

**LINKING PROGRAMME PLANNING APPROACHES TO
LIVELIHOOD OUTCOMES OF FARMERS: A CASE STUDY OF
AGRICULTURAL EXTENSION SERVICES IN GHANA**

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**DEPARTMENT OF AGRICULTURAL EXTENSION
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DECEMBER, 2014

DECLARATION

I hereby declare that the work presented in this thesis was carried out by myself and has never in any part or whole been presented to any other university for the award of a degree.

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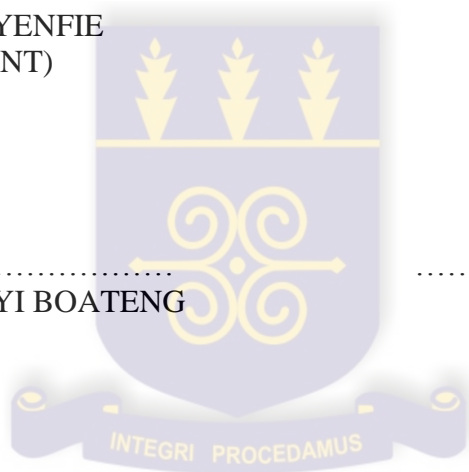
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DEDICATION

Dedicated to Mrs Elizabeth Gyenfie, my dear mother.



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To God be the Glory.

ABSTRACT

This study aimed to find out the effect of linking programme planning approaches to livelihood outcomes of farmers and verify which approach is likely to reduce poverty among farmers. The research problem confronting us is that livelihood outcomes of rural farmers have not been improved over the years despite several planning approaches used by Agriculture Extension Services to deliver programmes to farmers. The population of study was Agricultural Extension Agents of the Ministry of Food and Agriculture and farmers they provide services to. A multi-stage stratified sampling technique was used to randomly select eight districts out of a total of two hundred and sixteen (216) districts from the ten (10) regions of Ghana based on the four climatic and vegetation zones of the country. Two districts were randomly selected from each zone. A total of eighty-six (86) Agricultural Extension Agents and four hundred and two (402) farmers were interviewed. Districts were categorised into three as having (1) high, (2) medium and (3) low characteristics of the use of outcome logic model in programme delivery. Survey interview questionnaires were used to collect information from Agricultural Extension Agents (AEAs) and their farmers. Data collected were coded and analysed using Statistical Package for Social Sciences (SPSS). Descriptive statistics, Kruskal-Wallis H Test and Mann-Whitney U Test were used to describe and analyse data. Farmers operating in districts with high characteristics of OLM approach of planning of programmes received high training, practised more extension packages, had better access to financial and physical assets and achieved high overall livelihood outcomes. The study showed that programmes delivered by agricultural extension services which all stakeholders were involved in the initial planning process that identified the outcomes to be achieved and ensured that the needed resources were provided to carry out planned activities improved the performance and livelihood outcomes of farmers. It is recommended that the Outcome Logic Model approach should be the tool for planning pro-poor programmes by Agricultural Extension Services in Ghana since it has the potential of improving the performance and livelihood outcomes of farmers.

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List of Acronyms

ADP	Agriculture Diversification Project
AESD	Agricultural Engineering Services Directorate
ASIP	Agriculture Services Investment Project
CAADP	Comprehensive Africa Agriculture Development Programme
CDFO	Commercial Development of Farmer Based Organisations
CSIR	Council for Scientific and Industrial Research
DFID	Department for International Development
EAHC	Executive Agency for Health and Consumers
FAO	Food and Agricultural Organisation
FASDEP	Food and Agricultural Sector Development Programme
FBOs	Farmer-based Organizations
FCDP	Food Crops Development Project
FSSCBP	Fisheries Sub Sector Capacity Building Project
GLSS	Ghana Living Standard Survey
GPRS	Ghana Poverty Reduction Strategy
GRASP	Global and Regional Advocacy for Small Producers
GSS	Ghana Statistical Service
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
ISSER	Institute of Statistical, Social and Economic Research
LACOSREP	Land Conservation and Smallholder Rehabilitation Project
MCA	Millennium Challenge Account
MDG	Millennium Development Goal
METASIP	Medium Term Agriculture Sector Investment Plan
MiDA	Millennium Development Authority
MoFA	Ministry of Food and Agriculture
MTADP	Medium Term Agricultural Development Programme
NAEP	National Agriculture Extension Project

NARP	National Agriculture Research Project
NEPAD	New Partnership for Africa's Development
NLSP	National Livestock Services Project
OECD	Organisation for Economic Co-operation and Development
OLM	Outcome Logic Model
RELCs	Research and Extension Liaison Committees
REP	Rural Enterprise Programme
RTIMP	Roots and Tubers Improvement and Marketing Project
RTIP	Roots and Tubers Improvement Project
SCIMP	Small holder Credit, Input, Supply and Marketing Project
SPSS	Statistical Package for Social Sciences
T&V	Training and Visit
UES	Unified Extension System
UNDP	United Nation Development Programme
USAID	United State Agency for International Development
UWADEP	Upper West Agriculture Development Project
VIP	Village Infrastructure Project
WDR	World Development Report
WFP	World Food Programme
WIAD	Women In Agricultural Development Directorate

CHAPTER ONE

BACKGROUND

1.0 Introduction

Agricultural extension and advisory services play an important role in agricultural development and can contribute to improving the welfare of farmers and other people living in rural areas (Waddington et al. 2010). Agriculture has been observed to hold the key to poverty reduction and improvement in livelihoods of rural people engaged in farming in many developing countries (GRASP, 2009; IFPRI, 2010) with Ghana as no exception. This chapter examines the global concern of improving livelihoods of farmers, the concern area, effect of agricultural strategies on poverty reduction, the research problem, research questions research hypotheses, objectives, the significance of the study as well as operational definitions of terms used in the study are covered.

1.1 Global focus on improving livelihoods of farmers

The development goal of improving the livelihoods of farmers has been the concern of both the developed and developing countries and it has become an issue which has been set out to be implemented by all countries especially the developing countries. In the 21st century, agriculture continues to be a fundamental instrument for sustainable development and poverty reduction. It is estimated that three out of every four poor people in developing countries live in rural areas—2.1 billion living on less than \$2 a day and 880 million on less than \$1 a day—and most depend on agriculture for their livelihoods. Given, where they are and what they do best, promoting agriculture is imperative for meeting the Millennium Development Goal

(MDG) of halving poverty and hunger by 2015 and reducing poverty and hunger for several decades thereafter (World Bank, 2007).

The World Development Report (WDR) 2004 focused on those services that have the most direct link with human development. These included education, health, water, sanitation, electricity and explored the many dimensions of poverty, through outcomes of service delivery for poor people. It stipulated that access to affordable services was low especially for poor people in addition to a wide range of failures in quality. It suggested that the complexity of accountability must be established, as well as instruments for reforming institutions to improve services both in developing, and developed countries (World Bank, 2003).

Earlier, the World Development Report (2000/2001) with the theme “Attacking Poverty” argued that major reductions in all dimensions of poverty are possible--that the interaction of markets, state institutions, and civil societies can harness the forces of economic integration and technological change to serve the interests of poor people and increase their share of society's prosperity. In another development, in the year 2000, because of the importance attached to improvement in the livelihoods of the poor, 189 nations made a promise to free people from extreme poverty and multiple deprivations. This pledge became the eight Millennium Development Goals (MDGs) to be achieved by 2015 (UN, 2000). The eight Millennium Development Goals sought to

- Eradicate extreme poverty and hunger.
- Achieve universal primary education.
- Promote gender equality and empower women.

- Reduce child mortality.
- Improve maternal health.
- Combat HIV/AIDS, malaria, and other diseases.
- Ensure environmental sustainability.
- Develop a global partnership for development.

Recognizing the importance of agriculture to the economies of its member states and the many challenges faced in reducing poverty and enhancing food security on the continent by the African Union (AU), its New Partnership for Africa's Development (NEPAD), created an agricultural initiative called the Comprehensive Africa Agriculture Development Programme (CAADP) in 2003. African governments committed through the Maputo Declaration to increase public investment in agriculture to a minimum of 10 per cent of their national budgets and to raise sector growth by at least 6 per cent by 2008. The CAADP was to become a common framework for accelerating long term agricultural development and growth in order to eliminate hunger and reduce poverty through agriculture (GRASP, 2009; IFPRI, 2010).

Together, these show that poverty reduction and enhancing livelihoods of the actors especially the smallholder in agriculture has taken centre stage of the development agenda. Since agriculture is Ghana's most important economic sector, employing more than half the population on a formal and informal basis and accounting for almost half of GDP and export earnings (Asafo-Adjei, 2011), Ghana has actively supported and implemented such global poverty reduction strategies through planned public sector agricultural programmes carried out by the Department of Agricultural Extension Services of the Ministry of Food and

Agriculture at the National and Regional levels and the District Agricultural Development Units (DADU) of the Municipal/District Assemblies.

1.2 Geographic and demographic background of Ghana

The Republic of Ghana has Accra as its capital and has a population of 24.22 Million. It has population growth of 2.4% per annum. The country lies Latitude 4^o 44'N and 11 11'N; and Longitude 3 0 11' W and 1 0 11'E with a coastline of 550 km long. The principal agricultural exports include Cocoa, Timber, Horticultural Products, Fish/Sea Foods, Game & Wildlife while the principal mineral resources are Gold, Bauxite, Manganese and Diamond (MoFA, 2010).

1.2.1 Agro-Ecological Zones

There are 5 main agro-ecological zones defined on the basis of climate, reflected by the natural vegetation and influenced by the soils. These are Rain Forest, Deciduous Forest, Transitional Zone, Coastal Savanna and Northern Savanna (Guinea and Sudan Savanna) (MoFA, 2010).

1.2.2 Climate

The climatic condition of the country consists of warm and comparatively drier tropical eastern coastal belt, hot and humid south west corner is and hot and dry northern section. The temperatures ranges from an annual average of 26.1⁰ C in places near the coast to 28.9⁰ C in the extreme north however temperatures can move into the 40s. The highest temperatures are recorded in the Upper East Region, specifically at Navrongo (MoFA, 2010).

1.2.3 Topography

The topography is predominantly undulating, with slopes less than 1%. Even though the slopes are gentle, about 70% of the country is subject to moderate to severe sheet and gully erosion (MoFA, 2010).

1.2.4 Soils

The soils have predominantly light textured surface horizons in which sandy loams and loams are common. Lower soil horizons have slightly heavier textures varying from coarse sandy loams to clays. Heavier textured soils occur in many valley bottoms and in parts of the Accra Plains. Many soils contain abundant coarse material either gravel and stone, or concretionary materials which affect their physical properties, particularly their water holding capacity (MoFA, 2010).

1.2.5 Farming Systems

Agriculture is predominantly on a smallholder basis in Ghana. About 90% of farm holdings are less than 2 hectares in size, although there are some large farms and plantations, particularly for rubber, oil palm and coconut and to a lesser extent, rice, maize and pineapples. Main system of farming is traditional. The hoe and cutlass are the main farming tools. There is little mechanized farming, but bullock farming is practiced in some places, especially in the North. Agricultural production varies with the amount and distribution of rainfall. Soil factors are also important. Most food crop farms are intercropped. Mono cropping is mostly associated with larger-scale commercial farms (MoFA, 2010).

1.2.6 Political Boundaries

Ghana is divided into ten regions (capitals in parentheses). These are Ashanti Region (Kumasi), Brong –Ahafo (Sunyani), Central Region (Cape Coast), Eastern Region (Koforidua), Greater Accra (Accra), Northern Region (Tamale), Upper East Region (Bolgatanga), Upper West Region (Wa), Volta Region (Ho) and Western Region (Sekondi-Takoradi)

1.2.7 The study area

The study was carried out in eight (8) districts in the ten regions of the country. They are:

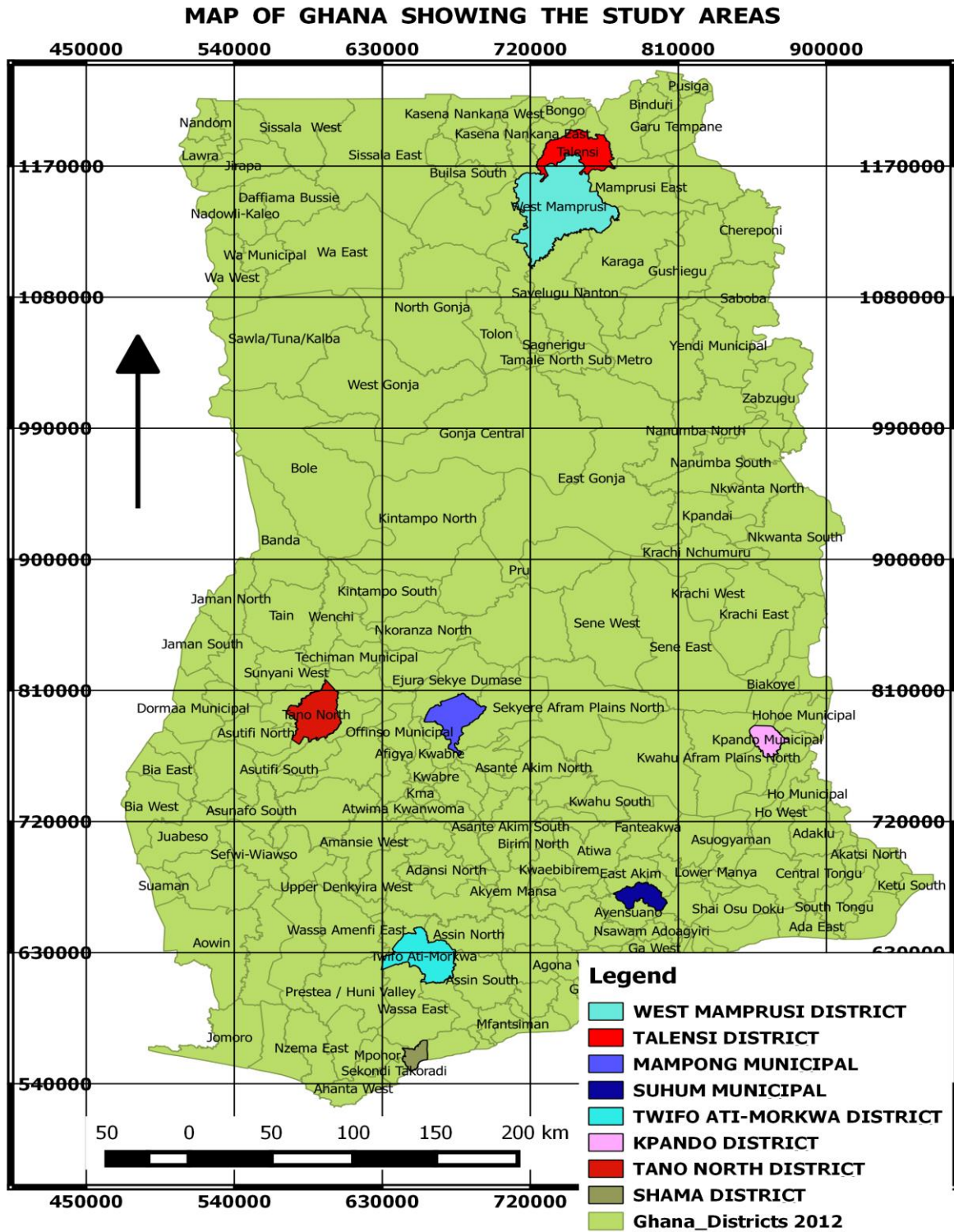
- West Mamprusi District- Northern Region,
- Talensi Nabdam- District-Upper East Region,
- Manpong Municipal-Ashanti Region,
- Suhum Municipal-Eastern Region,
- Twifo Ati-Morkwa-Central Region,
- Kpando Municipal-Volta Region,
- Tano North District-Brong Ahafo Region and
- Shama District-Western Region.

Apart from the two districts representing the three northern regions of the country which have uni-modal rainy season, the remaining six (6) districts have bi-modal rainy season. Land tenure system comprises of stool lands, leasehold and share cropping. There is also the possibility of outright sale of land to large scale commercial farmers.

The major crops grown are maize, cassava, plantain,vegetables (tomatoes, garden eggs, pepper, okro, onion), cocoyam, yam, cocoa, oil palm and citrus whilst poultry, sheep and

goats are the major animals reared. With regard to the northern districts, the predominant crops grown are maize, sorghum, millet rice, vegetable (tomatoes, pepper, okro, garden eggs), tubers (sweet potatoes, frafra potatoes and yams).

Figure 1.1: Map of Ghana showing the study areas



1.3 Concern area

Agriculture has been identified as one of the means through which the livelihood outcomes of rural poor smallholder farmers could be improved since that sector employs a greater percentage of the population especially in sub-Saharan Africa. While progress in poverty reduction has been concentrated in Asia, and especially, East Asia, with the major improvement occurring in China, the number of people in extreme poverty has increased in Sub-Saharan Africa (Hunger Notes, 2011).

Given that agriculture constitutes a large sector in Ghana's economy and provides livelihood for over 60% of the population (Asmah, 2011), it is expected that agricultural development activities play a key role to improve the livelihood of the people (Lartey, 2011; MoFA, 2010). However results from four Living Standard Surveys that were conducted {GLSS I (1987/88), GLSS II (1988/89), GLSS III (1991/92) and GLSS IV (1998/99)} suggested that poverty is higher in rural than urban areas (Ghana Living Standard Survey, 2006; Krugman, 2009).

This is coming on the heels of several agricultural policies such as "Making People Matter" A Human Development Strategy for Ghana (1991) followed by the National Development Policy Framework, (1994) which was a twenty five year development perspective and Vision 2020: the First step (1995), a five year policy statement later developed into the First Medium Term Development Plan 1996-2000, Ghana Poverty Reduction Strategy (GPRS), 2003-2005, (2003), FASDEP I, (2000) and FASDEP II, (2009) followed and currently the METASIP have been adopted for implementation to help farmers improve on their production through improvement in their knowledge, attitude and practices and ultimately their livelihood

outcomes as a result of continuous interaction of Agricultural Extension Agents (AEAs) with rural farmers (MoFA, 2010).

Despite all the efforts by MoFA to get farmers to improve upon their farming performance and livelihood outcomes through delivery of technologies in crops, livestock, fisheries, nutrition, marketing and agribusiness, there has not been much change in yield, productivity and relative poverty. Whilst Sagoe (2006) reported of decline in observed yield against predicted yields from 1981 to 1991, the yields of key staple crops i.e. maize, cassava, and plantain recorded a decline in 2006 from the 2005 levels (IMF, 2009), and has also led to reports of low observed yields compared to achievable yields in Ghana (Asuming-Brempong, 2009; MoFA, 2010). Maize yields in Ghana are relatively low, about 1.7 tons/hectare, even though there is potential for increased productivity, with yields of 6 metric tons/hectare (MoFA, 2010).

The current state of the rural Ghanaian farmers is that they still operate at subsistence levels and work on average land size of 2 hectares with majority cultivating about a quarter of a hectare. Estimates are that 90% of the land under maize cultivation in Ghana is comprised of plots of less than 1 ha (Nedelcovych and Shiferaw, 2012). Poverty is rather on the increase especially among rural farmers who are involved in food crop production. A recent report by Institute of Social Statistical and Economic Research (ISSER) (2013) indicated that the agricultural sector continue to perform poorly, a trend which had been observed since 2006. The report continued to show that the overall growth of the agricultural sector was 1.3 per cent in 2012 compared to 0.8 per cent in 2011, but well below the growth of 5.3 per cent in 2010 and this was also below the target growth rate of 4.8 per cent envisaged for the year 2012.

The situation of the smallholder farmers is worsened by the fact that there are no good enough storage facilities for them to store the little farm produce obtained due to low yields. The types of storage facilities they have been using lead to high post harvest losses and it is estimated that postharvest losses (e.g. maize) ranged from 5 – 70 % depending on the practices of each individual farmer (WABS, 2008). This situation shows clearly that even though MoFA is reaching out to rural farmers with several pro- poor interventions, there is not much improvement in their livelihood outcomes and this raises some concern as to what might be the fundamental cause(s) of the phenomenon of poor farming performance and limited improvement in the livelihood outcomes of farmers and therefore this study.

1.4 Research problem statement

Various strategies have been used to improve upon farm performance and ensure sustainable livelihood outcomes of small holder rural farmers in developing countries. Among the various strategies is the implementation of several pro poor agricultural interventions and programmes by Ghana's Ministry of Food and Agriculture through the use of different agricultural extension delivery approaches. In Ghana approaches of agricultural extension range from the top-down commodity-based approaches of the pre- and post-independence era to more participatory approaches in recent years include the World Bank's Training and Visit (T&V), commodity, and participatory approaches and the more recently farmer field schools (FFSs) in addition to innovative ICT based approaches which provides advice to farmers on-line and other approaches such as the promotion of mobile phones and community radio stations (MoFA, 2010).

It is expected that farmers will have acquired the knowledge, attitudes and skills through training from MoFA for their farming activities that will lead to improved yields of crops (Cerdán-Infantes et al., 2008) and improved livelihood outcomes (Farrington, et al., 2002; Godtland, et al. 2004). Unfortunately the situation on the ground is that farmers still have low productivities in crops (MoFA, 2010) and livestock (FAO, 2009) sectors leading to very high poverty amongst farmers (GSS, 2008).

Waddington et al., (2010) indicated that while there is a large literature dealing with agricultural extension issues in developing countries, rigorous impact evaluations of agricultural extension interventions are less common. Birner et al., (2006) were of the view that the factors influencing effectiveness of agricultural extension services in fostering improved outcomes for farmers and the reasons for different levels of effectiveness in different contexts needed to be investigated. Glendenning et al. (2010) indicated that human capacity, content of extension messages, process used to disseminate extension messages and the type of technologies disseminated are important factors that affect extension delivery. However these factors are also components of extension programme planning and make the issue of programme planning crucial to the success of extension delivery.

Even though programme planning serves several useful functions in today's Extension organization (Iowa State University, 2008), there is hardly any evidence on the effect of programme planning approaches of agricultural extension services on the performance and overall livelihood outcomes of farmers in Ghana. Several programme planning approaches have been used and they include ones controlled by government, organisations, institutions, farmer groups, jointly shared by farmers, agricultural extension officers and researchers. The Outcome Logic Model which is a planning tool used by NGOs describes logical linkages

among programme resources, activities, outputs, audiences and short, intermediate and long term outcomes related to specific problem or situation. Hence the relationship between the extent of use of the OLM in programme planning of agricultural extension services and the dynamics of rural livelihood outcomes are not properly understood in the country. This type of information, according to Davis (2008) is urgently needed to assess the strengths, weaknesses, and performance of extension, and to strengthen it to reduce rural poverty and to improve rural livelihoods. The problem confronting us is that livelihood outcomes of rural farmers have not been improved over the years despite several planning approaches used by the Ministry of Food and Agriculture to deliver programmes to farmers.

1.5 Research question

A research question is a formal statement of the goal of a study which states clearly what the study will investigate or attempt to prove. The research question is a logical statement that progresses from what is known or believed to be true (as determined by the literature review) to that which is unknown and requires validation (Marion, 2004). The research questions for this study are:

1. Does the use of the Outcome Logic Model approach of programme planning by extension service providers affect the livelihood outcomes of farmers?
2. Are the livelihood outcomes of farmers influenced by the extension methods used under different planning levels of agricultural programmes?
3. Does the use of the OLM approach of planning of agricultural programmes affect farmers' perception towards agricultural extension delivery?
4. Do farmers' access to livelihood assets have effect on their livelihood outcomes?

1.6 Research objectives

A research objective is a clear, concise, declarative statement, which provides direction to investigate the variables. They are the results sought by the researcher at the end of the research and summarize what is to be achieved by the study (Patidar, 2013).

1. To determine whether the extent of use of the Outcome Approach of programme planning of extension services has an effect on the livelihood outcomes farmers.
2. To determine whether the livelihood outcomes of farmers are influenced by type of extension methods used by AEAs operating under different planning levels of OLM.
3. To determine whether the use of the OLM approach of planning of agricultural programmes affect farmers' perception towards agricultural extension delivery.
4. To determine whether farmers' access to livelihood assets have effect on their livelihood outcomes.

1.7 Research hypotheses

Hypotheses are “more specific predictions about the nature and direction of the relationship between two variables” (Mellenbergh, 2008). Strong hypotheses give insight into a research question and give a hint on what we will find when we answer the research question. Hypothesis therefore gives a priori answer to the research question. The hypotheses for this research are;

- H1₀ The extent of use of the Outcome Logic Model of programme planning approach by agricultural extension service providers has no effect on the livelihood outcomes of farmers.

- H1₁ The extent of use of the Outcome Logic Model of programme planning approach by agricultural extension services has effect on the livelihood outcomes of farmers.
- H2₀. The livelihood outcomes of farmers are not influenced by the extension methods used by AEAs to deliver extension services to them.
- H2₁: The livelihood outcomes of farmers are influenced by the extension methods used by AEAs to deliver extension services to them.
- H3₀: The extent of use of the OLM approach of programme planning by agricultural extension services has no effect on farmers' perceptions towards agricultural extension delivery.
- H3₁: The extent of use of the OLM approach of programme planning has effect on farmers' perception towards agricultural extension delivery.
- H4₀: The types of livelihood assets available to farmers have no impact on their livelihood outcomes.
- H4₁: The types of livelihood assets available to farmers have impact on their livelihood outcomes

1.8 Significance of the research

Ghana is a country where majority of the population are in the rural areas and engaged in agriculture. Agriculture has been recognized as the key to poverty reduction (DFID, 2005) but poverty levels among the rural people have been high despite efforts to improve their livelihoods. Governmental and non-governmental developmental agencies have come out with poverty reduction programmes which are delivered to the farmers by agricultural extension agents. The objectives of these programmes were to improve farmers' production and ultimately their livelihood outcomes, however rural farmers continue to be relatively

poor. If all these efforts have not yielded the much needed improvement in farmers' livelihood outcomes, then it gives cause for concern.

This study which seeks to examine critically why agricultural programmes used by government and non-governmental organizations as strategy to address poverty levels of rural farmers have not achieved the desired result is of much significance as a lot of investments are made in the form of human resource and other logistics. The findings and conclusions of this study will have significant implications for key stakeholders involved in poverty reduction programmes in the country. The Ministry of Food and Agriculture which is the lead agency in the implementation of poverty reduction programmes will be able to review and adopt the best of programme planning approach of programmes delivered to farmers that will result in poverty reduction and sustained livelihood outcomes. It will also help the Government of Ghana and other development partners to develop new policy guidelines in tackling the poverty situation among rural farmers. The result and conclusions of this study will contribute to the current debate on how livelihood outcomes of rural smallholder farmers could be improved and sustained through the use of appropriate extension programme planning approaches.

This chapter gives a brief introduction of how world bodies and governments have recognized the importance of improving the livelihood outcomes of farmers through agricultural programmes delivered by Agricultural Extension Services. It gives the geographic and demographic background of Ghana and shows the eight districts where the study was carried out. The concern area, research problem statement, research questions, research objectives, hypotheses and significance of the research are also described here. Chapter Two is a literature review of theories and studies related to agricultural extension, programme planning

and livelihood outcomes. Chapter Three looks at the approaches of programme planning which includes top-down and bottom-up with emphasis on outcome logic model and how programme planning could be linked to agricultural extension delivery. It also identifies some programmes implemented in Ghana and categorizes them based on the extent to which the outcome logic model approach formed the basis of planning. The fourth chapter looks at the methodology of the research. Specifically the population of the study, data collection instruments techniques and data analysis processes are described.

Chapter Five presents finding of the study and describes the nature of extension agents, their activities and efforts of extension providers. Chapter Six identifies the level of livelihood assets available to farmers and also presents the personal and socio-economic characteristics of farmers who work with the AEAs and how they affect their performance. It also looks at the relationship between overall assets available to farmers and their perception towards agricultural extension delivery, extension packages practised and livelihood outcomes achieved. In addition the relationship between extent of use of the outcome logic model approach of planning and assets available to farmers, their perception towards extension delivery, extension methods used to deliver extension packages, extension packages practised as well as knowledge, attitude and skills of farmers are discussed. Chapter Seven describes the impact of the outcome logic model approach of planning on livelihood outcomes achieved by farmers. It also looks at the relationship between some personal and socio-economic characteristics and livelihood outcomes achieved by farmers.

Finally Chapter Eight summarizes the discussions on categorization of programmes into high, medium and low extent of use of the outcome logic model approach of planning, activities and efforts of extension service providers, livelihood assets available and their effect on

livelihood outcomes, how delivered programmes that used different levels of outcome approach of planning affected the livelihood outcome of farmers. It also gives the conclusions and outlines recommendations from the research.

CHAPTER TWO

LITERATURE REVIEW

LINKING PROGRAMME PLANNING APPROACHES TO LIVELIHOOD OUTCOMES FARMERS

2.0 Introduction

The theories underpinning the study are identified and the conceptual framework showing the relationship among the various concepts are discussed in this chapter. The meaning of extension as well as the role of agricultural extension services delivery on poverty reduction and enhanced livelihood outcomes is discussed. Furthermore a review on the importance of programme planning in agricultural extension, the basic steps involved in programme planning and how programme planning practices evolved is done. Importance of farmers' knowledge in technologies, technologies delivered to farmers and training received in marketing and utilization of farm produce are also reviewed. Perception of farmers towards agricultural extension delivery, strategies to improve livelihood outcomes, external factors affecting programmes delivered, vulnerability factors and their impact on livelihood outcomes as well as the types of resources available to farmers and the significance of the study are also discussed in this chapter.

2.1 Theoretical framework

The theoretical framework of the study is a structure that can hold or support a theory of a research work. It presents the theory which explains why the problem under study exists. Thus, the theoretical framework is but a theory that serves as a basis for conducting research (**Khan, no date**). Four different theoretical considerations are found to be relevant for this

study. These are (1) theory of change, (2) experiential learning, (3) social cognitive and (4) theory of participation.

2.1.1 Theory of Change

Theory of change is a dialogue-based process intended to generate a ‘description of a sequence of events that is expected to lead to a particular desired outcome’ (Vogel 2012). Anderson (2005) indicated that it is a tool for developing solution to complex social problem and explains how a group of early and intermediate accomplishments set the stage for producing long range results. According to Anderson (2005) a theory of change is created when the following steps are followed: (1) Identify the Long-Term Outcome, (2) Develop a Pathway of Change, (3) Operationalize Outcomes, (4). Define Interventions and (5) Articulate Assumptions.

Translating the steps in the theory of change, it requires that extension agencies have to clearly specify the intended outcomes, identify the activities that need to be implemented in order to achieve those outcomes, and the contextual factors that are likely to influence them. They also have to specify the indicators that will be used to assess the performance of the intervention. The issue therefore is that extension delivery is a complex pathway, and therefore if extension agencies and their personnel apply the theory of change approach by communicating the short term, medium term and long term expected outcome needs to all stakeholders and provide the needed activities and resources, then it is more likely to have effective programme implementation.

2.1.2 Experiential Learning Theory

Experiential learning theory (ELT) was defined by Kolb, (1984) as the process whereby knowledge is created through the transformation of experience and that knowledge results from the combination of grasping and transforming experience. Kolb presented his Experiential Learning Theory as a cycle of four elements: Concrete Experience- the learner has direct interaction with the phenomenon being studied. During this stage, learners grasp information through apprehension using the senses to see, hear, smell, feel, or taste the phenomenon; Reflective Observation- learners reflect on what they experienced and information is transformed through intention; Abstract Conceptualization- learners grasp the information through comprehension by forming rules, generalizations, or hypotheses about the phenomenon being studied and Active Experimentation- learners test the rules, generalizations, or hypotheses formed in the previous stage.

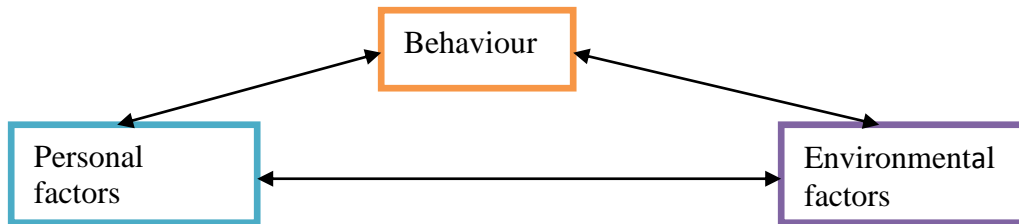
The ELT suggests that in the delivery of agricultural extension service to farmers, it is important that farmers are made to go through the learning cycle to enable them conceptualize and draw conclusions about what they experienced and observed which will lead to future actions in which the farmers could experiment with different behaviour. When this happens then it could be said that farmers have acquired the needed knowledge and that the delivery of extension service have been very effective.

2.1.3 Social Cognitive theory

The Social Cognitive theory by Bandura (1986) proposes that people are driven not by inner forces, but by external factors. The theory was supported with a model which suggests that human functioning can be explained by a triadic interaction of behavior, personal and

environmental factors as shown in Figure 2.1 which is often known as reciprocal determinism. Environmental factors represent situational influences and environment in which behaviour is performed while personal factors include instincts, drives, traits, and other individual motivational forces.

Figure 2.1 Social Cognitive Theory Model



Source: Bandura, 1986

2.1.4 Theory of participation

Arnstein's (1969) recognized that there are different levels of participation which begins from manipulation or therapy of citizens, through to consultation, and to what we might now view as genuine participation, i.e. the levels of partnership and citizen control. Stoker (1997) viewed 'political participation' as members of the public 'taking part in any of the processes of formulation, passage and implementation of public policies'. This is a wide-ranging definition, which extends the emphasis of public participation beyond the development of policy, to decision-making and implementation. Tandon and Cordeiro (1998) defined participation as a process through which primary stakeholders influence and share control of their development initiatives, decisions, and resources.

Bopp and Bopp (2006) were of the view that participation is the active engagement of the minds, hearts and energy of people in the process of their own healing and development.

Bopp and Bopp (2006) further indicated that because of the nature of what development really is, unless there is meaningful and effective participation, there is no development.

Levels of participation

Wilcox (1999) identifies five interconnected levels of community participation.

Level 1. Informing: Telling people about the development projects that are planned and what the benefits will be. This is most commonly done through community meetings or information pamphlets. Clear communication is a minimum requirement for development workers, but participation is passive rather than active, with no empowerment of local people or ownership of the planned activities.

Level 2. Consultation: Offering a number of options and listening to the feedback you get. Most commonly done through focus groups or interviews. This is an initial step to involving people and benefiting from their greater knowledge of local conditions and opinions. However, you are still retaining power and control.

Level 3. Deciding together: Encouraging others to provide their own ideas and join in deciding the best way forward. This is done through project committees or through community initiatives using participatory activities to encourage joint analysis, planning and decision-making. A range of stakeholders have the opportunity to empower themselves and take ownership of the process.

Level 4. Acting together: Not only do different interests decide together what is best, but they form a partnership to carry it out. Local people are involved at all stages of the process and there is an equal sharing of power. Development workers are acting much more as partners and facilitators.

Level 5. Supporting independent initiatives: Helping others do what they want – perhaps

within a framework of grants, advice and support. Power and control rests with local people: they are self-mobilised. Development workers play a consultation or facilitation role as requested.

2.1.5 Human behaviour

Behaviour can be defined as a response/s which is observed directly/indirectly. Direct observation is possible by studying the responses of people to a work environment. Indirect observations are decision making processes and attitudes, in terms of results or how people describe them verbally. With the increasing complexity of models for human beings the demands made on the design methodology for agent-based simulation models rise, too. There is a need for agents which are capable of modeling quite complex internal states as well as interactions between physical and psychical processes <http://www.arunk.com/pdf/study%20material/Unit-4.pdf> assessed on 01/12/2015.

Human behaviour is strongly influenced by physical, emotional, cognitive and social (PECS) factors. All of them play a role and determine the inner life of a human being. It is certainly an unjustified oversimplification to consider only a few factors and declare them as basic. Agents intended to represent human beings should be able to show individual behaviour, and should resemble their human counterparts in those respects which are relevant to the situation. Fortunately, it is not necessary for this purpose to model all human personality traits. The designer of an artificial agent can concentrate on those attributes which are relevant for a particular task. Therefore the internal structure of an agent is not generally and universally valid, but should be adapted to the task the agent has to fulfill (Schmidt, 2002).

2.1.6 Attitudes

Attitudes are a way of responding either favourably or unfavourably to objects, persons, concepts etc. They are evaluative statements. They reflect how one feels about something. Attitudes are related to behaviour. It is an unidimensional variable, i.e., positive or negative. They are hypothetical constructs. It is something inside a person. It may be observed but the attitude itself cannot. Attitudes in a person could be observed in three ways:

- Direct experience with the person or situation.
- Association with other similar persons or situations.
- Learning from others their association with the person or situation.

'Direct experience' is the concrete experience stage of learning. Association is similar to abstract conceptualisation and generalisation. Learning from others is like reflection and observation. Attitudes evolve out of perception and learning process. One is not born with attitudes but acquires them through life experiences. But certain basic attitude of trust or mistrust occurs during the infancy. If a child's basic needs are met in a loving manner, the child will develop a sense of trust otherwise a sense of mistrust develops. The child also develops a sense of autonomy or shame and doubt. All these affect one's behaviour. And this linkage to behaviour is what managers are concerned with; and they also tend to understand the ways in which behaviour affects attitudes <http://www.arunk.com/pdf/study%20material/Unit-4.pdf> assessed on 01/12/2015.

2.1.7 Conceptual Framework

Miles and Huberman (1994) defined a conceptual framework as a visual or written product, that explains either graphically or in narrative form, the main things to be studied i.e. the key

factors, concepts, or variables and the presumed relationships among them. This study “Linking Programme Planning Approaches to livelihood outcomes of farmers: A Case Study of Agricultural Extension Services in Ghana”, seeks to determine whether the planning approach of an extension programme that is based on the outcome logic model has an impact on farmers’ performance and livelihood outcomes.

Anderson (2005) indicates that if programmes are to be successful, it is best for stakeholders to identify the long term goal and work backwards towards its achievement which conforms with the principle of the Outcome Logic Model illustrated by the relationship between actions and outcomes and how outcomes are related to each other over the lifespan of the initiative. Livelihood outcomes are the goals which people aspire to as a result of pursuing their livelihood strategies. Different entities and individuals have come up with examples of livelihood outcomes to include: increased income, reduced vulnerability, increased well-being, improved food security and more sustainable use of natural resources (Ashley & Hussein, 2000; Kollmair and Gamper 2002; Serrat, 2010).

Figure 2.2 depicts diagrammatically how the variables considered in this study are interrelated using a combination of Sustainable Livelihood Approach (SLA) and the Outcome Logic Model. The Ministry of Food and Agriculture, Ghana, through the Agricultural Extension Agents provide a number of activities to the smallholder farmers which should in the short term lead to change in their knowledge, attitudes and skills. These initial changes that should happen in the lives of the smallholder farmers would result in change in perception of farmers towards agricultural extension delivery. When this happens there should be changes in behavior, decision making and practices which would eventually lead to changes in the

livelihood outcomes of the farmers which include social (well-being), health, income, natural resources utilization, food security and vulnerability.

The issue of needs assessment becomes critical in the work of extension organisations. According to McCawley (2004) needs assessment study the state of knowledge, ability, interest or attitude of target audience in order to design effective educational programmes that ensure efficient use of natural resources and provides information that can be used to document outcomes that forms the foundation for their logic model.

2.1.8 Training Needs Assessment

A training need assessment is a systematic approach to studying the state of knowledge, ability, interest, or attitude of a defined audience or group involving a particular subject. For extension, the goals of needs assessment are (1) to learn what our audience already knows and thinks, so that we can determine what educational products and services are needed (2) to understand what we can do to make our educational products more accessible, acceptable, and useful to our clientele (McCawley, 2009).

It may be helpful to visualize needs assessment as a form of gap analysis which can be seen as a systematic exploration of the divergence or discrepancy between the current situation or level of services (“what is”) and the desired situation or level of services (“what should be”). In analyzing the “gap,” project team members can begin to identify problems, opportunities, strengths, challenges, and possible new directions. Through a careful analysis of the existing “market,” and an assessment of organizational strengths, a more strategic understanding of gaps and potential opportunities emerges, reducing the chance of duplicating the efforts of existing programs or becoming sidetracked. Through this process, it is also possible to

identify and develop strategic partnerships to better reach underserved audiences (McCawley, 2009).

