83.

Rivera, W. M. & Zijp, W. eds. (2002). Contracting for Agricultural Extension: International Case Studies and Emerging Practices. Oxon, NY, US: *CABI Publishing.*

Rivera, W. M., & Cary, J. W. (1997). *Privatizing agricultural extension. Improving agricultural extension: a reference manual*. FAO, Roma (Italia).

Rivera, W. M., & Cary, J. W. (2002). Privatising Agricultural extension: Improving Agricultural Extension. *A reference manual*. FAO Rome. 203-211

Robinson, S. (1999). Measuring service quality: current thinking and future requirements. *Marketing Intelligence & Planning*, *17*(1), 21-32.

Robinson, W. I., & Robinson, W. I. (2003). *Transnational conflicts: Central America, social change and globalization*. Verso.

Rudie, M. J., & Wansley, H. B. (1985). Services marketing in a changing Environment. *The Merill Lynch quality program*.

Ruf, F. & Bini S. (2012), Cocoa and fertilizers in West-Africa, CIRAD, UMR Innovation.

Rutten, M. E., Dorée, A. G., & Halman, J. I. (2013). Exploring the value of a novel decision-making theory in understanding R&D progress decisions. *Management decision*.

Sachdev, S. B., & Verma, H. V. (2004). Relative importance of service quality dimensions: a multisectoral study. *Journal of services research*, *4*(1), 93.

Sahney, S., Banwet, D. K., & Karunes, S. (2004), "A SERVQUAL and QFD approach to total quality education: A student perspective", *International Journal of Productivity and Performance Management*, Vol.53, No.2, pp. 143-166.

Saleh, F. & Ryan, C. (1992). Analysis Service Quality in the Hospitality Industry Using the SERVQUAL Model. The Services Industries Journal, 11(3), pp 324-345

Schwab, J. A. (2002). Multinomial logistic regression: Basic relationships and complete problems. *Austin, Texas: University of Texas*.

Sebu. J. (2012). Off-farm labour participation and farm household income in Abura-Asebu-Kwamankese district of the central region of Ghana. Master's thesis, University of Cape coast.

Shaibu, B., Aliyu, H. & Bakshi, J. S. (1997). National agricultural research plan (1996-2010) *Federal ministry of Agriculture press*, Abuja, pp: 456

Shakya, P. B. & Flinn, J. C., (1985). Adoption of modern varieties and fertilizer use on rice in the eastern Tarai of Nepal. *J. Agric. Econ*., 36: 409-419.

Shekara, P. C. (2004). Status of private extension in India. *Accessed on*, *27*(11), 2012.

Silva, F. C. D., & Thuler, L. C. S. (2008). Cross-cultural adaptation and translation of two pain assessment tools in children and adolescents. *Jornal de pediatria*, *84*(4), 344-349.

Singh, I., Squire, L., & Strauss, J. (1986). *Agricultural household models: Extensions, applications, and policy*. The World Bank.

Smith, L. D. (2001). *Reform and decentralization of agricultural services: A policy framework*. Food & Agriculture Organisation of the United nation.

Speranza, C. I., Kiteme, B. & Opondo, M. (2009). Adopting Public Agricultural Extension Services to Climate Change: Insight from Kenya. Germany, German Development Institute.

Stoneman, P., & Karshenas, M. (1993). The diffusion of new technology: extensions to theory and evidence. *New Technologies and the Firm: Innovation and Competition*, 177-200.

Strauss, J., Babosa, M., Teixeira, S., Thomas, D. & Gomes, R., (1991). Role of education in adoption of technology: a study of upland rice and soybean farmers in central-west Brazil. Agric. Econ., 5: 341-359.

Stringfellow, R., Coulter, J., Hussain, A., Lucey, T., & McKone, C. (1997). Improving the access of smallholders to agricultural services in sub-Saharan Africa.: Farmer Cooperation and the Role of the Donor Community, Natural Resource Perspectives, *Small Enterprise Development*, *8*(3), 35-41.

Swanson, B. E. Bentz. RP, & Sofranko, A. J. (1997). *Improving agricultural extension: A reference manual*.3rd ed. FAO (Food and Agricultural Organisation of The United Nations), Rome, Italy.

