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CASSAVA FARMERS' PERCEIVED IMPACT OF THE WEST AFRICA AGRICULTURAL PRODUCTIVITY PROGRAMME ON THEIR LIVELIHOOD SYSTEMS IN BRONG-AHAFO REGION, GHANA

EMMANUEL ANIAPAH BAMPOE

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BY

EMMANUEL ANIAPAH BAMPOE

Thesis submitted to the Department of Agricultural Economics and Extension, School of Agriculture, College of Agriculture and Natural Sciences, University of Cape Coast, in partial fulfillment of the requirements for award of Master of Philosophy Degree in Agricultural Extension.

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidates' Name: Emmanuel Aniapah Bampoe

Signature: ……Date: ……..

Supervisors' Declaration

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

Principal Supervisor's Name: Prof. Edward Ntifo-Siaw

Signature……. Date: ……

Co-Supervisor's Name: Prof. Ernest Laryea Okorley

Signature: …….Date: ……..

ABSTRACT

Low productivity is one of the constraints identified by stakeholders as affecting the production of cassava in Ghana. The West Africa Agricultural Productivity Programme (WAAPP) aimed at supporting farmers to increase productivity, providing inputs and extension services to a group of farmers during the first phase of the programme. The study assessed the perceived impact of the WAAPP on the livelihood systems of the beneficiary cassava farmers in the Brong-Ahafo Region of Ghana.

Descriptive-correlational survey design was used to explore relationships and predict best predictors of impact. A census was used to elicit views from 106 cassava farmers who participated in the WAAPP. Results from the study showed that more females (64.2%) than males (35.8%) benefited from the programme. They were in the active age bracket (48yrs) and mostly of low formal educational background. Most of them (51.9%) had household sizes between six and ten, and average farming experience of 16 years. They were mainly small scale farmers. Generally, the WAAPP's components were perceived as "effective" by the respondents. The farmer groups were also very useful. There was also "positive" impact of WAAPP on all aspects of the farmers' livelihood capitals.

Results of stepwise multiple regression analysis indicated that the best predictors of impact were: group members' access to improved technology, WAAPP's provision of training and provision of inputs support. The study recommended that the women cassava farmers should request stakeholders to support them to procure processing machines at the districts to promote value addition of the fresh cassava roots before selling.

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DEDICATION

To my mother, Elizabeth Djamah Bampoe, my wife, Deborah Atwerh Bampoe and my children, Addy; Amankwaa; Naa; Amobia and Nii-Darko.

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LIST OF ABBREVIATIONS

AAP	African Action Plan
ADB	African Development Bank
AEA	Agricultural Extension Agent
CAADP	Comprehensive African Agricultural Development Programme
CARE	Corporative for Assistance and Relief Everywhere
CRI	Crop Research Institute
CSIR	Council for Scientific and Industrial Research
DFID	Department for International Development
FAO	Food and Agriculture Organisation
FBO	Farmer Based Organisation
FFS	Farmer Field School
FGI	Focus Group Interview
FRI	Food Research Institute
GDP	Gross Domestic Product
GSS	Ghana Statistical Service
HQCF	High Quality Cassava Flour
IEG	Independent Evaluation Group
IFAD	International Fund for Agricultural Development
IIAS	International Institute of Applied Systems
IITA	International Institute of Tropical Agriculture
IPM	Integrated Pest Management
ISSER	Institute of Statistical, Social and Economic Research
M & E	Monitoring and Evaluation
MOFA	Ministry of Food and Agriculture

NARP	National Agricultural Rehabilitation Project
NCOS	National Centre of Specialisations
NEPAD	New Partnership for Africa Development
NFE	Non Formal Education
NGO	Non-Governmental Organisation
PTD	Participatory Technology Development
R & D	Research and Development
RTIMP	Root and Tuber Improvement and Marketing Programme
RTIP	Root and Tuber Improvement Programme
SciDev.Net	Science and Development Network
SRID	Statistics Research and Information Directorate
TFR	Total Fertility Rate
TOP	Targeting Outcomes of Programme
UNDP	United Nations Development Programme
WAAPP	West Africa Agricultural Productivity Programme

CHAPTER ONE

INTRODUCTION

Background to the Study

Concerns about agricultural productivity growth in Africa have led to the New Partnership for Africa Development (NEPAD) to bring into force the Comprehensive African Agricultural Development Programme (CAADP). The CAADP framework projected the need for agricultural growth to attain at least six percent rate (MOFA, 2010, Sam & Dapaah, 2009). The agricultural sector in Ghana has a central role to play in promoting the needed growth and poverty reduction in the economy which is expected to lead to significant improvement in the rural livelihoods (World Bank, 2003). In this direction most agricultural interventions introduced to farmers were designed with the objectives of increasing productivity or food security and further improve the livelihood systems of the beneficiaries (Norton, 2004).

The successful adoption and utilisation of the improved technologies by the target beneficiaries are expected to be channeled through their decision-making and behavioural change processes. These are further expected to provide an enhancement in their productivity and then produce the desired livelihood impacts (Wu, 2005).

Cassava (*Manihot esculenta*) is one of the most important economic food crops in Africa. It provides the livelihood of up to 500 million households, countless processors and traders around the world (FAO, 2001). People in the tropical world particularly Africa depend on cassava as one

of their major staple food (RTIP, 2004). Ghana is the fourth largest cassava grower in Africa after Nigeria, Democratic Republic of Congo and Angola (Oppong-Anane, 2013). The crop is cultivated by over 90 percent of the farming population in Ghana, thus making it the right target crop for the reduction of poverty in the country (Oppong-Anane, 2013; Thiombiano, 2013). It also provides additional income earning opportunities and enhance the contribution of the youth to household security (FAO, 2005). Cassava contributes 22 percent of agricultural Gross Domestic Product (GDP) and employs a large proportion of the population (ISSER, 2014; MOFA, 2010).