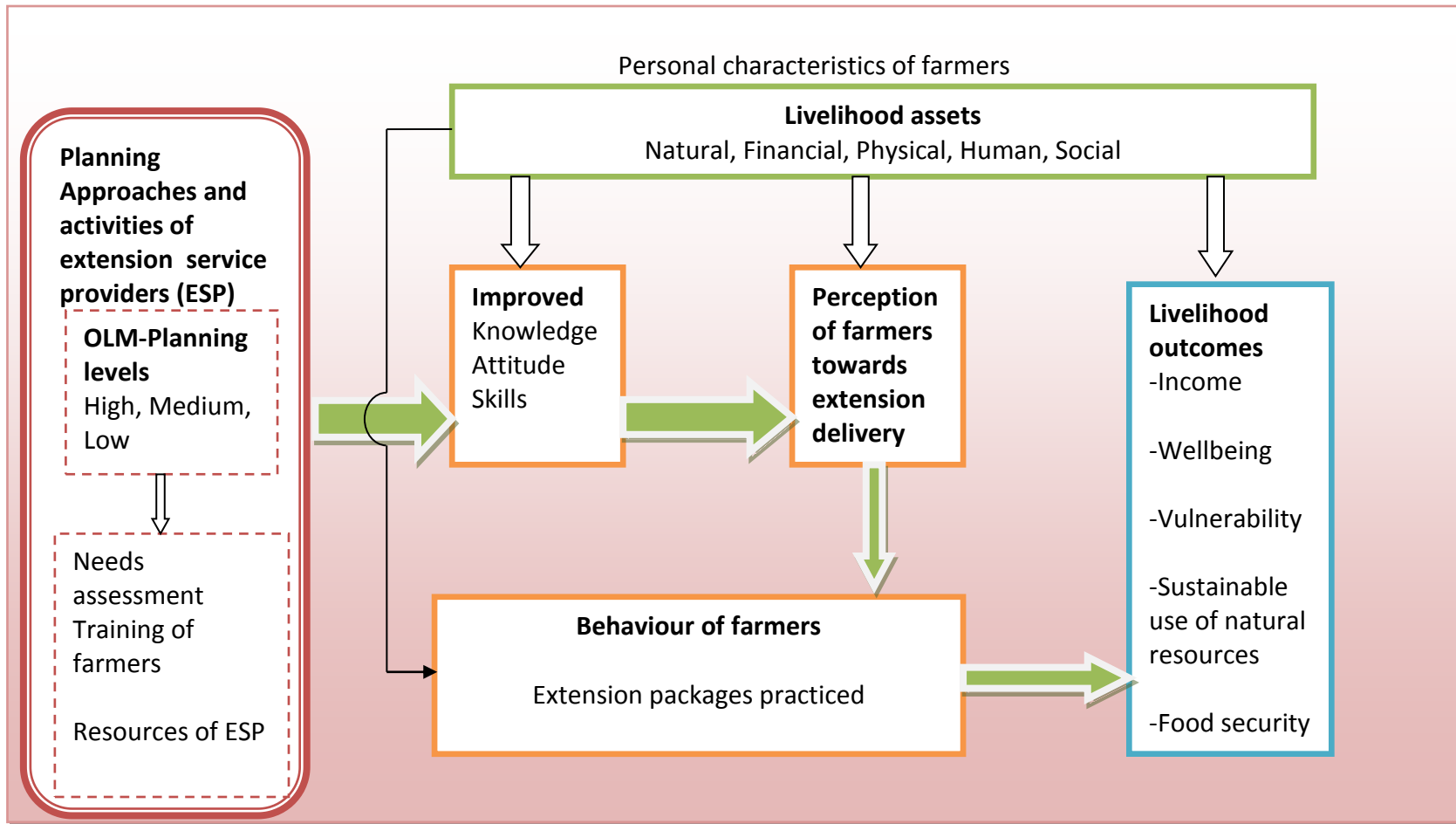
Kaufman and English (1979, p. 31) cited in National Oceanic and Atmospheric Administration, (2009) suggest, that a needs assessment is “a tool for determining valid and useful problems which are philosophically as well as practically sound. It keeps us from running down more blind educational alleys, from using time, dollars and people in attempted solutions which do not work.” Having assessed the needs of the target groups, extension service organizations should set the long term outcomes that they wish their clients achieve which can lead to improvement in their lifestyles. This conforms to the work of Rockwell & Bennett, (2004) who indicated that outcomes should emerge from a priority setting process based on a careful analysis of needs. Outcomes may be short term, intermediate, or long term, however long-term outcomes which include changes in social, economic, and environmental (SEE) conditions should be identified first.

The next step is to identify activities that will be carried to achieve the intended outcomes. Among the different activities is the dissemination of technologies to the target clients which will help achieve the intended outcomes. Technologies in crops, fisheries, livestock and poultry related activities are disseminated to farmers by extension staff using appropriate methods out of a variety of extension methods which include (a) individual farm and home visits for follow up, (b) group methods: demonstrations to farmers groups, field days (c) Mass Media to create awareness and reach large population at a time, (d) Farmers Trainings, and (g) Participatory methods in order to meet specific extension objectives (Koyenikan, 2008).

To be able to carry out these activities and achieve the intended outcomes, extension service require certain resources that will assist them. These resources could be in the form of inputs needed to carry out demonstrations, equipment, technologies and the requisite human resource to perform the planned activities. If extension services have access to these resources, then they could use them to accomplish their planned activities. If the extension organisations accomplish their planned activities, then, it is hoped they will deliver the amount of product and/or service that they intended which will result in cognitive changes in knowledge, skills, attitude, motivation and awareness of the farmers who are the target group.

CONCEPTUAL FRAMEWORK

Figure 2.2: Linking programme planning approaches to livelihood outcomes of farmers



Source: Adapted from Sustainable Livelihood Approach and Outcome Logic Model

However for extension organisations to achieve the intended outcomes it will depend on the type of people they are working with i.e. the personal characteristics of farmers, the kinds of resources (natural, physical, financial, human and social) available and accessible to them, policies, rules and regulations and how vulnerable the farmers are to shocks (conflict, illnesses, floods, storms, droughts, pests, disease), seasonalities (prices, and employment opportunities) and trends (rainfall, temperatures, producer and consumer prices across the year, household size, degradation/renewal situation, morbidity, mortality).

It is also expected that if extension organisations accomplish their planned activities to the extent intended, then it will change the behaviour and practices of their clients leading to a combination of activities that they could choose to undertake in order to achieve their livelihood goals. If these benefits to farmers are achieved, then certain changes in communities and the lifestyles of farmers will have improved and the organizations would have achieved their intended outcomes. Farmers will have improved income, reduced vulnerability, improved well-being, food security and sustainable use of natural resources which will have positive impact on the resources available to them.

2.2 *Definition of Agricultural Extension*

Several definitions of Agricultural Extension have been given by different authors. Anderson (2007) defines the terms agricultural extension and advisory services as “the entire set of organisations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies to improve their livelihoods”.

Birner et al. (2006) also defined agricultural extension as “the entire set of organizations that

support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being”.

Giving another dimension of what constitutes agricultural extension, Mahaliyanaarachchi (2003) defined it as an ongoing, non-formal educational process which occurs over a period of time and leads to improvement in the living conditions of farmers and their family members by increasing the profitability of their farming activities. Mahaliyanaarachchi (2003) indicated that to achieve above goals, it expects the improvement of the farmer’s knowledge, skills and change of their attitudes in agricultural technology, farming activities and agricultural marketing. More recently Christoplos (2010: p 3) also defined Extension as “systems that should facilitate the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agri-business, and other relevant institutions; and assist them to develop their own technical, organizational and management skills and practices”.

2.3 Role of agricultural extension services delivery on poverty reduction and enhanced livelihood outcomes.

Agricultural extension and advisory services has been considered to play an important role in agricultural development and can contribute to improving the welfare of farmers and other people living in rural areas (Waddington et al. 2010). However Christoplos (2010) indicated that even though the primary focus of extension is to provide advice and information, the role of extension has widened to include issues in rural areas that go beyond agriculture and may include services such as:

- Dissemination of information about technologies, new research, markets, input and financial Services, climate and weather.

- Training and advice for individual farmers, groups of farmers, farmer organizations, cooperatives and other agribusinesses along the market chain.
- Testing and practical adaptation of new technologies and practices on-farm.
- Development of business management skills among smallholder farmers and other local entrepreneurs.
- Facilitation of linkages among market actors (including financial and non-financial inputs, processing, trading, etc.) including brokering collaboration and promoting social learning among them.
- Linking smallholder farmers, rural entrepreneurs, and other members of the agricultural community with institutions offering training and education in fields relevant to the agricultural sector.
- Facilitation of linkages between farmers, their organizations and the public sector.
- Support to institutional development processes and to social, institutional and organizational innovations.
- Development of informal and formal farmer organizations, and rural youth organizations, and helping them to articulate their demands.
- Support to implementing government policies and programmes through information, awareness and advice on technological options, including land stewardship, food safety and animal welfare.
- Contributing to the development of more appropriate policies and programmes by facilitating feedback from farmers and local entrepreneurs.
- Increasing awareness of new opportunities for certification of 'green,' fair trade and other production methods.

- Facilitating access to non-extension government support (such as weather-related insurance, phytosanitary and certification services) and subsidy programmes, including payment for environmental services and other schemes related to carbon credits.
- Facilitating access to credit from rural finance institutions for farmers and local entrepreneurs.
- Nutrition education and home sciences.
- Mediating in conflicts over natural resources.
- Legal and fiscal advice.

Furthermore while Christoplos (2010) recognises extension as a much needed investment in the human and social capital of the rural population that will ensure food security and to achieve a range of rural development goals, he was of the view that extension has a role to ensure food security by promoting increased food production and reduced food losses to ensure food availability at reasonable prices whilst encouraging the creation of more livelihood opportunities to ensure entitlements and access to food.

In addition to the roles enumerated above, an important role of extension is a facilitator, broker, coach and even a partner in local rural development platforms and value chains, represents an opportunity for a new relationship with research. Through this extension can provide a window for learning about rural change and innovation processes through the dialogue among extension agents, farmers and other value chain actors about the relevance of different innovations in their livelihoods, the risks that arise in different farming systems, market preferences, power and gender aspects and a myriad of factors that appear in processes

of technological change, adaptation to climate risks and market development (Christoplos, 2010).

2.4 *Factors affecting extension delivery*

The provision of information and farmers' use of it are important and according to Glendenning, Babu, & Asenso-Okyere, (2010) it is influenced by a number of key factors, which include human capacity, content, process and technology.

2.4.1 Human Capacity

The capacity of extension personnel to engage and obtain feedback from farmers, and also to seek global and local information for sharing with farmers, influences how farmers use the information provided. Human capacity can also refer to both the quality and quantity of extension personnel. Their ability to acquire and develop new information and knowledge and to contextualize it for farmers in the operational area affects the use and impact of this knowledge on farmer productivity and income. Additionally, supporting farmers to process and integrate information from many different sources is important.

2.4.2 Content

The reliability, relevance, usability, and timeliness of the information are critical. Beyond the provision of information on the main cereal crops and technologies, efforts are needed to augment the content to include market intelligence, policy insights, farmers' experience, and off-farm enterprise information, as well as the integration of information to create links with supporting services and inputs.

2.4.3 Process

The process through which the information is shared can determine the effectiveness of the information and its use. Setting priorities for information needs in consultation with users, adding value to the information collected, learning from how information is used by farmers, and changing the dissemination strategy by stratifying and targeting users will influence the success of the extension approach.

2.4.4 Technology

Increasing use of technology can improve the nature and speed of information sharing. Effective and sustainable use of technology depends on the appropriateness of the technology for the user and the content shared via this technology.

2.5 *Developing programmes*

Glendenning et al. (2010) indicated that human capacity, content of extension messages, process used to disseminate extension messages and the type of technologies disseminated are important factors that affect extension delivery. However the issue of programming becoming crucial to the success of extension delivery cannot be over-emphasised.

2.5.1 Importance of programme planning in agricultural extension delivery

Colorado State University (2012) isolated and defined “programme” as a coordinated set of dynamic, results-oriented, educational activities focused on a problem and aimed at achieving predetermined, measurable objectives. International Federation of Red Cross and Red Crescent Societies (2010) defined “programme planning” as the selection of the related, purposeful activities that will be undertaken to achieve one or several related objectives. Programme planning according to Iowa State University, (2008) involves (1) identifying the

most critical needs of clientele, (2) projecting needs of clientele, (3) knowing our ability to respond to clientele needs, (3) planning and delivering programmes to address needs, (4) evaluating the outcome of our efforts, and (5) reporting that outcome back to partners, stakeholders, and constituents.

Cristóvão, Koehnen, and Portela (1997) cited in Okorley, Gray, and Reid (2011) described it as a dynamic process through which farmers' problems are identified and decisions as well as actions are taken to address them. From a social practice view, extension programme planning is seen as a negotiation process and a working platform involving different stakeholders, including researchers, subject-matter specialists, opinion leaders, representatives of farmers' organizations and groups, and other stakeholders. Programme planning is considered an essential process of an extension organization's operation. This is because it provides direction for the organization, contributes to learning and development among planning participants, allows for selection of relevant extension activities and management of programmes, and ultimately facilitates the social and economic progress of rural communities and families (Okorley et al. (2011).

Executive Agency for Health and Consumers (EAHC) (2012) recognized project planning as essential for a project's success, and thus the most important phase in project management and indicated that it helps by establishing the scope, aims and objectives of a project and mapping out the procedures, tasks, roles and responsibilities. Project planning helps reduce the main pitfalls leading to project failure, such as selecting an unimportant problem, not addressing the key determinants of the problem and not choosing the best intervention strategy to address the problem determinants.

2.5.2 Basic steps of programme planning

Extension programme planning involves specific activities and steps which may include: identifying the basis for programming – philosophies, policies, and procedures; situation analysis of community and clientele; identifying desired outcomes; identifying resources and support; designing an instructional plan; designing program of action consisting of calendar of events and activities; and evaluation – accountability of resources (Bennett & Kay, 1995; Cristóvão, Koehnen, & Portela, 1997; Oakley & Garforth, 1985) cited in Okorley et al. (2011).

Bennett and Kay (1995) put the programme planning process into three major steps: selecting needs, delivery methods, and targets for program accomplishments. The different steps of the programme planning are interrelated and the process does not always proceed neatly from one step to another; therefore, objectives set during the needs selection stage may later be altered as new insights and fuller understanding of the situation are gained in the process (Oakley & Garforth, 1985) cited in Okorley et al. (2011). Nova Scotia (2009) indicated that the programme planning process involved identifying who should be involved, developing a programme mission statement, developing a programme profile, exploring ways to achieve programme impacts, developing a programme logic model and developing an action plan.

2.5.3 Evolution of programme planning approaches practiced

The evolution of planning theory was traced to the work of Tyler and Knowles in what came to be known as ‘Tyler Rationale’ which was organised around four fundamental questions which focused on purpose, content, method and evaluation. Although Tyler’s focus was on elementary and secondary schools, his four questions provided attractive framework for others to produce models suitable for adult education (Wilson and Hayes(ed), 2000). Knowles

(1950) believed that programmes should address the needs of learners and suggested an approach to planning and conducting instruction that put the interest and experiences of learners in the foreground. As a follow-up Knowles (1970) published 'The Modern Practice of Adult Education' in which his earlier work was extended and updated, popularized andragogy as an alternative educational process to pedagogy.

Boyles (1981) on the other hand viewed programming as a comprehensive synthesis of theories, analysis and practices and indicated there were fifteen (15) relevant concepts upon which he believed programme development process rest. The first nine of these concepts refer to the planning stage, the next four to design and implementation and the final two refer to evaluation. In furtherance to the work of Boyles, Boone (1985) identified three sub processes of programming as (a) planning, (b) design and implementation, (c) evaluation and accountability.

Planning

Boone, (1985, p.64) defined planning as “a deliberate, rational, continuing sequence of activities through which the adult educator acquires a thorough understanding of and commitment to the organization’s functions, structure, and processes and becomes knowledgeable about and committed to a tested conceptual framework for programming, continuous organizational renewal, and linkage of the organization to its publics”. Boone, (1985) identified two distinct dimensions of programming:

1. The Planning Sub-Process:

- (a) The organisation and its renewal process:

- Understanding of and commitment to the organization's function i.e. mission, philosophy, objectives.
 - Understanding of and commitment to the organization's structure i.e. roles, and relationships.
 - Knowledgeable about and skilled in the organisation process i.e supervision, staff development, evaluation and accountability.
 - Understanding of and commitment to continuous organizational renewal.
- (b) Linking the organisation to its publics:
- Study, analysis and mapping of the organization's publics
 - Identify target publics
 - Identifying and interfacing with leaders of target publics
 - Collaborative identification, assessment and analysis of needs specific to the target public.

2. Design and Implementation

It involves translating the identified and analysed learning needs of target publics into meaningful and cogent designs and developing effective teaching-learning strategies for their implementation. This sub-process has three dimensions namely

- the planned programme,
- plans of action and action strategies for implementing plans of action and the planned programmes

Planned Programme

This is a master prospectus or plan for change toward which adult educators focus their efforts. The planned programme consists of

- a statement of macro needs,
- a statement of macro objectives that are keyed to the macro needs,
- specification of general educational strategies for achieving the macro needs, and
- specification of macro outcomes of the planned programme.

Plans of Actions

These are short-range in nature and logically sequenced include specific teaching-learning strategies designed to guide the adult educator in learners' needs and attaining the objectives contained in the long range planned programme.

Action Strategies

Implementation of the plan of action entails action strategies in which the adult educator engages to assure that the plan is carried through to successful completion. These action strategies are

- marketing;
- procuring, developing and using the necessary, available resources both human and material;
- monitoring ongoing teaching-learning transactions;
- reinforcing learners and teachers; and

- using feedback to evaluate and if needed, to revise teaching strategies or learner experiences or both to attain maximum behavioural change.

(3) Evaluation and accountability

Boone (1985) was of the view that evaluation is concerned with making informal judgments about the effectiveness of the planned programme and the plans of action based on established criteria and known observable evidence. It is therefore a means by which an organisation can justify and account for its decision by

- determining and measuring programme output,
- assessing programme inputs and
- using evaluation findings for programme revisions and organisational renewal and accounting to learners and leaders, the organisation, funding sources, the profession and where appropriate the governance body.

Other authors Yarbrough, Shulha, Hopson, & Caruthers (2011) defined evaluation as systematic investigation of the value, importance, or significance of something or someone along defined dimensions and Stufflebeam & Shinkfield (2007) also indicated that evaluation is the systematic process of delineating, obtaining, reporting, and applying descriptive and judgmental information about some object's merit, worth, probity (moral correctness), feasibility, safety, significance, or equity.

2.6 Using the logic model in programme planning

The Logic Model is a programme planning tool that can be used to help organize, design, implement and evaluate any kind of programme. Although there are other ways of planning a programme and its outcomes, the Logic Model has been largely adopted by Cooperative

Extension, in part because of its ease-of-use and flexibility. The Logic Model provides a template for describing what goes into a programme, who will participate, the activities and the outcomes, including long-term impacts. It can also be used to analyze programme assumptions and external factors that can influence success.

2.6.1 Components of logic models

The components illustrate the connection between planned work and intended results.

Planned work

It describes what resources are needed to implement the programme and what activities are intended.

Resources/inputs – include human, financial, organisational and community resources a programme has available to direct towards doing the work.

Activities – what the programme does with the resources; the processes, tools, events, technology and actions that are an intentional part of the programme implementation. These interventions are used to bring about intended changes or results.

Intended results

It consists all of the programme's desired results (outputs, outcomes and impact).

Outputs - direct products of programme activities and may include types, levels and targets of services to be delivered by the programme.

Outcomes – specific changes in programme participant's behaviour, knowledge, skills, status and level of functioning.

Impact – the fundamental intended or unintended change occurring in organisations, communities or systems as a result of programme activities.

2.6.2 Link between programme planning approaches and logic model

Kellogg (2004) indicated that a logic model is a systematic and visual way to present and share your understanding of the relationships among the resources you have to operate your programme, the activities you plan, and the changes or results you hope to achieve. Logic Models form a foundation for evaluating a programme's success because they define exactly what the programme manager hopes to accomplish.

2.6.3 Types of logic models for programme planning

Kellogg (2004) identified three types of logic models which include the Theory Approach, Activities Approach and Outcome Approach.

2.7 *Theory approach*

It emphasises the theory of change that has influenced the design and plan for the programme. This model provides an explanation of the reasons for beginning to explore an idea for a given programme. They can also specify the problem or issue addressed by the programme, describe the reasons for selecting certain types of solution strategies, and connect proven strategies to potential activities.

2.7.1 Activities approach

It pays attention to the specifics of the implementation process, linking the various planned activities together in a manner that maps the process of programme implementation.

2.7.2 Outcomes approach

This focuses on the early aspects of programme planning and attempts to connect the resources and/or activities with the desired results in a workable programme. Millar (2001)

cited by McCawley (2004) suggests that the planning sequence be focused on the outcomes to be achieved by asking “what needs to be done?” rather than “what is being done” which begins building logic model by asking questions in the following sequence (1) What is the current situation that we intend to impact? (2) What will it look like when we achieve the desired situation or outcome? (3) What behaviors need to change for that outcome to be achieved? (4) What knowledge or skills do people need before the behavior will change? (5) What activities need to be performed to cause the necessary learning? (6) What resources will be required to achieve the desired outcome?

2.8 Outcome logic model (OLM)

The model describes logical linkages among programme resources, activities, outputs, audiences, and short, intermediate, and long term outcomes related to a specific problem or situation. Once a programme has been described in terms of the logic model, critical measures of performance can be identified. Logic models are narrative or graphical depictions of processes in real life that communicate the underlying assumptions upon which an activity is expected to lead to a specific result. Logic models illustrate a sequence of cause-and-effect relationships—a systems approach to communicate the path toward a desired result (McCawley, 1997).

2.8.1 Outcome Logic Model (OLM) as a tool for programme planning

Rossi et al., (2004) indicated that knowledge of the programme outcomes results in ones expectations about cause and effect relationships between programme activities and resources is important in achieving short-term outcomes, intermediate outcomes, and long-term outcomes. Therefore Outcome Logic Model approach focuses on the early aspects of

programme planning and attempts to connect the resources and/or activities with the desired results in a workable programme (Kellogg, 2004).

Underlying a logic model is a series of ‘if then’ relationships that express the programme’s theory of change which indicates how and why a set of activities is expected to lead to short, medium and long-term outcomes over a specified period (Taylor-Powell, 2011). Logic modeling is a tool to help organize the relationship between major project activities and anticipated outcomes. It can be effective for planning a project design, implementing a project's activities, and evaluating project success (McLaughlin & Jordan 2004). Logic models provide stakeholders with roadmap describing the sequence of related events connecting the community’s needs with the agency’s desired impact (United Way, 2008).

2.8.2 Effect of outcome logic model on agricultural extension delivery

To prevent agricultural injuries among American Indian farm, the logic model process was used to help community stakeholders of Navajo Nation to conceive, design, implement and evaluate agricultural injury prevention project. A survey conducted by Helitzer, Willging, Hathorn and Benally (2009) to assess their perceived changes in capacity as a result of participating in the logic model development process indicated that the stakeholders understood in details all the factors that could lead to prevention of agricultural injuries.

2.9 *Agriculture technologies delivered to farmers in Ghana*

Agricultural Technology focuses on technological processes used in agriculture to create an understanding of how processes, equipment and structures are used with people, soil, plants, animals and their products, to sustain and maintain quality of life and to promote economic, aesthetic and sound cultural values. That is why the various Directorates under the Ministry of

Food and Agriculture (MoFA) have over the years identified several technologies which are disseminated through the agricultural extension system to farmers.

The Crops Directorate of MoFA has its goal to improve technology adoption by smallholder farmers and yields of maize, rice, sorghum, cassava and yam increased by 50% and cowpea by 25% by 2015 (MoFA, 2010). This has been done by

- Supporting the production of certified seeds/planting materials and increased farmer usage through intensification of awareness campaigns
- Intensify dissemination of updated crop production technological packages
- Facilitating the development of high-yielding, disease and pest-resistant varieties and increasing supply of certified planting material
- Ensuring that operators of urban agriculture are reached with the needed information technology and Inputs (MoFA, 2007).

The Livestock Directorate of MoFA also aimed at increasing the production of poultry (including guinea fowl) by 20% and small ruminants and pigs by 25% by 2015 through adoption of improved technologies which will be carried out through a set of activities that have been planned to increase the productivity of poultry which include:

- Identify, update and disseminate improved livestock technological packages
- Undertake genetic characterisation and improvement of local livestock species
- Introduce improved livestock breeds
- Train farmers on how to manage disease problems in livestock
- Focus on improving animal health (using community animal health workers

- Improve access to quality feed and water
- Enhance performance of indigenous breeds through a programme of selection
- Develop commercial poultry as the priority for improving meat supply in the short term while measures are implemented to transform smallholder production into profitable enterprises
- Improve access of operators to technology and appropriate financial instruments to enhance their competitiveness with imports
- Promote the development of appropriate technologies on management, breeding, nutrition and housing of livestock
- Facilitates the production of superior breeding stock from the indigenous breeds and
- Promote the development of the dairy industry in the country (MoFA, 2007; 2011).

The Fisheries Directorate of MoFA is to ensure that productivity of cultured fish is increased by 50% from 10,000mt in 2010 to 15,000 by 2013. In order to address the issue of low productivity of cultured fish, the following sets of interventions have been planned:

- Disseminate existing fish culture technological packages in all parts of the country by end of 2011
- Train farmers on stock management and good fishing practices
- Promote the use of communal small water bodies for fish production
- Train farmers on how to manage disease problems in fish production and
- Establish fish health unit.

The Women in Agricultural Directorate (WIAD) of MoFA is primarily responsible for developing and ensuring the implementation of policies which are beneficial to women farmers, processors in the rural, suburban and urban communities. The Directorate provides technical backstopping to regional and district staff for effective transfer of appropriate technologies to farm families in crop, livestock and fish production, processing, utilization and marketing through regional officers and other stakeholders. In the area of Nutrition the focus is on

- Food based nutrition education in relation to food production and diet improvement
- Value addition to agricultural produce, food processing and preservation
- Food safety (4) Natural Resource management (farm, home, processing site
- Gender mainstreaming of all agricultural policies, programs and projects (MoFA, 2012).

The Agricultural Engineering Services Directorate (AESD) also aims at improving farmers', fishermen and processors' access to appropriate agricultural technologies that will help modernize agriculture. It is for this reasons that the following centres i.e. National Animal Traction Expertise Centre (NATEC), Agric Mechanization Adaptive Research Station, Somanya, Agric Mechanization Centre, Atebubu, Afram Plains Mechanization Centre, Donkorkrom have been set up to provide services to people involved in agriculture in the country (MoFA, 2011).

2.10 Importance of farmers' knowledge of the marketing process

Marketing is the process by which a farmer seeks to maximise the return from farm production by providing buyers what they want and supplying it at a profit. The process

involves commodity or crop selection for the market (varieties, etc.), identification of any special field procedures, post-harvest handling, packaging, transportation and storage to meet the market requirements combined with techniques for minimising product losses and maintaining the quality of produce. Sometimes the marketing process also involves value adding through grading, packaging and/or farm processing the product. This brings to fore the importance of the value chain concept.

A value chain describes the entire range of activities undertaken to bring a product from the initial input-supply stage, through various phases of processing, to its final market destination, and it includes its disposal after use. For instance, agro-food value chains encompass activities that take place at the farm or rural level, including input supply, and continue through handling, processing, storage, packaging, and distribution. As products move successively through the various stages, transactions take place between multiple chain stakeholders, money changes hands, information is exchanged and value is progressively added. Macroeconomic conditions, policies, laws, standards, regulations and institutional support services (communications, research, innovation, finance, etc.) which form the chain environment are also important elements affecting the performance of value chains (UNIDO, 2009).

Product marketing is important for farming families since understanding the marketing process and using that knowledge in marketing produce can have a very major impact on the profitability (or net farm income) of a farm. Farming families with a poor knowledge of the marketing process can lack power or influence in the marketing process. They are price takers. Knowledge about the marketing process and marketing strategies can strengthen the farmer's position (FAO, (no date).

Dorward et al. (2003) highlighted three broad mechanisms through which agricultural growth can drive poverty reduction: (1) Through the direct impacts of increased agricultural productivity and incomes; (2) Through the benefits of cheaper food for both the urban and rural poor; (3) Through agriculture's contribution to growth and the generation of economic opportunity in the non-farm sector. However Kaaria et al. (2005) indicated that markets can fail the poor, especially poorest and marginalized groups, especially women.

Sievers, et al. (2011) indicated that rural producers are the starting point of most value chains. Helping them capture market opportunities, obtain fair deals, and produce higher-quality products improves value chain performance while increasing rural incomes and employment and harnessing economic growth for rural areas. Agricultural markets can play significant roles in reducing poverty in poor economies, especially in countries which have not already achieved significant agricultural growth.

Results of work by Kaaria et al.(2005) from various impact studies within the Enabling Rural Innovation (ERI) initiative which focused on assessing institutional and social innovations necessary for pro-poor market development; incentives for farmer reinvestment in technology and Natural Resource Management (NRM), and equity and distribution of benefits from farmer market linkages have shown that participatory approaches for linking farmers to markets increased the bargaining power of women, and translated into tangible household benefits. Impacts were in terms of household income, changes in social capital, changes in intra household decision-making towards more shared, skills in analyzing and understanding markets, in conducting experimentation and in taking on leadership positions in project.

Dorward et al. (2003) argues that an important gap in much of the conceptualization and application of livelihood approaches, is lack of emphasis on markets and their roles in livelihood development and poverty. Dorward et al. (2003) indicated that if the roles markets and market relationships are not properly addressed in livelihood analysis and action, it can lead to failure to identify and act on (i) livelihood opportunities and constraints arising from critical market process and (ii) institutional issues that are important for pro-poor market development.

That is why in the view of FAO (2005) it is important to communicate with farmers about markets on some of these areas (1) Crop calendars to show seasonality, (2) Calculating costs of production, (3) Maps showing location of production, (4) Diagrams to describe the marketing channels, (5) Providing information about traders, (6) Price trends over the year,(7) Helping farmers to understand their marketing problems and (8) Information about demand for different products.

2.11 Importance of training farmers on utilization of farm produce

Household food security is a prerequisite for people to have an adequate and balanced food intake. However, to attain good health and nutritional status, people also need sufficient knowledge and skills to grow, purchase, process, prepare, eat and feed to their families a variety of foods, in the right quantities and combinations. Nutrition education provides people with correct information on the nutritional value of foods, food quality and safety, methods of preservation, processing and handling, food preparation and eating to help them make the best choice of foods for an adequate diet. The provision of correct information is not in itself a sufficient objective to improve nutrition. Effective nutrition education programmes must

therefore be planned and executed in such a way as to motivate beneficiaries to develop skills and confidence for the adoption of positive and lasting practices (FAO, 1997).

2.12 Importance of knowledge, attitude and skills of farmers

Knowledge is the capacity to acquire, retain and use information; a mixture of comprehension, experience, discernment and skill. Knowledge is information of which a person, group of people, organization or other entity becomes aware of something. It is gained through learning, education or by experience or perception and thinking. Barkat, (2006) found that poor knowledge about agriculture technology, poor communication with resource specialist, resource organization, and lack of updated information about modern technology of agriculture of the farmers of Barind tract area caused hindrance to food availability at household level.

Knowledge is essentially the consciousness of an object, i.e. of anything, fact, or principle belonging to the physical, mental, or metaphysical order, that may in any manner be reached by cognitive faculties (Knight, 2009). In agriculture, innovation can include new knowledge or technologies related to primary production, processing, and commercialization, which can positively affect the productivity, competitiveness, and livelihoods of farmers and others in rural areas (Asenso-Okyere et al, 2008). At the farmer level, a wide variety of skill sets are needed, including group management, internal savings and lending, basic business skills, and the ability to access, adapt, and apply new technologies and to manage natural resources (Asenso-Okyere, 2008).

Barkat, (2006) described attitude as the mental state about any issue or subject and is manifested through practice by changing behavior of a person or organization. It also refers to

inclinations to react in a certain way to certain situations; to see and interpret events according to certain predispositions; or to organize opinions into coherent and interrelated structures. Attitude is essential that the RFs think sincerely, that the adoption of this innovation will be beneficial for the group or community.

Tesfaye et al., (2010) found that trainings that had been conducted by the three research centres showed improvement in the knowledge, attitude, and practice of the trained farmers compared to that of untrained farmers on extension packages on durum wheat, potato and onion. In another study, Endalew, (2009) found that the knowledge, attitude acquired in level of coffee management and practice of NFFS members were found to be lower as compared to FFS members. Khoram et al.(2006) found a positive correlation between knowledge-score and attitude-score ($r=0.38$, $p<0.001$) and they concluded that rural farmers are in fact soldiers who implement and expand sustainable agriculture, and so it was deemed a major and crucial task of agricultural authorities and decision-makers to promote knowledge, develop attitude, and improve practice of farmers.

2.13 Effect of extension teaching methods on the livelihood outcomes of farmers

Extension teaching methods are tools used by the extension workers/agents to achieve their set goals or objectives as a teacher. These are special tools needed to appeal to the desire of farmers to change (Okunade, 2007). Gaforth (1993) cited in Okunade (2007) classified extension teaching methods into three broad classes in terms of area of coverage as follows: (a) Individual method (b) Group method (c) Mass method. Individual contact methods usually are superior for conviction and action because of face-to-face relationship of teacher and learner, for example farm and home visits, office calls, telephone calls, correspondence and

result demonstration. Group contact methods are usually well suited to bringing specific information about practices, helping to move the individual through the desire for conviction and sometimes to taking action. Examples are method demonstration, Small Plot Adoption Techniques (SPAT), result demonstration, general meeting, lectures, group discussion and excursions. Mass media methods attract attention and stimulate the interest and desire for further information. They are the methods used to reach many people at the same time at different locations. Examples are bulletins, circulars, letters, leaflets, radio, television and cinema.

The effectiveness of these methods is measured by their ability to change a static situation into a dynamic one. Farinde (1991) cited in Okunade (2007) reported that group and individual contact methods were mostly employed in teaching farmers improved agricultural practices and that to create awareness of new farm technologies farm visits, radio and group meetings were employed. Okunade (2007) indicated that many situations and factors such as nature of subject matter, amount of time the extension worker intends to devote to the method and the time the farmers can devote, reinforcement, steps in extension teaching, materials and possible teaching situation available, preference and ability of the extension worker to perform successfully the various methods and evaluation performance affect the choice of extension methods to be used. It is therefore imperative that agricultural extension agents cannot bring about any significant change in the knowledge, skill and attitude of the farmers without employing the right mode of these extension teaching methods.

Ogunwale (1991) cited in Okunade (2007) stressed that the effective extension workers must not only have at their finger tip a variety of tools and methods to do their job, they must also know where to use them. Jibowo (1997) cited in Okunade (2007) identified eight factors that

can affect the effectiveness of the teaching methods. Such factors include openness, linkage, structure, reward, capacity, proximity or nearness, synergy and feedback. Okunade (1999) cited in Okunade (2007) found a positive and significant relationship between openness and effectiveness of extension teaching methods, there was no significant relationship for other variables: cost, feedback, linkage, synergy, capacity, reward, proximity and structure. However Okunade (2007) concluded that an effective extension communication system is therefore a necessity for extension service to achieve its broad set goal of farmers acquiring knowledge, skill and attitude and in the overall, better their economic strength and hence their level of living.

In another study, Apantaku, Olufade, Adebayo, & Oyekanmi, (2008) analyze the effects of extension teaching methods used by Ogun State (Nigeria) Agricultural Development Programme's extension agents on farmers' level of production in maize and cassava and found that the use of a combination of individual, group and mass methods of extension teaching had the best association and effect on production output.

Koyenikan (2008) indicated that it is necessary to select and use of appropriate methods which include (a) individual farm and home visits for follow up, (b) group methods: demonstrations to farmers groups, field days, (c) mass media to create awareness and reach large population at a time (d) farmers trainings, and (g) participatory methods in which extension staff work with farmers to analyze current situations and problems and determine appropriate action for self reliance (examples include RRA, PRA, FFS, IPM).in order to meet specific extension objectives with various categories of farmers.

Kachale and Mapila (no date) conducted a study to assess the effectiveness of the innovation systems concept in enhancing agricultural extension services for livelihood improvements in Central region of Malawi and found that the frequency of extension contacts did not lead to greater livelihood outcomes.

2.14 Perception of farmers towards extension delivery

Perception has been explained by Hornby (2010) as how people regard something and their beliefs about what it is like. Babasanya, Oladele, and Odidi, (2013) indicated that perception as bedrock of adoption is contingent upon many factors such as personal, socio-economic, socio-cultural and socio-political parameters. They stressed further that availability of credits, compatibility of existing technology with improved ones, suitability to farmers' circumstances and needs, and the financial benefits influence perception and adoption of innovations.

2.15 Strategies used by farmers to improve livelihood outcomes

Livelihood strategies are the combination of activities that people choose to undertake in order to achieve their livelihood goals. They include productive activities, investment strategies and reproductive choices. A major influence on people's choice of livelihood strategies is their access to assets and the policies, institutions and processes that affect their ability to use these assets to achieve positive livelihood outcomes. People are often forced to compete for limited resources and fundamental to livelihoods approaches is the principle that development support aimed at improving the livelihood strategies of some should not disadvantage those of others now or in the future. (Alinovi, D'Errico, Mane, & Romano, 2010; Haidar, 2009).

2.15.1 Agricultural intensification/extensification

Agricultural intensification is an increase in the productivity of existing land and water resources in the production of food and cash crops, livestock, forestry, and aquaculture. Generally associated with increased use of external inputs, intensification is now defined as the more efficient use of production inputs. Increased productivity comes from the use of improved varieties and breeds, more efficient use of labor, and better farm management (Dixon et al. 2001).

2.15.2 Livelihood diversification

Diversification is an adjustment of the farm enterprise pattern in order to increase farm income or reduce income variability by reducing risk, by exploiting new market opportunities and existing market niches, and diversifying not only production but also on-farm processing and other farm-based, income-generating activities (Dixon et al. 2001)

2.15.3 Migration

Migration, whether seasonal or permanent, is one common livelihood strategy. Social protection programmes can support the extreme poor to achieve their own positive livelihoods outcomes in cases where they are unable to compete with those with greater access to assets (Haidar, 2009).

2.16 *External influences affecting agricultural extension delivery*

Institutional, community, and public policies may have either supporting or antagonistic effects on many programmes.

2.16.1 Policies of government

DFID (2001) was of the view that policy is course of action designed to achieve particular goals or targets by government which are implemented through organisations and institutions to achieve particular outcomes and indicated that private organisations or communities may also form their own policy to achieve defined goals. The formulation and implementation of public policy can affect livelihoods by (a) changing institutions such that they are more or less supportive of poor people's livelihoods (e.g. land-reform measures following a policy for more equitable growth); (b) changing institutions such that they alter the incentive arrangements for organisations and their relationship with poor people.

The policy environment determines the overall orientation of the advisory service, the degree of resources devoted to it and the types of farmers targeted. Characteristics of local communities, such as heterogeneity in terms of land- and asset-holdings, ethnicity, education, gender roles and the degree of social exclusion, will determine the ability of the extension services to penetrate communities and reach the disadvantaged, and the degree of farmer-to-farmer diffusion. Finally, all of these factors, together with market access and weather conditions will determine the degree of adoption of techniques and final outcomes such as yields (for example, production per unit of land), income and empowerment (Waddington et al., 2010).

2.16.2 Institutional factors affecting livelihood outcomes of farmers

According to Crawford and Ostrom (1995), institutions are enduring regularities of human action in situations structured by rules, norms, and shared strategies, as well as by the physical world as cited in Ambinakudige (2011). These rules, norms, and shared strategies are constituted and reconstituted by human interactions in frequently occurring or repetitive

situations (Crawford and Ostrom, 1995). Institutional factors that influence livelihood outcomes include policies, legislation, customary laws, the organizational structure and social norms (Ambinakudige, 2006). These factors determine what livelihood strategies are open and attractive (Carney, 1999).