Swanson, B., & Samy. M. (2002). "Developing an Extension Partnership among Public, Private and Non-Governmental Organization." *Journal of International Agricultural and Extension Education 9* (1): 5–10.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Allyn & Bacon/Pearson Education.

Teicher, J., Hughes, O. & Dow N. (2002), "E-government: a new route to public service quality", Managing Service Quality, vol. 70, P 423-433.

Thaler, Richard (1983), "Transaction Utility Theory," Advances in Consumer Research, 10, Richard P. Bagozzi and Alice M. Tybout, eds., Ann Arbor, MI: Association for Consumer Research, 229-232.

Thaler, Richard (1985), "Mental Accounting and Consumer Choice," Marketing Science, 4 (Summer), 199-214

Thompson, P., DeSouza, G., & Gale, B. T. (1985). The strategic measurement of quality. *Cambridge, MA: The Strategic Planning Institute, PIMSLETTER*, (33).

True, A. C. (1928). *A history of agricultural extension work in the United States, 1785-1923*. USDA, Miscellaneous Publication No. 15. Washington, DC: U.S. Government Printing Office.

Ulimwengu, J., & Sanyal, P. (2011). Joint estimation of farmers' stated willingness to pay for agricultural services. *International Food Policy Research Institute Discussion Paper*, 1070.

United Nations (2014). World Urbanization Prospects, the 2014 revision, Highlights, (ST/SEA/SER.A/352), *Department of Economic and Social Affairs, Population Division*, pp 32

Van den Ban, A. W. & Hawkins, H. S. (1998). Agricultural Extension, *Black Well Science Ltd*. Pub., Oxford, pp. 256 - 258.

Van Iwaarden, J., Van der Wiele, T., Ball, L., & Millen, R. (2003). Applying SERVQUAL to web sites: An exploratory study. *International Journal of Quality & Reliability Management*, *20*(8), 919-935.

Vermeulen, W., Goos, A. & Vandebroek, H. (2008). Models and optimal designs for conjoint choice experiments including a no-choice option, *International Journal of Research in Marketing, Vol. 25* (2): 94-103.

Vittinghoff, E., Shiboski, S. C., Glidden, D. V., & McCulloch, C. E. (2005). Regression Methods in Biostatistics: Linear, Logistic, Survival, and Repeated Measures Models. New York: Springer Science Business Media, Inc.

Wessel, M., & Quist-Wessel, P. F. (2015). Cocoa production in West Africa, a review and analysis of recent developments. *NJAS-Wageningen Journal of Life Sciences*, *74*, 1-7.

Wienco, (2017). Retrieved from the Wienco website. http://www.wienco.com /profile.html

Wienco. (n.d.). Wienco agriculture: Agricultural production on a sustainable basis. Retrieved from the Wienco website: http://www.wienco.com /profile.html

Wilson M. (1991). Reducing the costs of public extension services: initiatives in Latin America. *In: Rivera, W. M., Gustafon, D. J. (Eds.) Agricultural Extension Worldwide: Institutional Evolution and Forces for Change*. Elsevier: Amsterdam.

Wisniewski, M. (2001), "Using SERVQUAL to assess customer satisfaction with public sector services, "Managing Service Quality, *11(6):* 350-388

Wisniewski, M., & Donnelly, M. (1996). Measuring service quality in local government: the SERVQUAL approach. *Total Quality Management Journal*, *7*(4), 357-365.

Woodruff, R. B., Cadotte, E. R., & Jenkins, R. L. (1983). Modeling consumer satisfaction processes using experience-based norms. *Journal of marketing research*, 296-304.

World Bank (2005). *Agricultural Investment Source book. Agriculture and Rural Development*. Washighton DC.

Yabe, M. & Yoshida, K. (2006). Use of stated preference methods for environmental payments in Japan: comparison of contingent valuation method and choice experiments. *Quarterly Journal of International Agriculture*, *45*(4):437–454.

Yara Ghana. (2015). Building knowledge for future yields. Retrieved from the Yara website: http://www.yaraghana.com/

Young, J. A., & Varble, D. L. (1997). Purchasing's performance as seen by its internal customers: a study in a service organization. *International Journal of Purchasing and Materials Management*, *33*(2), 36-41.