Nevertheless, the agricultural sector continues to play a significant role in Ghana's economy despite the fall in the sector's contribution to Gross Domestic Product (GDP) from 31.8 percent in 2009 to 22.0 percent in 2013. Agriculture in Ghana employs over 50 percent of the work force, mainly small landholders (ISSER, 2014). To make the sector play a more significant role, the government of Ghana through several programmes including the West Africa Agricultural Productivity Programme (WAAPP) has targeted cassava as important economic crop for promotion in Ghana.

Ghana's production of cassava is estimated to be over twelve million metric tons per annum (MOFA, 2009). Interestingly, cassava production has been increasing in the past five years since 2007. In 2007, total production of cassava was a little over 10.2 million metric tons (MT); 11.3 million MT in 2008; 12.2 million MT in 2009; 13.5 million MT in 2010; and 14.2 million MT in 2011 (MOFA, 2013). Correspondingly, the production in the Brong-Ahafo Region also saw a steady but marginal increase in yield from 2007 to 2010 (MOFA, 2013).

The cassava root is an extremely resilient crop which performs well on marginal lands, and it is regarded sometimes as nutritionally strategic famine reserve crop in areas of unreliable rainfall (Hendershot, 2004). Considering the prediction that the impact of changing rainfall patterns will worsen in the coming years and the confirmation by the Intergovernmental Panel on Climate Change (IPCC) 2007, that some African countries particularly those who depend on rain-fed agriculture like Ghana will see crop yields decline by up to 15 percent by 2020, it is most appropriate for cassava production to be given a much more attention than ever due to its ability to withstand the shocks of climate change.

Due to the above reasons, coupled with the increasing pressure on the land, rapid decline in soil fertility, increases in conflicts and natural and man-made disasters, donors and governments in the sub-region are now paying more attention to roots and tubers in efforts to enhance food security and alleviate poverty (Sam & Dapaah, 2009). To achieve this, a number of projects have been funded or are being funded by various donors to strengthen the provision of support services in a number of areas including research, extension, credit, rural infrastructure, marketing, and input delivery (Sam & Dapaah, 2009).

One of such supporting organisations which is currently investing huge capital and other resources to support cassava farmers to increase productivity in Ghana is the West Africa Agricultural Productivity Programme (IFAD, 2005). The West Africa Agricultural Productivity Programme (WAAPP) is part of the World Bank's instrument for the implementation of Africa Action Plan (AAP) aimed at supporting regional integration and making agriculture

more sustainably productive (MOFA, 2010; Sam & Dapaah, 2009). In order to significantly reduce poverty in the region, an annual Gross Domestic Product (GDP) growth rate of at least 8-10 percent is required to be sustained in the countries of the region.

The WAAPP was initiated in 2007 with implementation starting with Ghana, Senegal and Mali as part of a 10-year World Bank funded programme. The phase One focused on mechanisms for sharing technology, establishing National Center of Specialisations (NCOS) and funding of technology generation and adoption in the participating countries' top priority areas. These top priority areas are: roots and tubers (Ghana), rice (Mali) and drought-tolerant cereals for Senegal (MOFA, 2010; Sam & Dapaah, 2009).

The objectives of the initiative were two folds: The first was to promote growth in the agricultural sector by facilitating access to improved technologies for the benefit of agricultural producers and agro-industries so as to ensure improved agricultural productivity and competitiveness of African agricultural products on the international market. The second was to improve the living conditions of consumers, especially those in the extreme poverty brackets through the provision of agricultural products at competitive and affordable prices (Sam & Dapaah, 2009)

Under the first phase of the WAAPP between 2007 and 2012, eight districts (Wenchi, Asutifi North, Tain, Berekum, Sunvani West, Dormaa East, Nkoranza North and Atebubu/Amantin) from the Brong-Ahafo Region were selected to participate in the programme. Each of the districts identified and worked with Farmer Groups (FG), comprising farmers who had comparatively high interest in cassava cultivation. Inputs, improved technology and

extension services were provided to the groups to enable them establish at least one acre of cassava farm and cultivate any of the improved cassava varieties released by the Council for Scientific and Industrial Research (CSIR). The members of the farmer groups were also expected to access resources, agricultural technology, market information and empower their members for the improvement in their farming enterprise.

The idea was that the members of the group will use the piece of plot established as a Farmer-Field-School (FFS), where they come together to learn and practice the improved methods of planting cassava from land preparation to harvesting with the facilitation of the Agricultural Extension Agent (AEA). The proceeds are sold by the group and the planting materials are either sold or distributed among the members of the group to plant on their individual farms.

Statement of the Problem

Cassava production is a very important and widespread livelihood strategy in Ghana and particularly for the farmers in the Brong-Ahafo Region. Production of the crop has seen a steady increase in the region for the past five years from 2007 (MOFA, 2013). The Region's cassava production was 23.8 percent of the national total in 2007, and second leading producer after Eastern Region. The importance of the crop stems from the fact that it provides employment, food, and cash to majority of Ghanaian farmers, processors and producers along the value chain. For example joint (2006) estimated that 1, 998,184 farming households were engaged in the cultivation of cassava in Ghana.

The WAAPP is presently funding the productivity of root and tuber crops, realising the need for attention to be given to the Technology Generation Development (TGD), especially in cassava production in Ghana. Available records from WAAPP and MOFA indicate that remarkable achievements were made in the first phase of the programme between 2007 and 2012. The investigations carried out by the implementing agents (WAAPP and MOFA) were mainly to assess the project's success in terms of planned objectives. However, there is limited empirical information on the impact of WAAPP on the livelihoods of the farmers who participated in the programme. If the WAAPP is expected to increase productivity of cassava and also to improve the livelihoods of farmers, then it is important to know how the programme is affecting the beneficiaries, especially from their perspective.