2.16.3 Processes which frame the livelihood outcomes of farmers

Processes embrace the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, determine the way in which structures operate. Policy-determining structures cannot be effective in the absence of appropriate institutions and processes through which policies can be implemented. Processes are important to every aspect of livelihoods. They provide incentives that stimulate people to make better choices. They grant or deny access to assets. They enable people to transform one type of asset into another through markets. They have a strong influence on interpersonal relations. One of the main problems the poor and vulnerable face is that the processes which frame their livelihoods may systematically restrict them unless the government adopts pro-poor policies that, in turn, filter down to legislation and even less formal processes (Serat, 2008).

2.17 *Vulnerability context and its impact on livelihood outcomes*

Vulnerability is characterized as insecurity in the well-being of individuals, households, and communities in the face of changes in their external environment. People move in and out of poverty and the concept of vulnerability captures the processes of change better than poverty line measurements. Vulnerability has two facets: an external side of shocks, seasonalities, and critical trends; and an internal side of defenselessness caused by lack of ability and means to cope with these. The vulnerability context includes

- shocks, e.g., conflict, illnesses, floods, storms, droughts, pests, diseases
- seasonalities, e.g. prices, and employment opportunities
- critical trends, e.g., demographic, environmental, economic, governance, and technological trends (Serrat, 2008).

Vulnerability Contexts are important because they have a direct impact upon people's asset status and the options that are open to them in pursuit of beneficial livelihood outcomes.

Shocks can destroy assets directly (in the case of floods, storms, civil conflict, etc.). They can also force people to abandon their home areas and dispose of assets (such as land) prematurely as part of coping strategies. Recent events have highlighted the impact that international economic shocks, including rapid changes in exchange rates and terms of trade, can have on the very poor.

Trends may (or may not) be more benign, though they are more predictable. They have a particularly important influence on rates of return (economic or otherwise) to chosen livelihood strategies. Seasonal shifts in prices, employment opportunities and food availability are one of the greatest and most enduring sources of hardship for poor people in developing countries (DFID, 2001).

2.18 Types of livelihood assets available to farmers

People and their access to assets are at the heart of livelihoods approaches. Five categories of assets or capitals are identified, although subsequent adaptations have added others, such as political capital (power and capacity to influence decisions). The original five categories are natural, physical, human, financial and social capital.

2.18.1 Natural capital

Natural capital which is sometimes referred to as environmental resources comprises the land, water and biological resources that are utilized by people to generate means of survival and are thought of jointly as comprising the environment (Ellis, 2000). Natural capitals are not static nor are their utilization for survival purposes confined to gathering activities.

2.18.2 Physical capital

Physical assets comprise capitals that are created by economic production processes. Buildings, irrigation canals, roads, tools, machines, communications, and so on are physical assets. In economic terms, physical capital is defined as a producer good as contrasted to a consumer good. For example, roads have multiple effects in reducing the spatial costs of transactions in resources and outputs. They also facilitate movement of people between places offering different income earning opportunities (Ellis, 2000). Thus, this is the capitals which are available to the people that enable them to earn their livelihoods.

2.18.3 Human capital

It is often said that the chief asset possessed by the poor is their own labour. Human capital refers to the labour available to the household: its education, skills, and health (Carney, 1998 cited in Ellis, 2000). Human capital is increased by investment in education and training, as well as by the skills acquired through pursuing one or more occupations (Ellis, 2000). It enables the individuals to work or pursue some source of livelihoods.

2.18.4 Financial capital

Financial capital refers the capitals to stocks of money to which the household has access. This is chiefly likely to be savings, and access to credit in the form of loans. Neither money

savings nor loans are directly productive forms of capital, they owe their role in the asset portfolio of households to their convertibility into other form of capital, or, indeed, directly into consumption (Ellis, 2000). These are available to people in the forms of savings, supplies of credit or regular remittances or pensions which enables people to pursue their livelihoods.

2.18.5 Social capital

Moser (1998), cited in Ellis, (2000), defines social capital as reciprocity within communities and between households based on trust deriving from social ties. It attempts to capture community and wider social claims on which individuals and households can draw by virtue of their belonging to social groups of varying degree of inclusiveness in society at large. It is social networks system where the individuals and households can produce livelihoods through the relations e.g. community, family. The World Bank (1997) cited in McAlsan, (2002) has defined social capital as ‘the internal rules, norms and long-term relationship that facilitate coordinated actions and enable people to undertake co-operative ventures for mutual advantages. According to Putnam (1993) cited in McAlsan, (2002), social capital can be defined as the ‘features of social organizations, such as networks, norms, and trust that facilitate action and co-operation for mutual benefits.

2.19 Livelihood outcomes

Haidar (2009) indicated that livelihood outcomes are the goals to which people aspire after pursuing their livelihood strategies. Examples of livelihoods outcomes might include:

- increased income
- reduced vulnerability
- increased well-being

- improved food security
- more sustainable use of natural resources

Livelihoods outcomes according to Haidar (2009) are important because they help us understand:

- the results of peoples' livelihoods strategies in a particular context
- why people pursue particular strategies and what their priorities are
- how people are likely to respond to new opportunities or constraints

2.20 Definition of Concepts

Khan,(2005) described concept as gaining of an idea and understanding about a discipline, system or a thing i.e. what it is, what are its characteristics, merits, demerits, elements, definitions, principles, objectives, structure, etc. This section provides the meanings of concepts used in the research. These are (i) agricultural extension providers (ii) perception of farmers (iii) agricultural extension package (iv) extension packages practiced (v) livelihood strategies (vi) livelihood outcomes (vii) livelihood assets (viii) rural farmers and (ix) programme planning approaches.

Agricultural Extension Providers

Organizations that support people engaged in agricultural production and facilitate their efforts to solve problems by linking them to markets and other players in the agricultural value chain which is aimed at providing information, skills, and technologies to improve their livelihoods.

Perception of farmers towards extension delivery

The views of farmers about agricultural extension officers in respect of technologies they have received from them.

Agricultural Extension packages

Improved agricultural messages delivered by agricultural extension agents to farmers which is aimed at increasing their productivity and livelihoods.

Extension packages practised

Improved agricultural messages practised by farmers on their farms.

Livelihood outcomes

The goals people attain as a result of pursuing their livelihood strategies.

Livelihood (Capital) Assets

The assets people use to pursue their livelihood strategies; they consist of physical, natural, financial, human, and social. It include those owned or controlled directly by households or individuals, publicly owned assets and more intangible assets related to social and cultural relations.

Rural farmers

People who live in area with a population of less than 5,000 (Ghana Statistical Service, 2002) and depend either directly or indirectly on agriculture for their livelihood and survival (MoFA, 2010).

Performance of farmers

Perceived improvement observed by farmers in their knowledge, attitude and skills of through interactions with Agricultural Extension Agents.

Programme planning approaches

Forming objectives and drawing up of a logical sequence of actions (action plan) including the allocation of scarce resources in the most optimal way to achieve the set objectives.

2.21 Summary

The effort to reduce poverty among farmers in Ghana has necessitated the continuous delivery of programmes by the Agricultural Extension Services of the Ministry of Food and Agriculture. The objective of this is to ensure that through these programmes, the livelihood outcomes of farmers will be improved. Birner et. al. (2006) indicated that agricultural extension is an entire set of organisation that support and facilitate people engaged in agriculture production to solve problems and to obtain information, skills and technologies to improve their livelihood and wellbeing.

Glendenning et al. (2010) indicated that human capacity, content of extension messages, process used to disseminate extension messages and the type of technologies disseminated are important factors that affect extension delivery. Executive Agency for Health and Consumers (EAHC) (2012) recognized project planning as essential for a project's success, and thus the most important phase in project management and indicated that it helps by establishing the scope, aims and objectives of a project and mapping out the procedures, tasks, roles and responsibilities.

Sievers et al. (2011) indicated that helping farmers to capture market opportunities, obtain fair deals, and produce higher-quality products improves value chain performance while increasing rural incomes and employment and harnessing economic growth for rural areas. Agricultural markets can play significant roles in reducing poverty in poor economies, especially in countries which have not already achieved significant agricultural growth.

Schroeder's (1980) view of programming cited by Boone (1985) indicated that adult educators concern is with assessing needs, setting objectives, selecting and organizing learner experiences, choosing and implementing teaching strategies and evaluating outcomes. The review showed that in determining the effectiveness of extension delivery, the emphasis was placed on the competencies of the Agricultural Extension Agents (Apantaku, 2009; Okunade, 2007).

The use of a combination of individual, group and mass methods of extension teaching had the best association and effect on production output and so the study recommended that the use of a combination of extension teaching methods and media by extension agents should be encouraged. Even though Okunade (2007) concluded that the higher the level of education, the better and quicker the understanding of the extension teaching methods and the better decision that such farmers would take in adoption of innovations, the characteristics of farmers (social and psychological) need to be considered. It was also clear from the review the lack of literature on the implementation of agricultural extension programmes based on the principles of the Outcome Logic Model.

CHAPTER THREE

APPROACHES TO PROGRAMME PLANNING OF PUBLIC SECTOR AGRICULTURAL EXTENSION DELIVERY IN GHANA

3.0 Introduction

The chapter discusses the different approaches to programme planning used by the Agricultural Extension Services in Ghana. It will also discuss the extent of use of the outcome logic model approach of planning of some programmes implemented in the country after which districts studied are categorised as high, medium or low extent of use of the outcome logic model depending on the programmes implemented in those districts.

3.1 Approaches to programme planning

Two major planning approaches namely top-down and bottom –up (participatory) have formed the basis of planning of agricultural programmes delivered to farmers by the agricultural extension services in Ghana.

3.1.1 Top-down planning

Top-down approach, as implied above, is a situation in the planning of an extension programme where the extension organisation formulates its own programme objectives and then decides on the other aspects of the programme with or without the involvement of the beneficiaries of the programme. So the extension organisation initiates the programme with pre-determined objectives and may or may not involve the beneficiaries in deciding the other aspects of the programme.

3.1.2 Bottom-up (participatory planning process)

The Participatory programme planning approach is one in which everyone who has a stake in the intervention has a voice, either in person or by representation. Staff of the organization that will run it, members of the target population, community officials, interested citizens, and people from involved agencies, schools, and other institutions all should be invited to the table. Everyone's participation should be welcomed and respected, and the process shouldn't be dominated by any individual or group, or by a single point of view. The process provides community ownership and support of the intervention; information about community history, politics, and past mistakes; and respect and a voice for everyone. It also takes time, care, mutual respect, and commitment. If you can manage a planning process that meets all these requirements, the chances are that you will come up with a successful community intervention, one that truly works and meets the community's needs.

3.2 *Programme planning used under top-down extension delivery approaches*

The extension delivery approaches considered are General Extension, Commodity Specialized, Training and Visit, Project and Educational Institutional approaches

3.2.1 General agricultural extension approach

Under this approach, programme planning is controlled by Government and changes in priority from time to time and made on national basis with some freedom for local adaptation. Decisions about the goals and objectives of the extension programmes are made within the Ministry of Agriculture, sometimes involving participation by many professionals, administrative and political personnel. This approach of extension delivery was prominent immediately after Ghana's independence by the Ministry of Food and Agriculture.

3.2.2 The Commodity Specialized approach

Extension programme planning under the Commodity Specialized Approach is controlled by the commodity organization. The organization decides what should be the goals of extension programme, what should be the extension message, the timing of activities in the extension programme, who should participate in which aspects of that programme and who should be the officers of the extension staff. Companies like Benso Oil Palm Plantations (BOPP) Limited, Twifo Oil Palm Plantation (TOPP) Limited and Ghana Rubber Estate Limited (GREL) are using this planning approach in Ghana.

3.2.3 Training and Visit

The control of programme planning in the T&V Extension System is centralized. It usually reflects interaction between extension and research personnel of a Ministry of Agriculture. Decisions about what should be taught and when it should be taught tend to be made by professionals and then the programme is delivered down to the farmers. Programme planning follows the cropping pattern of priority crops and tends to feature rigid scheduling of extension activities particularly the training, the visits and supervision. This system was practiced during the implementation of the Upper Region Agricultural Development Project (URADEP) and Volta Region Agricultural Development Project (VORADEP) which were set up in 1976 and 1982 respectively.

3.2.4 Project approach

The Project Approach undertakes programme planning usually outside the village with Central Government, the donor agency or some combination. Control of programme planning is usually outside the village. It is at the Central government level and there are often considerable financial and technical inputs from an international development agency.

Projects implemented in Ghana which had these characteristics include the National Agriculture Research Project (NARP), National Agriculture Extension Project (NAEP), Agriculture Services Investment Project (ASIP) and Agriculture Diversification Project (ADP). Others were National Livestock Services Project (NLSP), Fisheries Sub Sector Capacity Building Project (FSSCBP), Small holder Credit, Input, Supply and Marketing Project (SCIMP) and Upper East Land Conservation and Smallholder Rehabilitation Project (LACOSREP)

3.2.5 Educational Institution approach

Programme planning under the Educational Institution Approach tends to be controlled by those who determine the curriculum of the educational institution. This approach uses educational institutions which have technical knowledge and some research ability to provide extension services for rural people. It is implemented through non-formal instruction in groups or individuals. Colleges of Agriculture namely Kwadaso, Ejura, Ohawu and Damongo as well as Farm institute at Wenchi in Ghana provide training to farmer groups.

3.3 *Programme planning used in bottom-up extension delivery approaches practised in Ghana*

The major types of these approaches practised in Ghana include Agricultural Extension Participatory Approach, Farming System Development Approach and Cost Sharing Approach.

3.3.1 Agricultural extension participatory approach

Programme planning is controlled locally often by such groups as farmers' associations. Participation by representatives of agricultural research and service organizations contribute

significantly to the success but it is the decentralization of programming controls which allows priorities to vary greatly from place to place within a country. The programme can shift on a timely basis when local situations change.

3.3.2 Farming system development approach

Programme planning evolve slowly during the process and may be different from each agro-climatic farm eco-system type, since the programme must take into account a holistic approach to the plants, the animals and the people in each particular location. The control of programmes is shared jointly by the local farm men and women, agricultural extension officers and agricultural researchers.

3.3.3 Cost sharing approach

The control of programme planning is shared by the various levels paying the costs but must be responsive to local interest in order to maintain cooperative financial arrangements. Local people tend to have a strong voice in programme planning since if they are dissatisfied, they will not provide their share of the cost.

3.4 *Projects implemented in Ghana*

In a review of agricultural projects delivered by agricultural extension services to farmers, Gyenfie, Boateng & Atengdem (2014) identified projects implemented under the MTADP. These include National Agriculture Research Project (NARP), National Agriculture Extension Project (NAEP), Agriculture Services Investment Project (ASIP) and Agriculture Diversification Project (ADP). Other projects were National Livestock Services Project (NLSP), Fisheries Sub Sector Capacity Building Project (FSSCBP), Small holder Credit,

Input, Supply and Marketing Project (SCIMP) and Upper East Land Conservation and Smallholder Rehabilitation Project (LACOSREP). The rest of the projects included Upper West Agriculture Development Project (UWADEP), Small Scale Irrigation Development Project (SSIDP), Village Infrastructure Project (VIP), Roots and Tubers Improvement Project (RTIP), Rural Enterprise Programme (REP) and Food Crops Development Project (FCDP).

While each individual project had its own specific objectives, the common goal was to accelerate agricultural growth and increase the income of smallholders through improvements in productivity and diversification, supported by the improvement of small rural infrastructure. Technology, institutional improvements, increased participation, and training were important means to achieve the objectives. It is however important to understand the planning process of these projects and how it can affect the livelihood outcomes of farmers.

3.4.1 National Agricultural Research Project (NARP)

The project was carried out between 1991 and 1999. The objectives of NARP were to initiate a long-term process to strengthen agricultural research system, in order to generate improved technologies, thus contributing to national development objectives and growth in the agricultural sector. It was to ensure that research priorities accord with national development priorities, the needs of farmers and sustainable use of Ghana's natural resources. The NARP supported the improvement of the planning, management, budgetary procedures, research extension linkages and human resources in the research system and invested in selected research programmes (MoFA and DFID, 2001).

3.4.2 National Agricultural Extension Project (NAEP)

The NAEP was carried out from 1992-1997 by MoFA. The project strengthened the extension services in all 10 regions and in the central ministry. It addressed the problem of weak, fragmented and poorly coordinated extension services by establishing a Unified Agricultural Extension Service (UAES) that promoted the widespread use of proven agricultural technologies and farming practices. It addressed the problem of weak and atomistic extension and farmer linkages by establishing Research and Extension Liaison Committees (RELCs) in the country. The outcome of an impact evaluation indicated significant adoption and yield increments but found that the nutrition objective was not achieved. A relatively high cost of recommended technologies seemed likely to militate against a substantial focus on the poor.

3.4.3 National Livestock Services Project (NLSP)

The NLSP was implemented from 1992 to 1998. It improved the capacity of the Open Nucleus Breeding Centers, rehabilitated veterinary laboratories, supported privatization of veterinary services, vaccination and work on tsetse control. Other achievements included increase on livestock production, i.e. meat and poultry, improvement in the nutrition, income and standard of living of a large number of rural families and small holders and increased employment (World Bank, 2001). The project faced certain challenges which included the complexity of project design which required considerable coordination between various government agencies. It was to be managed by the MOFA and implemented by the Animal Production and Veterinary Services Departments working in collaboration with the Ghana Irrigation Development Agency responsible for stock water development, Crop Services Department for seed production, and Animal Research Institute for range and forage

development. (2) Implementing agencies were not conversant with Bank procedures for project implementation led to slow project start up.

3.4.4 Agricultural Diversification Project (ADP)

The ADP was implemented between 1991 and 1999 and it supported diversification into higher value tree and horticulture crops, especially pineapple, through policy reforms to promote liberalization and privatization, through rehabilitation or planting of coffee, rubber, and oil palm, through feeder roads and through technical support for export crops. The project provided training and technical support to farmers as well as the institutions that were involved in the production of the target crops. The performance of all the crops improved under the project (World Bank, 2001)

3.4.5 Agricultural Sector Investment Project (ASIP)

The ASIP was carried out from 1992 to 1997. The main objective of ASIP was to increase the flow of resources, both technical and financial, for rural development so as to increase agricultural productivity and access. It supported small rural infrastructure including investments in small-scale water schemes, marketing infrastructure, feeder roads, storage and food processing and studies and technical assistance. The project provided assistance to the agro processing industry, developed market infrastructure (including storage facilities), rehabilitated and maintained rural feeder roads, and provided water in rural areas. This provided some of the needed incentives for increased agricultural production and thereby enhanced incomes and reduced poverty (FAO, 2003).

3.4.6 Fisheries Sub Sector Capacity Building Project (FSSCBP)

The FSSCBP was implemented from 1996 to 2001. The main objective was to establish the long-term sustainability of the fisheries resource and thereby maximize its contribution to the economy. This was promoted through extension and other support services, private smallholder investment in aquaculture, especially in the hinterland by strengthening the capacity of the Directorate of Fisheries (DoF) in financial management, collection and management of fisheries levies, budget planning and management through technical assistance and training of staff in extension methods, marketing, fisheries resources management, fisheries economics, and monitoring, control and surveillance and the revision of fisheries legislation (World Bank, 2003).

3.4.7 Small holder Credit, Input Supply and Marketing Project (SCIMP)

The SCIMP was implemented from 1996 to 1999. The goal was to help farmers achieve better food security by increasing production and managing their surpluses better. The project helped build access tracks and storage and processing facilities. Some 60 per cent of the beneficiaries were women. The project increased participants' food security and their ability to lead and sustain their own development. It strengthened farmers' organizations and enhanced participants' ability to use savings and manage credit. The project also supported improvements in food processing, storage and marketing (IFAD, 2006).

3.4.8 Upper East Region Land Conservation and Smallholder Rehabilitation Project (LACOSREP I & II)

The IFAD's Upper East Region LACOSREP was implemented from 1991 to 1997. The rationale for LACOSREP II was summarised in the Appraisal Report as: (i) strong existing

demand for dam rehabilitation in rural communities; (ii) the potential for water user associations (WUA) to be sustained and assure food security in the region; and (iii) building on existing credit experience to establish effective mechanisms for rural financial institutions. It had the objective of increasing the incomes of rural poor people in the region while protecting the environment and improving access to water (IFAD, 2006).

3.4.9 Root and Tuber Improvement Programme (RTIP)

The RTIP became effective in January 1999 and was scheduled to close in December 2004 but it was extended until September, 2005. The Project Appraisal Report (PAR) cited four compelling reasons to develop this commodity sector: (i) because they can be grown all year round and grow well on poor soils, can mitigate the vulnerability of resource-poor communities to seasonal food scarcity; (ii) as root and tuber crops are grown largely by the poorest segment of the rural population, improvements in root and tuber crop productivity will positively affect the incomes of those producers; (iii) the development of the root and tuber sector is important to further diversify the agricultural sector; and (iv) investments in the root and tuber sector would provide new opportunities to smallholders to increase incomes, thus favouring more equitable income distribution in the rural economy. At the time roots and tubers contributed 40% to agricultural GDP. Grown by about 55% of all farming households in Ghana, these crops were seen as both important revenue earners for poor households and potential contributors to export earnings (IFAD, 2004).

3.4.10 Root and Tuber Improvement and Marketing Programme (RTIMP)

The Root and Tuber Improvement and Marketing Programme (RTIMP) is a follow-up to the Root and Tuber Improvement Programme (RTIP) which was implemented from 1999 to 2005.

RTIMP was funded by the International Fund for Agricultural Development (IFAD) and the Government of Ghana (GoG) for a period of 8 years (2007-2014). The Goal of the Programme was to enhance income and food security in order to improve livelihoods of the rural poor. The main purpose of the intervention was to build a competitive market-based Root and Tuber Commodity Chain (RTCC) supported by relevant, effective and sustainable services that are available to the rural poor. RTIMP worked with a wide cross section of stakeholders in order to achieve maximum economic and social impact at all stages of the R&T commodity chains. The intervention focused especially on improving the outputs, incomes and hence living standards of small-scale R&T farmers, processors and traders, particularly women.

3.4.11 Small Scale Irrigation Development Project (SSIDP)

The SSIDP was completed in 2009 even though it was expected to be implemented from 1999 to 2004. The objective of the project was to enhance and increase production of farmers through the adoption of new and improved farming technologies. This was to be achieved by (1) developing 2,590ha of land (15 small scale irrigation schemes, 4 water conservation schemes and 12 micro irrigation schemes) and (2) organizing 6,000 farmers into 19 Irrigation Farmers Associations (IFAs) (Government of Ghana, 2010).

3.4.12 Village Infrastructure Project (VIP)

The Village Infrastructure Project (VIP) began from 1997 and ended in 2004 with the primary objective to improve the quality of life of Ghana's rural poor by increasing the transfer of technical and financial resources to improve basic village-level infrastructure. Specific project objectives were to: (i) empower local communities and beneficiary groups through technical assistance and other measures to identify, plan, implement and maintain small, village-level infrastructure investments; (ii) increase rural communities' access to development resources through small grants; (iii) strengthen community and district-level institutions to improve the efficiency of rural resource transfer and ensure the sustainability of poverty-reducing interventions (MoFA and DFID, 2001).

3.4.13 Upper West Agriculture Development Project (UWADEP)

UWADEP was approved by the IFAD Executive Board in September 1995, became effective in March 1996 and closed in December 2004. The objectives of UWADEP were to: (i) boost food production and incomes; (ii) strengthen community organisations; (iii) improve the economic status of women; (iv) develop dry season gardening; and (v) improve access to markets through feeder roads. The overall impact of UWADEP was considered modest. The number of functional dams by the closure of the project was small and the irrigated area limited. Many of the dams have engineering and technical problems which pointed to lack of supervision leading to limited overall impact on food security (IFAD, 2006).

3.4.14 Rural Enterprise Project (REP)

The REP was implemented over a 7 year period from 1995-2002. The objectives of the project were to increase rural production, employment and income in order to alleviate

poverty through the increased output of small off farm enterprises. This was done by facilitating access to technology and business advice, promoting easier access to financial services, improving efficiency of existing small rural enterprises, supporting the creation of new enterprises, removing communication constraints through feeder road rehabilitation (MoFA and DFID, 2001).

3.4.15 Food Crops Development Programme (FCDP)

The Food Crops Development Programme (FCDP) was implemented between the year 2000 and 2008. The objectives were to (1) improve household food security; (2) increase farmers' incomes and help alleviate poverty of small holder farmers in the district and (3) increase production and processing. The project assisted farmers with inputs in the production of maize, cowpea, groundnut, soybean and sorghum. Processing equipments were also given to households and small scale enterprises to improve on their income levels and food security situation (MoFA, 2011).

3.4.16 Commercial Development of Farmer Based Organisations (CDFO)

Recently in Ghana, thirty (30) districts benefited from an agricultural project under the Millennium Development Authority (MiDA) of the Millennium Challenge Account (MCA). The project which was implemented between 15th February 2007 and 16th February 2012 had an objective of enhancing the profitability of staple foods like rice, maize, yam and high value horticulture crops, and improve delivery of business and technical services to support the expansion of commercial agriculture and farmer-based organizations (FBOs) (MiDA, 2012)

3.5 *Characteristics of programmes/projects based on the Outcome Logic Model*

Approach of Planning.

Programmes delivered to farmers which are based on the Outcome Logic Model approach of planning according to McCawley (2004) is expected to focus on the early aspect of planning where all stakeholders should be made aware of the outcomes to be achieved and the type of activities and resources needed to achieve the outcomes. For a programme to be classified as having used the OLM approach of planning, the questions that arose are that;

- Were stakeholders made aware of the current situation that the organisation intended to impact?
- Were stakeholders aware of what it will look like when they achieve the desired situation or outcome?
- Were stakeholders aware of behaviors needed to be changed for that outcome to be achieved?
- Were stakeholders aware of the knowledge or skills the people need before the behavior will change?
- Were stakeholders aware of the activities needed to be performed to cause the necessary learning?
- Were stakeholders aware of the resources required to achieve the desired outcome?

The assumption is that if all the above issues were discussed and understood by all stakeholders by identifying the expected outcome to be achieved while the resources needed

to carry out the necessary activities are provided, it is expected that programmes delivered by agricultural extension services to farmers will lead to improvement in their livelihood outcomes.

3.6 Summary

Several programmes have been delivered to farmers within the country to reduce poverty through improvement in their livelihood outcomes. Two major planning approaches; Top-down approach is a situation in the planning of an extension programme where the extension organisation formulates its own programme objectives and then decides on the other aspects of the programme with or without the involvement of the beneficiaries of the programme. The extension delivery approaches considered are General Extension, commodity specialized, Training and Visit, Project and Educational Institutional approaches. Bottom-up approach is a participatory approach in which everyone who has a stake in the intervention has a voice, either in person or by representation. The extension delivery approaches practiced include Agricultural Extension Participatory Approach, Farming System Development Approach and Cost Sharing Approach.

Kellogg (2004) indicated that a logic model is a systematic and visual way to present and share your understanding of the relationships among the resources you have to operate your programme, the activities you plan, and the changes or results you hope to achieve. The Logic Model is a programme planning tool that can be used to help organize, design, implement and evaluate any kind of programme. It provides a template for describing what goes into a programme, who will participate, the activities and the outcomes, including long-term impacts. It can also be used to analyze programme assumptions and external factors that can influence success.

Kellogg (2004) identified three types of logic models which include the Theory Approach, Activities Approach and Outcome Approach. The Theory Approach emphasises the theory of change that has influenced the design and plan for the programme. The Activities Approach pays attention to the specifics of the implementation process, linking the various planned activities together in a manner that maps the process of programme implementation while Outcome Approach focuses on the early aspects of programme planning and attempts to connect the resources and/or activities with the desired results in a workable programme.

According to McCawley (2009) OLM approach of planning is expected to focus on the early aspect of planning where all stakeholders should be made aware of the outcomes to be achieved and the type of activities and resources needed to achieve the outcomes. For a programme to be classified as having used the OLM approach of planning, the questions that arose are; (1) were stakeholders made aware of the current situation that the organisation intended to impact? (2) were stakeholders aware of what it will look like when they achieve the desired situation or outcome? (3) were stakeholders aware of behaviors needed to be changed for that outcome to be achieved? (4) were stakeholders aware of the knowledge or skills the people need before the behavior will change? (5) were stakeholders aware of the activities needed to be performed to cause the necessary learning? (6) were stakeholders aware of the resources required to achieve the desired outcome? Helitzer, Willging, Hathorn and Benally (2009) used the logic model process to help community stakeholders of Navajo Nation to conceive, design, implement and evaluate agricultural injury prevention project and found that the stakeholders understood in details all the factors that could lead to prevention of agricultural injuries.

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

The previous chapter provided information on agricultural programmes delivered by the Agricultural Extension Service of the Ministry of Food and Agriculture to farmers. This chapter contains a discussion of the methodologies used to collect and analyse data for the study “Linking programme planning approaches to livelihood outcomes achieved by farmers” A case study of Agricultural Extension Services in Ghana”. The procedures, design and instruments that were employed to gather data needed and how the data was analysed are described here.

4.1 Population of study

The population for this study comprised of all Agricultural Extension Agents (AEAs) of the Ministry of Food and Agriculture and farmers who receive services from the Agricultural Extension Agents in Ghana. An estimated total of two thousand seven hundred and fifty-seven (2,757) technical staff and a farmer population of 4,199,185 (MoFA, 2011) were used for the study.

4.2 Sampling frame and process

The sampling frame is a comprehensive list of all the sampling units from which a sample is selected (East AFRITAC, 2010). In this study the sample frame consisted of ninety-six (96) AEAs and estimated two hundred and seventy-two thousand (272,000) farmers in the eight selected districts in the country.

4.2.1 Sample selection

A multi-stage stratified random sampling technique was used to select the districts (Table 4.1) where the research was conducted. The four zones namely Northern Agricultural Zone, Afram Basin Zone, Southern Horticultural Zone) and Forest Belt after which regions were identified as follows (MoFA, 2011, ISSER, 2012):

1. Northern Agricultural Zone: Northern, Upper East and Upper West Regions Afram
2. Afram Basin Zone: Ashanti and Eastern Regions
3. Southern Horticultural Belt: Greater Accra, Western and Volta Regions
4. Forest Belt: Brong-Ahafo and Central Regions

Two regions each were randomly selected from the Northern Agricultural and Southern Horticultural zones (which have three regions each). This was done by writing the names of the regions in each zone on pieces of papers after which it was folded and put into a small box. The box with its contents was shaken and two of the papers randomly selected. The selected papers were opened and names of the regions were noted. Zones with two regions were all selected. The regions selected for the research (Table 4.1) were as follows:

1. Northern Agricultural Zone: Northern and Upper East
2. Afram Basin Zone: Ashanti and Eastern Regions
3. Southern Horticultural Belt: Central and Volta Regions
4. Forest Belt: Brong-Ahafo and Western Regions

Table 4.1: Information on sampling frame, sampling process and sample size

STAGE	SAMPLING FRAME	SAMPLING PROCESS	SAMPLES
1	4 AGRO ZONES	SIMPLE RANDOM SAMPLING OF 2	REGIONS
	Northern Agricultural Zone	Northern Region Upper East Region Upper West Region	Northern Region Upper East Region
	Afram Basin Zone	Ashanti Region Eastern Region	Ashanti Region Eastern Region
	Southern Horticultural Zone	Western Region Greater Accra Region Volta Region	Western Region Volta Region
	Forest Belt	Brong-Ahafo Region Central Region	Brong-Ahafo Region Central Region
2	SAMPLING FOR DISTRICTS	PURPOSIVE SAMPLING	DISTRICTS SELECTED
	Northern Region (26 districts)	Selection was based on the type of projects delivered to farmers. The projects considered are LARCOSREP, NAEP, SCIMP, RTIP, CDFBO	Walewale
	Upper East Region (13 districts)		Talensi
	Ashanti Region (30 districts)		Mampong Municipal.
	Eastern Region (26 districts)		Suhum Municipal
	Western Region (22 districts)		Shama
	Volta Region (25 districts)		Kpando Municipal
	Brong Ahafo Region (27 dist)		Tano North
	Central Region (20 districts)		Twiifo Ati-Morkwaah
3	SAMPLING OF AEAs	PURPOSIVE	SAMPLE SIZE
	Total number of AEAs in Ghana is 2,757	All AEAs providing services to farmers in the selected districts	Eighty-six (86) AEAs
4	SAMPLING OF FARMERS	RANDOM SAMPLING	SAMPLE SIZE
	Total number of farmers in Ghana is 4,199,185	Minimum of five farmers who receive services from AEAs	Four hundred and two (402) farmers selected and interviewed

Source: Author, 2013

Purposive sampling procedure was used to select a district (Table 4.1) from each region based on the type of project(s) delivered to farmers in the districts. The projects considered for this study are LACOSREP, NAEP, SCIMP, RTIP and CDFBO. The selected districts/municipals for the study are as follows:

Northern Region	West Mamprusi District (CDFBO)
Upper East Region	Talensi Nabdam District (LACOSREP)
Ashanti Region	Mampong Municipal (CDFBO)

Eastern Region	Suhum Municipal (NAEP, RTIP)
Central Region	Twifo Ati Morkwaa (NAEP, RTIP)
Volta Region	Kpando Municipal (CDFBO)
Brong Ahafo Region	Tano North District (SCIMP)
Western Region	Shama District (NAEP, RTIP)

4.2.2 Sample size

A total of eighty-six (86) (89.6%) AEAs made up of seventy-six (76) males and ten (10) females were interviewed. The sample size for farmers was four hundred and two (402) (0.15%) made up of three hundred and three (303) males and ninety-nine (99) females were interviewed in this study.

4.3 Data collection

This is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes (Northern Illinois University, 2004). In this study data were collected using quantitative methods. A summary of information or type of information required to address the research questions, sources of information and data collection techniques used are shown in Table 4.2.

4.3.1 Quantitative method of data collection

Structured interview questionnaire was used to collect data on all variables identified in the research: “linking programme planning approaches to programme outcomes: A case study of Agricultural Extension Services in Ghana”.

4.3.2 Questionnaire for Agricultural Extension Agents (AEAs)

The questionnaire for the AEAs (Appendix 1) was made up nine parts which included

- Personal and Socio-economic characteristics of the Frontline Staff
- Principle of Operation of MoFA
- Approach used by Extension to deliver technologies
- Process of Delivery
- Technologies delivered by Frontline staff (FLS) to farmers. The others are
- Marketing Opportunities for farmers to sell farm produce,
- Opportunities for farmers to utilize farm produce and
- Resources required to deliver technologies.

4.3.3 Questionnaire for farmers

The questionnaire for the farmers (Appendix 2) consisted of nine parts. It included

- Personal and Socio-economic Characteristics of Respondents
- Activities of MoFA-Needs Assessment and Technologies received from Extension Officers.
- Extension Methods used to deliver extension packages.
- Perception of farmers towards agricultural extension delivery
- Marketing opportunities
- Utilization of Farm produce
- Access to assets and
- Achieving Livelihood Outcomes.

Table 4:2 Objectives/concepts, information required, sources of information and data collection techniques

Objectives/Concepts	Information required (Variables)	Source of Information	Data Collection Techniques
1. To determine the extent of use of OLM (1. High 2. Medium 3. Low) in planning approaches of programme delivered to farmers	(1) Were stakeholders made aware of the current situation that the organisation intended to impact? (2) Were stakeholders aware of what it will look like when they achieve the desired situation or outcome? (3) Were stakeholders aware of behaviors needed to be changed for that outcome to be achieved? (4) Were stakeholders aware of the knowledge or skills the people need before the behavior will change? (5) Were stakeholders aware of the activities needed to be performed to cause the necessary learning? (6) Were stakeholders aware of the resources required to achieve the desired outcome?	AEAs	Review of project appraisal and evaluation reports
2.To determine whether programme planning approaches have impact on livelihood outcomes of farmers	Short term outcome: improved knowledge, attitude, skill Medium term outcome: Perception of farmers, extension packages practiced Long term outcome: improved income, improved wellbeing, improved food security, Sustained use of natural resources, reduced vulnerability	Farmers	Analysis of questionnaire
3.To determine whether extension packages farmers are trained in is influenced by the planning levels they operate in	•Training content- Crops, Livestock, poultry, Fisheries, WIAD related activities, Non-traditional farming, Business development	Farmers AEAs	Interview questionnaire Likert scale
4. To determine whether the type of extension methods used by AEAs operating under different planning levels of OLM has influence on and livelihood outcomes of farmers.	Which methods were used by Extension Agents to deliver extension packages to farmers? • Methods used Individual- home and field visits, Group - demonstrations, field days, field trips, general meeting, lectures, group discussions. Mass- radio/television, pamphlets, fact sheets Teaching aids- board, photographs, real objects,	Farmers A. E. As	Interview questionnaire Likert scale

<p>5. To determine whether training of farmers on opportunities for marketing and utilization of farm produce as part of content of extension training is likely to impact on livelihood outcomes of farmers.</p>	<p>Marketing 1. Information on product planning 2. Information on current prices 3. Information on forecast of market trends. 4. Information on sales timing 5. Information on improved marketing practices. 6. Information on group marketing Utilization 1. Information on the nutritional value of foods, 2. Food quality and safety, 3. Methods of preservation, 4. Processing and handling, 5. Food preparation and eating</p>	<p>Farmers AEAs</p>	<p>Interview questionnaire Likert Scale</p>
<p>6. To determine whether farmers' access to assets have effect on their performance</p>	<p>How reliable are farmers access to livelihood assets? 1. Physical capital 2. Natural capital 3. Financial capital 4. Human capital 5. Social capital</p>	<p>Farmers</p>	<p>Interview questionnaire Likert Scale</p>
<p>7. To determine whether the demographic characteristics of the respondents in the study areas have impact on outcome of extension programmes.</p>	<p>1. Age, 2. Sex, 3. Years in farming, 4. Years of interaction with MoFA, 5. Marital status etc.</p>	<p>Farmers A. E. As</p>	<p>Interview questionnaire</p>

Source: Author, 2013

4.3.4 Determining programme planning approaches of projects in the study area

Five projects i.e. National Agricultural Extension Project (NAEP), Small holder Credit, Input Supply and Marketing Project (SCIMP), Upper East Region Land Conservation and Smallholder Rehabilitation Project (LACOSREP), Root and Tuber Improvement Programme (RTIP), and Commercial Development of Farmer Based Organisations (CDFO) were considered under this study.

To determine whether the characteristics of the outcome logic model of programme planning formed the basis of planning for these projects, the objectives expected to be achieved by the five projects delivered to farmers were used as proxy to measure the extent of use of the outcome approach of planning (Montgomery et al. (1999). Sixteen (16) activities as shown in Table 4.3 were used as proxy indicators and depending on the number of activities outlined by each project, a value of 3 was assigned when that indicator was highly implemented, a value of 2 was assigned when an indicator was moderately used while a value of 1 was also assigned when that indicator was lowly used and 0 assigned if it was not used. The total value for each programme was calculated and the mean value was also calculated. Projects which had a mean between 0 and 1.0 were classified as using low outcome logic model, those between 1.1-2.0 as using medium outcome logic model approach of planning and those between 2.1-3.0 as using high outcome logic model approach of planning (Appendix 3).

Table 4.3 List of programme objectives used as proxy indicators

PROGRAMME OBJECTIVES	
1	Irrigation facility
2.	Marketing of farm produce
3.	Utilization of farm produce
4.	Group loans given to farmers
5.	Portable water supply
6.	Improved road network
7.	Planting material availability
8.	Crop development
9.	Group formation/cohesion
10.	Demonstrations
11.	Enhanced extension contact
12.	High research component
13.	Land and water management
14.	Improved income
15.	Storage facility
16.	Food security

Source: Field survey, 2013

4.3.5 Validity and reliability of the results

Validity essentially means the closeness of a research finding to physical reality (Chambers, 1997). The validity or integrity of qualitative data is measured by trustworthiness, dependability and credibility.

Validity

Internal validity is yet another type of measure of the study's trustworthiness. Internal validity mostly relates to experimental research, but can be a factor in non-experimental research designs as well (Ary et al, 2002). Internal validity of the research design was improved through triangulation of data sources.

External validity refers to the extent that results of the study can be generalized (Ary et al., 1996). Population external validity, if high, means that results can be generalized to the larger population (Ary et al., 1996). In this study it would mean that results seen in a random sample of farmers in eight municipals/districts could be inferred or generalized to the general population of farmers Ghana. Generalizations or inferences can be made to the population only if a random sample was selected for the study.