Zeithaml, V., Parasuraman, A., & Berry, L. (1990). Balancing Customer Perceptions and Expectations. *Ed. Free Press. EE. UU*.

APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

RESEARCH QUESTIONNAIRE

TOPIC: WILLINGNESS TO PAY FOR IMPROVED EXTENSION SERVICE DELIVERY BY COCOA FARMERS IN AGONA EAST DISTRICT, CENTRAL REGION

This questionnaire is strictly for academic purposes and all information provided would be treated as such. Information provided would be treated with the outmost discretion as possible.

SECTION A: SOCIOECONOMIC CHARACTERISTICS OF RESPONDENT

1. Name of community……
2. Age ……..
3. Sex : Male [ ] Female [ ]
4. Marital status
   a. Single [ ]
   b. Married [ ]
   c. Widowed [ ]
   d. Divorced [ ]
5. What is the highest level of education you have attained?
   a. No formal education [ ]
   b. Primary [ ]
   c. JHS/ Middle [ ]
   d. SHS/Secondary [ ]
   e. Tertiary [ ]
   f. Other (Specify)……
6. How many children do you have? …….
7. Are you a household head?
   a. Yes [ ] b. No [ ]
8. How many dependents do you have? ……..
   a. Other (Specify) ……
9. How much do you spend daily on your family?.....

10. What is your main source of information?
    a. TV [ ]
    b. Radio [ ]
    c. Newspaper [ ]
    d. Friends [ ]
    e. Other (specify)…….
11. Are you engaged in another occupation apart from farming?
    a. Yes [ ] b. No [ ]
12. If yes, what is the other occupation?
    a. Civil servant [ ]
    b. Clergy [ ]
    c. Self-employed [ ]
    d. None [ ]
13. Is farmer land owner? .....
    a. Yes [ ] b. No [ ]
14. What right do you have to this farm
    a. Land owner
    b. Abunu/Sharecropping
    c. Caretaker
    d. Other (Specify) …….
15. Farm size (acres)……..
16. Years access to land..…….
17. How many workers work on your farm?.....
18. How many bags of cocoa do you harvest in a year?.....

SECTION B: QUESTIONS ON STATE OF EXTENSION SERVICE IN THE STUDY AREA

19. Do you receive extension service?
    a. Yes [ ] b. No [ ]
20. If yes, how often do you receive extension?
    a. Once in a month [ ]
    b. Once in 3 months [ ]
    c. Once in 6 months [ ]
    d. Once a year [ ]
21. What do you think of the current level of extension service delivery in Ghana? Please circle one of the points on the scale below.

Below satisfactory Above satisfactory
1 2 3 4 5 6 7

22. Are you satisfied with the number of extension visits you get?
Definitely dissatisfied Definitely Satisfied
1 2 3 4 5 6 7

23. Are you willing to have improvement in the extension service you are receiving?
    a. Yes [ ] b. No [ ]

24. Are you willing to pay for the improved extension service?
    a. Yes [ ] b. No [ ]

SECTION C: FARMERS' PERCEPTIONS ON CHARACTERISTICS OF AN EXTENSION SERVICE

25. Please can you rank the following characteristics (in order of importance) you consider as part of an extension service delivery (please use the codes). Enter a ranking for each, with 1= most important, 2=second most important . . . and 8=least important

- Farm visits
- Good communication
- Good form of Transport for agents
- Farm Advisory services (Access to relevant information from Research institutions and other key actors)
- Proximity of Agent
- Good Agent-farmer relation
- Availability of efficient tools and equipment
- Responsiveness of Agents

26. Please rank the following constraints to extension service in order of importance; 1=most pressing constraint to 10= least pressing constraint

Extension constraints

1. Lack of effective communication
2. Transportation (Lack of motorbikes to access areas, poor roads)
3. Perceived Funding problems of projects (Not released by Government on time)
4. Wide agent-farmer ratio
5. Lack of interactions between agents and key actors (Research institutions, Professionals and farmers)
6. Low competencies of agents
7. Lack of commitment of extension agents
8. Inadequate supervision by extension agents
9. Weak linkages between researchers-agent-farmer
10. Lack of training for farmers

SECTION D: FARMERS' AWARENESS OF PRIVATE EXTENSION

27. Have you heard of private extension?
    a. Yes [ ] b. No [ ]
28. Are you willing to receive private extension service?
    a. Yes [ ] b. No [ ]
29. Are you willing to pay premium for the private extension service?
    a. Yes [ ] b. No [ ]
30. If Yes, How often are you willing to pay your premium?
    a. monthly [ ] b. yearly [ ] c. not at all [ ]
    .