The Objectives of the Study

General Objective

The general objective of the study is to assess the perceived impact of the West Africa Agricultural Productivity Programme on the livelihood systems of cassava farmers in the Brong-Ahafo Region of Ghana.

Specific Objectives

The specific objectives of the study are to:

1. Describe the demographic and farm related characteristics of the cassava farmers in terms of sex, age, family size, educational background, farm size, years of working with group and years of farming experience.
2. Determine the perceived effectiveness of :

i. the components of the WAAPP in terms of provision of planting materials, inputs support, training and extension services

ii. farmer group members' access to resources; agricultural technology; market information and members' empowerment and

iii. determine the farmer group members' acceptability of the improved cassava varieties

3. Ascertain the perceived impact of WAAPP's components on the cassava farmers in terms of their livelihood assets.

4. Determine the best predictors of the perceived impact of the WAAPP on the livelihood systems of the cassava farmers.

Research Questions

1. What are the demographic and farm related characteristics of the cassava farmers?
2. What is the level of effectiveness of the farmer groups and each of the main components of the WAAPP as perceived by the cassava farmers?
3. What is the perceived impact of WAAPP on the cassava farmers in terms of natural, physical, financial, human and social assets?
4. Which components of the WAAPP predicted the best impact on the livelihood systems of the farmers?

Hypotheses of the study

The following main hypotheses were formulated to be tested at 0.05 alpha level:

1. H_0: There is no significant difference in the farmers' estimated cassava yields before and after the WAAPP's intervention.

H_1: There is significant difference in the farmers' estimated cassava yields before and after the WAAPP intervention.

2. H_0: There is no significant relationship between perceived impact of the WAAPP on the farmers' livelihood systems and farmers' perceived effectiveness of each of the main components of the WAAPP.

   H_1: There is significant relationship between perceived impact of the WAAPP on the farmers' livelihood systems and farmers' perceived effectiveness of each of the main components of the WAAPP.

Research Variables

The Dependent Variable:

Perceived level of impact on livelihood systems.

Livelihood is categorised into five different livelihood assets and outcomes namely:

1. Natural capital (productivity in yield per unit area, access to productive land)
2. Physical capital (ownership of knapsack sprayer, access to transport etc.)
3. Financial capital (increase in income, increase in savings, decrease in debt)
4. Human capital (access to skilled and unskilled labour)
5. Social capital (membership with group, ability to feed family members etc.).

The Independent Variables

The independent variables are:

1. The demographic characteristics of the farmers (age, sex, family size, educational level). Farm related characteristics (farm size, years of farming experience, and years of working with group.)
2. The effectiveness of the WAAPP's component (provision of improved cassava planting materials, inputs support, training and extension services.)
3. The effectiveness of the farmer groups (accessing resources, agricultural technology, market information, and members' empowerment.
4. The acceptability of the improved cassava varieties (among producers, small-scale processors and household consumers)

Delimitations of the Study

The study population included only cassava farmers in the eight districts (Wenchi, Tain, Asutifi, Sunyani West, Berekum, Dormaa East, Nkoranza North and Atebubu). Those who participated in the WAAPP during the first phase between 2007 and 2012, but not all cassava farmers in the Brong-Ahafo Region. The WAAPP strategically selected those districts in the region during the first phase.

Justification of the Study

The essence of the study is to assess the effectiveness of the WAAPP in respect to the cassava farmers' perceptions about the impact its components

have had on their livelihood systems. The process can increase farmers' involvement in the programme evaluation which can improve sustainability.

Information gathered from the study will serve as an important tool to assess the efficiency of the programme as to whether it is worth funding or continuing. The result can also assist in formulating and prioritising policies that are in the best interest of agricultural development in the country and also improvement and sustainability of the WAAPP. The result is expected to serve as an evaluation document that will help initiators and implementers of the WAAPP on how to review certain policies within the programme period. The result will complement the periodic reports from the monitoring and evaluation directorate of the WAAPP. It can also guide future Non-Governmental Organisations (NGOs), financial institutions, industries and individuals who would like to promote the production of root and tuber crops.

Ultimately, the outcome of the study will add to the body of knowledge in respect to perceptions on impact of livelihood systems among smallholder cassava farmers since most social intervention programmes focus much on the dissemination of improved technologies at the expense of improvement in the livelihood systems of the target beneficiaries.

Definition of Terms:

The following terms as used in the research are defined:

Livelihood Systems: A household livelihood systems are the numerous factors that together affect the household bio-physically and socio-economically to survive and thrive. These can include crop and livestock production, off-farm activities and remittances.

Livelihood: Livelihoods are the means, activities and entitlements by which the cassava farmers' make a living: The livelihood assets are natural capital, physical capital, financial capital, human capital and social capital.

Perception: Personal indications, opinions and attitudes that the cassava farmers will exhibit to disregard, emphasis or put meaning in their own way.

Improved planting materials**:** New varieties of cassava "seeds" released by CSIR and MOFA

Agricultural technology: In this context refers to the improved methods of production developed by research and released to the cassava farmers through the Agricultural Extension Agents (AEAs).

Inputs: Refers basically to the financial and material resources provided to the farmers for their production activities.

Productivity: The output per unit area of cassava cultivated or the cost of production per unit area of cassava produced.

Perceived impact: The degree to which the cassava farmers regard the WAAPP to have contributed positively or negatively to their livelihood systems.

Effectiveness: Defined in the context of this study as the degree to which the expected outcome have been achieved by the proposed intervention as perceived by the farmers.

Acceptability: Refers in this study as the willingness of the farmers to adopt the improved cassava varieties and the willingness of the public to make the maximum satisfaction from the end products.

Consumers: The category of the public in the cassava value chain who use the commodity as food.

Extension service: Refers to the technical backstopping activities that the AEAs undertake with the farmers during field visits.