Reliability

Reliability is the extent to which an instrument is consistent in measuring, or to which a particular technique will always yield the same result (Babbie, 2007). It can be compared to precision. Reliability was ensured in the following manner:

Pre-testing of instruments

The questionnaires were pre-tested in the Kwahu West Municipality in the Eastern Region of Ghana. The responses from the pre-testing were used to modify the questionnaire used in the data collection instrument for the main study.

Obtaining reliability coefficients from test constructs

Cronbach's Alpha coefficient was used to determine the reliability. Cronbach alpha is used when items are scaled and the scores can be a range of values, as is the case with Likert scales and semantic differential scales (Ary, Jacobs and Razavieh, 2002). Alphas in the range of .50 to .60 are acceptable when making decisions regarding groups of people for research purposes (Ary, Jacobs and Razavieh, 2002). Cronbach alphas test conducted on questionnaires for both staff and farmers gave alphas between 0.526 and 0.951.

Seminar

The researcher presented the study topic at a seminar before going to the field. The seminar was attended by senior lecturers and students who critiqued and made valuable contributions that were used to modify the final questionnaires.

4.4 Data collection process

An appointment to meet all AEAs at their municipal/district capitals was booked with the District Directors of Agriculture (DDA) of the selected municipals and districts. The towns involved are Kpando, Walewale, Asante Mampong, Tongo, Duayaw Nkwanta, Suhum, Twifo Praso, and Shama. The researcher arrived at the respective municipal/district a day before the meeting. On the meeting day the AEAs and other technical staff were briefed on the objectives of the research and the questionnaires for both the AEAs and farmers were

rigorously explained to them to enable them give meaningful responses to the questions in their own questionnaire and be able to administer some of the questionnaires to the farmers. The meeting also sought to inform the AEAs about the visiting schedule to their operational areas. On the scheduled day of the visit, a minimum of five farmers who attended the meeting called by the AEAs were randomly selected in each operational area and interviewed.

4.5 Problems encountered in the field

The data collection period which was from 7th January to 30th April 2013 coincided with the farming periods of some of the districts selected for the study. While some farmers who wanted to take advantage of the early rains and grow early maize, the normal major season land preparations were on going. Farmers therefore left very early for their farm but have to be convinced to wait for us. This made the researcher to travel very early in the morning in order to meet the farmers. The length of time (not less than one hour) taken to administer a questionnaire to a farmer was also a worry to the farmers. This made some of the selected farmers leave for their farms with several excuses. On the level of the AEAs, lack of funds to go about their extensions activities resulted in some of them making undue financial demands from the researcher.

4.6 Data analysis

The completed questionnaires for each day were examined to determine if all questions were answered appropriately after which all the necessary corrections were made. The responses for the questions were summarized and a coding scheme drawn. The coding scheme was used to code all the responses in the questionnaires. The data collected for the farmers and extension agents were analysed using the Statistical Package for Social Sciences (SPSS) 16.

Frequencies, percentages and cross-tabulation were used to describe the data. Pearson product-moment coefficient was used to describe the strength and direction of the linear relationship between technologies which AEAs have trained farmers and technologies farmers indicated they have received training from AEAs. Pearson is designed for interval level (continuous) variables. It can also be used if you have one continuous variable. Pearson correlation coefficients (r) can take on only values from -1 to $+1$.

Small: -0.29 to $-0.10 \leq r \leq 0.10$ to 0.29

Medium: -0.49 to $-0.30 \leq r \leq 0.30$ to 0.49

Large: -1.00 to $-0.50 \leq r \leq 0.50$ to 1.00

Further analysis was conducted using Kruskal-Wallis H Test and Mann-Whitney U Test to determine differences in means. The Kruskal-Wallis Test (sometimes referred to as the Kruskal-Wallis H Test) is the non-parametric alternative to a one-way between-groups analysis of variance. It allows you to compare the scores on some continuous variable for three or more groups. It is similar in nature to the Mann-Whitney test, but it allows you to compare more than just two groups. Scores are converted to ranks and the mean rank for each group is compared. This is a 'between groups' analysis, so different people must be in each of the different groups. The Mann-Whitney U Test actually compares medians. It converts the scores on the continuous variable to ranks, across the two groups. It then evaluates whether the ranks for the two groups differ significantly. As the scores are converted to ranks, the actual distribution of the scores does not matter (Pallant, 2005).

4.7 Summary

A multi-stage stratified random sampling technique was used to select the sample size. The four zones of the country which is based on the climate and vegetation of the ten regions were

used for the study. Two regions were randomly selected from two zones which were made up of three regions each and added to the other two zones which had two regions each giving a total of eight regions. A purposive sampling method was then used to select eight municipal/districts for the study. The selected municipal/districts include Talensi-Nabdam, West Mamprusi, Tano North, Mampong, Twifo Hemang Lower Denkyira, Shama, Suhum and Kpando. The population for the study was farmers and Agricultural Extension Agents. A random sampling of four hundred and two (402) farmers made up of three hundred and three (303) males and ninety-nine (99) females were interviewed while eighty-six (86) AEAs made up of seventy-six (76) males and ten (10) females were also interviewed.

The data collection techniques used included interview questionnaire for both farmers and Agricultural Extension Agents. Data collection was carried out between 7th January, and 30th April, 2013. A code book was developed after which it was used to code the questions. Data entry was done using SPSS (16). Descriptive statistics was used to describe the data. Pearson product-moment coefficient was used to measure the strength of association between training AEAs have given to farmers and technologies farmers indicated they have received training from AEAs. Further analysis was conducted using Kruskal-Wallis H Test and Mann-Whitney U Test to determine differences in means.

Using five projects delivered to farmers and the extent to which characteristics of the outcome logic model formed part of the planning approaches, sixteen (16) objectives as proxy indicators and depending on the extent of use of any of the indicators in the planning approaches of the programmes based on their project rationale as indicated in the project documents. Programmes/projects which had mean between “0 and 1.0” were classified as using low outcome logic model approach of planning, those between “1.1-2.0” as using

medium outcome logic model approach of planning and those between “2.1-3.0” as using high outcome logic model approach of planning.

CHAPTER FIVE

ACTIVITIES AND EFFORTS OF EXTENSION SERVICE PROVIDERS

5.0 Introduction

The previous chapter discussed the methodologies used to collect and analyse data of this study. This chapter which discusses findings on activities and efforts of extension service providers will be presented in two sections. The first section i.e. extension packages provided by AEAs to farmers, categorizes five projects as having used high, medium or low extent of the outcome logic model approach in their planning process and districts where a particular project was implemented were also categorised as such. It seeks to find out the level of knowledge of AEAs on the principles of the Outcome Logic Model, technologies they have trained farmers in and whether their knowledge is influenced by the planning approach of projects that are implemented in their operational areas. The second section i.e. extension services received by farmers, also seeks to analyse statements from farmers indicating the technologies they have been trained in, as well as the level of consultation of farmers on their agricultural needs and how these are influenced by the planning approach of programmes. The personal and socio-economic characteristics of the agricultural extension agents who provide services to the farmers are first described here.

5.1 Personal characteristics of Agricultural Extension Agents

It is important that the personal characteristics of the Agricultural Extension Officers who were involved in this research are determined to understand their effect on their activities. Personal characteristics are factors that are unique to an individual and so for this research the characteristics to be considered include age, gender, marital status, years worked as

Agricultural Extension Agent, number of years worked in operational area, number of years worked in the district and highest educational level obtained.

5.1.1 Age of staff

Table 5.1 shows the minimum and maximum ages of Agricultural Extension Agents were 25 years and 59 years respectively with a mean age of 45.94 years and a standard deviation of 9.704. The result shows that the median age was 47.50 years however the results showed three modal ages of 48, 56 and 58 years

Table 5:1 Descriptive statistics of AEA's

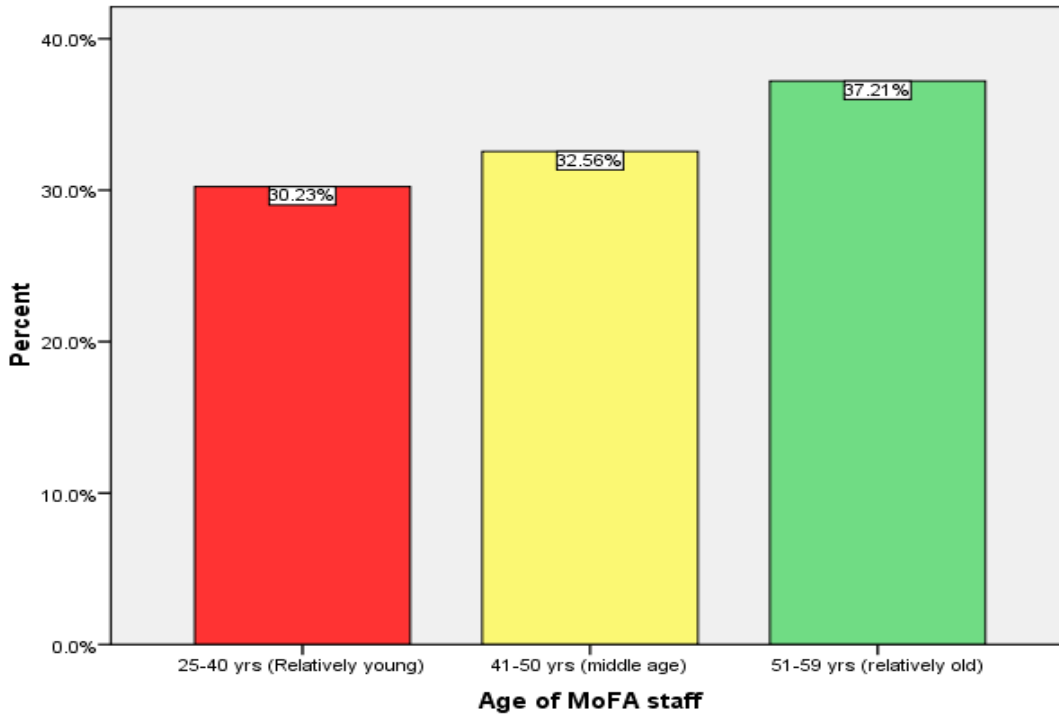
	Age of Staff	Years worked with extension	Years worked as AEA	Years worked in operational area
N	86	86	86	86
Mean	45.94	17.74	15.05	9.87
Median	47.50	17.50	13.50	7.00
Mode	48 ^a	3	3	4
Std. Deviation	9.704	10.879	9.700	8.066
Skewness	-.508	.125	.398	1.502
Std. Error of Skewness	.260	.260	.260	.260
Minimum	25	2	2	1
Maximum	59	38	37	37

a. Multiple modes exist. The smallest value is shown

Source: Field survey, 2013

Figure 5.1 shows that 30.23% of the staff were relatively young (25-40 years) while 32.56% of them are within the age group of 41-50 years. There were 37.21% of the staff who are above the age of 50.

Figure 5.1: Age groups of Staff (yrs)

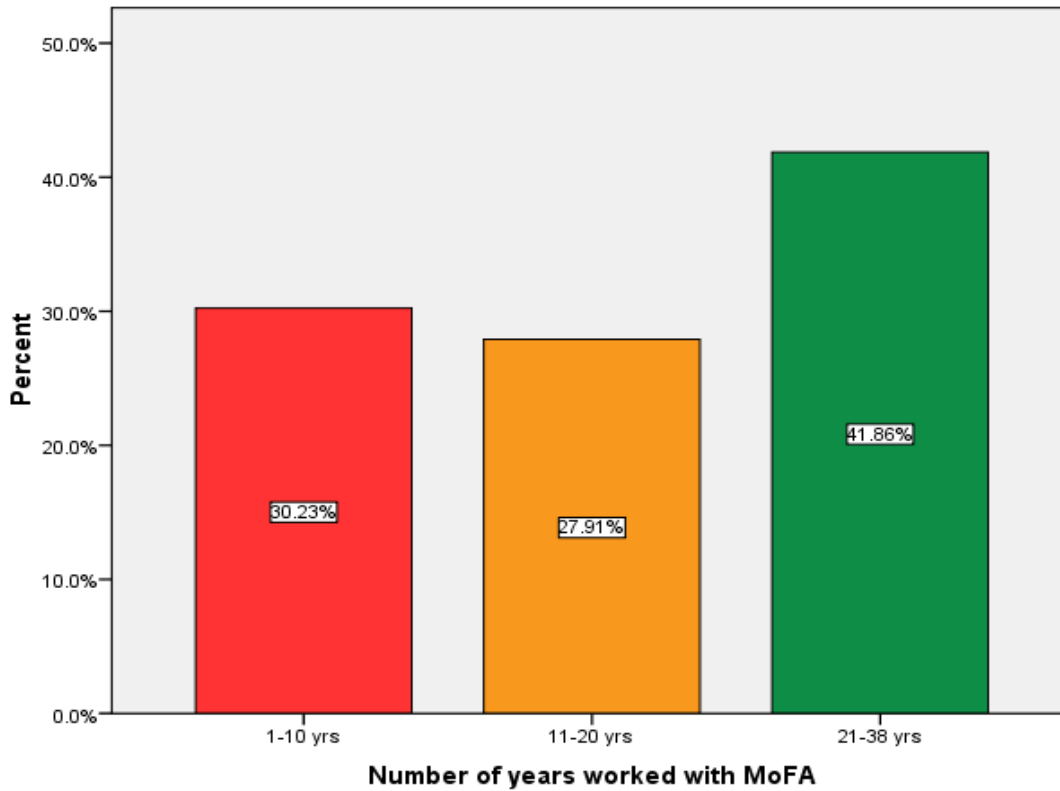


Source: Field Survey, 2013

5.1.2 Number of years worked with MoFA

Table 5.1 shows the minimum and maximum years Agricultural Extension Agents have worked with Ministry were 2years and 38 years respectively with a mean year of 17.74 and a standard deviation of 10.79. The result shows that the median years they have worked with MoFA was 17.50 years however the results showed that the most frequent years AEAs have worked is three years. Figure 5.2 shows that 30.25% of the staff have worked with MoFA for ≤ 10 years while 41.86% of the staff have worked for more than twenty years with MoFA respectively.

Figure 5.2: Years AEAs have work with MoFA

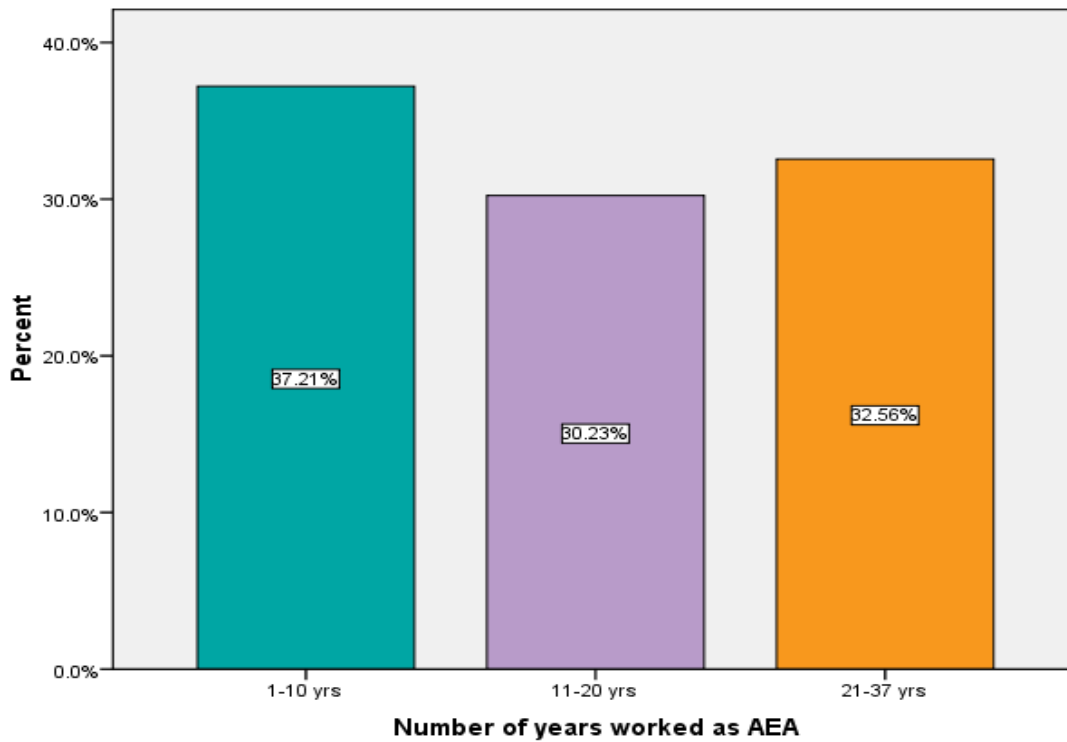


Source: Field survey, 2013

5.1.3 Number of years worked as Agricultural Extension Agents

Table 5.1 shows that the minimum and maximum years AEAs have worked as extension agents with Ministry were 2 years and 37 years respectively with a mean year of 15.05 years and a standard deviation of 9.70 years. The result shows that the median years they have worked as AEA was 13.50 years however the results showed that the most frequent years they have worked as AEAS is 3 years. Figure 5.3 shows the number of years they have worked with MoFA as AEAs. Whilst 37.2% of the staff have worked less or equal to ten years as AEAs, a greater percentage (62.89%) of them have worked more than eleven years as AEAs.

Figure 5.3: Years worked as AEA

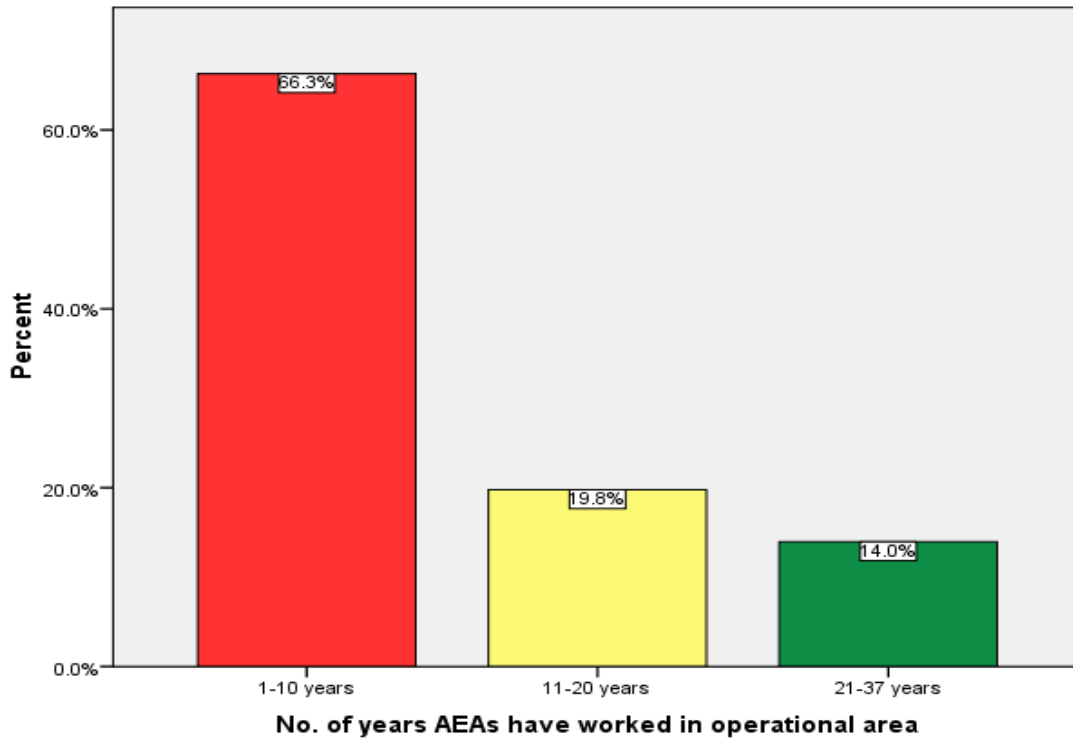


Source: Field Survey, 2013

5.1.4 Number of years worked in operational area

Table 5.1 shows that the minimum and maximum years AEA staff have worked as extension agents with Ministry were 1 year and 37 years respectively with a mean of 9.87 years and a standard deviation of 8.006 years. Figure 5.4 shows that 66.3% of staff have worked ≤ 10 years in their operational areas while 19.8% and 14.0% have worked 11-20 years and 21-37 years respectively in their operational areas.

Figure 5.4: Years worked in operational area



Source: Field survey, 2013

5.1.5 Gender of MoFA staff

Table 5.2 shows that out of the eighty-six (86) MoFA staff interviewed, seventy-six (88.4%) are males and the remaining ten (11.6%) are females. The more males found could be attributed to the nature of the work which involves a lot of trekking which women generally see to be stressful and difficult.

Table 5.2 Gender of staff

Gender of staff	Frequency	Percent
Male	76	88.4
Female	10	11.6
Total	86	100.0

Source: Field survey, 2013

5.1.6 Marital status of staff

Table 5.3 shows that 84.9% of the staff interviewed are married while thirteen (15.1%) of them are either single, divorced or widowed. The farmers believe that AEAs who are married are responsible people in the society and will therefore respect and adhere to advice given by them. This could lead to higher adoption of technologies by farmers.

Table 5.3 Marital status of staff

Marital status	Frequency	Percent
Single/Divorced/Widowed)	13	15.1
Married	73	84.9
Total	86	100.0

Source: Field survey, 2013

5.1.7 Highest educational level of MoFA staff

There are three levels of educational systems in Ghana from which the Ministry of Food and Agriculture recruits staff. These are (1) Certificate (2) Diploma and (3) Degree levels. The AEAs who are the technically qualified staff of the Ministry and have direct contact with farmers are recruited from people who have obtained Certificate in Agriculture which is a post secondary training as Technical Officers. Technical Officers who serve the Ministry for more than three years have the opportunity to pursue a two-year diploma programme and obtain National Diploma Certificate from the country's Universities and are absorbed back into the Sub-professional class of the Ministry. The Ministry also recruits directly people with National Diploma Certificates into the Sub-Professional class. The third category of staff recruited as Professionals into the Ministry are people who have completed their first degrees from the Universities, however staff with diploma degrees who serve in the Ministry for more than three years are also legible to pursue degree courses in the Universities and return as Professionals.

The results of the study shown in Table 5.4 indicates that 65.1% of the staff have Certificate in Agriculture as their highest level of education while 16.3% have National Diploma in Agriculture. There are also 18.6% of the staff who have degree (BSc. MSc./MPhil.) in Agriculture.

Table 5.4 Educational level of staff

Educational level	Frequency	Percent
Certificate in agriculture	56	65.1
Diploma in agriculture	14	16.3
Degree	16	18.6
Total	86	100.0

Source: Field survey, 2013

5.2 Categorization of projects implemented in the study areas in respect of the extent of use of the Outcome Logic Model approach of programme planning

Programmes/projects which had mean between “0 and 1.0” were classified as using low outcome logic model approach of planning, those between “1.1-2.0” as using medium outcome logic model approach of planning and those between “2.1-3.0” as using high outcome logic model approach of planning (Appendix 3). Based on this classification, the districts where the study was conducted were also grouped into High, Medium and Low extent of use of the outcome logic model approach of programme planning.

5.2.1 High Outcome Logic Model Approach of Planning

The Commercial Development of Farmer Based Organisation (CDFO) under MiDA had a mean of 2.4 which is between the range of 2.1-3.0 thus indicates high extent of use of the outcome logic model approach. The districts involved were Mampong Municipal, West

Mamprusi and Kpando Municipal within the Ashanti, Northern and Volta regions respectively.

5.2.2 Medium Outcome Logic Model Approach of Planning

The LACOSREP and SCIMP projects had means between the range of 1.1-2.0 which indicate that with regard to the extent of use of outcome logic model, they were classified as having medium extent of use of Outcome Logic Model. These projects took place in Talensi and Tano North districts within the Upper East and Brong Ahafo regions respectively.

5.2.3 Low Outcome Logic Model (LOLM) Approach of Planning

The National Agricultural Extension Project (NAEP) and the Root and Tuber Improvement Project (RTIP) had mean between 0.1-1.0 which indicated that with respect to the extent of use of the Outcome Logic Model, they were classified as having low extent of use of the Outcome Logic Model. The districts involved are Suhum, Shama and Twifo Ati Mokwaa in the Eastern, Western and Central regions respectively.

5.3 *Extension services provided by AEAs to farmers*

This is to find out from the AEAs whether their knowledge of the principle of the outcome logic model and district they are operating in has influence on the training they give to their farmers.

5.3.1 Knowledge of AEAs on the principles of Outcome Logic Model

The span of knowledge of the staff on the principles of the Outcome Logic Model was calculated using a total of five statements listed in Table 5.5 The A.E.As were asked to indicate by ticking how they agree with these statements on a Likert scale of five ranging

from 1 (strongly disagree) through to 5 (strongly agree). Using SPSS, their responses were computed and the total score was divided by the number of items in order to bring it back in the original scale used for each of the items (Pallant, 2005).

Table 5.5 Knowledge of staff in the principles of OLM

Needs of farmers should be identified before programmes were introduced to them	Farmers should be made aware of the current situation they were in and which Extension intend to impact	Farmers should know of what it will look like when they achieve the desired situation or outcome.
Farmers should know of the behaviors they needed to change for that outcome to be achieved.	Farmers should know of the resources required to achieve the desired outcome.	

Source: Field survey, 2013

Table 5.6 shows that eleven (12.8%) of the staff have high knowledge of the principle of outcome logic model while seventy-five (87.2%) of the staff have low knowledge of the principle of outcome logic model.

Table 5.6 Knowledge of AEA's in principles of the Outcome Logic Model

	Frequency	Percent
Low (1-3.99)	75	87.2
High (4-5)	11	12.8
Total	86	100.0

Source: Field survey, 2013

5.3.2 Distribution of staff in relation to the extent of use of the Outcome Logic Model in study area

The frequencies of staff operating in districts where projects delivered to them use different levels of the OLM were calculated. Table 5.7 shows that twenty-four (27.9%) of staff are found in districts where projects delivered uses high level of the outcome logic model approach of planning while twenty-five (29.1%) of them are in the medium outcome approach

of planning areas. There were however thirty-seven (43.0%) of the staff who were operating in areas where projects delivered use low outcome logic model approach of planning.

Table 5.7 Distribution of staff in relation to level of OLM approach in operational areas

Extent of use of OLM	Frequency	Percent
High	24	27.9
Medium	25	29.1
Low	37	43.0
Total	86	100.0

Source: Field survey, 2013

5.3.3 Technologies AEAs have trained farmers

The span of knowledge of the staff was calculated using a total of one hundred and three (103) technologies considered under crops, livestock, poultry, fisheries, WIAD activities, non-traditional farming practices and farm management. The AEAs were asked to indicate by ticking either “yes” or “no” to the technologies listed below in Table 5.8 which they have trained farmers in. Technologies in which they trained farmers were given a code of “1” while those they have not trained the farmers were coded as “2”.

Table 5.8 Technologies AEAs have trained farmers

Crops		
Ploughing	Earth bunding	Harrowing
Timely application of weedicides with regards to physiological stage of crop	Use of improved drying methods to achieve grain moisture level acceptable for the crop.	Timely harvesting of the crop with regards to physiological growth stage of the crop (use of maturity index)
Hoing across the slope	Gleaning after harvesting	Timely harvesting of crop with regards to temperature of day.
Minimum tillage	Sorting of farm produce into grades	Land rotation
Mulching	Packaging in cartons/sacks/ crates of harvested crop	Crop rotation
Construction of fire belt	Storing under shed/pre-cooling units /cold van	Mounding
Use of improved varieties	Timely carting of harvested crops from fields	Germination test for all seeds before planting
Good nursery practices	Use of improved threshing	Avoiding/smoking/ drinking

	methods	when spraying
Row planting/spacing	Cover cropping	Yam multiplication methods
No. of plants/hill	Use of chemicals to store maize	Plantain sucker multiplication methods
Timely weed control	Construction of patios for drying	Use of disease free planting materials
Use of appropriate type of fertilizer/manure	Use of appropriate storage structure(narrow ventilated cribs/mud silos/warehouse)	Irrigating field
Use of adequate quantity of fertilizer/manure applied at a time	Disposal of used chemical containers by deep burying	Agroforestry practices
Timely application of fertilizer (moisture availability)	Disposal chemical containers by burning	Adequacy of quantity of plant protection products applied at a time
Timely application of fertilize with regards to physiological growth stage	Farms should be sited at least 50 meters from water bodies	Timely application of pesticides to plant product before harvesting or marketing of the crop.
Appropriate type of pest management or protection product applied to the type of crop	Use of protective wears (Nose mask, Wellington boots, gloves, Overall)	Spraying at appropriate period- Morning or evening with regards to temperature and wind direction
Bullock ploughing		Hand washing with soap after spraying
Livestock		
Identify symptoms of schedule and zoonotic disease	Proper housing of animals	Deworming (drenching, tablets, injection etc.)
Traits to look out for during the selection of breeding stock.	Proper ventilation	Proper watering of animals
Animals to be slaughtered in the abattoir	Fodder banks	Culling of old/spent animals
Good sanitation in pens of farm animals	Avoid overcrowding	Dry season feeding of farm animals
Routine vaccination of farm animals		Use of improved breeds of animals
Poultry		
Identify symptoms of schedule diseases	Deworming -	Proper feeding of birds
Practice routine vaccination and medication	Brooding	Avoid overcrowding
Debeaking	Proper housing of birds	Ensure proper ventilation
Culling		I -2 Vaccination
Fisheries-Aquaculture/Marine/freshwater		
Site selection	Feeding	Pollution of the water resource
Pond construction	Disease and pest control	Avoiding over exploitation
Soil type	Over stocking	Using appropriate mesh size for fishing
Stocking	Harvesting	Formation of Community Based

		Fisheries Mgt. Committee
WIAD Activities	Non Traditional farming	Farm Management
Construction of Smokeless stove	Snail farming	Formation of farmer groups
Construction of Soak-away pits	Bee keeping	Planning of farm activities
Preparation of Soya milk	Mushroom Production	Keep records of all farm activities
Preparation of Soya kebab	Grasscutter Production	Save with Bank
Preservation of roots and tubers using sawdust		Group marketing of farm produce
Incorporation of Moringa powder in household diets		
Preservation of tomatoes and garden eggs		

Source: Field survey, 2013

Using SPSS, a count was made of all the technologies AEAs indicated they have trained the farmers. Table 5.9 shows that majority of the staff (70.9%) provided high span of training to farmers while twenty-three (26.7%) of the staff have medium span of training in all the technologies to farmers.

Table 5.9 Technologies AEAs have trained farmers

Technologies AEAs have trained farmers	Frequency	Percent
Low span(≤ 34 technologies)	2	2.3
Medium span (35-69 technologies)	23	26.7
High span (70-103 technologies)	61	70.9
Total	86	100.0

Source: Field survey, 2013

5.3.4 Resources received by AEAs to perform extension duties

The Agricultural Extension agents were asked to indicate on a Likert scale of five ranging from 1 (strongly agree) through to 5 (strongly disagree) how they agree with nineteen activities listed in Table 5.10. SPSS was used to compute the total scores from their responses. The total score was divided by the number of items in order to bring it back in the original scale used for each of the items (Pallant, 2005). Recoding was done and AEAs who

were found to have score between 1 and 3.99 were classified as having low resources while those with score between 4 and 5 were classified to have high resources.

Table 5.10 Resources available to AEA's

I have been trained in how to organize farm Visit.	I have been trained in how to use Radio to train farmers.	I have Flip Charts that I use to train farmers.
I have been trained in how to organize home Visit.	I have been trained in preparation and use of Posters.	I have access to Real Objects which I show to farmers during training.
I always had all materials needed to conduct method demonstration with my farmers.	I have been trained in the preparation and use of Fact sheets.	I have always had a means of transport to carry out my duties.
I always had all materials needed to conduct result demonstration to train my farmers.	I have been trained in the preparation and use of Booklets.	I have regular funds to undertake my field work.
I was always assisted to send my farmers on Field tours/trips to observe new technologies.	I have access to Blackboard during training of farmers.	I always have the necessary inputs needed to carry out demonstration with farmers.
I have been trained in skills of conducting Farmer meetings.	I have Photographs to show farmers during training.	Inputs for farmers are always delivered on time to enable them practice whatever they have learnt.
I have been trained in the skill of organising farmers to do Role Play.		

Source: Field survey, 2013

A look at Table 5.11 shows that eighty-four (97.7%) of the staff received low level of the needed resources to perform their extension duties while only two (2.3%) of the staff who also indicated they have received high level of resources to perform their extension duties.

Table 5.11 Resources received by AEA's to perform extension duties

Resources AEA's received to perform extension duties	Frequency	Percent
Low(1-3.99)	84	97.7
High (4 -5)	2	2.3
Total	86	100.0

Source: Field survey, 2013

5.4 Relationship between knowledge of AEsAs on the principles of OLM and planning level they operate at

A Kruskal-Wallis Test (sometimes referred to as the Kruskal-Wallis H Test) is the non-parametric alternative to a one-way between-groups analysis of variance. It allows the comparison of scores on some continuous variable for three or more groups. Scores are converted to ranks and the mean rank for each group is compared. This test was relevant because the dependent variable which is AEsAs knowledge of principle of OLM is measured on the ordinal level (e.g., a 5-point scale from "strongly disagree" through to "strongly agree"), while the independent variable (farmers operating in the different planning levels consist of three categorical, independent groups. This test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on AEsAs knowledge of the principles of the Outcome Logic Model. Table 5.12 shows that there was no statistically significant difference $\chi^2(2, N = 402) = 1.549, p > .05$ between AEsAs operating in different planning levels and their knowledge of the principles of the OLM. The result suggests that AEsAs knowledge of the principles of the OLM is not dependent on the planning approach used in his or her operational area.

Table 5.12 Kruskal-Wallis H test of knowledge of AEsAs in the principles of OLM and planning levels they operate at

	Levels of planning	N	Mean Rank	Test statistics
AEsAs knowledge of principle of outcome logic model	High	24	47.75	$\chi^2 = 1.549,$ df=2, p=0.461
	Medium	25	43.02	
	Low	37	41.07	
	Total	86		

Source: Field survey, 2013

5.5 *Relationship between planning levels AEA's operate from and resources available to them for extension duties*

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning levels (Low, Medium and High OLM) AEA's operate from and resources available to them for extension duties. Table 5.13 shows that the test was not statistically significant $\chi^2(2, N = 86) = 1.530, p > .05$. The result shows that availability of the needed resources for AEA's to perform their duties is independent of the planning level they find themselves.

Table 5.13 Planning levels and resources available to AEA's

	Levels of OLM	N	Mean Rank	Test statistics
Resources available to AEA's for extension duties	High	24	44.29	$\chi^2=1.530$ df=2 p=.465
	Medium	25	44.22	
	Low	37	42.50	
	Total	86		

Source: Field Survey, 2013

5.6 *Extension services received by farmers*

This is to find out from the farmers the training they have received from the extension officers in marketing opportunities for farm produce, opportunities to utilize farm produce and extension packages.

5.6.1 **Training received by farmers on marketing opportunities for farm produce**

The farmers were asked to indicate on a Likert scale of five ranging from 1 (strongly agree) through to 5 (strongly disagree) the extent they have received training in ten (10) marketing activities (Table 5.14). Using SPSS, their responses were computed and the total score was divided by the number of items in order to bring it back in the original scale used for each of the items (Pallant, 2005). Recoding was done and farmers who were found to have score

between 1 and 3.99 were classified to have low training while those with score between 4 and 5 were classified as having received high training in marketing of farm produce.

Table 5.14 Marketing activities farmers received training in

Extension trained us how to gather information on product planning	Extension trained us on how to look for information on sales timing	Extension trained us on how to advocate for good roads to market centres
Extension trained us how to seek information on current prices.	Extension trained us how to seek for information on improved marketing practices	Extension trained us how to link to the buyers through the value chain concept
Extension trained us how to use information on forecast of market trends	Extension trained us how to do group marketing.	Extension trained us how to seek for improvement of market infrastructure
Extension trained us how to access processing equipment		

Source: Field survey, 2013

Table 5.15 shows that almost two-thirds (65.2%) of the farmers indicated they have received low level of training on marketing while one hundred and forty (34.8%) of them responded they have received high level of training on issues relating to marketing of their farm produce from the extension agents.

Table 5.15 Training received in marketing opportunity

	Frequency	Percent
Low (1-3.99 total score)	262	65.2
High (4-5 total score)	140	34.8
Total	402	100.0

Source: Field survey, 2013

5.6.2 Training received by farmers on opportunities to utilize farm produce

The farmers were asked to indicate on a Likert scale of five ranging from 1 (strongly agree) through to 5 (strongly disagree) the extent they have received training in eight (8) activities on utilization (Table 5.16). Using SPSS, their responses were computed and the total score was divided by the number of items in order to bring it back in the original scale used for each of the items (Pallant, 2005). Recoding was done and farmers who were found to have score

between 1 and 3.99 were classified as having received low training while those with score between 4 and 5 were classified to have high training in utilization of farm produce.

Table 5.16 Utilization activities farmers received training

Extension trained me on how to ensure quality and safe use of my farm produce	Extension has trained me on how to prepare and eat good food	Extension has trained me on how to combine various farm produce to improve household dietary intake
Through Extension I can use different methods to preserve my farm produce	Extension has trained me how to use farm produce for different dishes	Extension has trained me on how to produce different food products from my farm produce to feed my children
Extension has trained me on processing and handling of farm produce	Extension has trained me on how to process farm produce for medicinal purposes	

Source: Field survey, 2013

Table 5.17 shows that more than half (54.2%) of the farmers indicated that they received low level of training on food utilization from Extension officers while the remaining one hundred and forty (45.8%) of the farmers indicated they have received high level of training on how to utilize their farm produce.

Table 5.17 Training received in utilization opportunity

	Frequency	Percent
Low (1-3.99 total score)	218	54.2
High (4-5 total score)	184	45.8
Total	402	100.0

Source: Field survey, 2013

5.6.3 Training received by farmers in extension packages

Four Directorates of MoFA namely Crops Services, Animal Production, Fisheries and Women in Agriculture provide training to AEAs on various technologies to equip them to also train farmers. A total of one hundred and three extension packages were considered under crops, livestock, poultry, fisheries, WIAD activities, non-traditional farming practices and farm management. Farmers were asked to indicate “yes” or “no” to the technologies listed in

Table 5.18. Using SPSS, a count of the all the technologies farmers indicated they received training was done.

Table 5.18 Extension packages farmers received training

Crops		
Ploughing	Earth bunding	Harrowing
Timely application of weedicides with regards to physiological stage of crop	Use of improved drying methods to achieve grain moisture level acceptable for the crop.	Timely harvesting of the crop with regards to physiological growth stage of the crop(use of maturity index)
Hoeing across the slope	Gleaning after harvesting	Timely harvesting of crop with regards to temperature of day.
Minimum tillage	Sorting of farm produce into grades	Land rotation
Mulching	Packaging in cartons/sacks/ crates of harvested crop	Crop rotation
Construction of fire belt	Storing under shed/pre-cooling units /cold van	Mounding
Use of improved varieties	Timely carting of harvested crops from fields	Germination test for all seeds before planting
Good nursery practices	Use of improved threshing methods	Avoid eating/smoking/drinking when spraying
Row planting/spacing	Cover cropping	Yam multiplication methods
No. of plants/hill	Use of chemicals to store maize	Plantain sucker multiplication methods
Timely weed control	Construction of patios for drying	Use of disease free planting materials
Use of appropriate type of fertilizer/manure	Use of appropriate storage structure(narrow ventilated cribs/mud silos/warehouse)	Irrigating field
Use of adequate quantity of fertilizer/manure applied at a time	Disposal of used chemical containers by deep burying	Agroforestry practices
Timely application of fertilizer (moisture availability)	Disposal chemical containers by burning	Adequacy of quantity of plant protection products applied at a time
Timely application of fertilize with regards to physiological growth stage	Farms should be sited at least 50 meters from water bodies	Timely application of pesticides to plant product before harvesting or marketing of the crop.
Appropriate type of pest management or protection product applied to the type of crop	Use of protective wears (Nose mask, Wellington boots, gloves, Overall)	Spraying at appropriate period- Morning or evening with regards to temperature and wind direction
		Hand washing with soap after spraying
Livestock		
Identify symptoms of schedule and zoonotic disease	Proper housing of animals	Deworming (drenching, tablets, injection etc.)