31. If Yes, How would you like to pay for the private extension services you access?
    a. Monthly cash payments [ ]
    b. Monthly in cocoa beans [ ]
    c. receive on credit and pay at the end of the year [ ]
    d. Other (Specify) ……

SECTION E: QUESTIONS TO EXAMINE THE QUALITY OF EXTENSION SERVICE PROVIDED

Center column contains some attributes that as a farmer, you would expect from an excellent Agricultural Extension Delivery System. There are two scales on each side of this column, the one on the left measures your expectations and the one on the right measures your perceptions. Please read each attribute first and then circle the numbers in both scales that indicate your judgments. The corresponding values for the numbers are shown at the top of both scales.

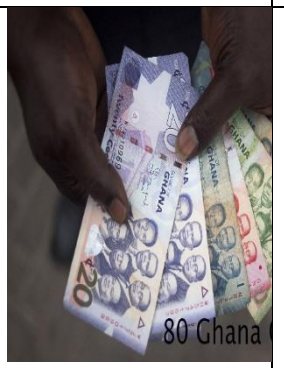
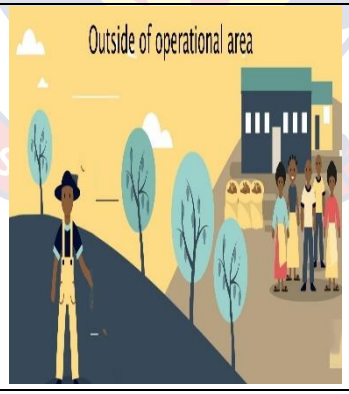
When evaluating the service quality of an efficient Private Extension as a farmer, indicate the extent to which you agree or disagree with each statement using the scale 1 = Strongly disagree, 2 = disagree, 3 = Neither disagree nor agree, 4 = Agree and 5 = Strongly agree?					List of attributes	If you evaluated the services of the Government Extension service delivery, how would you rate the service for the attributes given in the center column using the scale 1 = Strongly disagree, 2 = disagree, 3 = Neither disagree nor agree, 4 = Agree and 5 = Strongly agree?				
Reliability										
1	2	3	4	5	When the organisation promises to do something by a certain time,they do so	1	2	3	4	5
1	2	3	4	5	The agents show sincere interest on solving farmers' Problems	1	2	3	4	5

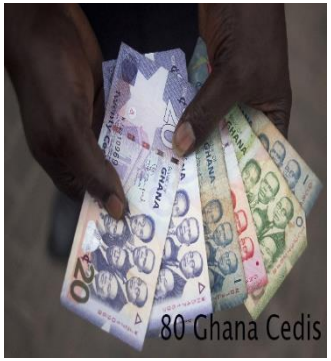
1	2	3	4	5	The institution is dependable	1	2	3	4	5
1	2	3	4	5	They provide services at the time required/ promised	1	2	3	4	5
1	2	3	4	5	The organisation provides correct /accurate information to their farmers	1	2	3	4	5
Responsiveness										
1	2	3	4	5	The extension agents provide prompt services to their customers	1	2	3	4	5
1	2	3	4	5	The organization is always willing to help farmers	1	2	3	4	5
1	2	3	4	5	The agents are never too busy to respond to farmers' request	1	2	3	4	5
Assurance										
1	2	3	4	5	Farmers have confidence in the organisation	1	2	3	4	5

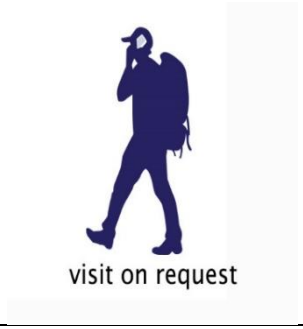
1	2	3	4	5	The Institution can be trusted by farmers	1	2	3	4	5
1	2	3	4	5	The agents are consistently courteous to farmers	1	2	3	4	5
1	2	3	4	5	The agents get adequate support from the institution	1	2	3	4	5
1	2	3	4	5	The agents have the required knowledge to answer farmers' questions	1	2	3	4	5
					Empathy					
1	2	3	4	5	The organisation gives individual attention to farmers	1	2	3	4	5
1	2	3	4	5	The organization has farmers' best interest at heart	1	2	3	4	5
1	2	3	4	5	The agents understand the specific needs of farmers	1	2	3	4	5
1	2	3	4	5	The organization has working hours convenient to farmers	1	2	3	4	5