Organisation of the Study

The whole study is organised into five chapters. Chapter one which consists of the introduction has the following sub headings; background to the study, statement of the problem, general objectives, specific objectives, hypotheses of the study, justification, and delimitation of the study. Chapter two is basically literature that has been reviewed, including the conceptual framework of the study. Chapter three consists of the methodologies and the design used in the study. Chapter four contains the analysed data, results and discussion of the study. The chapter five consists of the summary, conclusions, limitations and recommendations of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

The literature review of a study denotes the gap between the researcher's curiosity and knowledge of the subject area (Boswell & Cannon, 2014). It helps the researcher to improve the research design and instrument (Cottrel, & McKenzie, 2010). According to O'Leary (2004), a well presented literature review provides credibility of the researcher such that the entire benefits of the study can be obtained.

The literature review sought to present the existing theoretical and empirical studies that provided the background and basis for the study. It discusses writings and study that other people have done which helped the researcher in the present studies. The following thematic areas have been covered: Agricultural technology, technology adoption theories, programme impact assessment, working with farmer groups, principles of perception, technology transfer in agricultural programmes, elements of sustainable livelihoods approach, conceptual framework and demographic and farm related characteristics of cassava farmers.

Agricultural Technology

Technology can simply be defined as the process by which nature is modified by human beings for the acquisition of his basic needs. Hornby (2000) defined technology as the scientific study and use of mechanical arts

and applied sciences as well as their practical application in industries. Atala (2002) also defined technology as organisation of capacity for a purposive task.

According to Science and Development Network, agricultural technologies and knowledge have until recently been largely developed and disseminated by public institutions (SciDev.Net, 2014). Over the past two decades, due to the rapid development of biotechnology for agricultural production as well as the globalised and liberalised nature of the world's economy, countries in the sub-region have witnessed a boost in private investment in agricultural research and technology (Rubenstein & Heisey, 2005). This phenomenon has led to the exposure of agriculture in developing countries to international markets and also influence of multinational corporations. However, the key role played by public sector agriculture, particularly in managing the new knowledge, supporting research to fill any remaining gaps, promoting and regulating private companies, and ensuring that their effects on the environment are adequately assessed, cannot be over emphasised (SciDev.Net, 2014, Rubenstein & Heisey, 2005).

James (2004) and Pineiro (2007) identified a new and more complex model for transferring technology, which he called the Evolving Model (EM). Evolving Model has four main components namely; knowledge management, gap filling research, promotion and regulation of the private sector, and environmental impact analysis. Under knowledge management, the public agricultural sector continues to be largely responsible for knowledge management. It articulates national needs, matches them to scientific

opportunities, mobilises available technology, and adjusts them to farmers' needs (James, 2004).

With gap-filling research, major responsibility lies on National Public Research Institutions (NPRI) to research in areas ignored by the private sector. The public institutions research into agriculture in developing countries represents about a quarter of worldwide expenditure in agricultural research (Pineiro, 2007). If this will produce high quality research to augment internationally available technologies and also help developing countries have access to them, then there is a need for effective management of the process (James, 2004).

According to Pineiro (2007) with regards to promoting and regulating the Private Sector, the public sector agriculture needs to promote private investment and regulate private companies. It means that policies can be developed to help and encourage the private sector to invest in technologies that are relevant to farmers in developing countries and for that matter promote pluralistic technology transfer.

With environmental impact analyses, policymakers are advised to consider the environmental consequences of agricultural research. It is known that new agricultural technologies often use natural resources intensively and potentially damage the environment. Examples are, through land degradation or contamination of water bodies. This especially happens if the new technology is imported without being tested in local conditions (James, 2004 & Pineiro, 2007). To overcome this menace, policy makers are once again advised to develop regulatory measures, like mandatory environmental impact

assessments. This can minimise potential environmental damage and also protect consumers as well as users of the technologies (James, 2004).

Technology Adoption Theories

Extensive research has shown that Rogers' diffusion innovation theory is the most appropriately used framework with regards to adoption of technology in agricultural programmes (Foust Chapman & Health-Camp, 2005). Rogers (2003) referred to the word "technology "and "innovation" as synonymous. He defined technology as "a design for instrumental action that reduces the uncertainty in the cause-effect relationship that is involved in achieving a desired outcome" (Rogers, 2003)

Four factors are known to influence adoption of an innovation. These include the innovation itself, the communication channels used to spread information about the innovation, time and the nature of the society to whom that particular innovation or technology is being introduced (Rogers, 1995). Eneh (2010) identified four adoption theories of Rogers' as theories on technology adoption and diffusion, innovation decision process theory, and perceived attributes theory.

The innovation-decision process theory is known to be based on time and has five distinct stages. The first stage is knowledge; here potential adopters must first learn about the innovation, and they must act to the merits of the innovation. They must also decide to be persuaded to adopt the innovation, and finally once they adopt the innovation, they must implement it. Above all, they must confirm that their decision to adopt that innovation

was appropriate. Once these stages are achieved, then diffusion is known to have successfully taken place (Rogers, 1995).

The theory of rate of adoption suggests that the adoption of innovations is best represented by an s-curve on a graph. The theory alludes that adoption of an innovation grows slowly and gradually in the early stages. This is followed by a period of rapid growth that is expected to taper off, become stable and finally decline with time (Eneh, 2010).

The theory of perceived attributes is based on the notion that individuals are more apt to adopt an innovation if only they perceive that the innovation has the following attributes: First, the innovation must have some relative advantage over an existing innovation or the status quo. Second, the innovation must essentially be compatible with existing values and practices. Third, the innovation must not look too complex. Fourth, the innovation must have the ability to be tried (implying, the innovation can be tested for a limited time without being adopted) and finally, the particular innovation must be able to offer observable results (Eneh, 2010; Rogers, 1995).