Traits to look out for during the selection of breeding stock.	Proper ventilation	Proper watering of animals
Animals to be slaughtered in the abattoir	Fodder banks	Culling of old/spent animals
Good sanitation in pens of farm animals	Avoid overcrowding	Dry season feeding of farm animals
Routine vaccination of farm animals		Use of improved breeds of animals
Poultry		
Identify symptoms of schedule diseases	Deworming -	Proper feeding of birds
Practice routine vaccination and medication	Force moulting	Avoid overcrowding
Debeaking	Brooding	Ensure proper ventilation
Culling	Proper housing of birds	I -2 Vaccination
Fisheries-Aquaculture/Marine/freshwater		
Site selection	Feeding	Pollution of the water resource
Pond construction	Disease and pest control	Avoiding over exploitation
Soil type	Over stocking	Using appropriate mesh size for fishing
Stocking	Harvesting	Formation of Community Based Fisheries Mgt. Committee
WIAD Activities	Non Traditional farming	Farm Management
Construction of Smokeless stove	Snail farming	Formation of farmer groups
Construction of Soak-away pits	Bee keeping	Planning of farm activities
Preparation of Soya milk	Mushroom Production	Keep records of all farm activities
Preparation of Soya kebab	Grasscutter Production	Save with Bank
Preservation of roots and tubers using sawdust		Group marketing of farm produce
Incorporation of Moringa powder in household diets		
Preservation of tomatoes and garden eggs		

Source: MoFA, 2013

Farmers who received training in 0-34, 35-69 and 70-103 of all the extension packages are classified as having low, medium and high knowledge respectively. Table 5.19 shows that seventeen (4.2%) of the farmers were found to have received low training in extension packages while one hundred and eighty-three (45.5%) were found in the medium category.

There was however two hundred and two (50.2%) of the farmers who indicated they received high training from the extension officers.

.Table 5.19 Training received by farmers in extension packages

	Frequency	Percent
Low training received (0-34 packages)	17	4.2
Medium training received (35-69 packages)	183	45.5
High training received (70-103 technologies)	202	50.2
Total	402	

Source: Field survey, 2013

5.6.4 Relationship between training given by AEAs and training received by farmers

Pearson coefficient of correlation was computed to find if there was correlation between training given by AEAs and training received by farmers. It was found that there was largely positive relationship $r = 0.95$ between training given by AEAs and training received by farmers (Appendix 4).

5.7 Level of consultation of farmers on their extension needs

Nine sectors of agriculture namely crops, livestock, fisheries, utilization, marketing, farm management, credit and input requirements were considered as areas farmers needed to be consulted in order to identify their needs. Farmers who were consulted on their needs in four or less of the sectors were categorised as having low overall needs consultation while those who were consulted in five or more of the areas were also classified as having high overall need consultation. Table 5.20 shows that seventy (17.4%) of the farmers are found in the low group while three hundred and thirty-two (82.6%) of them are found in high group.

Table 5.20 Overall level of consultation of farmers on agricultural needs

Consultation of farmers on their needs	Frequency	Percent
Low (≤ 4 need areas)	70	17.4
High (5-9 need areas)	332	82.6
Total	402	100.0

Source: Field survey, 2013

5.8 Relationship between planning levels farmers' operate and training they received in marketing of farm produce

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) farmers' operate in and training received by farmers on marketing of their farm produce. Table 5.21 shows that the test was significant $\chi^2(2, N = 402) = 50.761, p < .05$. Follow-up tests using Mann-Whitney U Test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated a significant difference ($U=4423.50, z = -4.805, p=.001$) between farmers operating in the high group and those in the medium group. There was also significant difference ($U=7435.50, z = -6.702, p=.001$) between farmers operating in the high group and those in the low group. There was however no significant difference ($U=7458.00, z = -.943, p =.346$) between farmers in medium and low groups.

Table 5.21 Kruskal-Wallis H Test for comparison between planning levels farmers' operate and training they received in marketing of farm produce.

	Planning levels	N	Mean Rank	Test statistics
Training farmers' received in marketing opportunities	High	140	247.79	$\chi^2 = 50.761,$ df=2, p= .001
	Medium	93	183.37	
	Low	169	173.13	
	Total	402		

Source: Field survey, 2013

5.9 *Relationship between planning levels farmers' operate from and training they received in utilization of farm produce*

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on training received by farmers on utilization of their farm produce. Table 5.22 shows that the test was significant $\chi^2 (2, N = 402) = 36.842$, $p < .05$. Follow-up tests using Mann-Whitney U Test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated statistically significant difference ($U=4425.50$, $z= -4.790$, $p < .05$) between farmers operating in the high group and those in the medium group. This is because as part of the planning process, programmes which operate on the high principles of OLM make the necessary preparations towards the final disposal and consumption of items produced. There was also statistically significant difference ($U=8101.50$, $z= -5.508$, $p=.001$) between farmers operating in the high group and those in the low group. This is because farmers in the high group are provided with the necessary training on utilization compared with those found in the low planning level. There was however no significant difference ($U=7819.00$, $z= -.082$, $p =.935$) between farmers in medium and low groups.

Table 5.22 Kruskal-Wallis H Test for comparison between planning levels farmers' operate from and training they received in utilization of their farm produce.

	Planning levels	N	Mean Rank	Test statistics
Training farmers received in utilization of farm produce	High	140	243.02	$\chi^2 = 36.845$, df=2, p= .001
	Medium	93	178.66	
	Low	169	179.67	
	Total	402		

Source: Field survey, 2013

5.10 *Relationship between planning levels farmers' operate from and consultation on their agricultural needs*

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on level of consultation of farmers on their agricultural needs. Table 5.23 shows that the test was significant $\chi^2(2, N = 402) = 6.497, p = .039$. Follow-up tests using Mann-Whitney U Test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated there was statistically significant difference ($U=10522.0, z= -2.544, p<.05$) between farmers operating in the high and the low groups. This is because structures are put in place that enable farmers operating in the high OLM planning level to actively participate in process of identifying their needs before programmes are drawn for them. There was however no statistically significant difference ($U=6134.0, z= -1.252, p= .211$) between farmers operating in the high and the medium groups and also no statistically significant difference ($U=7443.5, z= -1.009, p =.313$) between farmers in medium and low groups.

Table 5.23 Kruskal-Wallis H Test for comparison between planning levels farmers' operate from and consultation on their agricultural needs

	Planning levels	N	Mean Rank	Test Statistics
Consultation of farmer on agricultural needs	High	140	213.53	$\chi^2=6.497$ df=2 p=.039
	Medium	93	201.92	
	Low	169	191.30	
	Total	402		

Source: Field survey, 2013

5.11 *Relationship between planning levels farmers' operate from and training received in extension packages*

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning (Low, Medium and High) on training farmers' received in extension packages. Table

5.24 shows that the test was statistically significant $\chi^2 (2, N = 402) = 7.338, p < .05$. Follow-up tests using Mann-Whitney U Test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated no statistically significant difference ($U=6203.0, z= -.924, p= .358$) between farmers operating in the high group and those in the medium group. There was statistically significant difference ($U=10329.0, z= -2.648, p<.05$) between farmers operating in the high group and those in the low group. There was however no statistically significant difference ($U=7232.00, z= -1.413, p =.158$) between farmers in medium and lower groups. The result shows that because farmers who operate in the high OLM planning level participate actively in identification of their agricultural needs, it will lead to training of farmers on appropriate extension packages that will address the identified needs.

Table 5.24 Kruskal-Wallis H Test for comparison between planning levels and training received in extension packages by farmers

	Planning levels	N	Mean Rank	Test statistics
Extension packages farmers are trained	High	140	214.41	$\chi^2=7.338$ df=2 p=.026
	Medium	93	204.94	
	Low	169	188.91	
	Total	402		

Source: Field survey, 2013

5.12 Summary

The age of staff involved in the study ranged between 25-59 years with an average age of 45.9. Majority (88.4%) are males who are married (84.9%) and have worked with MoFA for a minimum of 2 years and a maximum of 38 years giving an average of 17.74 years. Most of the staff interviewed have Certificate in Agriculture as their highest educational level (65.1%) and have worked for a minimum of 2 years and a maximum of 37 years with an average 15.02 years as Agricultural Extension Agents. They were on the average found to have worked 9.87 years with a minimum of 1 and maximum of 37 years in their operational areas.

Most of the staff (87.2%) had high knowledge of the principles of operation used by MoFA to carve out programmes for farmers and it was found that 27.9%, 29.1% and 43.0% of the AEAs were working in operational areas where programmes delivered to farmers used high, medium and low level of the outcome logic model approach respectively. Majority of the staff (70.9%) were found to have high knowledge in agricultural extension packages delivered to farmers. Majority (97.2%) of the staff indicated they have received low level of resources to perform their extension duties.

It was also found that most of the farmers (65.2%) have received low training in marketing of their farm produce while 54.2% indicated they have received low training in how to utilize their farm produce from the AEAs. However with regard to training in extension packages about half (50.2%) of the farmers indicated they have received high training while 45.5% and 4.2% indicated they received medium and low training respectively.

There was statistically significant relationship between different levels of the OLM farmers' operate from and training received in marketing ($\chi^2 = 50.761$, $df=2$, $p= .001$), utilization ($\chi^2 = 36.845$, $df=2$, $p= .001$) of farm produce as well as training received ($\chi^2 = 7.338$, $df=2$, $p < .05$) in extension packages. There was statistically significant difference ($\chi^2 = 6.497$, $df=2$, $p < .039$) between farmers found in different planning levels and level of consultation in their agricultural extension needs. There was no statistically significant difference $\chi^2 (2, N = 402) = .895$, $p > .05$ between AEAs operating in different planning levels and their knowledge of the principles of the OLM. There was no statistically significant difference $\chi^2 (2, N = 402) = 1.549$, $p > .05$ between AEAs operating in different planning levels and their knowledge of the principles of the OLM.

In conclusion, even though the result suggests that AEAs knowledge of the principles of the OLM is not dependent on the planning approach used in his or her operational area, it was evident that farmers who worked with AEAs operating in areas where planning of programmes used high level of OLM received high training in extension packages, marketing and utilization of farm produce. This indicates that programme planning approach used play important role in improving the performance of both AEAs and farmers.

CHAPTER SIX

IMPACT OF EXTENSION SERVICES PROVIDED TO FARMERS

6.0 Introduction

This chapter gives general information about the types of resources available and how these resources affect farmers' performance (knowledge, attitude, skill), their perception towards agricultural extension delivery, extension packages practiced and extension methods used to deliver services to farmers. The personal and socio-economic characteristics of the farmers in the study are described. It also describes the relationship between overall access to assets and livelihood outcomes achieved by farmers. The relationship between extension methods used and overall livelihood outcome achieved is determined. Furthermore the relationships between levels of the outcome approach of planning and extension packages received and practised by farmers are described. The relationship between levels of the outcome approach of planning programmes and knowledge, attitude, skill, perception towards agriculture extension delivery, extension packages practised as well as their effect on livelihood assets achieved by farmers are described.

6.1 Type of farmers

This section presents findings on farmers involved in the survey by looking at their personal and socio-economic characteristics which include gender distribution, age, educational background, marital status, total farmland available for farming, total farmland owned, total farmland hired, number of years farmers have received training from MoFA, farming experience of farmers, household labour available to farmers, frequency of contact by extension agents, mode of storage of farm produce and implements used by farmers. Table 6.1

below presents a description of certain characteristics of the farmers interviewed in the study area.

6.1.1 Age of farmers

With regard to age of the farmers, the results from the interview shown in Table 6.1 indicate that the range of ages is from 19 to 81 years, with a mean of 48.3 and standard deviation of 11.268. The median age is 48 years while the modal age is 42 years.

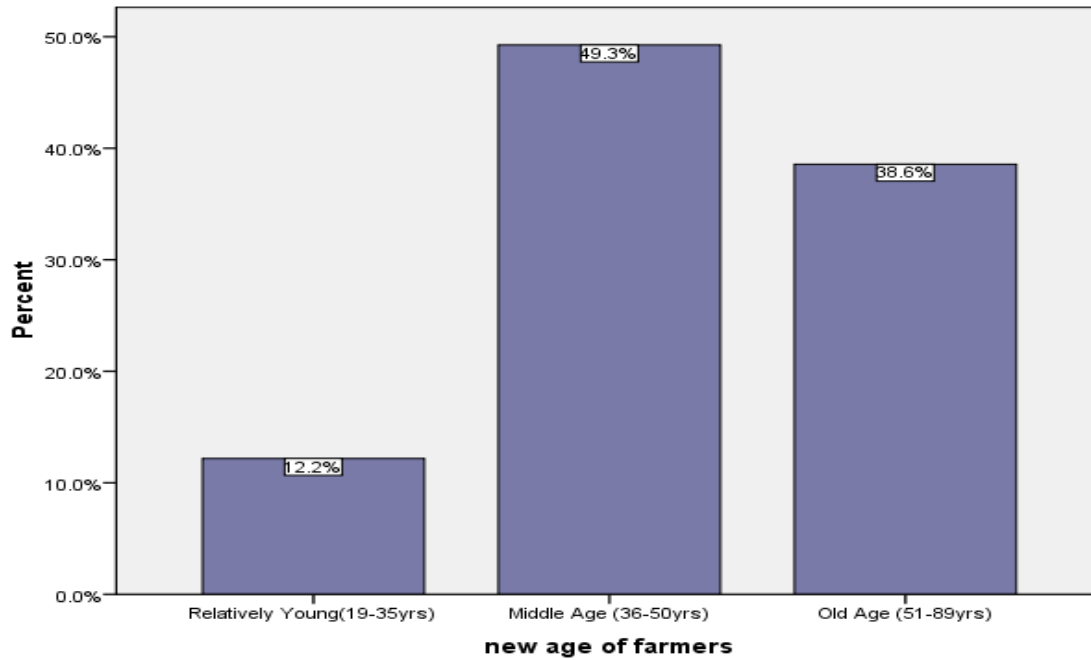
Table 6.1 Descriptive statistics of certain characteristics of farmers interviewed

Variables	N	Min	Max	Mean	Std. Dev	Mode
Age of farmers	402	19	81	48.30	11.262	42
Years of farming	402	1	60	22.60	11.058	20
Household labour available to farmer	402	0	22	4.02	3.598	3
Total farm land avail for farming(ha)	402	0.4	100	6.32	9.01	2
Size of total farmland owned by farmer(ha)	402	0	100	4.35	7.84	0.00
Size of total land hired by farmer	402	0	48	1.96	3.987	0.00
No. of yrs received training from MoFA	402	0	48	8.87	6.976	5

Source: Field survey, 2013

Figure 6.1 shows the age distribution of farmers involved in the study. The result shows that only 12.2% of the respondents are within the 19-35 year age while 38.6% of the farmers were above 50 years. There were however 49.3% of the farmers who were within 36-50 year group.

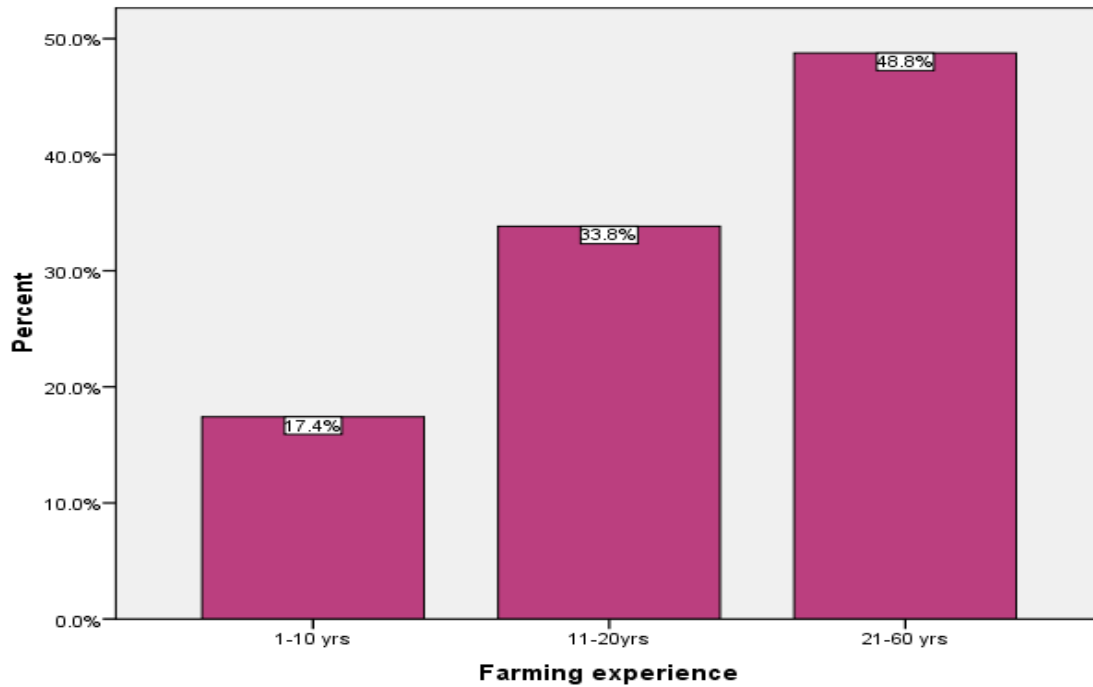
Figure 6.1 Age of farmers (yrs)



Source: Field Survey, 2013

6.1.2 Farming experience

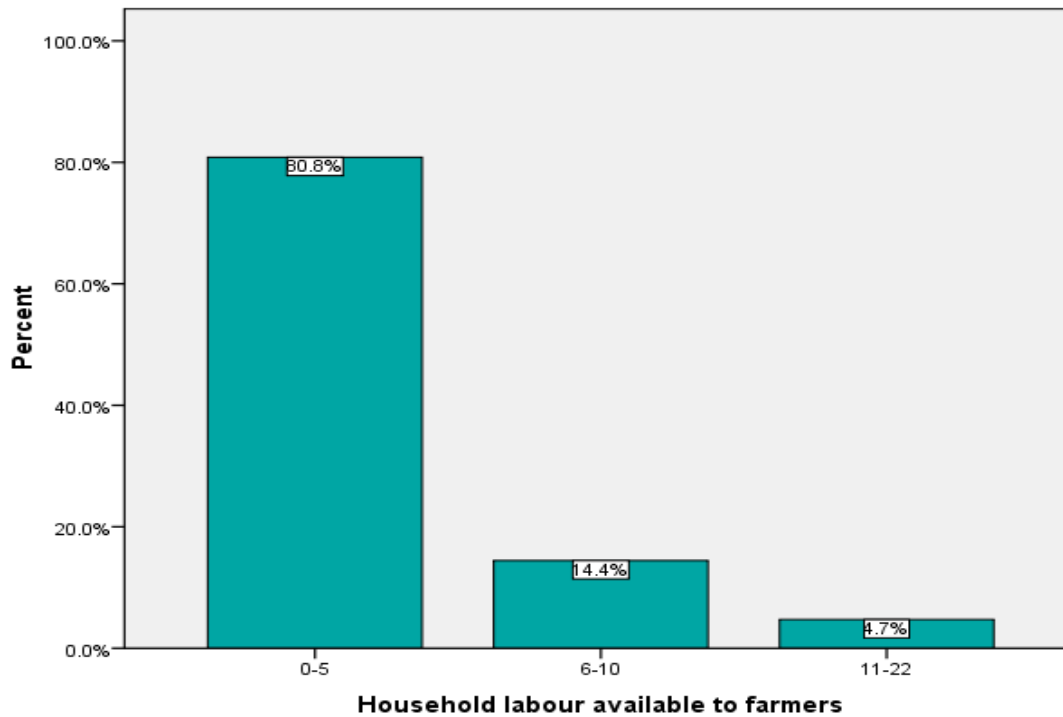
Table 6.1 shows that farming experience acquired by farmers range from 1 to 60 years with a mean of 22.6 and standard deviation of 11.05. Figure 6.2 shows that about 49.0% of the farmers have been in the farming business for over 20 years. This result suggests that farmers have long years of interaction with extension agents which could lead to improvement in their level of knowledge.

Figure 6.2 Farming experience (yrs)

Source: Field Study, 2013

6.1.3 Household labour available to farmers

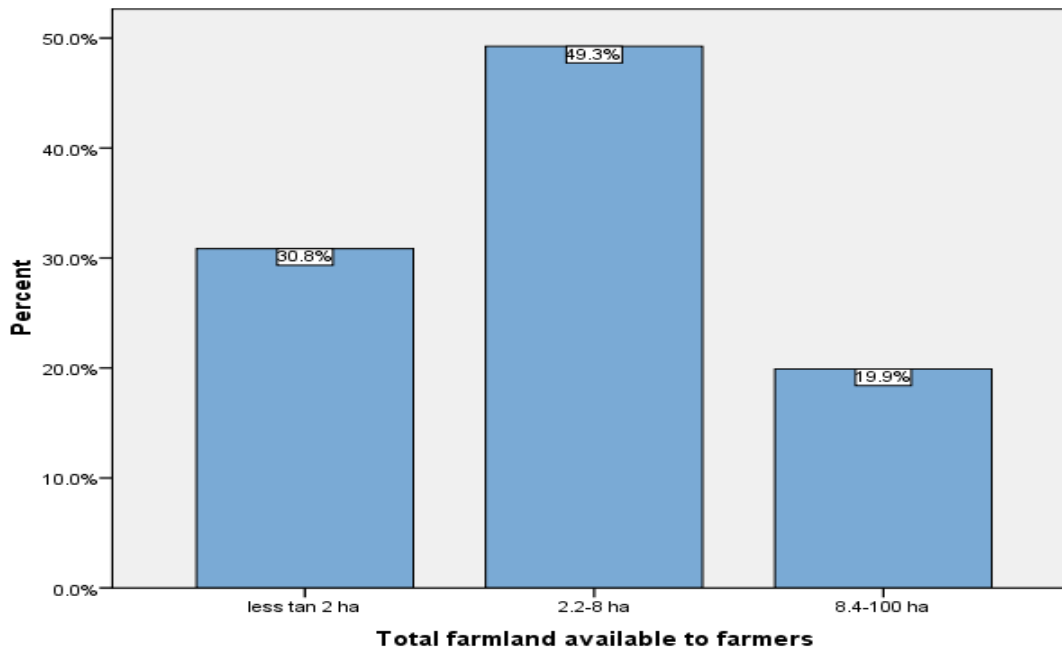
Table 6.1 shows that range of household labour available to farmers range from 0 to 22 people, with a mean of 4.02 and standard deviation of 3.598. Figure 6.3 shows that majority (80.8%) of the farmers have access to about five household labour for their farming activities. The result suggests that farmers still have access to enough household labour which will reduce the high labour cost if he/she goes to hire external labour. This will ultimately reduce the production cost of farmers.

Figure 6.3 Household labour available to farmers

Source: Field Survey, 2013

6.1.4 Total farm land available for farming

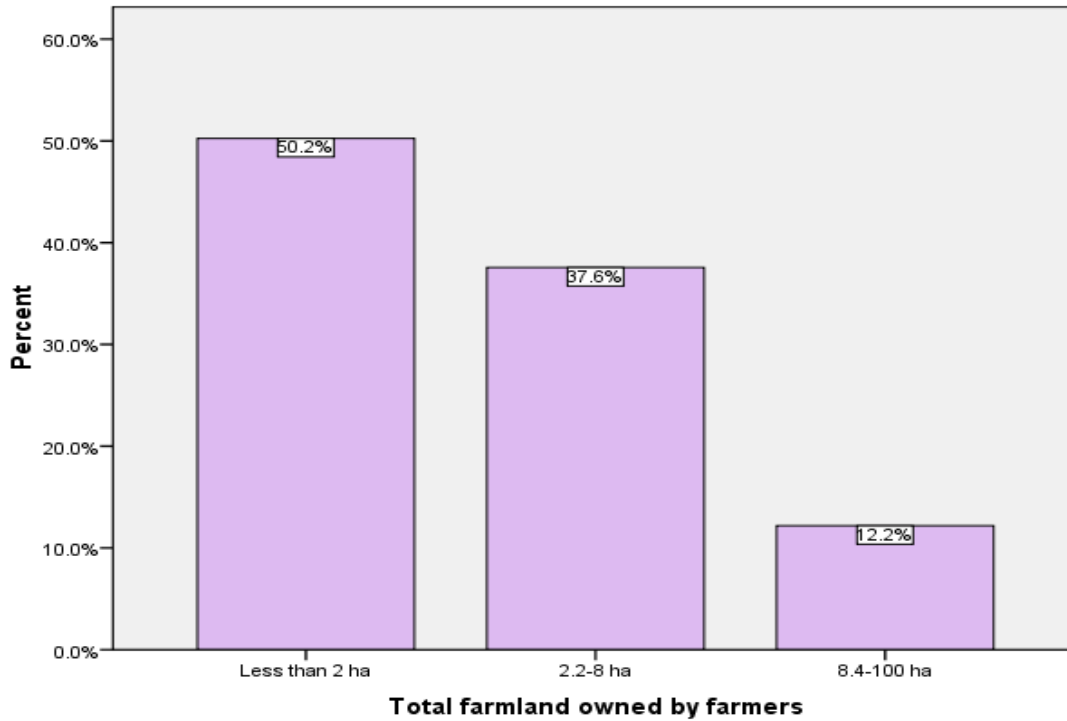
Table 6.1 shows that the total farmlands available to farmers range from a minimum of 0.4 ha to a maximum of 100 ha with an average of 6.32 ha. Majority of the farmers have 2.0 ha of land for their farming activities. Figure 6.4 shows that 49.3% of farmers have between 2.2-8 hectares of land for their farming activities while 30.8% of the farmers have less than 2 hectares. There was however 19.1% of the farmers who have access to more than 8.0 hectares and this situation does not encourage large scale farming.

Figure 6.4: Total farmland available for farming (Ha)

Source: Field Survey, 2013

6.1.5 Total farm land owned by farmers

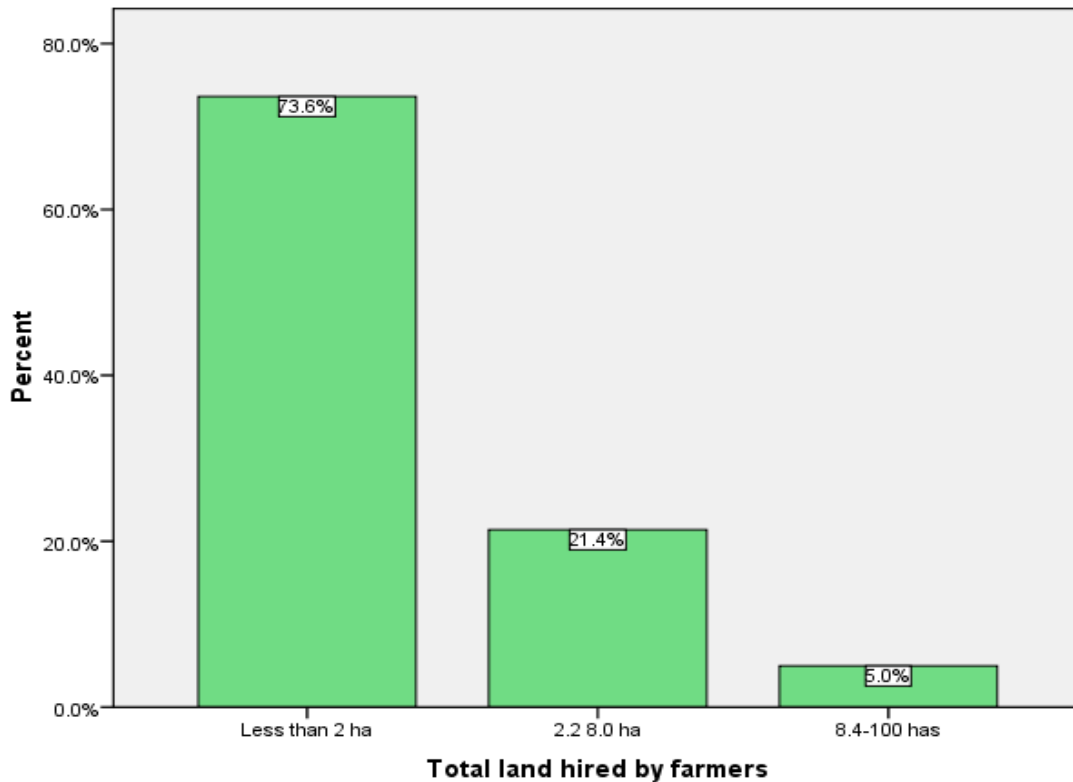
Table 6.1 shows that out of the total land owned by farmer for farming ranges from a minimum of 0 ha to a maximum of 100 ha. Averagely farmers in the study area owned 4.35 ha. Figure 6.5 shows a graphical presentation of ownership of land by farmers. Majority (87.8%) of farmers owned less than 10 ha of land. This situation gives rise to high tenant farmers who will not be willing to invest in long term agricultural projects which require commitment of resources since the they are not sure of the security on the land.

Figure 6.5 Size of farmlands owned by farmers (Ha)

Source: Field survey, 2013

6.1.6 Size of total land hired by farmers

With regard size of total land hired by farmers, the results from the interview shown in Table 6.1 indicates that the maximum size of land hired by farmers is 48 ha with an average of 1.96 ha and standard deviation 3.98. Figure 6.6 shows that hiring of land is positively skewed and it suggests that majority of the farmers can only hire small sizes of land for agricultural activities.

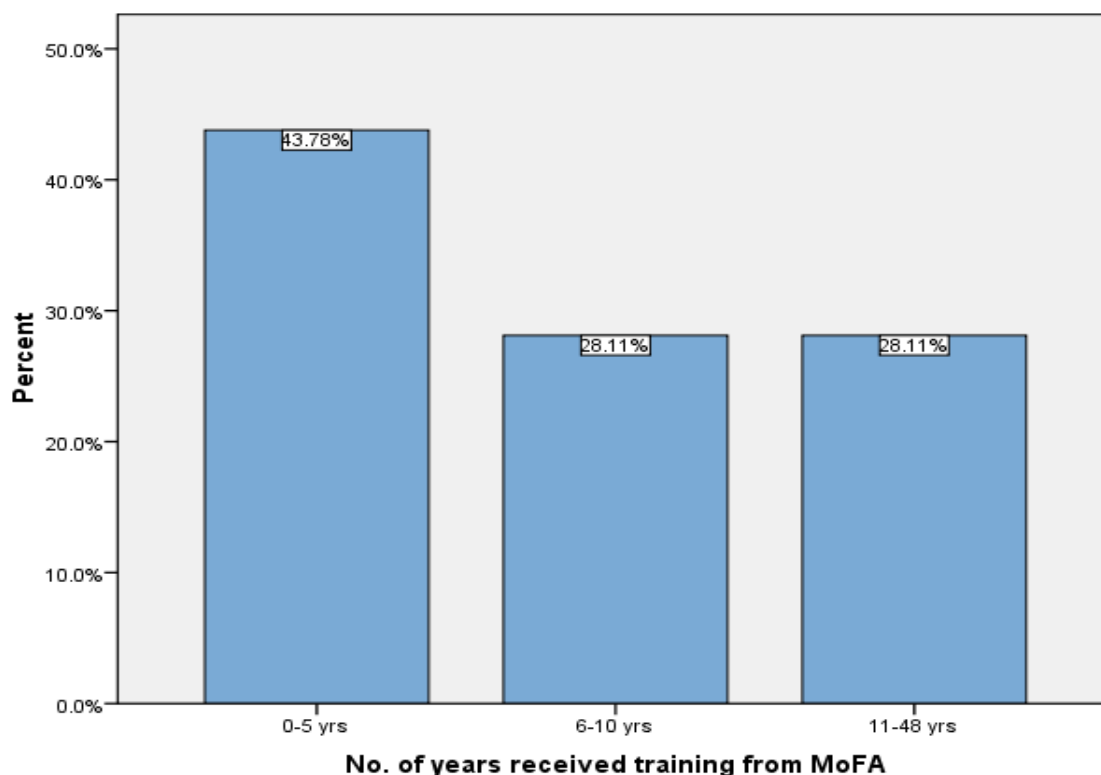
Figure 6.6 Size of farmland hired by farmers (Ha)

Source: Field Survey, 2013

6.1.7 Number of years farmers have received training from MoFA

Table 6.1 shows that farmers have received a minimum of 0 to a maximum of 48 years of training from the AEAs with a mean of 8.87 and modal years of training being 5. Figure 6.7 shows that number of years farmers' have received training from the extension officers is positively skewed and more than one-thirds (43.8%) of the farmers received five years or less of training from extension officers while one hundred and thirteen (28.1%) each of the farmers have received between six to ten years and eleven years and over training respectively from extension officers.

Figure 6.7 Number of years trained by MoFA



Source: Field Survey, 2013

6.1.8 Gender distribution of farmers

Three hundred and three (75.4%) of the farmers interviewed are males while ninety-nine (24.6%) are females as shown in Table 6.2. This result shows clearly the wide gap between male and female extension agents in the country. There is therefore the need to employ more females into the Ministry as extension agents in order to reduce the high male: female extension agent ratio.

Table 6.2 Gender distribution of AEAs

Gender of farmers	Frequency	Percent
Male	303	75.4
Female	99	24.6
Total	402	100.0

Source: Field survey, 2013

6.1.9 Educational background of farmers

The Ghanaian education system has a basic education which lasts 11 years. It is divided into Kindergarten, Primary school and Junior High School (JHS) which ends on the Basic Education Certificate Examination (BECE). Kindergarten lasts for 2 years and is for children between the ages 4-6 years. The Primary school lasts 6 years and is for children between the ages 6-11 years. Junior Secondary School lasts for 3 years and is also for children from age 12 to 15 years. Students who pass the BECE can proceed into secondary education, either general or vocational. The secondary general education is assumed by the Senior High School (SHS) and has a curriculum which lasts for 3 years. The SHS ends on a final exam called the West African Senior School Certificate Examination (WASSCE). Vocational and Technical Education (also called “TVET”) takes different forms. After obtaining the BECE, students can also pursue vocational Education. There is also the Tertiary education which is made up of the Universities, Polytechnics and many Colleges of Education.

Farmers interviewed were grouped into two categories with respect to their educational background i.e. up to basic and above basic levels of education. Table 6.3 shows that majority (82.6%) of the farmers interviewed have up to basic level of education (either completed Middle School or Junior High School or not attended school before). There are only 17.4% of them who have above basic level of education i.e. have SHS, O’/ A’ Level certificates or University education. The result indicates that because majority of the farmers have up to basic level of education, extension services should use appropriate extension methods and channels of communication to disseminate information to farmers to impact on their livelihood outcomes. Most of the farmers will prefer individual or group methods combined with spoken and visual channels of communication.

Table 6.3 Educational background of farmers

Educational background	Frequency	Percent
Up to basic level (no education, MSLC,JHS)	332	82.6
Above basic level of education(SHS, Tertiary)	70	17.4
Total	402	100.0

Source: Field survey, 2013

6.1.10 Marital status of farmers

Table 6.4 shows that three hundred and forty-three (85.3%) of the farmers indicated they are married while the remaining fifty-nine (14.7%) are living alone single, divorced or widowed.

Table 6.4 Marital status of farmers

Marital status	Frequency	Percent
Married	343	85.3
Single/divorced/widowed/ Separated	59	14.7
Total	402	100.0

Source: Field survey, 2013

6.1.11 Mode of storage of farm produce

With regard to storage of farm produce Table 6.5 shows that more than half (51.0%) of the farmers store their farm produce either in kitchen barns, heap on the ground or in any local barn. The remaining farmers (49.0%) also indicated they treat their produce with chemicals and store them in cribs.

Table 6.5 Mode of storage of farm produce

Mode of storage	Frequency	Percent
Kitchen Barn/Heap on floor/Local barn	203	50.5
Treat with chemical/Crib	199	49.5
Total	402	100.0

Source: Field survey, 2013

6.1.12 Implements used by farmers

Table 6.6 shows that two hundred and forty-one (60.0%) of the farmers interviewed indicated they use basic tools (i.e. cutlasses, hoes and knapsacks) for their farming activities while remaining one hundred and sixty-one (40.0%) of them indicated they use other implements like water pumping machine, tractors, bullock ploughs in addition to the cutlasses, hoes and knapsacks.

Table 6.6 Implement used by farmers

Implements used	Frequency	Percent
Basic tools (cutlass/ho/knapsack)	241	60.0
Basic/other implements	161	40.0
Total	402	100.0

Source: Field survey, 2013

6.2 Extension Contact

The agricultural extension worker's responsibility is to educate farmers in the rural community on improved technologies and practices. These activities are carried out through certain techniques and methods which the extension agents choose to set up learning situation and maximize transfer of technologies and skills to the farmers (Khan, 2005). The methods and techniques considered in this research include individual, group and mass methods.

6.2.1 Frequency of contact by AEAs

Farmers were asked to indicate how frequent Agricultural Extension Agents visit to deliver extension packages to them. Table 6.7 shows that weekly visits was ranked first by 38.3% of the farmers. This was followed by fortnightly, monthly, daily, occasional and bimonthly visits respectively.

Table 6.7 Frequency of contact by extension agents

Frequency of contact	Frequency	Percent	Rank
Daily	19	4.7	4
Weekly	154	38.3	1
Fortnightly	151	37.6	2
Monthly	57	14.2	3
Bimonthly	7	1.7	6
Occasional	14	3.5	5
Total	402	100.0	

Source: Field survey, 2013

6.2.2 Extension methods used by AEAs

Farmers were asked to indicate the methods used by the Agricultural Extension Agents to deliver extension packages to them. The methods considered included individual (farm and home visits), group (method demonstration, result demonstration, field trip/tour, farmer meeting, role play) and mass (radio, posters, fact sheets, booklets). Response from farmers in Table 6.8 indicated that among the eleven methods used, farm visit was ranked first followed by farmer meeting, home visit, method demonstration, result demonstration, radio, posters, role play, field trip/tour, booklet and fact sheet respectively.

Table 6.8 Extension methods used by AEAs

Types of methods	Frequency	Percent	Rank
Farm Visit	391	97.3	1
Home visit	360	89.6	3
Method demonstration	351	87.3	4
Result demonstration	330	82.1	5
Field trip/tour	204	50.7	9
Farmer meeting	372	92.5	2
Role play	207	51.5	8
Radio	233	58.0	6
Posters	213	53.0	7
Fact Sheets	145	36.1	11
Booklets	180	44.8	10

Source: Field survey, 2013

6.3 *Perceived knowledge, attitude and skills of farmers*

Eleven activities were considered in respect of three extension methods (i.e. individual, group, mass) used by Agricultural Extension Agents. Farmers were asked to indicate by ticking the activities under each method they perceived were used by the extension agent to deliver extension packages brought improvement in their knowledge, attitude and skills. Farmers who ticked ≤ 3 , 4-7 and 8-11 were perceived to have low, average and high knowledge, attitude and skills respectively.

6.3.1 **Perceived knowledge of farmers**

Table 6.9 shows that one hundred and twenty-four (30.8%) of the farmers were found to have low knowledge as a result of their interaction with extension agents while one hundred and seventy (42.3%) of them have average knowledge. There were one hundred and eight (26.9%) of the farmers who were perceived to have high knowledge as a result of their interaction with Extension Agents.

Table 6.9 Perceived knowledge of farmers

Knowledge of farmers	Frequency	Percent
Low (≤ 3 methods)	124	30.8
Average (4-7 methods)	170	42.3
High (8-11 methods)	108	26.9
Total	402	100.0

Source: Field survey, 2013

6.3.2 **Perceived attitude of farmers**

Table 6.10 shows that two hundred and forty-two (60.2%) of the farmers indicated that they have low attitude as a result of their interaction with the extension officers while one hundred and one (25.1%) of them indicated they have average attitude. There were fifty-nine (14.7%)

of the farmers who have high attitude as a result of their interaction with the Extension Agents.

Table 6.10 Perceived attitude of farmers

Attitude of farmers	Frequency	Percent
Low (≤ 3 methods)	186	46.3
Average (4-7 methods)	146	36.3
High (8-11 methods)	70	17.4
Total	402	100.0

Source: Field survey, 2013

6.3.3 Perceived skills of farmers

Table 6.11 shows that two hundred and thirty-seven (59.0%) of the farmers indicated that they have low skills as a result of their interaction with the extension officers while one hundred and two (25.4%) of them indicated they have average skills. There were sixty-three (15.7%) of the farmers who have high skills as a result of their interaction with the Extension Agents.