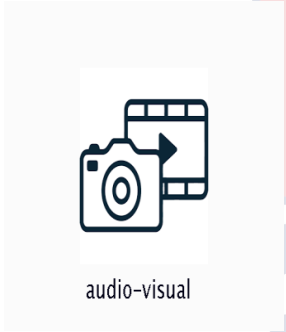
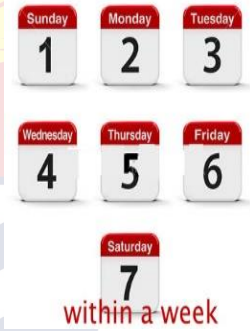
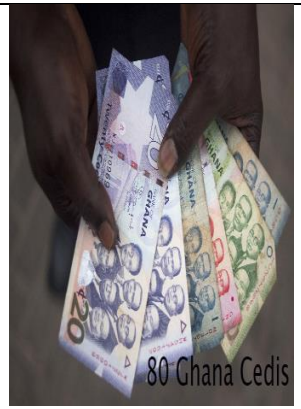
Tangibles										
1	2	3	4	5	The organization has up-to-date equipment	1	2	3	4	5
1	2	3	4	5	The working tools are visually appealing and in good shape	1	2	3	4	5
1	2	3	4	5	The agents are well dressed and appear neat	1	2	3	4	5
Satisfaction										
1	2	3	4	5	Overall, I am satisfied with the services of the organization	1	2	3	4	5
Loyalty										
1	2	3	4	5	I intend to be affiliated to this organisation	1	2	3	4	5
1	2	3	4	5	I will recommend this organisation to someone who seeks my advice	1	2	3	4	5

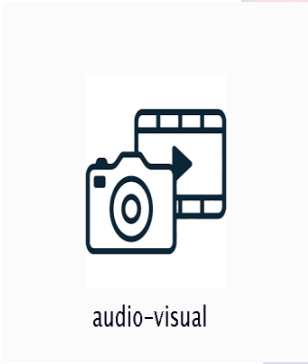
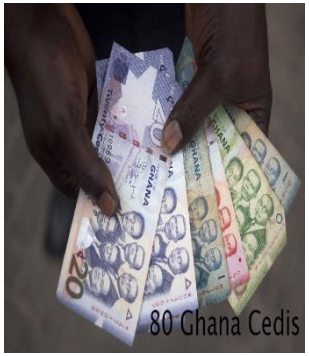
SECTION F: CHOICE SELECTION OF VARIOUS EXTENSION PRODUCTS

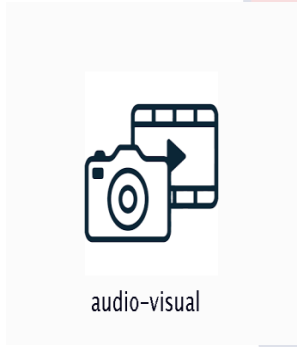
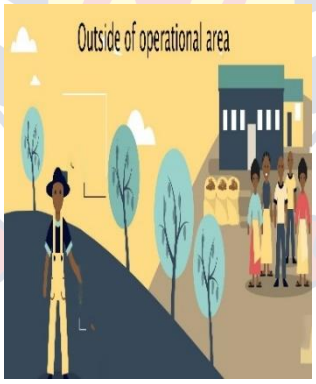
1	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A	 visit on request	 audio-visual				
B	 one visit/month	 audio-visual				

2	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A	 visit on request					
B	 one visit/month	 audio-visual				