Technology Adoption among Farmers

Empirical studies undertaken to find the determinants of agricultural technology adoption among farmers focused on the following: risks and uncertainties according to Koundouri, Nauges and Tzouvelekas (2006), Simtowe, Mduma, Alban and Zeller (2006). Information asymmetric, institutional constraints, human capital, and access to inputs according to Feder, Just and Rosenzweig (1995), Singh and Kohli (2005) and availability of

supportive infrastructure, as well as social networks and learning. These were identified as the possible predictors of adoption decisions.

In a comparative study on the adoption of High Yielding Varieties (HYVs) of rice among some states in India, Singh and Kohli (2005) observed that affordability and easy access to the technology can be enhanced when the complimentary inputs are available and affordable. In another school of thought, social network and learning principles opined that adoption of technologies are influenced by the "Bayesian Learning" concept (Tenenbaum, 1999). The Bayesian Learning concept stipulates that only a handful of farmers may adopt a technology after they have experienced the technology on a very small scale. The understanding is that recipients of the technology will only adopt and use them when they realise the first positive results. In this case there is high possibility that the rate of adoption will increase in the following years.

Applying what is known as the "target-input model" transfer of new technology, Foster and Rosenzweig (1995), and Conley and Udry, (2002) obtained similar results in a study they conducted. They realised that farmers were hesitant and conservative in making the best use of inputs or innovations when they were first introduced to them.

Conley and Udry (2002) undertook a study in fertilizer application on pineapples in Ghana whilst Foster and Rosenzweig (1995) undertook a study in adoption of HYVs of rice in India. Conclusions from their results indicated that initially there was low adoption of the innovations by the farmers which could possibly come as a result of poor communication and knowledge about the management and productivity of the new technology (Foster &

Rosenzweig 1995; Conley & Udry, 2002). However, adoption of the technology scaled up with time as the farmers practiced farmer-to-farmer technology and also built up their individual personal experiences (Foster & Rosenzweig 1995; Conley & Udry, 2002).

Bandiera and Rasul (2006) reviewed the connection between the social networks and technology adoption in the Northern parts of Mozambique. They supported the target-input model idea from their findings and propounded that farmers who discussed agricultural practices with their neighbours have high prospects to adoption of new technologies.

Agricultural Productivity and Farmers' Livelihood

Agricultural productivity is defined through literature in several ways: The definitions include general output per unit of input, farm yield by crop or the total output per hectare, or output per worker. According to Poulton, Kydd and Dorward (2004) agricultural productivity depends upon both technical change and the availability of input, seasonal finance and marketing systems to increase farm production, and issue to consumers at competitive prices.

Empirical evidence from several studies conducted across rural farming communities support the assertion that growth in productivity has a direct positive influence on improvement in farmers' livelihood (Mellor, 1999). Studies conducted on small scale cassava farmers in Zambia revealed that production of cassava through traditional methods and adoption of improved varieties contributed significantly to the livelihoods of those who were located at the northern and western belts (Cadoni, 2010). The study out doored the strong belief of the Kanakantapa Women Cassava Processors (KWCP) about the sustainability of the cassava production programmes in the

area. According to the women group, their belief is based on the fact that the crop is multipurpose, drought tolerant and has low inputs requirements for production (Cadoni, 2010).

Literature provides evidence that growth in agricultural productivity can improve livelihoods in several ways such as real income changes, generation of rural non-farm activities, and effects on food and cash crops (Thirtle, Lin & Piesse, 2003). Case studies review conducted in twelve countries by Byerlee, Diao and Jackson (2009), compared agricultural growth among farmers within the selected countries. The study revealed that countries with optimal agricultural growth per work exhibited the highest rate of rural livelihood improvement (Byerlee, Diao & Jackson, 2009). Fan, Hazell and Thorat, (1999) also found out that investment in road networks, agricultural research and provision of extension services had the highest impact on both productivity and livelihood improvement.

Demographic and Farm Characteristics and Productivity

Extensive review of literature revealed that farmers' demographic and farm related characteristics have a significant relationship with agricultural productivity. Studies by Obasi, Henri-Ukoha, Ukewuihe and Chidiebere-Mark (2013) among arable crop farmers in Imo State, Nigeria showed that the age, educational level, farming experience and farm sizes significantly affected agricultural productivity. Teryomenko (2008); Helfand (2003); Kausar (2011) and Gill (2011) confirmed the above assertions. Helfand however, proved further that relations between farm size and productivity is far complex than is perceived by earlier research. For example, he opined that productivity is influenced primarily by how large a farm is.

Higher household sizes promote agricultural productivity and also ensure food security. Studies such as Bassey and Okon (2008), Nandi, Gunn and Yukushi (2011) reported that larger household size impacted positively on cassava production in Nigeria.

Improved Cassava Yields and Productivity

According to the World Bank (2000) the global strategy to improve agricultural and rural statistics considers crop area, crop production and crop yield as three key variables that should be part of the minimum principal data set that all countries should be able to provide. It identified crop yield, as one of the important indicators for agricultural development. In effect, crop yield is defined as: CROP YIELD = Amount of harvested products ÷ Crop area. It is normally expressed in kilogramme (kg) or metric tons (World Bank, 2000).

Improved cassava yields in Sekyere South District in Ashanti Region of Ghana reported 12.1 tons per hectare in 1997 and 12.8 ton per hectare in 2008, with an average yield of 12.0 tons per hectare (MOFA, 2009). It is noted that the new cassava varieties out-yield the local without fertilizer (Owusu & Donkor, 2012)**.** For example**,** two improved varieties (Nkabom and IFAD Bankye) released by KNUST in 2005 has an average yield of 48 tons per hectare (Owusu & Donkor, 2012). According to Addy, Kashaija, Moyo, Quynh, Singh and Walekhwa's study (as cited in Sam & Dapaah, 2009), some farmers in the Brong-Ahafo and the Ashanti Regions have testified that the improved varieties yield three times more than the local varieties. Low yields in cassava are due largely to the fertility of our soils, coupled with inefficiencies in agricultural production, low adoption rates of technologies

and to some extent inadequate provision of support services (Sam & Dapaah, 2009).