Table 6.11 Perceived skills acquired by farmers

Skills acquired by farmers	Frequency	Percent
Low (≤ 3 methods)	186	46.3
Average (4-7 methods)	146	36.3
High (8-11 methods)	70	17.4
Total	402	100.0

Source: Field survey, 2013

6.4 *Farmers' perception towards agricultural extension delivery*

Farmers were asked to indicate how they agree with nineteen (19) statements listed in Table 6. Responses from farmers on a five point Likert scale ranging from 1 (strongly agree) through to 5 (strongly disagree) were computed to obtain total scores of farmers perception towards agricultural extension delivery. The total score was divided by the number of items in order to bring it back to the original scale used for each of the items (Pallant, 2005). The

score was then re-coded into two as “1-3.99” and “4-5”. Farmers whose score fell within “1-3.99” and “4-5” were classified to have “low” and “high” perception towards agricultural extension delivery respectively.

Table 6.12 Statements on perception of farmers on agricultural extension delivery

Statements	
1	Extension programs offer up-to-date information on crops related activities
2	Extension programs offer up-to-date information on livestock related activities
3	Extension programs offer up-to-date information on fisheries related activities
4	Extension programs offer up-to-date information on poultry related activities
5	Extension programs offer up-to-date information on marketing of agricultural produce
6	Extension programs offer up-to-date information on food utilization
7	Extension programs offer up-to-date information on processing of agricultural produce
8	Attending extension programmes will not change my lifestyle
9	The opinions of other farmers are important to me in attending extension programmes
10	Generally speaking, I do what other farmers think I should do regarding attendance at extension programs.
11	It is mostly up to me whether or not to attend extension programs
12	I feel in complete control over whether to attend an extension program
13	I always find it easy to put into practice advice I receive from the extension officer
14	It is very difficult for me to put into practice advice I receive from extension officer
15	All inputs given to farmers for all programmes should not be paid for.
16	Farmers are not to pay the cost of inputs because they are been compensated by Government through such programmes
17	Farmers should pay for the cost of all inputs supplied for all programmes
18	Improvement in my lifestyle cannot be attributed to my association with extension service
19	Relying on the advice of extension service have not changed my lifestyle

Table 6.13 shows that more than two-thirds (66.9%) of the farmers have low perception towards agricultural extension delivery while one hundred and thirty-three (33.1%) of the farmers had high perception towards agricultural extension delivery.

Table 6.13 Perception of farmers’ towards agricultural extension delivery

Perception towards extension	Frequency	Percent
Low (1-3.99 total score)	269	66.9
High (4-5 total score)	133	33.1
Total	402	100.0

Source: Field survey, 2013

6.5 Technologies practised by farmers

Using a total of one hundred and three (103) technologies considered under crops, livestock, poultry, fisheries, WIAD activities, non-traditional farming practices and farm management, farmers were asked to indicate by ticking either “yes” or “no” to which of the technologies listed in Table 6.14 they are practising. Technologies which they were practising were given a code of “1” while those they have not practised were coded as “2”.

Table 6.14 Technologies practised by farmers

Crops		
Ploughing	Earth bunding	Harrowing
Timely application of weedicides with regards to physiological stage of crop	Use of improved drying methods to achieve grain moisture level acceptable for the crop.	Timely harvesting of the crop with regards to physiological growth stage of the crop (use of maturity index)
Hoeing across the slope	Gleaning after harvesting	Timely harvesting of crop with regards to temperature of day.
Minimum tillage	Sorting of farm produce into grades	Land rotation
Mulching	Packaging in cartons/sacks/ crates of harvested crop	Crop rotation
Construction of fire belt	Storing under shed/pre-cooling units /cold van	Mounding
Use of improved varieties	Timely carting of harvested crops from fields	Germination test for all seeds before planting
Good nursery practices	Use of improved threshing methods	Avoid eating/smoking/drinking when spraying
Row planting/spacing	Cover cropping	Yam multiplication methods
No. of plants/hill	Use of chemicals to store maize	Plantain sucker multiplication methods
Timely weed control	Construction of patios for drying	Use of disease free planting materials
Use of appropriate type of fertilizer/manure	Use of appropriate storage structure (narrow ventilated cribs/mud silos/warehouse)	Irrigating field
Use of adequate quantity of fertilizer/manure applied at a time	Disposal of used chemical containers by deep burying	Agroforestry practices
Timely application of fertilizer (moisture availability)	Disposal chemical containers by burning	Adequacy of quantity of plant protection products applied at a time
Timely application of fertilizer with regards to physiological growth stage	Farms should be sited at least 50 meters from water bodies	Timely application of pesticides to plant product before harvesting or marketing of the crop.
Appropriate type of pest	Use of protective wears (Nose	Spraying at appropriate period-

management or protection product applied to the type of crop	mask, Wellington boots, gloves, Overall)	Morning or evening with regards to temperature and wind direction
		Hand washing with soap after spraying
Livestock		
Identify symptoms of schedule and zoonotic disease	Proper housing of animals	Deworming (drenching, tablets, injection etc.)
Traits to look out for during the selection of breeding stock.	Proper ventilation	Proper watering of animals
Animals to be slaughtered in the abattoir	Fodder banks	Culling of old/spent animals
Good sanitation in pens of farm animals	Avoid overcrowding	Dry season feeding of farm animals
Routine vaccination of farm animals		Use of improved breeds of animals
Poultry		
Identify symptoms of schedule diseases	Deworming -	Proper feeding of birds
Practice routine vaccination and medication	Force moulting	Avoid overcrowding
Debeaking	Brooding	Ensure proper ventilation
Culling	Proper housing of birds	I -2 Vaccination
Fisheries-Aquaculture/Marine/freshwater		
Site selection	Feeding	Pollution of the water resource
Pond construction	Disease and pest control	Avoiding over exploitation
Soil type	Over stocking	Using appropriate mesh size for fishing
Stocking	Harvesting	Formation of Community Based Fisheries Mgt. Committee
WIAD Activities		
Non Traditional farming		
Farm Management		
Construction of Smokeless stove	Snail farming	Formation of farmer groups
Construction of Soak-away pits	Bee keeping	Planning of farm activities
Preparation of Soya milk	Mushroom Production	Keep records of all farm activities
Preparation of Soya kebab	Grasscutter Production	Save with Bank
Preservation of roots and tubers using sawdust		Group marketing of farm produce
Incorporation of Moringa powder in household diets		
Preservation of tomatoes and garden eggs		

Source: MoFA, 2013

SPSS was used to count technologies practiced by farmers. Recoding was done and farmers who practiced between “≤34”, “35-69” and “70-103” technologies were classified as low, medium and high respectively. Table 6.15 shows that forty-two (10.4%) were found in the low category while two hundred and fourteen (53.2%) were also in the medium category. There were however one hundred and forty-six (36.3%) of the farmers found in the high category.

Table 6. 15 Technologies practiced by farmers

	Frequency	Percent
Low (≤34 technologies)	42	10.4
Medium (35-69 technologies)	214	53.2
High (70-103 technologies)	146	36.3
Total	402	100.0

Source: Field study, 2013

6.6 *Effect of extension methods used on performance of farmers*

This is to find out whether knowledge, attitude, skills, perception towards extension delivery and extension packages practiced by farmers are affected by extension methods used.

6.6.1 **Effect of number of extension methods used on perceived knowledge of farmers**

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of extension methods (Low, Medium and High) on perceived knowledge of farmers. The test shown in Table 6.16 was significant $\chi^2(2, N = 402) = 113.317, p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was significant difference ($U = 8633, z = -9.527, p < .05$) between farmers in high and medium groups. There was statistically significant difference ($U = 360.00, z = -6.488, p < .05$) between farmers operating in the high group and those in the low group. There was also statistically significant difference ($U = 680.000, z = -5.692, p < .05$) between farmers

operating in the Medium group and those in the low group. The result agrees with work done by Kassem (2014) who recommended that extension programmes should use several methods simultaneously to enhance knowledge of the stakeholders.

Table 6.16 Kruskal-Wallis H Test for comparison between number of extension methods used and knowledge of farmers

Extension method used		Mean Rank	Test statistics
Knowledge due to use of extension methods	Low (≤ 3 ext. methods)	20	$\chi^2=113.317$ df=2 p=001
	Average (4-7 ext. methods)	199	
	High (8-11 ext. methods)	183	
Total		402	

Source: Field study, 2013

6.6.2 Effect of number of extension methods used on the attitude of farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Average and High) on improvement in attitude of farmers. The test shown in Table 6.17 was statistically significant $\chi^2 (2, N = 402) = 37.735, p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was statistically significant difference ($U= 33332.00, z= -5.011, p<.05$) between farmers in high and average groups. There was statistically significant difference ($U=920.000, z= -4.070, p<.05$) between farmers operating in the high group and those in the low group. There was also statistically significant difference ($U=680.000, z= -5.692, p <.05$) between farmers operating in the average group and those in the low group. The result shows that farmers reached with extension packages through more extension methods have improved attitude.

Table 6.17 Kruskal-Wallis H Test for comparison between number of extension methods used and attitude of farmers

	Extension method used	N	Mean Rank	Test statistics
Attitude due to use of extension methods	Low(≤ 3 ext. methods)	20	121.50	$\chi^2=37.735$ df=2 P=.001
	Average (4-7 ext. methods)	199	180.96	
	High (8-11 ext. methods)	183	233.57	
	Total	402		

Source: Field study, 2013

6.6.3 Effect of number of extension methods used on the skills of farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Average and High) on improvement in skills of farmers. The test shown in Table 6.18 was statistically significant $\chi^2(2, N = 402) = 113.122, p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was statistically significant difference ($U = 8572.500, z = -9.661, p < .05$) in the skills of farmers in high and average groups. There was statistically significant difference ($U = 430.000, z = -5.956, p < .05$) in the skills of farmers operating in the high group and those in the low group. There was also statistically significant difference ($U = 1230.000, z = -3.412, p < .05$) between farmers operating in the average group and those in the low group. Farmers reached with extension packages through more extension methods have improved skills.

Table 6.18 Kruskal-Wallis H Test for comparison between number of extension methods used and skills of farmers

	No. of extension methods used by AEs	N	Mean Rank	T statistics
Skills of farmers	Low (≤ 3 ext. methods)	20	93.50	$\chi^2=113.122$ df=2 P=.001
	Average (4-7 ext. methods)	199	156.90	
	High (8-11 ext. methods)	183	261.81	
	Total	402		

Source: Field study, 2013

6.6.4 Effect of number of extension methods used on the perception of farmers towards agricultural extension delivery

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of extension methods used (Low, Average and High) on improvement in perception of farmers. The test shown in Table 6.19 was statistically significant $\chi^2 (2, N = 402) = 113.122, p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was statistically significant difference ($U=8572.500, z= -9.661, p<.05$) between farmers in high and medium groups. There was statistically significant difference ($U=430.000, z= -5.956, p<.05$) between farmers operating in the high group and those in the low group. There was also statistically significant difference ($U=1230.000, z= -3.412, p <.05$) between farmers operating in the average group and those in the low group. Farmers reached with extension packages through more extension methods have improved perception towards agricultural extension delivery.

Table 6.19 Kruskal-Wallis H Test for comparison between number of extension methods used and perception of farmers towards extension delivery

	No. of extension methods used by AEAs	N	Mean Rank	Test statistics
Perception towards extension	Low (≤ 3 extension. methods)	20	142.15	$\chi^2=40.824$ df=2 P=.001
	Average (4-7 extension methods)	199	199.37	
	High (8-11 extension methods)	183	210.30	
	Total	402		

Source: Field study, 2013

6.6.5 Effect of number of extension methods used on extension packages practiced by farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of extension methods used (Low, Average and High) on improvement in technologies practiced

by farmers. The test shown in Table 6.20 was statistically significant $\chi^2 (2, N = 402) = 80.166$, $p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was statistically significant difference ($U = 8572.500$, $z = -9.661$, $p < .05$) between farmers in high and medium groups. There was statistically significant difference ($U = 10765.500$, $z = -7.766$, $p < .05$) between farmers operating in the high group and those in the low group. There was also statistically significant difference ($U = 1151.000$, $z = -3.656$, $p < .05$) between farmers operating in the average group and those in the low group. Farmers reached with extension packages through more extension methods practised more technologies.

Table 6.20 Kruskal-Wallis H Test for comparison between number of extension methods used on extension packages practiced by farmers

	No. of extension methods used by AEs	N	Mean Rank	Test statistics
Extension packages practiced by farmers	Low (≤ 3 extension methods)	20	94.50	$\chi^2 = 80.168$ df=2 P=.001
	Average (4-7 extension methods)	199	168.31	
	High (8-11 extension methods)	183	249.28	
	Total	402		

Source: Field study, 2013

6.7 Farmers' perception on their access to livelihood assets

This is to find out farmers' perception of their access to livelihood assets in the study area.

The assets considered include natural, financial, physical, human and social capitals.

6.7.1 Farmers' perceived access to natural capital

Table 6.21 shows that three hundred and fifty-one (87.3%) of the farmers indicated they have low access to natural capital for their farming activities. There were fifty-one (12.7%) of the farmers who responded they have high access to natural capital. The natural capital considered include farming land, water for irrigation, grazing land, livestock and tree

plantation. The total score of a five item Likert scale of 1 (strongly disagree) to 5 (strongly agree) was computed with SPSS for the various responses farmers made after which it was divided by the number of items to bring it back to original scale used. Recoding was done and farmers whose total score fell within the range of 1-3.99 were classified to have low access while those within the range of 4.0 – 5.0 were classified to have access to the asset.

Table 6.21 Farmers' perceived access to natural capital

capital	Frequency	Percent
Low access to natural capital (1-3.99 total score)	351	87.3
High access to natural capital (4-5 total score)	51	12.7
Total	402	100.0

Source: Field survey, 2013

6.7.2 Farmers' perceived access to financial capital

Four issues namely income from other relatives, financial savings, access to credit and remittance from relatives were considered under financial capital. The SPSS was used to compute the total score for the various responses farmers gave on the five item Likert scale from 1 (strongly disagree) to 5 (strongly agree) after which it was divided by the number of items to bring it back to the original scale. Recoding was done and farmers whose total scores fell within the range of 1-3.99 were classified to have low access while those within the range of 4.0 – 5.0 were classified to have high access to financial capital. Table 6.22 shows that three hundred and forty-nine (86.8%) of the farmers were found to have low access to financial capital while fifty-three (13.2%) have high access to financial capital.

Table 6.22 Perceived access to financial capital

Access to financial capital	Frequency	Percent
Low access to financial capital(1-3.99 total score)	349	86.8
High access to financial capital (4-5 total score)	53	13.2
Total	402	100.0

Source: Field survey, 2013

6.7.3 Farmers' perceived access to physical capital

Table 6.23 shows that majority (87.6%) of the farmers indicated they have unreliable access of physical capital while only fifty (12.4%) of the farmers indicated they have reliable access to physical capital. Areas considered under physical capital include access to good roads, electricity, pipe-borne water, spraying machines, tractor, irrigation pump and house. Responses from farmers on their perceived access to the above stated assets on a five item Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) were computed using SPSS after which it was divided by the number of items to bring it back to the original scale. Recoding was done and farmers whose scores fell within the range of 1-3.99 were classified to have low access while those within the range of 4.0 – 5.0 were classified to have high access to physical capital.

Table 6.23 Farmers' perceived access to physical capital

Access to physical capital	Frequency	Percent
Low access to physical capital (1-3.99 total score)	352	87.6
High access to physical capital (4-5 total score)	50	12.4
Total	402	100.0

Source: Field survey, 2013

6.7.4 Farmers' perceived access to human capital

Table 6.24 shows that majority (71.4%) of the farmers indicated they have low access to physical capital while one hundred and fifteen (28.6%) of the farmers indicated they have high access to physical capital. Areas considered under human capital include access to family labour, information, schools and health facilities. The SPSS was used to compute for the various responses farmers gave on the five item Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Recoding was done and farmers whose total scores fell within

the range of “1-3.99” were classified to have low access while those within the range of “4.0 – 5.0” were classified to have high access to human capital.

Table 6.24 Farmers’ perceived access to human capital

Access to human resources	Frequency	Percent
Low access to human capital(1-3.99 total score)	287	71.4
High access to human capital (4-5total score)	115	28.6
Total	402	100.0

Source: Field survey, 2013

6.7.5 Farmers’ perceived access to social capital

Two issues namely membership of organisations and support from kin and friends were considered under social capital. SPSS was used to compute the responses farmers gave on five item Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) after which it was divided by the number of items to bring it back to the original scale. Recoding was done and farmers whose scores fell within the range of 1-3.99 were classified to have low access while those within the range of 4.0 – 5.0 were classified to have high access to social capital. Table 6.25 shows that two hundred and ninety-one (72.4%) of the farmers responded they have low access to social capital while one hundred and eleven (27.6%) of them indicated they have high access to social capital.

Table 6.25 Farmers’ perceived access to social capital

Access to social capital	Frequency	Percent
Low access to social capital(1-3.99 total score)	291	72.4
High access to social capital (4-5 total score)	111	27.6
Total	402	100.0

Source: Field survey, 2013

6.7.6 Farmers’ overall access to assets for farming activities

Twenty-three assets were considered under natural, financial, physical, human and social capitals as shown in Table 6.26. SPSS was used to compute the various responses farmers

gave on a five item Likert scale ranging from 1 (strongly unreliable) to 5 (strongly reliable) after which it was divided by the number of items considered in order to bring it to the original scale. Recoding was done and farmers whose total scores fell within the range of 1-3.99 were classified to have low overall access to assets while those within the range of 4.0 – 5.0 were classified to have high overall access to capital assets respectively.

Table 6.26 Farmers’ overall access to capital assets

TYPES OF ASSETS		
Natural capital	Physical capital	Social capital
1.Farming Land	1. Access to good roads	1. Membership of organisations
2.Water for irrigation	2. Electricity	2. Support from kin, friends
3.Grazing land	3. Piped water	Human capital
4.Livestock	4. Spraying machines	1. Family labour
5.Tree plantation	5. Tractor	2. Access to information
Financial capital	6. Irrigation pump	3. Schools
1.Income from other activities	7. House	4. Health facilities
2.Financial savings		5. Equitable access to social assets among household members
3.Access to credit		
4.Remittance from relatives		

Source: Field survey, 2013

Table 6.27 shows that three hundred and seventy (92.0%) farmers have low overall access to livelihood assets while thirty-two (8.0%) have high overall access to assets.

Table 6.27 Overall access to assets by farmers

Overall access to assets	Frequency	Percent
Low overall access to assets (1-3.99 total score)	370	92.0
High overall access to assets (4-5 total score)	32	8.0
Total	402	100.0

Source: Field survey, 2013

6.8 Relationship between access to assets and performance indicators farmers

The relationship between farmers’ access to assets and its effect on their knowledge, attitude and skills are discussed in this section.

6.8.1 Relationship between access to assets and knowledge of farmers

A Mann-Whitney U Test was used to compare overall assets of farmers and improvement in their knowledge. The results of the test show there is statistically significant difference ($U=4721.000$, $Z=-2.040$ $p=.041$) between farmers' overall access to assets and improvement in their knowledge (Table 6.28). Farmers who had high overall access to assets were found to have high knowledge compared with those who had low overall access to assets.

Table 6.28 Mann-Whitney U Test for comparison of overall access to assets and improved knowledge of farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Improved knowledge of farmers	Low overall assets (1-3.99 total score)	370	198.26	73356.00	$U=4721.000$ $Z=-2.040$ $p=.041$
	High overall assets (4-5 total score)	32	238.97	7647.00	
	Total	402			

Source: Field survey, 2013

6.8.2 Relationship between access to assets and attitude of farmers

A Mann-Whitney U Test was used to compare assets of farmers and improvement in their attitude towards extension delivery. The results of the test show that there is statistically significant difference ($U=4847.000$, $Z = -2.150$, $p = .032$) between farmers' access to assets and their attitude towards agricultural extension delivery (Table 6.29). Farmers who had low overall access to assets were found to have improved attitude towards agricultural extension delivery compared with those who had high overall access to assets.

Table 6.29 Mann-Whitney U Test for comparison of overall access to assets and improved attitude of farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Attitude of farmers towards agricultural extension delivery	Low overall assets (1-3.99 total score)	370	204.40	75628.00	U=4847.000 Z = -2.150, p = .032
	High overall assets (4-5 total score)	32	167.97	5375.00	
	Total	402			

Source: Field survey, 2013

6.8.3 Relationship between access to assets and skills of farmers

A Mann-Whitney U Test was used to compare access to assets of farmers and improvement in their skills. The results of the test show that there is statistically significant difference ($p < .05$) between farmers' level of access to assets and improvement in their skills (Table 6.30). Observation of the mean ranks indicates that farmers who had low overall access to assets were found to have improved skills compared with those who had high overall access to assets. The reasons that could be assigned is that asset rich farmers may not be attending meetings called by the extension officers where farmers have hands on practical training given to them.

Table 6.30 Mann-Whitney U Test for comparison of access to assets and skills of farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Improved skills of farmers	Low overall assts (1-3.99 total score)	370	204.51	75669.50	U=4805.500, Z = -2.008, p = .045
	High overall assets (4-5 total score)	32	166.67	5333.50	
	Total	402			

Source: Field survey, 2013

6.8.4 Relationship between access to assets and farmers' perception towards agricultural extension delivery

A Mann-Whitney U Test was used to compare assets of farmers and improvement in their perception towards agricultural extension delivery. The results of the test show that there is no statistically significant difference ($U= 5033.000$, $Z=-1.726$, $p= .084$) between farmers' level of access to assets and improvement in their perception towards agricultural extension delivery (Table 6.31). This result suggests that access to assets has no influence on farmers' perception towards agricultural extension delivery.

Table 6.31 Mann-Whitney U Test for comparison of access to assets and perception of farmers towards agricultural extension delivery

	Access to assets	N	Mean Rank	Sum of Ranks	Test statistics
Perception of farmers towards extension delivery	Low access to assets (1-3.99 total score)	370	199.10	73668.00	$U= 5033.000$, $Z=-1.726$, $p= .084$
	High access to assets (4-5 total score)	32	229.22	7335.00	
	Total	402			

Source: Field survey, 2013

6.8.5 Relationship between access to assets and extension packages practiced by farmers

A Mann-Whitney U Test was used to compare overall assets of farmers and extension packages they practice. The results of the test show that there is no statistically significant difference ($U=5014.000$, $Z=-1.766$, $P=.077$) between farmers' level of access to assets and extension packages practiced (Table 6.32). This result suggests that access to assets has no influence on extension packages practiced by farmers.

Table 6.32 Mann-Whitney U test for comparison of overall access to assets and extension packages practiced by farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Extension packages practiced by farmers	Low access to assets (1-3.99 total score)	370	199.05	73649.00	U=5014.000 Z=-1.766 P=.077
	High access to assets (4-5 total score)	32	229.81	7354.00	
	Total	402			

Source: Field survey, 2013

6.9 Relationship between access to assets and livelihood outcomes achieved

This is to find out the relationship between farmers' access to assets and income, wellbeing, reduced vulnerability, sustainable use of natural resources and food security.

6.9.1 Relationship between access to assets and income achieved by farmers

A Mann-Whitney U Test was used to compare access to assets by farmers and improved income by farmers. The results of the test in Table 6.33 show that there is statistically significant difference ($p < .05$) between farmers' level of access to assets and income achieved by farmers. This result suggests that access to assets has influence on income achieved by farmers. This disagrees with work done by Abenakyo et al. (2007) who found that there was no significant effect of social capital on household income.

Table 6.33 Mann-Whitney U test for comparison of access to assets and income achieved by farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Income achieved	Low access to assets (1-3.99 total score)	370	198.02	72746.50	U=4111.50 Z=-3.232 p=.001
	High access to assets (4-5 total score)	32	241.72	8256.50	
	Total	402			

Source: Field survey, 2013

6.9.2 Relationship between access to assets and wellbeing of farmers

A Mann-Whitney U Test was used to compare access to assets by farmers and impact on their wellbeing. The results of the test show that there is no statistically significant difference (p U=5414.50 Z = -.903, p = .367 between farmers who have low or high access to assets and improvement in their wellbeing (Table 6.34). This result suggests that access to assets has no influence on wellbeing of farmers.

Table 6.34 Mann-Whitney U Test for comparison of access to assets and wellbeing of farmers

	Access to assets	N	Mean Rank	Sum of Ranks	Test statistics
Improved wellbeing	Low access (1-3.99 total score)	370	200.13	74049.50	U=5414.50 Z= -.903 p= .367
	High access (4-5 total score)	32	217.30	6953.50	
	Total	402			

Source: Field survey, 2013

6.9.3 Relationship between access to assets and reduced vulnerability

A Mann-Whitney U Test was used to compare access to assets by farmers and reduced vulnerability. The results of the test show that there is no statistically significant difference ($p > .05$) U=5152.50, Z =-1.284, p = .199) between access to assets and the vulnerability levels of farmers as shown in Table 6.35. This result suggests that access to assets has no influence on vulnerability of farmers.

Table 6.35 Mann-Whitney U Test for comparison of access to assets and reduced vulnerability achieved by farmers

	Access to assets	N	Mean Rank	Sum of Ranks	Test statistics
Reduced vulnerability	Low access (1-3.99 total score)	370	199.43	73787.50	U=5152.50 Z=-1.284 p= .199
	High access (4-5 total score)	32	225.48	7215.50	
	Total	402			

Source: Field survey, 2013

6.9.4 Relationship between access to assets and sustainable use of natural resources

A Mann-Whitney U Test was used to compare access to assets by farmers and sustainable use of natural resources. The results of the test show that there is no statistically significant difference ($p > .05$, $U=5107.00$, $Z= -1.527$, $p= .127$) between farmers' level of access to assets and (Table 6.36). This result suggests that access to assets of farmers has no influence on the extent they sustain the natural resources available to them.

Table 6.36 Mann-Whitney U Test for comparison of access to assets and sustainable use of natural resources achieved by farmers

	Access to assets	N	Mean Rank	Sum of Ranks	Test statistics
Sustainable natural resources	Low access (1-3.99 total score)	370	199.30	73742.00	$U=5107.00$ $Z=-1.527$ $p= .127$
	High access (4-5 total score)	32	226.91	7261.00	
	Total	402			

Source: Field survey, 2013

6.9.5 Relationship between access to assets and food security of farmers

A Mann-Whitney U Test was used to compare access to assets and food security achieved by farmers. The results of the test in Table 6.37 show that there is statistically significant difference ($U=4100.50$, $Z= -3.020$, $p= .003$) between farmers' level of access to assets and food security achieved. This result suggests that access to assets has influence on food security achieved by farmers.

Table 6.37 Mann-Whitney U Test for comparison of access to assets and food security achieved by farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Food security	Low access (1-3.99 total score)	370	196.58	72735.50	U=4100.50 Z= -3.020 p= .003
	High access (4-5 total score)	32	258.36	8267.50	
	Total	402			

Source: Field survey, 2013

6.9.6 Relationship between access to assets and overall livelihood outcome achieved by farmers

A Mann-Whitney U Test was used to compare overall assets of farmers and overall livelihood outcome achieved by farmers. The results of the test in Table 6.38 show that there is statistically significant difference (U=4545.50, Z=-2.200, p= .028) between farmers' level of access to assets and overall livelihood outcome achieved by farmers. This result suggests that access to assets has influence on overall livelihood outcome achieved by farmers.

Table 6.38 Mann-Whitney U test for comparison of overall access to assets and overall livelihood outcome achieved by farmers

Access to assets		N	Mean Rank	Sum of Ranks	Test statistics
Overall livelihood outcomes	Low access (1-3.99 total score)	370	197.79	73180.50	U=4545.50 Z=-2.200 p= .028
	High access (4-5 total score)	32	244.45	7822.50	
	Total	402			

Source: Field survey, 2013

6.10 Relationship between levels of OLM and performance indicators of farmers

This is to find out whether improvements in knowledge, attitude, skills, perception towards extension delivery and extension packages practiced by farmers are influenced by the levels of the OLM in the planning process of projects.

6.10.1 Relationship between levels of OLM and knowledge of farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of OLM planning conditions (Low, Medium and High) on improvement in the knowledge of farmers. The test shown in Table 6.39 was not statistically significant $\chi^2 (2, N = 402) = 1.105$, $p > .05$. This result suggests that improvement in knowledge of a farmer does not depend on the OLM planning approach used but other factors may contribute to it.

Table 6.39 Kruskal-Wallis H Test for comparison between levels of OLM and knowledge of farmers

	OLM levels used	N	Mean Rank	Test statistics
Improved knowledge	High	140	207.52	$\chi^2 = 1.105$
	Medium	93	192.23	df=2
	Low	169	201.61	P=.575
	Total	402		

Source: Field survey, 2013

6.10.2 Relationship between levels of OLM and attitude of farmers towards agricultural extension delivery

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on improvement in attitude of farmers. The test shown in Table 6.40 was significant $\chi^2 (2, N = 402) = 25.909$, $p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was statistically significant difference ($U = 4709.000$, $z = -3.977$, $p < .05$) between farmers in high and medium groups. There was statistically significant difference ($U = 8700.000$, $z = -4.518$, $p < .05$) between farmers operating in the high group and those in the low group. There was however no significant difference ($U = 7764.500$, $z = -.195$, $p > .05$) between farmers operating in the medium group and those in the low group.

.Table 6.40 Kruskal-Wallis H Test for comparison between levels of OLM and attitude of farmers

	OLM used	N	Mean Rank	Test statistics
Attitude of farmers	High	140	236.72	$\chi^2=25.909$ df=2 P=.001
	Medium	93	181.12	
	Low	169	183.54	
	Total	402		

Source: Field survey, 2013

6.10.3 Relationship between levels of OLM and skills of farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on improvement in skills of farmers. The test shown in Table 6.41 was significant $\chi^2 (2, N = 402) = 39.366, p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was statistically significant difference ($U= 3919.5000, z= -5.516, p<.05$) between farmers in high and Medium groups. There was statistically significant difference ($U=8246.500, z= -4.934, p<.05$) between farmers operating in the high group and those in the low group. There was however no significant difference ($U=6855.500, z= -1.928, p >.05$) between farmers operating in the medium group and those in the low group.

Table 6.41 Kruskal-Wallis H Test for comparison between levels of OLM and skills of farmers

	OLM level used	N	Mean Rank	Test statistics
Skills of farmers	High	140	245.60	$\chi^2 =39.366$ df=2 P=.001
	Medium	93	162.85	
	Low	169	186.23	
	Total	402		

Source: Field survey, 2013

6.10.4 Relationship between levels of OLM and perception of farmers towards agricultural extension delivery

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on perception of farmers towards agricultural extension delivery. The test shown in Table 6.42 was significant $\chi^2(2, N = 402) = 15.458, p < .001$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated a significant difference ($U=9502, z= -3.606, p < .001$) between farmers operating in the High group and those in the Low group. There was also significant difference ($U=5284, z=-2.891, p < .001$) between farmers in High and Medium groups. There was however no significant difference ($U=7792, z= -149, p>.05$) between farmers operating in the Medium group and those in the Low group. This result agrees with work done by Aphunu, and Otoikhian, (2008) who found that respondents perceived extension agents to have vast knowledge of subject matter which led to significant association between the effectiveness of extension agents and the adoption of technologies by the respondents.

Table 6.42 Kruskal-Wallis H Test for comparison between levels of OLM and perception of farmers

	Levels of OLM	N	Mean Rank	Test Statistics
Perception of farmers towards agricultural extension delivery	High	140	226.89	$\chi^2 = 15.458$ df=2 p=0.001
	Medium	93	189.03	
	Low	169	187.33	
	Total	402		

Source: Field survey, 2013

6.10.5 Relationship between levels of OLM and extension packages practised by farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on extension packages practised by farmers. The test shown in Table 6.43 was statistically significant $\chi^2(2, N = 402) = 32.300, p < .001$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated no statistically significant difference ($U=5976.500, z= -1.190, p =.234$) between farmers operating in the high group and those in the medium group. There was also statistically significant difference ($U=7991.500, z=-5.508, p = .001$) between farmers in High and Low groups. There was also statistically significant difference ($U=5985.000, z= -3.596, p=.001$) between farmers operating in the Medium group and those in the Low group.

Table 6.43 Kruskal-Wallis H Test for comparison between levels of OLM and extension packages practised by farmers

	OLM levels	N	Mean Rank	Test statistics
Extension packages practised by farmers	High	140	232.73	$\chi^2=32.300$ df=2 P=.001
	Medium	93	215.91	
	Low	169	167.70	
	Total	402		

Source: Field survey, 2013

6.11 Relationship between levels of OLM and extension methods used by AEAs to deliver technology to farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on extension methods used by A. The test shown in Table 6.44 was significant $\chi^2(2, N = 402) = 23.109, p < .001$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three

groups. The results of these tests indicated a significant difference ($U=5138.000$, $z= -3.110$, $p =.002$) between farmers operating in the high group and those in the medium group. There was also significant difference ($U=8568.000$, $z=-4.725$, $p = .001$) between farmers in high and Low groups. There was no significant difference ($U=7383.500$, $z= -.915$, $p=.360$) between farmers operating in the medium group and those in the low group.

Table 6.44 Kruskal-Wallis H Test for comparison between levels of OLM and number of extension methods use by AEAs to deliver technology to farmers

	OLM levels	N	Mean Rank	Test statistics
Extension methods used by AEAs	High	140	234.60	$\chi^2=23.109$ df-2 p=.001
	Medium	93	191.85	
	Low	169	179.39	
	Total	402		

Source: Field survey, 2013

6.12 Relationship between number of extension methods used by AEAs and livelihood outcome

A Kruskal-Wallis H test was conducted to evaluate differences among the number of extension methods used to reach farmers and overall livelihood outcomes achieved by farmers. The test shown in Table 6.45 was significant $\chi^2 (2, N = 402) = 62.612$, $p < .001$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated a significant difference ($U=12496.000$, $z= -7.023$, $p =.001$) between farmers operating in the high group and those in the average group. There was also significant difference ($U=888.500$, $z=-7.302$, $p = .001$) between farmers in high and low groups. There was statistically significant difference ($U=1413.000$, $z= -2.518$, $p=.012$) between farmers operating in the average group and those in the Low group. This result shows that when several extension methods are used to deliver extension packages to farmers, it leads to improved livelihood outcomes.

Table 6.45 Kruskal-Wallis H Test for comparison between number of extension methods used and overall livelihood outcome achieved by farmers

	No. of extension methods used by AEs	N	Mean Rank	Test statistics
Overall livelihood outcome achieved by farmers	Low (≤ 3 extension methods)	20	277.42	$\chi^2=62.612$ df=2 P=.001
	Average (4-7 extension methods)	199	225.05	
	High (8-11 extension methods)	183	167.60	
	Total	402		

Source: Field study, 2013

6.13 Relationship between levels of OLM and assets available to farmers

This is to find out how assets needed by farmers to carry out their farming activities are available in the different levels of use of the outcome logic model of planning

6.13.1 Relationship between levels of OLM and natural capital of farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (low, medium and high) on natural capital available to farmers. The test shown in Table 6.46 was not statistically significant $\chi^2 (2, N = 402) = 5.293, p > .05$.

Table 6.46 Kruskal-Wallis H Test for comparison between levels of OLM and natural capital of farmers

	Levels of OLM used	N	Mean Rank	Test statistics
Natural capital available to farmers	High	140	194.66	$\chi^2=5.29$ df=2 p=.071
	Medium	93	214.90	
	Low	169	199.79	
	Total	402		

Source: Field survey, 2013

6.13.2 Relationship between levels of OLM and financial capital available to farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on financial capital available to farmers. The test shown in Table 6.47 was statistically significant $\chi^2 (2, N = 402) = 14.348, p < .05$.

Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was significant difference ($U= 5458.000$, $z=-3.374$, $p < .05$) between farmers in High and Medium groups. There was no statistically significant difference ($U=11584.00$, $z= -614$, $p>.05$) between farmers operating in the High group and those in the Low group. There was however statistically significant difference ($U=6752.00$, $z= -2.996$, $p <.05$) between farmers operating in the Medium group and those in the Low group.

Table 6.47 Kruskal-Wallis H test for comparison between levels of OLM and financial capital of farmers

	Levels of OLM used	N	Mean Rank	Test statistics
Financial capital	High	140	192.23	$\chi^2 =14.348$ df=2 p<.05
	Medium	93	224.71	
	Low	169	196.41	
	Total	402		

Source: Field survey, 2013

6.13.3 Relationship between levels of OLM and physical capital available to farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on physical capital available to farmers. The test shown in Table 6.48 was statistically significant $\chi^2 (2, N = 402) = 6.468$, $p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. There was no statistically significant difference ($U= 6117.500$, $z=-1.244$, $p>.05$) between farmers in High and Medium groups. There was statistically significant difference ($U=10697.50$, $z= -2.518$, $p<.05$) between farmers operating in the High group and those in the Low group. There was however no statistically significant difference ($U=7580.00$, $z= -.932$, $p >.05$) between farmers operating in the Medium group and those in the Low group.

Table 6.48 Kruskal-Wallis H Test for comparison between levels of OLM and physical capital available to farmers

	Levels of OLM used	N	Mean Rank	Test statistics
Physical capital	High	140	212.39	$\chi^2 = 6.468$ df=2 p=.039
	Medium	93	200.27	
	Low	169	193.15	
	Total	402		

Source: Field survey, 2013

6.13.4 Relationship between levels of OLM and human capital available to farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on human capital available to farmers. The test shown in Table 6.49 was not statistically significant $\chi^2 (2, N = 402) = 1.129, p > .05$. This means that farmers' access to family labour, information and other social assets is not dependent on the planning level they operate from.

Table 6.49 Kruskal-Wallis H Test for comparison between levels of OLM and human capital available to farmers

	Levels of OLM used	N	Mean Rank	Test Statistics
Human capital	High	140	198.56	$\chi^2 = 1.129$ df=2 p=.559
	Medium	93	195.87	
	Low	169	207.04	
	Total	402		

Source: Field survey, 2013

6.13.5 Relationship between levels of OLM and social capital available to farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on social capital available to farmers. The test shown in Table 6.50 was not statistically significant $\chi^2 (2, N = 402) = 1.469, p > .05$. This indicates that farmers could belong to a group as well as receive support from kins and friends irrespective of the planning levels they operate from.

Table 6.50 Kruskal-Wallis H Test for comparison between levels of OLM and social capital available to farmers

	Levels of OLM	N	Mean Rank	Test statistics
Social capital	High	140	196.25	$\chi^2 = 1.469$ df=2 p>.05
	Medium	93	197.87	
	Low	169	207.85	
	Total	402		

Source: Field survey, 2013

6.13.6 Relationship between levels of OLM and overall assets available to farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on overall assets achieved by farmers. The test shown in Table 6.51 was significant $\chi^2 (2, N = 402) = 14.976, p < .001$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated no significant difference ($U=11482.50, z= -3.606, p>.05$) between farmers operating in the High group and those in the Low group. There was significant difference ($U= 5622.500, z=-3.551, p < .001$) between farmers in High and Medium groups. There was also significant difference ($U=7018.00, z= -2.719, p<.05$) between farmers operating in the Medium group and those in the Low group.

Table 6.51 Kruskal-Wallis H Test for comparison between levels of OLM and assets of farmers

	Levels of OLM used	N	Mean Rank	Test Statistics
Overall assets available to farmers	High	140	192.68	$\chi^2 = 14.976$ df=2 p<.001
	Medium used	93	220.08	
	Low	169	198.58	
	Total	402		

Source: Field survey, 2013

6.14 Relationship between levels of OLM and training farmers' received in technologies

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (LOLM, MOLM and HOLM) on overall span of training received in technologies by farmers. The test shown in Table 6.52 was significant $\chi^2(2, N = 402) = 9.060$, $p < .05$. Follow-up tests using the Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated no significant difference ($U=6086.000$, $z= -1.220$, $p>.05$) between farmers operating in the HOLM group and those in the MOLM group. There was significant difference ($U= 10078.000$, $z=-5.177$, $p < .05$) between farmers in High and Low groups. There was no significant difference ($U=7206.500$, $z= -1.413$, $p<.05$) between farmers operating in the Medium group and those in the Low group.