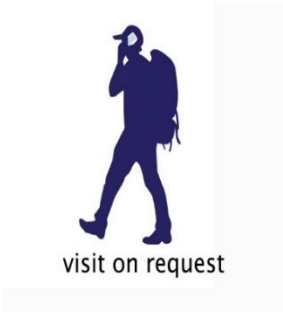
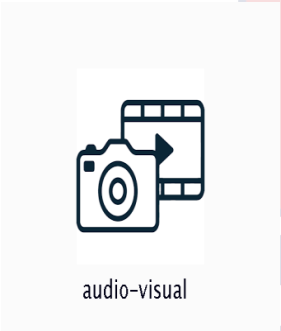
3	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A		 audio-visual				
B						

4	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A						
B						

5	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A						
B						

6	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A						
B						

7	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A	 visit on request					
B	 one visit/month	 audio-visual				

8	Frequency of farm visit	Farm Advisory Service	Proximity of Agent	Response time	Price of Extension Package	Choice (Tick)
A						
B						

Multivariate Regression Results Showing Factors Affecting Farmers' Assessment of the Quality of Agricultural Extension Service Provision

Parameter Estimates

Dependent Variable	Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Reliability value of respondent	Intercept	6.258	10.502	.596	.552	-14.532	27.049
	Age	-.005	.003	-1.525	.130	-.012	.002
	Educational Level	.106	.050	2.133	.035	.008	.204
	Gender	.059	.096	.618	.538	-.131	.250
	Family Size	.007	.012	.554	.581	-.017	.030
	Other Occupation	.028	.060	.464	.643	-.091	.146
	Farm size	.016	.027	.590	.556	-.037	.069
	Years of Farming	.007	.005	1.318	.190	-.004	.018
	Daily budget	.002	.005	.433	.666	-.007	.011
	Harvest/annum	-.003	.005	-.598	.551	-.013	.007
	How often do you receive visits from agents	-.004	.138	-.026	.979	-.276	.269
	Effective communication	-1.204	1.183	-1.018	.311	-3.546	1.138
	Transportation	.798	.666	1.198	.233	-.521	2.117
	Funding of Government projects	2.626	2.602	1.009	.315	-2.524	7.777
	agent-farmer ratio	-2.219	2.508	-.885	.378	-7.183	2.745
	interactions between farmers and key actors in extension	-.633	.541	-1.171	.244	-1.703	.437
	competency of agents	-1.941	2.018	-.962	.338	-5.935	2.053
	commitment of extension agents	-.397	.485	-.819	.414	-1.357	.562
	supervision of extension agents	-.496	.536	-.924	.357	-1.558	.566
	linkages between researchers-agents-farmers	0[a]	.	.	.	.	.
	training of farmers	0[a]	.	.	.	.	.
	level of extension	-.120	.051	-2.345	.021	-.222	-.019
	Satisfaction with visits	.112	.052	2.138	.035	.008	.215
	Farm visits	-.315	.282	-1.117	.266	-.872	.243
	Good communication	-.103	.222	-.466	.642	-.543	.336
	Responsiveness of Agents to farmers' call	-.167	.219	-.763	.447	-.601	.267
	Good form of Transport for agents	.094	.170	.556	.579	-.242	.431
	Access to Farm Advisory services	-.081	.214	-.377	.707	-.503	.342
	Proximity of Agent	-.242	.237	-1.021	.309	-.712	.228
	Good agent-farmer relations	-.038	.170	-.224	.823	-.375	.299