Some Constraints to Productivity and Livelihoods

Strangely, it is not always the case that growth in productivity translates into real farm households' income and hence improvement in livelihood unless certain conditions are met (Fan, 2004). There is the need for governments and other stakeholders to help crop farmers to address the problem of high production and transportation costs, vis-a-vis assisting to provide farmers with readily available market, favourable pricing policies and needed infrastructure for value addition (Neven, Odera, Reardon, & Wang, 2009). Agricultural based developing countries like Ghana faces challenges of postharvest losses during glut situations for some perishable staples like cassava. Without international markets and value addition for such domestic products, livelihoods are adversely affected (World Bank, 2007)

Some studies were done by Diao and Pratt (2007) in Ethiopia; Minten and Barrett (2008) in Madagascar; Jayne et al. (2010) in Kenya, Malawi and Mozambique on productivity and livelihood. The results showed that agricultural productivity in staple crops have potentials of improving livelihood than any other agricultural and non-agricultural sector. In actual fact, there are some constraints to productivity which can best be described as barriers to productivity. Literature (Neven et al., 2009) has shown that some of these barriers include population growth, technology, asset and income distribution, and access to market.

Productivity can be affected by population growth, especially in sub-Saharan Africa where the demographic and farm related characteristics of most

countries are partially related to a poverty trap also referred to as “Malthusian trap” (Thirtle, Lin, Piesse, 2003). The Malthusian trap connotes a situation whereby population growth outpaces per capita economic growth of a country (Thirtle, Lin, Piesse, 2003).

Irz and Roe (2000) proved in their multisector growth model that a minimum rate of productivity is necessary to counter population growth and avoid a possible “Malthusian trap”. There a several factors that sometimes limit the resource poor when opportunities to increase productivity is based on the use of improved technology or innovation (Thirtle, Irz, Lin, McKenzie-Hill & Wiggins, 2001). These constraints limit their technology adoption and has the tendency to affect their livelihood systems (Thirtle et al., 2001).

Technology alone without infrastructure like accessible road network, and extension advice or education would be inadequate to impact livelihood (Thirtle et al., 2001). It is only when there are provision of social services and infrastructure and also initial asset and income disparities are lower, that the resource poor is able to benefit from technology generation (IFAD, 2004). Rural livelihood impact normally depends on the production and consumption patterns that result from increased agricultural productivity. Situations where production resources are unequally distributed, it is the elites in society who normally benefit from the limited resources generated (Ellis & Freeman, 2004). Studies were conducted by Rios, Masters and Shively (2008) by using the World Bank Living Standard Measurement Survey (WBLSMS) data from Tanzania, Guatemala and Vietnam. The results indicated that farm households with higher productivity are more likely to access market for agricultural products but not the vice versa.

Role of Agricultural Extension Agents in Technology Transfer

Agricultural Extension Service (AES) has been identified as the important aspect of the intended transformation of the agricultural sector (Rivera, 1997, Leeuwis, 2013). For rural communities to fulfill their respective roles, they require access to productive information on inputs, new technologies, early warning systems for droughts, pests and diseases control mechanisms, credit availability as well as market prices and competitions (Kiplangat, 2003).

The role played by Agricultural Extension Agents (AEAs) in any agricultural enterprise is very critical. Their services are strategic investments because if even land, production inputs, labour, capital, planting materials, technology and favourable weather conditions are available; untrained, ill-advised farmers cannot efficiently and productively use them (Dada, 1997).

The AEA also facilitates the process for small-scale farmers to organise themselves into groups. Farmer Groups (FG) are mostly able to gain access to credit and other production requirements and also market their produce through group action (MALA, 1998). The AEA acts as a link between farmers and researchers, thus providing a two-way communication flow between farmers and researchers (Leeuwis, 2013).

Background of Agricultural Extension Approaches

Extension approach means differently to different authors. For instance Rivera (1997) described it as “system”, whilst Duvel (2004) referred to it as “model”. Leeuwis (20013) also defined it as the fundamental planning philosophy that is practiced by an agricultural extension organisation.

Bergevoet and van Woerkum (2006) classified agricultural extension service delivery under four approaches as Transfer of new technology (TOT), Problem Solving, Learning and Adult Education, and Human Capacity Development. Transfer of new technology is commonly used and known to bring about behavioural change in the farmers in the form of the adoption of new technologies that are externally developed. These technologies are normally already available and tested or practiced by management through the process of information delivery, opportunity and persuasion (Coutts, 1994). It is a mono-way model developed from researchers to the field, thereby making the client a passive receiver (Coutts, 1994). In this instance knowledge is perceived as a product that is moved from science and research to the client.

The TOT approach is also criticised because technology is not adapted or suitable for the specific situations that a clientele farmer is confronted with (Bergevoet et al., 2006). Some other identified disadvantages of the TOT are that the propensity of the approach to reinforce social inequalities by benefiting producers who are better resourced than their counterparts materially, intellectually, socially and economically. It also has the tendency to ignore the knowledge, skills, experiences and farmer adaptive abilities (Bergevote et al., 2006).

Problem-Solving Approach

Problem solving is an important day-to-day role played by AEAs (Madukwe, 2006). Extension communication or advice is often given based on the individual farmers' practices and information needs (Hogeveen, Dijkhuizen & Sol, 1992). As a group facilitator, problem-solving becomes an on-going and integral part of the AEAs' life as well as that of the group

members (Ribori, 1997). Seven models can be applied in a problem solving situation and Ribori, (1997) explained them as follows:

There is need for the problem to be defined. A good problem definition states the current and the expected situation. The expected situation becomes an objective and should be stated in a clear, concise and concrete language, and also be realistic and feasible. The root causes of the problems also need to be identified by the group members through brainstorming. Rules of the group must be applied and when necessary gather data or other forms of analysis beyond the group's discussion.