Table 6.52 Kruskal-Wallis H Test for comparison between levels of OLM and training received by farmers

	Levels of OLM used	N	Mean Rank	Test statistics
Span of training received in all technologies by farmers	High	140	217.04	$\chi^2 = 9.060$ df=2 p<.001
	Medium	93	203.95	
	Low	169	187.28	
	Total	402		

Source: Field survey, 2013

6.15 Summary

Majority of the farmers interviewed are males (75.4%). There are about 49.3% of the farmers who are within the age bracket of 36-50 years while 38.6% of them are 51 years or more. Only 12.2% of them were in the 19-35 year group. Most of the farmers (86.2%) have low education but have farming experience of twenty years and above (48.8%). A greater percentage (60.0%) of the farmers' farm for both subsistence and commercial purposes and

use combination of family, hired and reciprocal (46.5%) means of labour to undertake their farming activities. Majority (80.8%) of the farmers have access to 1-5 household labour available for their farming activities and own less than 2 hectares of farmlands (50.2%). About 73.6% of the farmers hire land less than 2 hectares for their farming activities. Cutlasses, hoes and knapsacks are basic implements used by 60.0% of all the farmers interviewed while 40.0% of them used tractors, water pump and bullock plough in addition to the basic implements. Most (56.2%) of farmers received five or more years of training from MoFA which they indicated was the main organisation for extension delivery to farmers (93.3%).

Majority (84.1%) of the farmers received infrequent visit from the extension officers while sixty-four (15.9%) also received frequent visits. More than half (58.5%) of the farmers were reached with extension packages by extension agents using more than three methods while less than half (41.5%) of the farmers were reached with extension packages through the use of one or two extension methods. Interaction with extension agents, majority (76.6%) of the farmers achieved low to medium knowledge. Majority (86.3%) of farmers achieved low to medium improvement in attitude while majority (84.4%) achieved low to medium skills towards extension packages. This resulted in majority (66.9%) of the farmers having low perception towards agriculture however 67.2% of the farmers were found to be in the high practicing category of extension packages delivered by extension officers.

Farmers reached with extension packages by Extension Agents who use combinations of different extension methods had improved knowledge, attitude, skills, perception towards agricultural extension delivery and practiced more extension packages compared to farmers reached through less extension methods. Majority of the farmers had low access in natural

capital (87.3%), financial capital (86.8%), physical capital (87.6%), human capital (71.4%) and social capital (72.4%) which resulted in overall low access (92.0%) to capital by farmers. It was found that farmers who had high overall assets had improved knowledge, attitude and skills however there was no significant difference between farmers who had either high or low overall assets and their perception towards agricultural extension delivery and extension packages they practice. It was also found that farmers who had high overall access to assets had improved income, food security ($p=.003$), and overall livelihood outcome ($p= .028$) however there was no significant difference between farmers who had either high or low overall assets and wellbeing ($p= .367$), reduced vulnerability ($p= .199$), and sustainable use of natural resources ($p=.127$).

It was found that there was no significant difference $\chi^2 (2, N = 402) = 1.861, p = .394$ between farmers operating within different programme planning approaches and their level of knowledge. There was statistically significant relationship ($\chi^2 (2, N = 402) = 45.439, p = .001$.) between farmers operating within different programme planning approaches and their attitude. There was statistically significant relationship ($\chi^2 (2, N = 402) = 69.489, p = .001$) between farmers operating within different programme planning approaches and their skills. There was statistically significant relationship ($\chi^2 (2, N = 402) = 15.458, p = .001$) between farmers operating within different programme planning approaches and their perception towards agricultural extension delivery. There was statistically significant relationship $\chi^2 (2, N = 402) = 25.793, p = .001$ between farmers operating within different programme planning approaches and extension packages they practice. There was statistically significant relationship ($\chi^2 (2, N = 402) = 13.989, p < .001$) between farmers operating within different programme planning approaches and extension methods used by AEA's.

There was no significant $\chi^2 (2, N = 402) = 5.293, p > .05$ between the three levels of planning conditions (Low, Medium and High) on natural capital available to farmers. There was significant $\chi^2 (2, N = 402) = 14.348, p < .05$ between the three levels of planning conditions on financial capital available to farmers. Farmers operating within high OLM had better access to financial capital than those found in medium OLM groups however those in the medium OLM group also had better access to financial capital than those in the low OLM group. There was significant $\chi^2 (2, N = 402) = 6.468, p < .05$ between the three levels of planning conditions (Low Medium and High) on physical capital available to farmers. While there was no significant difference ($U= 6117.500, z=-1.244, p>.05$) between High and Medium groups, farmers operating in the high group had significant ($U=10697.50, z= -2.518, p<.05$) access to physical capital compared to those in the low group. There was no significant $\chi^2 (2, N = 402) = 1.129, p > .05$ differences among the three levels of planning conditions on human capital available to farmers. There was no significant $\chi^2 (2, N = 402) = 1.469, p > .05$ differences among the three levels of planning conditions on social capital available to farmers. There was significant differences $\chi^2 (2, N = 402) = 14.976, p < .001$ among the three levels of planning conditions on overall assets available to farmers.

There was significant differences $\chi^2 (2, N = 402) = 9.060, p < .05$ among the three levels of planning conditions on overall span of training received in technologies by farmers. Mann-Whitney U test were conducted indicated no significant difference ($U=6086.000, z= -1.220, p>.05$) between farmers operating in the high group and those in the medium group as well as between farmers operating in the medium group and those in the low group ($U=7206.500, z= -1.413, p<.05$). There was significant difference ($U= 10078.000, z=-5.177, p < .05$) between farmers in high and low groups.

There was significant differences $\chi^2 (2, N = 402) = 28.663, p < .001$ among the three levels of planning conditions on overall span of technologies practiced by farmers. While Mann-Whitney U test conducted indicated no significant difference ($U=5921.500, z= -1.542, p>.05$) between farmers operating in the high group and those in the medium group, there was significant difference ($U= 8429.500, z=-5.177, p < .001$) between farmers in high and low groups as well as between farmers operating in the medium group and those in the low group ($U=6310.00, z= -3.070, p<.05$).

CHAPTER SEVEN

IMPACT OF OUTCOME APPROACH OF PLANNING ON LIVELIHOOD OUTCOMES OF FARMERS

7.0 Introduction

The nature of resources available to farmers who received extensions service based on different levels of the outcome logic model of programme planning is likely to reflect the level of improvement in their knowledge, attitude, skills and perception towards agricultural extension delivery, as well as extension packages practiced by farmers. This chapter seeks to find out the impact of different levels of the use of the outcome approach of planning in extension delivery on livelihood outcomes achieved by farmers and whether improvement in knowledge, attitude, skills, perceptions towards agricultural extension delivery and extension packages practiced by farmers that was discussed in previous chapter contributed to livelihood outcomes achieved by farmers.

7.1 Livelihood Outcomes achieved by farmers

Livelihood outcomes expected to be achieved by farmers in the study include sustainable natural resources, improved food security, improved income, improved wellbeing and reduced vulnerability are determined.

7.1.1 Sustainable natural resources achieved by farmers

Four indicators listed below were considered under sustainable natural resources.

- fertility of soil improved,
- forest is not degraded,

- continuous increase in crop yields and
- improvement in reproduction and growth in livestock

Farmers were asked to indicate either “yes” or “no” whether they have achieved these indicators as a result of their interaction with the extension agents. Farmers who responded “yes” to 2 or less of the four statements were classified to have low sustainable use of natural resources while those who responded “yes” to 3 to 4 were classified as having high sustainable use of natural resources. Table 7.1 shows that three hundred and thirty-nine (84.3%) of the farmers were found to have high sustainable use of natural resources compared to only sixty-three (15.7%) of the farmers found in the low category.

Table 7.1 Sustainable natural resources achieved

	Frequency	Percent
Low sustainable natural resource (≤ 2 indicators)	63	15.7
High sustainable natural resource (≥ 3 indicators)	339	84.3
Total	402	100.0

Source: Field survey, 2013

7.1.2 Perceived improved food security achieved by farmers

Food security is a function of whether food is available either on-farm or in the market, whether households have access to the food, and whether patterns of food utilization, including intra-household distribution, are such that the nutritional needs of all household members are met. Seven (7) indicators namely;

- duration of the lean period (in months/year) reduced for household,
- quantity of food consumed per day during the lean period increased,
- quality of the diet improved for household,
- share of household budget spent on food items reduced,

- household takes three square meals daily,
- household has all year round stock of food and
- household has diverse food stuffs for consumption during the year

were considered under food security. Farmers were asked to indicate “yes” or “no” whether they achieved these indicators as a result of their interaction with the Agricultural Extension Agents. Farmers who responded “yes” to 3 or less were classified as having low food security while those who responded “yes” to 4 or more of the issues were classified as having high food security. Three hundred and thirty-nine (84.3%) of the farmers were found to have achieved high food security compared to sixty-three (15.7%) who were found to have achieved low food security as shown in Table 7.2

Table 7.2 Food security achieved by farmers

	Frequency	Percent
Low (≤ 3 indicators)	63	15.7
High (≥ 4 -indicators)	339	84.3
Total	402	100.0

Source: Field survey, 2013

7.1.3 Improved income achieved by farmers

The indicators considered under improved income were;

- annual household income improved, acquired more household assets,
- household debt levels reduced and
- household savings levels improved were

Farmers were asked to indicate “yes” or “no” whether they achieved these issues as a result of their interaction with the Agricultural Extension Agents. Farmers who responded “yes” to 2 or less were classified to have achieved low income while those who responded “yes” to 3 or more were also classified to have high income. Table 7.3 shows that majority (76.9%) of the

farmers were found to have high improvement in their incomes while ninety-three (23.1%) of them were found in the low income category.

Table 7.3 Improved income achieved by farmers

	Frequency	Percent
Low (≤ 2 indicators)	93	23.1
High (≥ 3 indicators)	309	76.9
Total	402	100.0

Source: Field survey, 2013

7.1.4 Wellbeing of farmers

The indicators considered under wellbeing are

- Self-esteem,
- political enfranchisement,
- maintenance of cultural heritage,
- monetary Income/Consumption,
- non monetary income,
- nutrition and food security,
- health of family improved, pay all cost concerning education of children,
- control and security and
- enhanced identity in the community

Farmers who responded “yes” to 4 or less of the issues were classified as having low wellbeing while those who responded “yes” to 5 or more of the issues were classified as having high wellbeing. Table 7.4 shows that majority (89.3%) of the farmers interviewed were found to have high wellbeing compared to forty-three (10.7%) of them who were found to have low wellbeing.

Table 7.4 Wellbeing achieved

	Frequency	Percent
Low (≤ 4 indicators)	43	10.7
High (≥ 5 indicators)	359	89.3
Total	402	100.0

Source: Field survey, 2013

7.1.5 Reduced vulnerability of farmers

Issues considered under reduced vulnerability include

- reduction in chemical poisoning,
- Reduction in flooding/destruction by wind of farm,
- reduction in conflict among farmers,
- reduction in crop/livestock diseases,
- stability of prices of farm produce,
- reduction in sickness among household members,
- employment opportunities for household members and
- stable production over the years

were the indicators considered under reduced vulnerability. Farmers who responded yes to 4 or less of the issues were classified to have achieved low reduced vulnerability while those who responded yes to 5 or more of the issues were classified to have high reduced vulnerability. Table 7.5 shows that three hundred and twenty-eight (81.6%) of the farmers were found in the high reduced vulnerability category compared to seventy-four (18.4%) of them who were found in the low category.

Table 7.5 Reduced vulnerability achieved

	Frequency	Percent
Low (≤ 4 indicators)	74	18.4
High (≥ 5 indicators)	328	81.6
Total	402	100.0

Source: Field survey, 2013

7.1.6 Overall livelihood outcome achieved by farmers

The overall livelihood outcome achieved by farmers as result of their interaction with agricultural extension agents were determined in the area of sustainable natural resources,

- food security,
- improved income
- improved wellbeing and
- reduced vulnerability.

Farmers who achieved high in more than four (≥ 4) of the above outcomes as shown in Tables 7.1 to 7.5 were classified as having achieved high overall livelihood outcome. Farmers who achieved high in 2-3 of the outcomes are classified as having medium overall livelihood outcome, while farmers who achieved high in only one (≤ 1) of the outcomes were classified to have achieved low overall livelihood outcome. Table 7.6 shows that three hundred and fifteen (78.4%) of the farmers were found to have achieved overall high livelihood outcomes while fifty-six (13.9%) of them were found in the medium category. There was thirty-one (7.7%) of the farmers who were found to be in the low livelihood outcome category.

Table 7.6 Livelihood outcome achieved by farmers

	Frequency	Percent
High (high in 4-5 outcomes)	315	78.4
Medium (high in 2-3 outcomes)	56	13.9
Low (high in 1 outcome)	31	7.7
Total	402	100.0

Source: Field survey, 2013

7.2 *Relationship between level of OLM and livelihood outcomes of farmers*

This is to find out whether the extent of use of OLM approach of planning programmes delivered by extension services to farmers has effect on their livelihood outcomes. The livelihood outcomes expected to be achieved by farmers are sustainable use of natural resources, food security, improved income, improved wellbeing and reduced vulnerability.

7.2.1 **Level of OLM and sustainable use of natural resources by farmers**

A Kruskal-Wallis test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on sustainable use of natural resources achieved by farmers. The test as shown in Table 7.7 indicated there was significant difference between level of OLM and sustainable use of natural resources ($\chi^2(2, N = 402) = 16.241, p < .001$). Therefore Mann-Whitney U tests were conducted as a follow up to evaluate pairwise differences among the three groups. The results of these tests indicated a statistically significant difference ($U=10058.500, z= -3.445, p<.05$) between farmers operating in the high group and those in the Low group. There was also statistically significant difference ($U=6712.500, z= -2.869, p<.05$) between farmers operating in the Medium group and those in the Low group. There was however no statistically significant ($U=6484.500, z= -1.00, p>.05$)

difference between farmers in High and Medium groups as far as sustainable use of natural resources was concerned.

Table 7.7 Kruskal-Wallis test for comparison between levels of OLM and sustainable natural resources

	Level of OLM used	N	Mean Rank	Test Statistics
Sustainable natural resources	High	140	214.34	$\chi^2=16.241$ df=2
	Medium	93	213.55	
	Low	169	184.24	p<.001
	Total	402		

Source: Field survey, 2013

7.2.2 Levels of OLM and food security achieved by farmers

A Kruskal-Wallis test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on food security achieved by farmers. The test as shown in Table 7.8 was statistically significant ($\chi^2 (2, N = 402) = 18.650, p = .001$) between the levels of OLM and food security. Mann-Whitney U Test was conducted as follow-up tests to evaluate pairwise differences among the three groups. The results of these tests indicated statistically significant difference ($U=5832.000, z= -2.605, p<.05$) between farmers operating in the high group and those in the medium group. There was also statistically significant difference ($U=9706.000, z= -4.330, p<.05$) between farmers operating in the high group and those in the low group. There was however no statistically significant difference ($U=7266.000, z= -1.431, p>.05$) between farmers in medium and low groups.

Table 7.8 Kruskal-Wallis test for comparison between levels of OLM and food security achieved by farmers

	Level of OLM	N	Mean Rank	Test Statistics
Food security achieved	High	140	221.51	$\chi^2=18.650$ df=2
	Medium	93	200.58	
	Low	169	185.43	p=.001
	Total	402		

Source: Field survey, 2013

7.2.3 Levels of OLM and income achieved by farmers

A Kruskal-Wallis test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on income achieved by farmers. The test in Table 7.9 was statistically significant $\chi^2 (2, N = 402) = 34.371, p < .001$. Mann-Whitney U was used as follow-up tests to evaluate pairwise differences among the three groups. The results of these tests indicated statistically significant (U=5038.500.500, z= -4.665, p<.05) difference between farmers operating in the high group and those in the medium group. There was also statistically significant difference (U=8600.500, z= -5.819, p<.05) between farmers operating in the high group and those in the low group. There was however no statistically significant difference (U=7489.500, z= -.778, p>.05) between farmers in medium and low groups.

Table 7.9 Kruskal-Wallis test for comparison between levels of OLM and income achieved by farmers

	Level of OLM	N	Mean Rank	Test Statistics
Income achieved	High	140	235.08	$\chi^2=34.371$
	Medium	93	189.65	df=2
	Low	169	180.21	p<.001
	Total	402		

Source: Field survey, 2013

7.2.4 Levels of OLM and wellbeing achieved by farmers

A Kruskal-Wallis test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High use of OLM) on wellbeing achieved by farmers. The test in Table 7.10 was significant $\chi^2 (2, N = 402) = 15.278, p < .001$. Follow-up tests using Mann-Whitney U test were conducted to evaluate pairwise differences among the three groups. The results of these tests indicated no statistically significant difference (U=6415.500, z= -.472, p>.05) between farmers operating in the high group and those in the medium group.

There was also significant difference ($U=10321.500$, $z= -3.431$, $p<.05$) between farmers operating in the high group and those in the low group. There was however no significant difference ($U=6970.500$, $z= -2.537$, $p<.05$) between farmers in medium and low groups.

Table 7.10 Kruskal-Wallis H test for comparison between levels of OLM and wellbeing achieved by farmers

	Level of OLM	N	Mean Rank	Test Statistics
Wellbeing achieved	HOLM used	140	212.95	$\chi^2=15.278$ df=2 p<.001
	MOLM used	93	210.03	
	LOLM used	169	187.32	
	Total	402		

Source: Field survey, 2013

7.2.5 Levels of OLM and reduced vulnerability achieved by farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High use of OLM) on reduced vulnerability achieved by farmers. Table 7.11 shows that the test was significant $\chi^2(2, N = 402) = 33.306$, $p < .001$. Mann-Whitney U test were used as follow-up tests to evaluate pairwise differences among the three groups. The results of these tests indicated there was no statistically significant difference ($U=6205.000$, $z= -1.220$, $p>.05$) between farmers operating in the high group and those in the medium group. There was also statistically significant difference ($U=8965.000$, $z= -5.254$, $p<.05$) between farmers operating in the high group and those in the low group. There was however statistically significant difference ($U=6323.500$, $z= -3.514$, $p<.05$) between farmers in medium and low groups.

Table 7.11 Kruskal-Wallis H test for comparison between levels of OLM and reduced vulnerability of farmers

	Levels of OLM	N	Mean Rank	Test of Statistics
Reduced Vulnerability achieved	High	140	256.95	$\chi^2=33.306$ df=2 p<.001
	Medium	93	187.30	
	Low	169	163.38	
	Total	402		

Source: Field survey, 2013

7.2.6 Levels of OLM and overall livelihood outcome achieved by farmers

A Kruskal-Wallis H test was conducted to evaluate differences among the three levels of planning conditions (Low, Medium and High) on overall livelihood outcome achieved by farmers. Table 7.12 shows that the test was statistically significant $\chi^2(2, N = 402) = 54.377$, $p < .001$. Mann-Whitney U Test was used as follow-up tests to evaluate pairwise differences among the three groups. The results of these tests indicated statistically significant difference ($U=4015$, $z = -5.04$, $p < .05$) between farmers operating in the high group and those in the medium group. There was also statistically significant difference ($U=6372$, $z = -7.06$, $p < .05$) between farmers operating in the high group and those in the low group. There was however no statistically significant difference ($U=6894.5$, $z = -1.65$, $p > .05$) between farmers in medium and low groups.

Table 7.12 Kruskal-Wallis H test for comparison between levels of OLM and livelihood outcomes of farmers

	Levels of OLM	N	Mean Rank	Test statistics
Overall livelihood outcomes achieved	High	140	258.30	$\chi^2 = 54.377$ df=2 $p < .001$
	Medium	93	185.04	
	Low	169	163.50	
	Total	402		

Source: Field survey, 2013

7.3 Personal characteristics of farmers and overall livelihood outcome achieved

This is to find out how certain personal and socio-economic characteristics influence the overall livelihood outcome achieved by farmers. The personal and socio-economic characteristics considered include gender, marital status, age, education, household labour available, implement used, total farmland available to farmers, total farmland owned, total

farmland hired, number of years farmers have received training, farming experience, mode of storage and consultation of farmers on their needs.

7.3.1 Gender of farmers and overall livelihood outcome achieved

Gender of farmers did not significantly influence their overall livelihood outcome ($p=.634$). Mann-Whitney U test results shown in Table 7.13 indicate that there was no difference between male and female farmers as far as achieving overall livelihood outcome. It suggests that both male and female farmers can be encouraged to improve upon their livelihood outcomes.

Table 7.13 Mann-Whitney U test of gender of farmers and overall livelihood outcome achieved

	Gender of farmers	N	Mean Rank	Sum of Ranks	Test statistics
Overall livelihood outcomes	Male	303	199.94	60582.50	Z=-.476
	Female	99	206.27	20420.50	U=14526.5
	Total	402			p=.635

Source: Field survey, 2013

7.3.2 Age of farmers and overall livelihood outcome achieved

The Kruskal-Wallis H test results in Table 7.14 indicated no relationship between age of farmers and overall livelihood outcome achieved. It shows that there is no significant difference between the three age groups ($\chi^2 = 2.713$, $p = .258$). Thus there is no difference in overall livelihood outcome achieved between relatively young (19-35yrs), middle age (36-50yrs) and old age (51-89yrs) farmers.

Table 7.14 Kruskal- Wallis H test for comparison of median score of age of farmers and overall livelihood outcome achieved

	Age of farmers (yrs)	N	Mean Rank	Test statistics
Overall of livelihood outcome achieved	Relatively Young	49	198.50	$\chi^2 = 2.713$ df=2 p=.258
	Middle Age	198	210.79	
	Old Age	155	190.59	
	Total	402		

Source: Field survey, 2013

7.3.3 Marital status of farmers and overall livelihood outcome achieved

Mann-Whitney U test results indicated in Table 7.15 show no relationship between marital status of farmers and overall livelihood outcome achieved. It shows that there is no statistically significant difference between the two marital groups (U=8792, Z= 1.624, p=.104). This suggests that there is no difference between overall livelihood outcome achieved between married and single (divorced, widowed, separated) farmers.

Table 7.15 Mann-Whitney U test of marital status of farmers and overall livelihood outcome achieved

	Marital Status	N	Mean Rank	Sum of Ranks	Test statistics
Overall livelihood outcome achieved	Married	343	205.37	70441.00	U=8792 Z= 1.624 P=.104
	Single/divorced/ widowed/ Separated	59	179.02	10562.00	
	Total	402			

Source: Field survey, 2013

7.3.4 Educational level of farmers and overall livelihood outcome achieved by farmers

Level of education of farmers did not have relationship with overall livelihood outcome achieved by farmers. Mann-Whitney U test results in Table 7.16 shows there is no statistically significant difference (U=11299, z= -.369, p= .71) between low and high educated farmers.

Table 7.16 Mann-Whitney U test on educational level of farmers and overall livelihood outcome achieved

	Education level	N	Mean Rank	Sum of Ranks	Test of sig
Overall livelihood outcome achieved	Low education	332	200.53	66577.00	U=11299
	High education	70	206.09	14426.00	z= -.369
	Total	402			p= .714

Source: Field survey, 2013. Note: Nil-no education, mslc-middle school leaving certificate, jhs-junior high school, shss-senior high secondary school

7.3.5 Household labour available and overall livelihood outcome achieved by farmers

Mann-Whitney U test results shown in Table 7.17 indicate that there is statistically significant difference ($p=.028$) between farmers who have access to ≤ 5 or ≥ 6 household labour for their farming activities and overall livelihood outcome achieved. An inspection of the mean rank shows that farmers who had ≥ 6 household labour had better overall livelihood outcome. The result suggests that livelihood outcome achieved by farmers is influenced by the number of household labour available to them.

Table 7.17 Mann-Whitney U test on household labour available to farmers and overall livelihood outcome achieved

	Household labour (number of persons)	N	Mean Rank	Sum of Ranks	Test of Stat
Overall livelihood outcome achieved	≤ 5	325	195.35	63489.00	U=10514
	≥ 6	77	227.45	17514.00	Z= -2.2
	Total	402			P=.028

Source: Field survey, 2013

7.3.6 Total farmlands available and overall livelihood outcome achieved by farmers

Total farmland available to farmers did not have relationship with overall livelihood outcome achieved by farmers. Kruskal-Wallis H test results shown in Table 7.18 indicate there is no statistically significant difference ($\chi^2 = 4.021$, $df=2$, $p= .134$) between farmers who have ≤ 2 , 2.2-8 and 8.4-100 hectares of land available for farming and overall livelihood outcome they

achieved. This result suggests that overall livelihood outcome achieved by farmers is not dependent on the size of land available to farmers.

Table 7.18 Kruskal- Wallis H test of total farmland available to farmers and overall livelihood outcome achieved

	Total farmland available (ha)	N	Mean Rank	Test statistics
Overall livelihood outcomes achieved	≤2	124	199.58	X ² =4.021 df=2 p=.134
	2.2 – 8	198	193.61	
	≥8.4	80	224.01	
	Total	402		

Source: Field survey, 2013

7.3.7 Total farmland owned by farmers and overall livelihood outcome achieved

Kruskal-Wallis H test results in Table 7.19 show that there is statistically significant difference ($\chi^2=8.918$, df=2, p= .012) between size of farmlands owned by farmers and overall livelihood outcome they achieved. Thus there is a difference in livelihood outcome achieved between farmers who owned ≤ 2, 2.2-8 and ≥8.4hectares of land. An inspection of the mean ranks of the groups suggest that the ≥8.4hectares group had the highest overall livelihood outcome and those with 2.2-8.0 hectares have the least overall livelihood outcome.

Table 7.19 Kruskal-Wallis H test of total farmland owned by farmers and overall livelihood outcome achieved

	Total farmland owned (ha)	N	Mean Rank	Test statistics
Overall livelihood outcomes achieved	≤ 2	202	202.00	X ² =8.918 df=2 p=.012
	2.2 – 8	151	187.15	
	≥8.4	49	243.66	
	Total	402		

Source: Field survey, 2013

7.3.8 Total farmlands hired and overall livelihood outcome achieved

Total farmland hired by farmers did not have relationship with overall livelihood outcome achieved by farmers. Kruskal-Wallis H test results shown in Table 7.20 indicate there is no statistically significant difference ($\chi^2=1.301$, df=2, p= .522) between farmers who hire ≤ 2,

2.2-8 and 8.4-100 hectares of land available for farming and overall livelihood outcome they achieved. This result suggests that overall livelihood outcome achieved by farmers is not influenced by the size of land hired by farmers for their farming activities.

Table 7.20 Kruskal-Wallis H test for total farmland hired and overall livelihood outcome achieved

	Total land hired ha)	N	Mean Rank	Test stat
Overall	≤ 2	296	200.74	X ² =1.301 df=2 p=.522
livelihood outcomes achieved	2.2 – 8	86	197.60	
	≥8.4	20	229.58	
	Total	402		

Source: Field survey, 2013

7.3.9 Farmer training period and overall livelihood outcome achieved

Number of years farmers have received training did not have relationship with overall livelihood outcome achieved by farmers. Kruskal-Wallis H test results shown in Table 7.21 indicate there is no statistically significant difference ($\chi^2 = .159$, df=2, p= .924) between farmers who have received ≤ 5, 6-10 and ≥11 years of training and overall livelihood outcome they achieve. This result suggests that overall livelihood outcome achieved by farmers is not dependent on the number of years they have received training.

Table 7.21 Kruskal- Wallis test for number of years of training and overall livelihood outcome achieved

	Years receive training	N	Mean Rank	Test statistics
Overall	≤5	176	203.23	X ² =.159 df=2 p=.924
livelihood outcome achieved	6-10	113	197.88	
	≥11	113	202.42	
	Total	402		

Source: Field survey, 2013

7.3.10 Relationship between farming experience and livelihood outcome achieved

Kruskal-Wallis H test results in Table 7.22 show that there is no statistically significant difference ($\chi^2 = .056$, df=2, p= .973) between farming experience of farmers and overall

livelihood outcome they achieve. Thus there is no difference in livelihood outcome achieved between farmers who have ≤ 10 , 11-20, and 21-60 years of experience in farming.

Table 7.22 Kruskal-Wallis Test for farming experience and overall livelihood outcome achieved

	Farming experience (yrs)	N	Mean Rank	Test Statistics
Overall livelihood outcome achieved	1-10	70	198.64	$X^2=.056$ df=2 p=.973
	11-20	136	202.56	
	21-60	196	201.79	
	Total	402		

Source: Field survey, 2013

7.3.11 Purpose of farming and livelihood outcome achieved by farmers

Kruskal-Wallis H test results in Table 7.23 show that there is statistically significant difference ($\chi^2 = 17.604$, df=2, $p < .05$) between purpose of farming and overall livelihood outcome achieved by farmers. Thus there is a difference in livelihood outcome achieved between farmers who farm either for subsistence, commercial and both subsistence and commercial purpose. An inspection of the mean ranks of the groups suggest that farmers who farmed for both subsistence and commercial purposes had the highest overall livelihood outcome while those who do subsistence farming have the least overall livelihood outcome.

Table 7.23 Kruskal-Wallis H test to compare purpose of farming and livelihood outcome

	Purpose of farming	N	Mean Rank	Test Statistics
Overall livelihood outcome achieved	Subsistence	107	161.50	$X^2=17.604$ df=2 p<.05
	Commercial	54	214.75	
	Both	241	216.29	
	Total	402		

Source: Field survey, 2013

7.3.12 Relationship between types of implements used and livelihood outcome

Mann-Whitney U test results shown in Table 7.24 indicate that there is statistically significant difference ($p=.044$) between farmers who use different implements for their farming activities and overall livelihood outcome achieved. The result suggests that livelihood outcome

achieved by farmers is influenced by the type of implement they use. Farmers who use other implements (tractors, water pumps, bullock plough) in addition to cutlasses, hoes and knapsacks had better overall livelihood outcome.

Table 7.24 Mann-Whitney U Test of implement used and livelihood outcome

	Implement used	N	Mean Rank	Sum of Ranks	Test statistics
Overall livelihood outcome achieved	Basic tools (cutlass/hoe/knapsack)	241	192.05	46284.00	U=17123 z= -2.013 p= .044
	Basic/other implements	161	215.65	34719.00	
	Total	402			

Source: Field survey, 2013

7.3.13 Relationship between mode of storage of farm produce and overall livelihood outcome achieved by farmers

Table 7.25 shows that there is statistically significant difference (U=14166.5, z= -5.226, p<.05) between farmers who use different mode of storage and overall livelihood outcome they achieved. Farmers who treated and stored farm produce in narrow cribs achieved better overall livelihood outcome compared to those who store their produce in local barn/heap on floors without treatment.

Table 7.25 Mann-Whitney U Test to compare mode of storage and livelihood outcome achieved by farmers

	Mode of storage of farm produce	N	Mean Rank	Sum of Ranks	Test Statistics
Overall livelihood outcome achieved	Kitchen Barn/Heap on floor/Local barn	203	171.79	34872.50	U=14166.5 z= -5.226 p<.05
	Treat with chemical/Crib	199	231.81	46130.50	
	Total	402			

Source: Field survey, 2013

7.3.14 Relationship between level of needs identification and overall livelihood outcome achieved

A Mann-Whitney U Test was used to compare extent of consulting farmers on agricultural extension needs and improvement in their livelihood outcome. The results of the test show that there is statistically significant difference ($U=8183.5$ $z= -3.925$ $p<.05$) between the two groups (low and high) and overall livelihood outcome achieved (Table 7.26). Farmers who were consulted in more than five agricultural need areas before extension packages were delivered to them achieved high overall livelihood outcome compared with those consulted in less than five of the agricultural need areas.

Table 7.26 Mann-Whitney U test of needs identification and overall livelihood outcome achieved by farmers

	Consult on needs	N	Mean Rank	Sum of Ranks	Test stat
Overall livelihood outcome achieved	Low (0-4 packages)	70	152.41	10668.50	U=8183.5 z=-3.925 p<.05
	High (5-9 packages)	332	211.85	70334.50	
	Total	402			

Source: Field survey, 2013

7.3.15 Relationship between frequency of contact and livelihood outcome achieved

Mann-Whitney U test results shown in Table 7.27 indicate that there is no statistically significant difference ($p>.05$) between frequency of visit by AEAs to farmers and overall livelihood outcome achieved. The result suggests that livelihood outcome achieved by farmers is not influenced by whether farmers are visited infrequently or frequently by the AEAs. This result agrees with a study conducted by Kachale and Maphila (no date) which showed that frequency of extension contact did not lead to greater livelihood outcomes. This result disagrees with Ofuoku (2012) who indicated that frequency of extension contact with

farmers and availability to farmers are very important as they promote better understanding of agricultural technology messages by farmers and further enhances adoption of agricultural technologies. The result of this study disagrees with work done by Ofuoku *et al.* (2008) who argued that the more extension agents visited farmers and educate them, the better they understand and adopt technologies.

Table 7.27 Mann-Whitney test of frequency of contact and livelihood outcome

	Frequency of contact	N	Mean Rank	Sum of Ranks	Test of Sig
Overall livelihood outcomes	Infrequent	338	202.53	68456.00	U=10467 z= -.413 p=.679
	Frequent	64	196.05	12547.00	
	Total	402			

Source: Field survey, 2013

7.4 Summary

Majority of the farmers were found to have achieved high sustainable use of natural resources (84.3%), food security (84.3%), income (76.9%), wellbeing (89.3%) and reduced vulnerability (81.6%) which resulted in majority of the farmers (78.4%) achieving high overall livelihood outcome compared to 13.9% and 7.7% who achieved medium and low overall livelihood outcome respectively. There was statistically significant relationship between different level of use of the outcome approach of planning of programmes and sustainable natural resources ($\chi^2 = 17.588$, $df=2$, $p<.05$), food security ($\chi^2 = 11.299$, $df=2$, $p<.05$), income ($\chi^2 = 57.269$, $df=2$, $p<.05$), wellbeing ($\chi^2 = 41.337$, $df=2$, $p<.05$), reduced vulnerability ($\chi^2 = 57.293$, $df=2$, $p<.05$) and overall livelihood outcome ($\chi^2 = 54.377$, $df=2$, $p<.05$). Farmers found in areas where programme delivered to them use high outcome model approach of planning have higher sustainable natural resources, food security, income, wellbeing, reduced vulnerability compared to those found in areas where programme delivered to them use medium or low outcome approach of planning respectively. There was

however no difference in the livelihood outcomes achieved between farmers found in areas where medium and low level of planning approaches were respectively used.

It was also found that there was no significant difference between gender, age, marital status, educational level, farmlands available to farmers, total farmland hired, number of years farmers received training from extension agents, frequency of contact by extension agents, farming experience and overall livelihood outcome achieved by farmers. There was however significant difference between household labour available to farmers, total farmland owned, purpose of farming, types of implement used, mode of storage of farm produce, consultation of farmers on their agricultural needs, extension methods used and overall livelihood outcome achieved.

CHAPTER EIGHT

SUMMARY OF DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

8.0 *Summary of discussion*

Various programmes were delivered by the agricultural extension agents of the Ministry of Food and Agriculture (MoFA) to get farmers to improve upon their farming performance and livelihood outcomes. This was carried out by training farmers in extension packages such as crops, livestock, fisheries, nutrition, marketing and agribusiness. There has however not been much improvement in the livelihood outcome of farmers and this raises concern as to whether the planning approaches of programmes delivered to farmers could have influence on their livelihood outcomes. If it is so then which programme planning approach is likely to improve the knowledge, attitude, skill, perception, practices and livelihood outcomes of farmers and thereby reduce the poverty situation of farmers?

The assumptions for this research is that if planning approach focuses on the early aspects of programme planning and attempts to connect the resources and/or activities with the desired results in a workable programme, AEA's are likely to work collaboratively with farmers to implement programmes that will result in improvement in their performance and livelihood outcomes.

The results obtained from the survey regarding linking programme planning approaches to livelihood outcomes of farmers is discussed to find out whether they support the hypothesis which states that:

- The extent of use of the Outcome Logic Model of Programme planning approach by agricultural extension service providers has no effect on the livelihood outcomes of farmers.
- The choice of extension methods under different planning levels of OLM has no effect on the livelihood outcomes of farmers.
- Extent of use of the OLM approach of programme planning by agricultural extension services has no effect on farmers' perceptions towards agricultural extension delivery.
- The types of livelihood assets available to farmers have no effect on their livelihood outcomes.

The study area represents districts in the ten regions of the country i.e. West Mamprusi District- Northern Region, Talensi Nabdam- District-Upper East Region, Mampong Municipal-Ashanti Region, Suhum Municipal-Eastern Region, Twifo Ati-Morkwaa-Central Region, Kpando Municipal-Volta Region, Tano North District-Brong Ahafo Region and Shama District-Western Region. Apart from the two districts representing the three northern regions of the country which have uni-modal rainy season, the remaining eight districts have bi-modal rainy season with land tenure system comprising of stool lands, leasehold and share cropping. There is also the possibility of outright sale of land to large scale commercial farmers.

The major crops grown are maize, cassava, plantain,vegetables (tomatoes, garden eggs, pepper, okro, onion), cocoyam, yam, cocoa, oil palm and citrus whilst poultry, sheep and goats are the major animals reared in the southern districts. With regard to the northern districts, the predominant crops grown are maize, sorghum, millet rice, vegetable (tomatoes,

pepper, okro, garden eggs), tubers (sweet potatoes, frafra potatoes and yams) while cattle, sheep, goats and guinea fowls are the animals reared.

8.1 Outcome Logic Model approach of planning has no effect on the livelihood outcomes of farmers.

The result of the study shows that there is no statistically significant relationship ($\chi^2=1.861$, $df=2$, $p= 0.394$) between farmers operating within different OLM planning levels and level of knowledge due to interaction with AEAs. Several reasons could be assigned to this observation. Among them, it could be that farmers might not be attending meetings called by extension officers where several issues on agricultural technologies are discussed. There was however statistical significant difference in the level of attitude ($\chi^2=45.43$, $df=2$, $p=0.001$), skills ($\chi^2=69.489$, $df=2$, $p=0.001$), perception of farmers towards agricultural extension delivery ($\chi^2= 15.496$, $df=2$, $p<0.05$), extension packages they practice ($\chi^2=25.857$, $df=2$, $p<0.05$) and the extent of use of the outcome logic model approach of planning of agricultural programmes.

With respect to the effect of the extent of use of the outcome logic model of planning on livelihood outcome achieved by farmers, the results from Chapter 6 showed that there was statistically significant relationship between different level of use of the outcome approach of planning of programmes and sustainable natural resources ($\chi^2 =17.588$, $df=2$, $p<.05$), food security ($\chi^2 =11.299$, $df=2$, $p<.05$), income ($\chi^2 =57.269$, $df=2$, $p<.05$), wellbeing ($\chi^2 =41.337$, $df=2$, $p<.05$), reduced vulnerability ($\chi^2 =57.293$, $df=2$, $p<.05$) and overall livelihood outcome ($\chi^2 =54.377$, $df=2$, $p<.05$). Farmers found in areas where programme delivered to them use high outcome logic model of planning have higher sustainable natural resources, food

security, income, wellbeing and reduced vulnerability compared to those found in areas where programme delivered to them use medium or low outcome approach of planning respectively. The reasons that could be used to explain these findings are that farmers who operated in areas where there was high extent of use of the outcome logic model approach for planning agricultural programmes had significant improvement in their attitude, skills, perception towards agricultural extension delivery and practiced more extension packages. In addition to the above, farmers who were in the high category also had high access to financial and physical assets for their farming activities. There was however no difference in the livelihood outcomes achieved between farmers found in areas where medium and low extent of use of the outcome approach of planning were respectively used.

8.2 The number of extension methods used by AEAs has no effect on the livelihood outcomes of farmers

The study revealed that farmers reached with extension packages by Extension Agents who used combinations of different extension methods had improved knowledge, attitude, perception towards agricultural extension delivery and practised more extension packages compared to farmers reached through two or less extension methods. This was as result of statistical significant relationship ($\chi^2=14.024$, $df=2$, $p<0.05$) found between farmers operating within different programme planning approaches and extension methods used by AEAs where majority (70.7%) of farmers operating in high OLM were found to be reached by AEAs who use three or more extension methods compared to 48.4% and 53.8% of farmers respectively in the medium OLM and low OLM. This result suggests that agricultural programmes which are planned based on the outcome logic model of planning use more extension methods to deliver extension packages to farmers. Farmers who were found in areas with high extent of use of

the outcome logic model of planning were also found to have improved knowledge, attitude, skills, high perception towards agricultural extension delivery and practiced more of the extension packages delivered to them compared to those found in the medium and low extent of use of the outcome logic model of planning. By this results the hypothesis that extension methods used by extension staff to deliver extension packages have no effect on the on knowledge, attitude, skills, perception of farmers towards agricultural extension delivery, extension packages practiced by farmers and livelihood outcomes achieved by farmers should be rejected.

8.3 Outcome Logic Model approach of programme planning has no effect on farmers' perceptions towards agricultural extension delivery.