	Availability of efficient tools and equipment	.105	.155	.678	.499	-.201	.412
	Intercept	6.506	12.509	.520	.604	-18.256	31.268
	Age	.006	.004	1.424	.157	-.002	.014
	Educational Level	.012	.059	.200	.842	-.105	.129
	Gender	-.083	.115	-.723	.471	-.310	.144
	Family Size	-.007	.014	-.491	.625	-.035	.021
	Other Occupation	-.083	.071	-1.158	.249	-.224	.059
	Farm size	.005	.032	.145	.885	-.059	.068
	Years of Farming	-.007	.007	-1.043	.299	-.020	.006
	Daily budget	.008	.006	1.508	.134	-.003	.019
	Harvest/annum	-.002	.006	-.419	.676	-.014	.009
	How often do you receive visits from agents	-.047	.164	-.288	.774	-.372	.277
	Effective communication	-1.622	1.409	-1.151	.252	-4.411	1.167
	Transportation	.982	.794	1.238	.218	-.589	2.553
	Funding of Government projects	3.945	3.099	1.273	.205	-2.190	10.079
	agent-farmer ratio	-3.739	2.987	-1.252	.213	-9.652	2.173
	interactions between farmers and key actors in extension	-.814	.644	-1.264	.209	-2.089	.461
	competency of agents	-3.130	2.403	-1.303	.195	-7.887	1.627
Responsiveness value of respondent	commitment of extension agents	-.580	.577	-1.005	.317	-1.723	.562
	supervision of extension agents	-.720	.639	-1.128	.262	-1.985	.544
	linkages between researchers-agents-farmers	0[a]	.	.	.	.	.
	training of farmers	0[a]	.	.	.	.	.
	level of extension	.071	.061	1.161	.248	-.050	.192
	Satisfaction with visits	-.107	.062	-1.720	.088	-.231	.016
	Farm visits	-.021	.336	-.062	.951	-.685	.644
	Good communication	.199	.265	.750	.454	-.325	.722
	Responsiveness of Agents to farmers' call	.059	.261	.227	.821	-.458	.576
	Good form of Transport for agents	.101	.202	.498	.619	-.300	.501
	Access to Farm Advisory services	.013	.254	.051	.960	-.491	.516
	Proximity of Agent	.058	.283	.204	.838	-.502	.617
	Good agent-farmer relations	.087	.203	.431	.667	-.314	.488
	Availability of efficient tools and equipment	.164	.184	.890	.375	-.201	.529
Assurance value of respondent	Intercept	7.308	12.189	.600	.550	-16.822	31.438
	Age	.004	.004	.893	.374	-.004	.011
	Educational Level	-.049	.058	-.844	.400	-.163	.065
	Gender	.215	.112	1.928	.056	-.006	.436
	Family Size	-.001	.014	-.059	.953	-.028	.026
	Other Occupation	.034	.069	.488	.626	-.104	.171
	Farm size	-.014	.031	-.433	.666	-.075	.048
	Years of Farming	.003	.006	.479	.633	-.010	.016
	Daily budget	-.001	.005	-.173	.863	-.012	.010
	Harvest/annum	.001	.006	.226	.821	-.010	.012

	How often do you receive visits from agents	-.153	.160	-.959	.339	-.469	.163
	Effective communication	-.087	1.373	-.063	.950	-2.805	2.632
	Transportation	-.085	.773	-.109	.913	-1.616	1.446
	Funding of Government projects	.838	3.020	.277	.782	-5.141	6.816
	agent-farmer ratio	-1.068	2.910	-.367	.714	-6.830	4.693
	interactions between farmers and key actors in extension	-.128	.627	-.204	.839	-1.370	1.114
	competency of agents	-.844	2.342	-.360	.719	-5.479	3.792
	commitment of extension agents	-.305	.563	-.542	.589	-1.419	.809
	supervision of extension agents	-.143	.623	-.230	.818	-1.376	1.089
	linkages between researchers-agents-farmers	0[a]	.	.	.	.	.
	training of farmers	0[a]	.	.	.	.	.
	level of extension	.046	.060	.779	.438	-.072	.164
	Satisfaction with visits	.021	.061	.347	.729	-.099	.141
	Farm visits	-.006	.327	-.019	.985	-.654	.641
	Good communication	-.156	.258	-.606	.545	-.667	.354
	Responsiveness of Agents to farmers' call	.123	.254	.485	.629	-.380	.627
	Good form of Transport for agents	-.051	.197	-.259	.796	-.441	.339
	Access to Farm Advisory services	.096	.248	.389	.698	-.394	.587
	Proximity of Agent	-.135	.275	-.489	.625	-.680	.410
	Good agent-farmer relations	-.174	.197	-.882	.379	-.565	.217
	Availability of efficient tools and equipment	-.201	.180	-1.120	.265	-.557	.154
	Intercept	-9.281	16.063	-.578	.564	-41.079	22.518
	Age	.003	.005	.604	.547	-.007	.014
	Educational Level	-.031	.076	-.413	.680	-.182	.119
	Gender	-.059	.147	-.400	.690	-.350	.232
	Family Size	-.010	.018	-.537	.592	-.046	.026
	Other Occupation	.025	.092	.275	.784	-.156	.206
	Farm size	-.028	.041	-.687	.493	-.110	.053
	Years of Farming	-.006	.008	-.659	.511	-.022	.011
	Daily budget	.005	.007	.681	.497	-.009	.019
	Harvest/annum	.010	.007	1.287	.201	-.005	.024
Empathy value of respondent	How often do you receive visits from agents	.228	.210	1.085	.280	-.188	.645
	Effective communication	-.595	1.810	-.329	.743	-4.177	2.987
	Transportation	.272	1.019	.266	.790	-1.746	2.289
	Funding of Government projects	2.175	3.980	.547	.586	-5.702	10.053
	agent-farmer ratio	-2.194	3.835	-.572	.568	-9.787	5.398
	interactions between farmers and key actors in extension	-.601	.827	-.727	.468	-2.238	1.035
	competency of agents	-1.946	3.086	-.631	.530	-8.055	4.163