There is need for alternative solutions to be generated from the group members through brainstorming. Evaluation and criticism of other group members should be avoided. The alternative solutions must be evaluated. The group must establish criteria for judging the solutions. Emotional reactions and unnecessary criticisms must be avoided. In the process best solutions must be agreed upon either by voting or criterion evaluation. When used constructively, controversies and disagreements can help select the best solutions (Ribori, 1997).

Finally, the people must be involved to develop an action plan. Their commitments must be built, as well as effective and timely implementation of the solutions must also be ensured. Solutions must be implemented according to planned action and also be evaluated. Possibly, AEAs must add regular and routine check for group progress to their meeting agenda (Ribori, 1997).

Learning and Adult Education Approach

Teaching farmers in groups is a means of proactive informal education that aims at assisting individual farmers to better understand their situations (Coutts 1994; Madukwe, 2006). The techniques of learning cycles and styles in agriculture that is helpful as conceptual framework in adult learning include concrete experience, observation and reflection, the formation of abstract concepts and generations, and hypothesis for future testing which leads to new experiences. The learning process is a continuous recurring or cycle coupled with the understanding that the individual develop his own learning cycles. Kolb (1984) identified four learning styles as being associated with the different stages of the learning cycle, namely; assimilative, accommodative, convergent and divergent learning styles.

The assimilative learning style is characterised by the ability to reason inductively. It is concerned with ideas and abstract concepts rather than people and social interactions (Kolb, 1984). The accommodative learning style is characterised by ability to solve problems in an intuitive trial- and- error manner rather than through careful examination of facts. It relies heavily on other people for information rather than on its own analytic ability (Kolb, 1984).

The convergent learning style is characterised by the ability to efficiently solve problems, make decisions and apply practical ideas to solve problems. It deals with technical tasks and challenges rather than interpersonal and social interactive issues (Kolb, 1984). The divergent learning style is characterised by the ability to identify concrete examples of a concept and to generate various qualities about the concepts from various perspectives. It is

brainstorming in nature, and individuals with such qualities are very creative, emotionally oriented and prefer to observe rather than act (Kolb, 1984).

Human Capacity Development Approach

Extension in relation to human development is a means to facilitate and support individuals or groups to take initiatives to identify and access their needs and problems. Extension also seeks to guide individuals and groups to acquire knowledge and skills required to cope effectively with their situations (Coutts, 1994; Madukwe, 2006). The human development in extension involves a participating approach that applies the principle of participation, adult and action research and learning. The compounding complexities of agricultural and environmental issues make it more ideal to encourage farmers to adopt participatory technology development (PTD) approach to finding solutions to their problems.

The advantages of the human capacity approach include promoting the recognition of local ways of knowing, supporting local innovation and adaptation of technologies. Also involving stakeholders in research that has social and/or financial impact on the farming community, and acknowledging the value of sharing information and ideas among the farmers. Finally, encouraging stakeholder ownership of both problems and solutions, and making use of group processes and learning (Coutts, 1994; Madukwe, 2006). These approaches have been however criticised on grounds that farmers may lack the expertise to identify problems because the problems may be new to them (an example is environmental issues) and knowledge developed among the farmers is likely to be limited only to that group of farmers (Black, 2000).

Swanson (2010) also summarised agricultural extension delivery under four paradigms as technology transfer, advisory services, non-formal education, and facilitation extension. The technology transfer paradigm generally uses persuasive methods for telling farmers which varieties and production practices they should use to increase their agricultural productivity and thereby maintain national food security for both the rural and urban populations of the country. With the advisory services, farmers in most cases are "advised" to use a specific practice or technology to solve persuasive advisory techniques when recommending specific technical inputs to farmers who want to solve a particular problem and / or maintain their productivity (Swanson (2010).

The non-formal education (NFE) paradigm continues to be used in most extension systems however, the focus is shifting more toward training farmers on how to utilise specific management skills and technical knowledge to increase their production efficiency. In other words to utilise management practices, such as integrated pest management (IPM), as taught through Farmer Based School (FBS). With regards to facilitation extension, front–line extension agents primarily work as "knowledge brokers" in facilitating the teaching and learning processes among all types of farmers (including women) and rural young people. Under this extension paradigm, the field staff first works with different groups of farmers (small-scale, men and women farmers, landless farmers) to identify their specific needs and interests. Once their specific needs and interests have been determined, then the next step is to identify the best services of expertise that can help these different groups address specific issues and/ or opportunities (Swanson, 2010).

Working with Farmer Groups

Organising individual farmers who have common objectives (or problems to solve) into one force is generally known as farmer- based organisations (FBOs) but this can include all types of farmer groupings such as Farmer Co-oporative (FC), Farmer Interest Groups (FIGs), Producer Groups (PGs), and Farmer Associations (FAs) and /or Self Help Groups (SHGs) (Swanson, 2010). FBOs have the potential to strengthen the bargaining power of farmers in the marketplace, both in inputs supply and in market supply (Swanson, 2010).

FBOs can provide a wide range of extension and advisory services (Diaz, Le Coq, Merccoiret & Pesche, 2004). For instance, they may be organised around clientele groups, and specific interest or larger commercial farmers; or group of farmers who are exporting high value crops. They may also carry out specific functions and different economic activities ranging from input supply co-oporatives to packaging and marketing of high-value products for export.

Organising farmers into groups can increase the efficiency and effectiveness in supplying the needed extension and advisory service to various classes of farmers. Group formation can facilitate the dissemination of agricultural technology, and help to transform farming systems among various farm households and communities. It can also encourage farmers to adopt environmentally friendly farming practices. FBOs can also influence government policies and programmes that are targeted towards increasing farm income and thereby improve rural livelihoods (Chamala & Shingi, 1997). Group formation is ideally done by farmers themselves. This process can be

facilitated by locally identified and specially trained Group Promoters (GPs) or AEAs, who assist the group development process and act as intermediaries (Diaz, Le Coq, Merccoiret & Pesche, 2004).