The result of the study showed significant differences $\chi^2 (2, N = 402) = 15.458, p < .001$ between extent of use of the Outcome Logic Model of Programme planning (LOLM, MOLM and HOLM) on perception of farmers towards agricultural extension delivery. The study further showed a significant difference (U=9502, z= -3.606, p < .001) between farmers operating in the HOLM areas and those in MOLM and LOLM areas. Farmers operating in HOLM areas had better perception towards agricultural extension delivery compared to those in the LOLM and MOLM group. There was however no significant difference (U=7792, z= -149, p>.05) between farmers operating in the MOLM group and those in the LOLM areas. The hypothesis that extent of use of the outcome logic model has no effect on farmers perception towards agricultural extension delivery should be rejected.

8.4 *Livelihood assets available to farmers have no impact on their livelihood outcomes.*

The results of the study showed that farmers who had high overall assets had improved knowledge, attitude and skills however there was no significant difference between farmers who had either high or low overall assets and their perception towards agricultural extension delivery and extension packages they practice. It was also found that farmers who had high overall access to assets had improved income, food security ($p=.003$), and overall livelihood outcome ($p = .028$). There was however no significant difference between farmers who had either high or low overall assets and wellbeing ($p= .367$), reduced vulnerability ($p= .199$), and sustainable use of natural resources ($p=.127$). The result suggests that level of assets available to farmers play a major role in their farming performance and overall livelihood outcome especially in the areas of income and food security. The hypothesis that farmers' accesses to resources have no effect on their livelihood outcomes should therefore be rejected.

8.5 *Other factors affecting livelihood outcomes achieved by farmers*

It was also found that there was no significant difference between gender, age, marital status, educational level, farmlands available to farmers, total farmland hired, number of years farmers received training from extension agents, frequency of contact by extension agents, farming experience and overall livelihood outcome achieved by farmers. There was however significant difference between household labour available to farmers, total farmland owned, purpose of farming, types of implement used, mode of storage of farm produce, consultation of farmers on their agricultural needs, extension methods used and overall livelihood outcome achieved.

8.6 *Conclusion of Study*

This research on the extent of use of the outcome approach of planning on the performance and livelihood outcomes of farmers was based on the assumption that if planning approach focuses on the early aspects of programme planning and attempts to connect the resources and/or activities with the desired results in a workable programme, it will result in improvement in the performance and livelihood outcomes of farmers.

Several agriculture programmes have been delivered to farmers through the Agricultural Extension Agents (AEAs) aimed at improving the performance and livelihood outcomes of farmers but there has been limited improvement in the lifestyles of farmers. The planning approach of five projects i.e. National Agricultural Extension Project (NAEP), Small holder Credit, Input Supply and Marketing Project (SCIMP), Upper East Region Land Conservation and Smallholder Rehabilitation Project (LACOSREP), Root and Tuber Improvement Programme (RTIP), and Commercial Development of Farmer Based Organisations (CDFO) were determined using their objectives as proxy to describe the extent of use of the outcome approach of planning under this study.

Based on the types of objectives expected to be achieved by each project, three categories “High” (Commercial Development of Farmer Based Organisations (CDFO)), “Medium” (Small holder Credit, Input Supply and Marketing Project (SCIMP), Upper East Region Land Conservation and Smallholder Rehabilitation Project (LACOSREP)) and “Low” (National Agricultural Extension Project (NAEP) and Root and Tuber Improvement Programme (RTIP)) extent of use of the outcome approach of planning were identified. The districts were also categorised into three based on where these projects were implemented which are “High”

– West Mamprusi, Mampong, Kpando; “Medium” – Talensi, Tano North and “Low” – Suhum, Shama and Twifu Ati-Morkwaa.

Based on the extent of use of the outcome logic model approach of planning in the projects delivered to farmers it was found that there was significant differences among the three levels of planning conditions (Low, Medium and High) and overall span of training received in technologies by farmers. There was also significant difference between the three levels of planning conditions (Low, Medium and High) and overall span of extension packages practiced by farmers. This could be explained by the fact that farmers who were found in areas where projects delivered were based on high extent of use of the outcome logic model approach of planning were reached through combinations of extension methods. The resultant effect was that farmers operating within areas with high extent of use of the outcome planning approaches of programmes had high level of attitude, skills and perception towards agricultural extension delivery.

Even though there was no significant difference between the three levels of planning conditions (Low, Medium and High) on natural capital, human capital, social capital available to farmers, there was significant difference between the three levels of planning conditions (Low, Medium and High) and financial capital and physical capital available to farmers. Farmers operating in High levels of using the OLM category had better access to financial and physical capital compared to those in the Low group.

The study showed that certain personal and socio-economic characteristics affected the livelihood outcome of farmers. It is important to consider critically factors like household labour available to farmers, total farmland owned, purpose of farming, types of implement

used, mode of storage of farm produce, consultation of farmers on their agricultural needs and extension methods used to deliver extension packages since they have significant effect on overall livelihood outcome achieved by farmers.

8.7 Recommendation

Based on the purpose and objectives of the study and data analysis, the following recommendations are made.

Policy Recommendation

Agricultural Extension Services continue to deliver programmes to farmers aimed at improving their performance and livelihood outcomes. The result of this study shows that there was statistically significant relationship in sustainable natural resources, food security, income, wellbeing, reduced vulnerability and overall livelihood outcome achieved by farmers within different level of use of the outcome approach of planning of programmes. This was as a result of significant difference in training received in agricultural extension packages and extension packages practiced by farmers operating in the three categories of the extent of use of outcome logic model approach of planning which could be attributed to the high level of attitude, skills and perception towards agricultural extension delivery achieved by farmers found in high extent of use of the outcome logic model approach of planning programme category. Even though there was no significant difference in natural, human and social capitals available to farmers for the three levels of planning conditions, there was significant difference in access to financial and physical capitals available to farmers in the three levels of planning conditions.

It is recommended that the early aspects of planning pro-poor programmes by Agricultural Extension Service providers should be strengthened through the use of the outcome logic model approach as it has the potential of improving the livelihood outcomes of farmers in Ghana. This could be achieved if the following are considered.

- Project Committees should be formed to include all stakeholders who will identify the state the beneficiaries are in and what the project intends to impact.
- Beneficiary farmers should be made to come with their ideas in deciding the way forward and encouraged to take part in joint analysis, planning and deciding what the desired outcome should be.
- Local people should partner development agencies to carry out all projects activities through their involvement at all stages of the process.
- The Department of Agriculture in the various Assemblies should be equipped with the necessary resources to enable them use combination of extension methods to deliver technologies to farmers.
- Government should ensure that all resources needed by farmers to carry out their farming activities are provided especially financial (credit) and physical (access to good roads, electricity, good drinking water, farm equipment) since they have significant effect on their income and food security.
- Ownership of projects by farmers should be built through partnership with Extension Service Providers by scaling up the participation process such that farmers will not

only be informed about the advent of projects but will be supported to initiate own projects with development workers serving as consultants or facilitators.

- The Outcome Logic Model Approach of programming should form the basis of all programmes/projects development by Agricultural Extension providers in the country.

Research Recommendation

The outcome logic model approach of planning focuses on the early aspects of programme planning. It attempts to connect the resources and/or activities with the desired results in a workable programme. This suggests that if all stakeholders are brought on board and made aware of what the outcome of the programme will be and the resources and activities needed to achieve the desired outcome, then agricultural programmes delivered to farmers will bring about improvement in the performance and livelihood outcome of farmers. The result of the study showed that farmers found in areas where programmes delivered to them were based on high extent of use of the outcome approach of planning had improved performance and livelihood outcomes.

It will therefore be important to conduct in-depth research to determine from farmers' point of view the extent to which they have been involved in the early aspect of planning of projects delivered to them and how this collaboration could be improved. Further research should be conducted to determine what other factors could make programmes delivered to farmers' improve their performance and livelihood outcomes.

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APPENDIX 1

SURVEY INTERVIEW QUESTIONNAIRE FOR AGRICULTURAL EXTENSION AGENTS

LINKING PROGRAMME PLANNING APPROACHES TO LIVELIHOOD OUTCOMES OF FARMERS

A CASE STUDY OF AGRICULTURAL EXTENSION SERVICES IN GHANA

DEPARTMENT OF AGRICULTURAL EXTENSION

UNIVERSITY OF GHANA

This survey is being conducted in an attempt to assess the impact of linking programme planning approaches to programme outcomes by studying the agricultural extension services in Ghana. The areas covered are as follows:

- Part A—Personal and Socio-economic characteristics of the Frontline Staff.
- Part B— Principle of Operation of MoFA.
- Part C— Approach used by Extension to deliver technologies.
- Part D— Process of Delivery.
- Part E-- Technologies delivered by Frontline staff (FLS) to farmers.
- Part F-- Marketing Opportunities for farmers to sell farm produce.
- Part G— Opportunities for farmers to utilize farm produce.
- Part H-- Resources required to deliver technologies.

You are assured that any information you provide will be held in confidence.

Thank you for taking time to answer these questions.

J. NKETIA GYENFIE

PART A: PERSONAL CHARACTERISTICS OF FRONTLINE STAFF

0. Questionnaire Number.....
1. Region.....
2. District.....
3. Operational Area.....
4. Name of AEA.....
5. Age (yrs) of staff.....
6. Sex 1. Male [] 2. Female []
7. Marital Status
8. How long have you worked with the Department of Agricultural Extension Services?.....
9. How long have you worked as a frontline staff/DAO/RAO?.....
10. How long have you worked in your operational area/District/Region?.....
11. Highest educational level.....

PART B: PRINCIPLE OF OPERATION OF MoFA

Please indicate how strongly you agree with the following statements by ticking the number that represents your answer using this guide:

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

	STATEMENTS	1	2	3	4	5
12	Needs of farmers should be identified before programmes were introduced to them					
19	Farmers should be made aware of the current situation they were in and which Extension intend to impact					
14	Farmers should know of what it will look like when they achieve the desired situation or outcome.					
15	Farmers should know of the behaviors they needed to change for that outcome to be achieved.					
16	Farmers should know of the resources required to achieve the desired outcome.					

PART C: EXTENSION METHODS USED BY EXTENSION

Indicate by checking [X] either YES or NO the method you used to deliver technology to farmers and show by ticking [√] which of them helped improve the knowledge, skills and attitude of farmers towards agricultural extension packages.

				IF YES, WHAT CHANGE IT MADE TO YOUR FARMERS		
	PROCESS TYPE	YES	NO	KNOWLEDGE	SKILLS	ATTITUDE
17	INDIVIDUAL METHOD					
	1. Farm Visit					
	2. Home Visit					
	3. None above					
18	GROUP METHOD					
	1. Method demonstration					
	2. Result demonstration					

	3. Field tours/trips					
	4. Farmer meetings					
	5. Role Play					
	6. None above					
19	MASS METHODS					
	1. Radio					
	2. Posters					
	3. Fact sheets					
	4. Booklets					
	5. None above					
20	TEACHING AIDS					
	1. Blackboard					
	2. Photograph					
	3. Flip Chart					
	4. Real Object					
	5. None above					

PART D – TECHNOLOGIES DELIVERED TO FARMERS

Indicate by ticking [√] either YES or NO from the table below which of the technologies you have trained your farmers in and whether they are practicing it. Give reasons for not practicing it.

	Crops	TRAINED		PRACTICING	
		YES	NO	YES	NO
21	Ploughing				
22	Harrowing				
23	Hoeing across the slope				
24	Minimum tillage				
25	Mulching				
26	Construction of fire belt				
27	Use of improved varieties				
28	Good nursery practices				
29	Row planting/spacing				
30	No. of plants/hill				
31	Timely weed control				
32	Use of appropriate type of fertilizer/manure				
33	Use of adequate quantity of fertilizer/manure applied at a time				
34	Timely application of fertilizer (moisture availability)				
35	Timely application of fertilizer with regards to physiological growth stage				
36	Appropriate type of pest management or protection product applied to the type of crop				
37	Adequacy of quantity of plant protection products applied at a time				

38	Timely application of pesticides to plant product before harvesting or marketing of the crop.				
39	Timely application of weedicides with regards to physiological stage of crop				
40	Timely harvesting of the crop with regards to physiological growth stage of the crop(use of maturity index)				
41	Timely harvesting of crop with regards to temperature of day.				
42	Land rotation				
43	Crop rotation				
44	Mounding				
45	Germination test for all seeds before planting				
46	Earth bunding				
47	Cover cropping				
48	Gleaning after harvesting				
49	Sorting of farm produce into grades				
50	Packaging in cartons/sacks/ crates of harvested crop				
51	Storing under shed/pre-cooling units /cold van				
52	Timely carting of harvested crops from fields				
53	Use of improved threshing methods				
54	Use of improved drying methods to achieve grain moisture level acceptable for the crop.				
55	Use of chemicals to store maize				
56	Construction of patios for drying				
57	Use of appropriate storage structure(narrow ventilated cribs/mud silos/warehouse)				
58	Disposal of used chemical containers by deep burying				
59	Disposal chemical containers by burning				
60	Farms should be sited at least 50 meters from water bodies				
61	Use of protective wears (Nose mask, Wellington boots, gloves, Overall)				
62	Spraying at appropriate period-Morning or evening with regards to temperature and wind direction				
63	Hand washing with soap after spraying				
64	Avoid eating/smoking/drinking when spraying				
65	Yam multiplication methods				
66	Plantain sucker multiplication methods				
67	Use of disease free planting materials				
68	Irrigating field				
69	Agroforestry practices				
70	Bullock ploughing				

	Livestock	TRAINED		PRACTISING	
		YES	NO	YES	NO
71	Identify symptoms of schedule and zoonotic disease				
72	Traits to look out for during the selection of breeding stock.				
73	Animals to be slaughtered in the abattoir				
74	Proper housing of animals				
75	Proper ventilation				
76	Fodder banks				
76	Avoid overcrowding				
77	Good sanitation in pens of farm animals				
78	Routine vaccination of farm animals				
79	Deworming (drenching, tablets, injection etc.)				
80	Proper watering of animals				
81	Culling of old/spent animals				
82	Dry season feeding of farm animals				
83	Use of improved breeds of animals				

	Poultry	TRAINED		PRACTISING	
		YES	NO	YES	NO
84	Identify symptoms of schedule diseases				
85	Practice routine vaccination and medication				
86	Debeaking				
87	Culling				
88	Deworming -				
90	Brooding				
91	Proper housing of birds				
92	Proper feeding of birds				
93	Avoid overcrowding				
94	Ensure proper ventilation				
95	I -2 Vaccination				

	Fisheries-Aquaculture	TRAINED		PRACTISING	
		YES	NO	YES	NO
96	Site selection				
97	Pond construction				
98	Soil type				
99	Stocking				
100	Feeding				

101	Disease and pest control				
102	Over stocking				
103	Harvesting				
	Fisheries-Marine/freshwater				
104	Pollution of the water resource				
105	Avoiding over exploitation				
106	Using appropriate mesh size for fishing				
107	Formation of Community Based Fisheries Mgt. Committee				

	WIAD Activities	TRAINED		PRACTISING	
		YES	NO	YES	NO
108	Construction of Smokeless stove				
109	Construction of Soak-away pits				
110	Preparation of Soya milk				
111	Preparation of Soya kebab				
112	Preservation of roots and tubers using sawdust				
113	Incorporation of Moringa powder in household diets				
114	Preservation of tomatoes and garden eggs				

	Non Traditional farming	TRAINED		PRACTISING	
		YES	NO	YES	NO
115	Snail farming				
116	Bee keeping				
117	Mushroom Production				
118	Grasscutter Production				

	Farm Management	TRAINED		PRACTISING	
		YES	NO	YES	NO
119	Formation of farmer groups				
120	Planning of farm activities				
121	Keep records of all farm activities				
122	Save with Bank				
123	Group marketing of farm produce				

PART E-- MARKETING OPPORTUNITIES FOR FARM PRODUCE

Please indicate how strongly you agree with the following statements by ticking [√] the number that represents your answer using this guide:

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

						1	2	3	4	5

124	Farmers have been trained on accessing information on product planning					
125	Farmers have been trained on accessing information on current prices.					
126	Farmers have been trained on how to access information on forecast of market trends					
127	Farmers have been provided with information on sales timing					
128	Farmers have been provided with information on improved marketing practices					
129	Farmers are provided with information on group marketing.					
130	Extension service facilitates provision of good roads to market centres					
131	Farmers have been trained to link buyers through the value chain concept					
132	Extension service facilitates improvement of market infrastructure					
133	Extension service facilitates the provision of processing equipment					

PART F-- OPPORTUNITIES FOR UTILIZING FARM PRODUCE

Please indicate how strongly you agree with the following statements by ticking [√] the number that represents your answer using this guide:

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

	Statement	1	2	3	4	5
134	Farmers have been trained on quality and safe use of farm produce					
135	Farmers have been trained to use different methods to preserve their farm produce					
136	Farmers have been trained to process and handle farm produce					
137	Farmers have been trained on how to prepare and eat good food					
138	Farmers have been trained to prepare different dishes from farm produce					
139	Farmers have been trained on how to process farm produce for medicinal purposes					
140	Farmers have been trained on how to combine various farm produce to improve household dietary intake					
141	Farmers have been trained on how to produce different food products from their farm produce to feed my children					

PARTG—RESOURCES RECEIVED TO PERFORM EXTENSION DUTIES

Please indicate how strongly you agree with the following statements by ticking [√] the number that represents your answer using this guide:

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

S/N	STATEMENT	1	2	3	4	5
142	I have been trained in how to organize farm Visit.					
143	I have been trained in how to organize home Visit.					
144	I always had all materials needed to conduct method demonstration with my farmers.					
145	I always had all materials needed to conduct result demonstration to train my farmers.					
146	I was always assisted to send my farmers on Field tours/trips to observe new technologies.					
147	I have been trained in skills of conducting Farmer meetings.					
148	I have been trained in the skill of organising farmers to do Role Play.					
149	I have been trained in how to use Radio to train farmers.					
150	I have been trained in preparation and use of Posters.					
151	I have been trained in the preparation and use of Fact sheets.					
152	I have been trained in the preparation and use of Booklets.					
153	I have access to Blackboard during training of farmers.					
154	I have Photographs to show farmers during training.					
155	I have Flip Charts that I use to train farmers.					
156	I have access to Real Objects which I show to farmers during training.					
157	I have always had a means of transport to carry out my duties.					
158	I have regular funds to undertake my field work.					
159	I always have the necessary inputs needed to carry out demonstration with farmers.					
160	Inputs for farmers are always delivered on time to enable them practice whatever they have learnt.					

APPENDIX 2

SURVEY INTERVIEW QUESTIONNAIRE FOR FARMERS

LINKING PROGRAMME PLANNING APPROACHES TO LIVELIHOOD OUTCOMES OF FARMERS : A CASE STUDY OF AGRICULTURAL EXTENSION SERVICES IN GHANA DEPARTMENT OF AGRICULTURAL EXTENSION UNIVERSITY OF GHANA

This survey is being conducted in an attempt to assess the impact of linking programme planning approaches to programme outcomes by studying the agricultural extension services in Ghana. The areas covered are as follows:

Part A--Personal and Socio-economic Characteristics of Respondents.

Part B—Principle of Operation of MoFA.

Part C—Activities of MoFA.

1. Needs Assessment.
2. Technologies received from Extension Officers.

Part D-- Methods of delivery used.

Part E--Perception of farmers towards agricultural extension delivery.

Part F--Marketing opportunities.

Part G--Utilization of Farm produce.

Part H--Access to assets.

Part I-- Achieving Livelihood Outcomes.

You are assured that any information you provide will be held in confidence.

Thank you for taking time to answer these questions.

J. NKETIA GYENFIE

PART A: PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS OF FARMERS

0. Questionnaire Number.....
1. Region.....
2. District.....
3. Name of farmer.....
4. Sex: 1. M [] 2. F []
5. Marital Status? 1. Single [] 2. Married [] 3. Divorced [] 4. Others []
6. How old are you?.....
7. Educational background?.....
8. How long have you been farming?

9. Purpose of farming?
 1. Subsistence [] 2. Commercial [] 4. Both subsistence and commercial [] 5. Others (specify) [].....
10. Source of labour?
 1. Family [] 2. Hired [] 4. Reciprocal (Nnobia) [] 8. Other (specify) [].....
11. Number of members of household available to provide labour to you?.....
12. What is the size of land you have been farming on for the past two years ?.....
13. What size of the total land available to you is owned by you?.....
14. What size of the total land available to you is hired by you?.....
15. How long have you been receiving training from the Ministry of Food and Agriculture?.....
16. What farm implements do you use for your farming activities?
 1. Cutlasses/ Hoes [] 2. Knapsack [] 4. Tractor/accessories [] 8. Water pumps [] 16. Other (specify) [].....
17. Where do you receive extension services?
 1. MoFA Extension Agents [] 2. NGO Extension staff [] 4. Others (indicate) [].....
18. How do you store your farm produce?
 1. Kitchen barns []
 2. Crib []
 4. Heap on floor in a room []
 8. Treat with chemical []

PART B: PRINCIPLE OF OPERATION BY EXTENSION

Please indicate how strongly you agree with the following statements by ticking [√] the number that represents your answer using the following guide.

		1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree	
	STATEMENTS	1	2	3	4	5	
19	Our needs were identified before programmes were introduced to us.						
20	Extension officer made us aware of the current situation we are in and which they intend to impact.						
21	Extension officer made us aware of what it will look like when we achieve the desired situation or outcome.						

22	Extension officer made us aware of the behaviors we needed to change for that outcome to be achieved.					
23	Extension officer made us aware of the knowledge or skills we needed before our behavior will change.					
24	Extension officer made us aware of the activities needed to be performed to cause the necessary learning					
25	Extension officer made us aware of the resources required to achieve the desired outcome					
26	Extension officer assessed our activities after the programme period to determine whether we achieved the desired situation or outcome expected					

PART C: ACTIVITIES OF MOFA

1. NEEDS ASSESSMENT

Indicate by ticking [√] either YES or NO from the table below the areas you have been consulted by MoFA/Extension Officer to discuss your training needs.

NO	NEED AREA	YES	NO
27	Crops related		
28	Livestock related		
29	Fisheries related		
30	Utilization /Nutrition		
31	Marketing related		
32	Farm Management		
33	Credit Requirement		
34	Inputs needs		
35	Equipment needs		

2 EXTENSION PACKAGES RECEIVED FROM EXTENSION OFFICERS

Indicate by ticking [√] either YES or NO from the table below which of the packages you have received training from your extension officer and whether you are practicing it.

	Crops	TRAINED		PRACTISING	
		YES	NO	YES	NO
36	Ploughing				
37	Harrowing				
38	Hoeing across the slope				
39	Minimum tillage				
40	Mulching				
41	Construction of fire belt				
43	Use of improved varieties				
44	Good nursery practices				
45	Row planting/spacing				
46	No. of plants/hill				
47	Timely weed control				

48	Use of appropriate type of fertilizer/manure				
49	Use of adequate quantity of fertilizer/manure applied at a time				
50	Timely application of fertilizer (moisture availability)				
51	Timely application of fertilize with regards to physiological growth stage				
52	Appropriate type of pest management or protection product applied to the type of crop				
53	Adequacy of quantity of plant protection products applied at a time				
54	Timely application of pesticides to plant product before harvesting or marketing of the crop.				
55	Timely application of weedicides with regards to physiological stage of crop				
56	Timely harvesting of the crop with regards to physiological growth stage of the crop(use of maturity index)				
57	Timely harvesting of crop with regards to temperature of day.				
58	Land rotation				
59	Crop rotation				
60	Mounding				
61	Germination test for all seeds before planting				
62	Earth bunding				
63	Cover cropping				
64	Gleaning after harvesting				
65	Sorting of farm produce into grades				
66	Packaging in cartons/sacks/ crates of harvested crop				
67	Storing under shed/pre-cooling units /cold van				
68	Timely carting of harvested crops from fields				
69	Use of improved threshing methods				
70	Use of improved drying methods to achieve grain moisture level acceptable for the crop.				
71	Use of chemicals to store maize				
72	Construction of patios for drying				
73	Use of appropriate storage structure(narrow ventilated cribs/mud silos/warehouse)				
74	Disposal of used chemical containers by deep burying				
75	Disposal of chemical containers by burning				
76	Farms should be sited at least 50 meters from water bodies				
77	Use of protective wears (Nose mask, Wellington				

	boots, gloves, Overall)				
78	Spraying at appropriate period-Morning or evening with regards to temperature and wind direction				
79	Hand washing with soap after spraying				
80	Avoid eating/smoking/drinking when spraying				
81	Yam multiplication methods				
82	Plantain sucker multiplication methods				
83	Use of disease free planting materials				
84	Irrigating field				
85	Agroforestry practices				
86	Bullock Ploughing				

	Livestock	TRAINED		PRACTICED	
		YES	NO	YES	NO
87	Identify symptoms of schedule and zoonotic disease				
88	Traits to look out for during the selection of breeding stock.				
89	Animals to be slaughtered in the abattoir				
90	Proper housing of animals				
91	Proper ventilation				
92	Fodder banks				
93	Avoid overcrowding				
94	Good sanitation in pens of farm animals				
95	Routine vaccination of farm animals				
96	Deworming (drenching, tablets, injection etc.)				
97	Proper watering of animals				
98	Culling of old/spent animals				
99	Dry season feeding of farm animals				
100	Use of improved breeds of animals				

	Poultry	TRAINRD		PRACTICED	
		YES	NO	YES	NO
101	Identify symptoms of schedule diseases				
102	Practice routine vaccination and medication				
103	Debeaking				
104	Culling				
105	Deworming -				
107	Brooding				
108	Proper housing of birds				
109	Proper feeding of birds				

110	Avoid overcrowding				
111	Ensure proper ventilation				
112	I -2 Vaccination				

Fisheries-Aquaculture		TRAINED		PRACTICED	
		YES	NO	YES	NO
113	Site selection				
114	Pond construction				
115	Soil type				
116	Stocking				
117	Feeding				
118	Disease and pest control				
119	Over stocking				
120	Harvesting				
Fisheries-Marine/freshwater					
121	Pollution of the water resource				
122	Avoiding over exploitation				
123	Using appropriate mesh size for fishing				
124	Formation of Community Based Fisheries Mgt. Committee				

WIAD Activities		TRAINED		PRACTICED	
		YES	NO	YES	NO
125	Construction of Smokeless stove				
126	Construction of Soak-away pits				
127	Preparation of Soya milk				
128	Preparation of Soya kebab				
129	Preservation of roots and tubers using sawdust				
130	Incorporation of moringa in household diets				
131	Preservation of tomatoes and garden eggs				

Non Traditional farming		TRAINED		PRACTICED	
		YES	NO	YES	NO
131	Snail farming				
132	Bee keeping				
133	Mushroom Production				
134	Grasscutter Production				

Farm Management		TRAINED		PRACTICED	
		YES	NO	YES	NO
135	Formation of farmer groups				

136	Planning of farm activities				
137	Keep records of all farm activities				
138	Save with Bank				
139	Do group marketing of farm produce				

PART D: METHODS OF DELIVERY

Indicate by checking [X] either YES or NO the methods used by extension officers to deliver extension packages to you. Show by ticking [√] which of them helped to improve your knowledge, skills and attitude towards extension packages.

				If yes, show by ticking the ones which led to improvement in the following		
	METHOD TYPE	YES	NO	KNOWLEDGE	SKILLS	ATTITUDE
140	INDIVIDUAL METHOD					
	1. Farm Visit					
	2. Home Visit					
	3. None above					
141	GROUP METHOD					
	1. Method demonstration					
	2. Result demonstration					
	3. Field tours/trips					
	4. Farmer meetings					
	5. Role Play					
	6. None above					
142	MASS METHODS					
	1. Radio					
	2. Posters					
	3. Fact sheets					
	4. Booklets					
	5. None above					
143	TEACHING AIDS					
	1. Blackboard					
	2. Photograph					
	3. Flip Chart					
	4. Real Object					
	5. None above					

144 What is the frequency of contact?

- 1. Daily []
- 2. Weekly []
- 3. Fortnightly []
- 4. Monthly []
- 5. Bi-monthly []

6. Other (specify) [].....

PART E—PERCEPTION OF FARMERS TOWARDS AGRICULTURAL EXTENSION DELIVERY

Please indicate how strongly you agree with the following statements by ticking the number that represents your answer using this guide:

1 Strongly Disagree 4 Disagree 3 Neutral 4 Agree 5 Strongly Agree

	Statement	1	2	3	4	5
145	Extension programs offer up-to-date information on crops related activities					
146	Extension programs offer up-to-date information on livestock related activities					
147	Extension programs offer up-to-date information on fisheries related activities					
148	Extension programs offer up-to-date information on poultry related activities					
149	Extension programs offer up-to-date information on marketing of agricultural produce					
150	Extension programs offer up-to-date information on food utilization					
151	Extension programs offer up-to-date information on processing of agricultural produce					
152	Attending extension programmes will not change my lifestyle					
153	The opinions of other farmers are important to me in attending extension programmes					
154	Generally speaking, I do what other farmers think I should do regarding attendance at extension programs.					
155	It is mostly up to me whether or not to attend extension programs					
156	I feel in complete control over whether to attend an extension program					
157	I always find it easy to put into practice advice I receive from the extension officer					
158	It is very difficult for me to put into practice advice I receive from extension officer					
159	All inputs given to farmers for all programmes should not be paid for.					
160	Farmers are not to pay the cost of inputs because they are been compensated by Government through such programmes					
161	Farmers should pay for the cost of all inputs supplied for all programmes.					
162	Improvement in my lifestyle cannot be attributed to					

	my association with extension service					
163	Relying on the advice of extension service have not changed my lifestyle					

PART F--MARKETING OPPORTUNITIES FOR FARM PRODUCE

Please indicate how strongly you agree with the following statements by ticking the number that represents your answer using this guide:

	Statement	1	2	3	4	5
164	Extension provides us with information on product planning					
165	Extension provides us with information on current prices.					
166	Extension provides us with information on forecast of market trends					
167	Extension provides us with information on sales timing					
168	Extension provides us with information on improved marketing practices					
169	Extension provides us with information on group marketing.					
170	Extension facilitates provision of good roads to market centres					
171	Extension helps us link to the buyers through the value chain concept					
172	Extension facilitate improvement of market infrastructure					
173	Extension facilitate the provision of processing equipment					

Part G-- OPPORTUNITIES FOR UTILIZING FARM PRODUCE

Please indicate how strongly you agree with the following statements by ticking the number that represents your answer using this guide:

	Statement	1	2	3	4	5
174	Extension provides training on quality and safe use of farm produce					
175	Through Extension I can use different methods to preserve my farm produce					
176	Extension has trained me on processing and handling of farm produce					
177	Extension has trained me on how to prepare and eat good food					

178	Extension has trained me how to use farm produce for different dishes					
179	Extension has trained me on how to process farm produce for medicinal purposes					
180	Extension has trained me on how to combine various farm produce to improve household dietary intake					
181	Extension has trained me on how to produce different food products from my farm produce to feed my children					

Part H: ACCESS TO ASSESTS

Indicate by ticking [√] how reliable your access to these assets for your household.

1 Strongly Unreliable 2 Unreliable 3 Neutral 4Reliable 5Strongly Reliable

	TYPES OF ASSETS	1	2	3	4	5
182	Natural capital					
	1.Farming Land					
	2.Water for irrigation					
	3.Grazing land					
	4.Livestock					
	5.Tree plantation					
183	Financial capital					
	1.Income from other activities					
	2.Financial savings					
	3.Access to credit					
	4.Remittance from relatives					
184	Physical capital					
	1. Access to good roads					
	2. Electricity					
	3. Piped water					
	4. Spraying machines					
	5. Tractor					
	6. Irrigation pump					
	7. House					
	8. Cutlasses and Hoes					
	9. Bullock Plough					
185	Human capital					
	1. Family labour					
	2. Access to information					
	3. Equitable access to social assets among household members					
	4. Schools					
	5. Health facilities					
	6. Water					
	7. Sanitation facilities					

186	Social capital					
	1. Membership of organisations					
	2. Support from kin, friends					

PART I— ACHIEVING LIVELIHOOD OUTCOMES

Indicate by ticking [] either YES or NO in the table below what has been the result of your interaction with extension.

	Outcome	YES	NO
187	Sustainable use of natural resources		
	1. Fertility of soil improved		
	2. Forest is not degraded		
	3. Continuous increase in crop yields.		
	4. Improvement in reproduction and growth in livestock.		
188	Food Security		
	1. Duration of the lean period (in months/year) reduced for household		
	2. Quantity of food consumed per day during the lean period increased:		
	3. Quality of the diet improved for household		
	4. Share of household budget spent on food items reduced:		
	5. Household takes three square meals daily		
	6. Household has all year round stock of food		
	7. Household has diverse food stuffs for consumption during the year		
189	Income		
	1. Annual household income improved		
	2. Acquired more Household assets		
	3. Household debt levels reduced		
	4. Household savings levels improved		
190	Wellbeing		
	1. Self-esteem		
	2. Political enfranchisement		
	3. Maintenance of cultural heritage		
	4. Monetary Income/Consumption		
	5. Non monetary income		
	6. Nutrition and food security		
	7. Health of family improved		
	8. Pay all cost concerning education of children		
	9. Control and security		
	10. Enhanced identity in the community		
191	Vulnerability		
	1. Reduction in chemical poisoning		
	2. Reduction in flooding/destruction by wind of farm		

	3. Reduction in Conflict among farmers		
	4. Reduction in Crop/livestock diseases		
	5. Stability of prices of farm produce		
	6. Reduction in sickness among household members		
	7. Employment opportunities for household members		
	8. Stable production over the years		

APPENDIX 3

MATRIX OF THE EXTENT OF USE OF THE OUTCOME LOGIC MODEL APPROACH
IN PLANNING PROGRAMMES

	PROGRAMME ACTIVITIES	NAEP	SCIMP	LACOSREP	RTIP	CDFBO
1	IRRIGATION FACILITY	0	0	3	0	3
2	MARKETING OF FARM PRODUCE	0	3	0	0	3
3	UTILIZATION OF FARM PRODUCE	0	3	0	0	3
4	GROUP LOANS GIVEN TO FARMERS	0	3	3	0	3
5	PORTABLE WATER SUPPLY	0	3	3	0	3
6	IMPROVED ROAD NETWORK	0	0	3	0	3
7	PLANTING MATERIAL AVAILABILITY	0	0	0	3	3
8	CROP DEVELOPMENT	3	3	0	3	3
9	GROUP FORMATION/COHESION	1	3	3	0	3
10	DEMONSTRATIONS	3	3	3	0	3
11	ENHANCED EXTENSION CONTACT	3	0	2	0	3
12	HIGH RESEARCH COMPONENT	0	0	3	3	0
13	LAND AND WATER MANAGEMENT	0	0	3	0	3
14	IMPROVED INCOME	0	3	3	3	3
15	STORAGE FACILITY	0	3	0	0	3
16	FOOD SECURITY	3	3	3	3	3
	TOTAL	13	30	32	15	45
	AVERAGE	0.8	1.9	2.0	0.9	2.8

APPENDIX 4

COMPARISON OF TECHNOLOGIES BOTH AEAS AND FARMERS INDICATED THEY HAVE NOT TRAINED OR BEEN TRAINED

Technologies	No AEA	No Farm	Yes AEA	Yes Farm
Ploughing	41	213	45	189
Harrowing	47	213	39	189
Hoeing across the slope	16	103	70	299
Minimum tillage	14	59	72	343
Mulching	9	48	77	354
Construction of fire belt	12	45	74	357
Use of improved varieties	2	17	84	385
Good nursery practices	5	30	81	372
Row planting/spacing	2	12	84	390
No. of plants/hill	2	18	84	384
Timely weed control	2	11	84	391
Use of appropriate type of fertilizer/manure	2	15	84	387
Use of adequate quantity of fertilizer/manure applied at a time	2	16	84	386
Timely application of fertilizer (moisture availability)	2	16	84	386
Timely application of fertilize with regards to physiological growth stage	3	24	83	378
Appropriate type of pest management or protection product applied to the type of crop	6	52	80	350
Adequacy of quantity of plant protection products applied at a time	9	66	77	336
Timely application of pesticides to plant product before harvesting or marketing of the crop.	7	36	79	366
Timely application of weedicides with regards to physiological stage of crop	3	26	83	396
Timely harvesting of the crop with regards to physiological growth stage of the crop(use of maturity index)	4	40	82	362
Timely harvesting of crop with regards to temperature of day.	14	55	72	347
Land rotation	9	62	77	340
Crop rotation	4	46	82	356
Mounding	25	129	61	273
Germination test for all seeds before planting	11	82	75	320
Earth bunding	26	151	60	251

Gleaning after harvesting	29	111	57	291
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Sorting of farm produce into grades	15	68	71	334
Packaging in cartons/sacks/ crates of harvested crop	20	141	66	261
Storing under shed/pre-cooling units /cold van	28	141	58	261
Timely carting of harvested crops from fields	10	78	76	324
Use of improved threshing methods	22	120	64	282
Use of improved drying methods to achieve grain moisture level acceptable for the crop.	18	88	68	314
Use of chemicals to store maize	8	38	78	364
Construction of patios for drying	37	177	49	225
Use of appropriate storage structure(narrow ventilated cribs/mud silos/warehouse)	11	52	75	350
Disposal of used chemical containers by deep burying	11	30	75	372
Disposal chemical containers by burning	10	64	76	338
Farms should be sited at least 50 meters from water bodies	13	55	73	347
Use of protective wears (Nose mask, Wellington boots, gloves, Overall)	3	14	83	388
Spraying at appropriate period-Morning or evening with regards to temperature and wind direction	2	21	84	381
Hand washing with soap after spraying	3	12	83	390
Avoid eating/smoking/drinking when spraying	2	20	84	382
Yam multiplication methods	51	180	35	222
Plantain sucker multiplication methods	36	133	50	269
Use of disease free planting materials	16	44	70	338
Irrigating field	39	173	47	229
Agroforestry practices	22	139	64	263
Bullock ploughing	52	266	34	136
Identify symptoms of schedule and zoonotic disease	30	181	56	221
Traits to look out for during the selection of breeding stock.	16	146	70	256
Animals to be slaughtered in the abattoir	30	191	56	203
Proper housing of animals	7	100	79	302
Proper ventilation	8	98	78	304
Fodder banks	36	207	50	195
Avoid overcrowding	7	102	79	300
Good sanitation in pens of farm animals	6	92	80	310
Routine vaccination of farm animals	8	118	78	284

Deworming (drenching, tablets, injection etc.)	11	128	75	274
Proper watering of animals	12	127	74	275
Culling of old/spent animals	15	142	71	260
Dry season feeding of farm animals	20	137	66	265
Use of improved breeds of animals	8	119	78	283
Identify symptoms of schedule diseases	21	168	65	234
Practice routine vaccination and medication	13	162	73	240
Debeaking	27	192	59	210
Culling	22	173	64	229
Deworming -	17	165	69	237
Brooding	23	186	63	216
Proper housing of birds	12	120	74	282
Proper feeding of birds	11	122	75	280
Avoid overcrowding	11	124	75	278
Ensure proper ventilation	9	129	77	273
I -2 Vaccination	19	181	67	221
Site selection	63	342	23	60
Pond construction	64	343	22	59
Soil type	63	343	23	59
Stocking	64	344	22	58
Feeding	63	344	23	58
Disease and pest control	65	350	21	52
Over stocking	64	350	22	52
Harvesting	65	350	21	52
Pollution of the water resource	71	324	15	78
Avoiding over exploitation	72	321	14	81
Using appropriate mesh size for fishing	70	321	16	81
Formation of Community Based Fisheries Mgt. Committee	73	328	13	74
Construction of Smokeless stove	52	273	34	129
Construction of Soak-away pits	42	249	44	153
Preparation of Soya milk	38	245	48	157
Preparation of Soya kebab	45	253	41	149
Preservation of roots and tubers using sawdust	47	221	39	181
Incorporation of Moringa powder in household diets	36	203	50	199
Preservation of tomatoes and garden eggs	45	231	41	171
Snail farming	43	248	43	154
Bee keeping	42	226	44	176

Mushroom Production	60	292	26	110
Grasscutter Production	42	239	44	163
Formation of farmer groups	3	25	83	377
Planning of farm activities	1	31	85	371
Keep records of all farm activities	2	21	84	381
Save with Bank	5	50	81	352
Group marketing of farm produce	14	123	72	279