	commitment of extension agents	-.588	.741	-.793	.429	-2.055	.880
	supervision of extension agents	-.350	.820	-.426	.671	-1.974	1.275
	linkages between researchers-agents-farmers	0[a]	.	.	.	.	.
	training of farmers	0[a]	.	.	.	.	.
	level of extension	-.010	.078	-.125	.901	-.165	.146
	Satisfaction with visits	-.032	.080	-.398	.692	-.190	.127
	Farm visits	.844	.431	1.959	.052	-.009	1.697
	Good communication	.361	.340	1.062	.290	-.312	1.033
	Responsiveness of Agents to farmers' call	.617	.335	1.842	.068	-.046	1.281
	Good form of Transport for agents	.496	.260	1.909	.059	-.018	1.010
	Access to Farm Advisory services	.558	.327	1.710	.090	-.088	1.205
	Proximity of Agent	.072	.363	.199	.842	-.646	.791
	Good agent-farmer relations	.596	.260	2.292	.024	.081	1.111
	Availability of efficient tools and equipment	.440	.237	1.857	.066	-.029	.908
	Intercept	-1.997	9.803	-.204	.839	-21.404	17.409
	Age	.004	.003	1.221	.224	-.002	.010
	Educational Level	.092	.046	1.985	.049	.000	.184
	Gender	.068	.090	.756	.451	-.110	.246
	Family Size	.003	.011	.310	.757	-.018	.025
	Other Occupation	.022	.056	.388	.699	-.089	.132
	Farm size	.026	.025	1.045	.298	-.023	.076
	Years of Farming	.004	.005	.875	.383	-.006	.015
	Daily budget	-.002	.004	-.401	.689	-.010	.007
	Harvest/annum	-.001	.005	-.280	.780	-.010	.008
	How often do you receive visits from agents	-.065	.128	-.510	.611	-.320	.189
	Effective communication	.633	1.104	.573	.568	-1.553	2.819
Tangibles value of respondent	Transportation	-.362	.622	-.582	.561	-1.594	.869
	Funding of Government projects	-.297	2.429	-.122	.903	-5.105	4.511
	agent-farmer ratio	-.232	2.341	-.099	.921	-4.866	4.402
	interactions between farmers and key actors in extension	.022	.505	.043	.966	-.977	1.021
	competency of agents	-.255	1.883	-.135	.892	-3.983	3.473
	commitment of extension agents	-.200	.452	-.441	.660	-1.095	.696
	supervision of extension agents	.192	.501	.384	.702	-.799	1.183
	linkages between researchers-agents-farmers	0[a]	.	.	.	.	.
	training of farmers	0[a]	.	.	.	.	.

	level of extension	-.036	.048	-.756	.451	-.131	.059
	Satisfaction with visits	-.001	.049	-.016	.987	-.097	.096
	Farm visits	.059	.263	.224	.823	-.462	.579
	Good communication	.100	.207	.481	.631	-.311	.510
	Responsiveness of Agents to farmers' call	.097	.205	.475	.636	-.308	.502
	Good form of Transport for agents	.022	.159	.138	.891	-.292	.336
	Access to Farm Advisory services	.029	.199	.147	.883	-.365	.424
	Proximity of Agent	.047	.221	.213	.832	-.391	.486
	Good agent-farmer relations	.000	.159	-.003	.998	-.315	.314
	Availability of efficient tools and equipment	.066	.145	.458	.648	-.220	.352

a. This parameter is set to zero because it is redundant.