Some Benefits of Working with Farmer Groups

Farmers coming together to form working groups has enormous benefits and these can be described mainly as benefits to the individual farmers and also benefits to the government (FAO, 1996). According to Benard and Spielman (2009), and Kruijssen, Keizer and Giuliani (2009) farmer groups are regarded as potentially effective mechanisms to increase farmers' livelihood by reducing information distortions and transaction costs. Small-holders can pool resources and market their products collectively particularly, overcoming the high transaction costs that they incur as a result of their small individual sizes as they maintain their membership in their farmer groups.

Farmer groups are able to improve their members' access to resources such as inputs, credit, training, transport and information and also increase their bargaining power, and in some cases facilitate certification and labelling of their products (Bosc et al., 2002). Collective action when taken by farmer groups can reduce the individual's farmer risks with long term investments such as those required for perennial crops (e.g. cassava) and capital-intensive processing technologies. Di Gregorio et al., (2004) also observed that organised farmer groups can be supported and promoted as useful avenues for increasing farmer productivity and also for the implementation of food security and other developmental projects.

Groups' Sustainability and Self-reliance Mentality

For the benefits of group action to continue even after outside assistance ceases, the groups must become self-reliant and cohesive units. This requires adherence to the following suggested thematic points (Di Gregoria et al, 2004): A group should not depend too much on a single individual. Regular group savings are essential and should be encouraged. The members' contributions to group activities can help them build a sense of group ownership and solidarity. Records keeping should be encouraged because it helps the group to remember what has been decided at meetings and keep track of contributions, income and expenses. Records keeping are also essential for monitoring group business activities.

Small groups have their limits, and it is encouraging for small groups to link up into larger inter-group to have favourable policy environments. Farmer groups are best promoted where legal and policy conditions favour such forms of co-operation, and when the government confines its role to that of a facilitator rather than a controller. The legal and policy environment should encourage rural participation and the formation of informal self-help groups. Meanwhile, rural people should be allowed to organise their own group businesses and concerns. What the government need to do is to encourage the development of rural communication systems that facilitate information exchange and networking. Also assistance programmes should aim at developing group self-help capacities since too much financial assistance can create over dependencies.

Cassava Farmer Field School (CFFS)

The provision of knowledge to traditional farmers to improve their ecological literacy was a major concern for many organisations including the Food and Agricultural Organisation (FAO, 2013). It is in this direction that an educational approach which was called the farmer field school (FFS) was developed in 1989 in Indonesia as part of an FAO Integrated Pest Management (IPM) programmed; initially to address crop health problems on rice (FAO, 2013).

The application of FFS to cassava began in Africa in the late 1990s. The idea of the Cassava Farmer Field School (CFFS) came about as an intervention to address the spread of strains of the viruses causing cassava mosaic virus disease and, more recently, cassava brown streak disease at the time. The main objective was to promote IPM and ecologically friendly cassava production (FAO, 2013). CFFS were established to link up with programmes that distributed disease-tolerant cassava varieties and which they have tested in multiplication fields. The main goal of this learning-by-doing approach was to provide the opportunity for farmers to develop strategies to manage disease problems more effectively, while improving their cassava production practices (FAO, 2013).

CFFSs help farmers to validate and test local knowledge, as well as scientific knowledge generated outside their communities. A process of sharing and critical analysis helps farmers to adapt new information and technologies to their local situation. The CFFS approach (group work) aims to strengthen collaboration within and between groups. It focuses on interaction with farmers, extension services and research. It also helps farmers to improve

their knowledge and skills in field management, leading to improved production of cassava. They also help farmers to become better organised and to network with peers and other groups effectively (FAO, 2013).

The basic principle and concept of the CFFS is that, it is a participatory approach for learning that builds on principles of non-formal education. It is a "school without wall" that takes place in a field where the crop (cassava) is grown. The farmers meet regularly in that field to develop their capacities to analyse and solve their individual and shared challenges. The Root and Tuber Improvement and Marketing Programme (RTIMP) adopted a similar training for their participating farmers which were called Farmer Field Fora [FFF] (MOFA, 2010).

Elements of Sustainable Livelihoods Approach

Livelihood approach is the manner in which thoughts and ideas are directed towards the objectives, scope, and priorities that lead to development (DFID, 2000). The Sustainable Livelihood Approach (SLA) is a general principle or idea adopted by the Department for International Development (DFID) in the late 1990s (DFID, 2000). The SLA concept has been adopted by various organisations like Oxfam, Institute of Development Studies (IDS); which they modified in their specific contexts, priorities, and applications in their work (DFID, 2000).

The combination of the resources (both material and social), and the activities being undertaken by an individual or household for the material provision of its members, comprises their livelihood (Chambers & Conway, 1992). Livelihoods however, go beyond material and monetary rewards.

According to DFID (2000) a livelihood is said to be sustainable when it can cope with and recover from stress and shock, and maintain or enhance its capabilities and assets both now and in future, while not undermining the natural resource base. As a concept, livelihood can impact to less tangible benefits among the clientele farmers such as a sense of greater social acceptance or of being more empowered (Braun, Thiele, Femandez, 2000).

Livelihood systems adequately cover the dynamics of household decision-making and actions. In other words, clientele farmers can take the production of their crop as part of a livelihood diversification strategy for better risk management and income generation. What this means is that for cassava production to remain an attractive option of households, it has to maintain its comparative advantage over on-farm and off-farm livelihoods. This can be achieved by possibly increasing productivity and value addition of the crop (Braun et al., 2000).

According to Farrington, Carney, Ashley and Turton (1999), a focus on livelihood should focus on three main characteristics which are people and their activities, the holistic nature of people's activities and the link between the micro and the macro enterprises of the people. Chambers and Conway (1992) also reiterated that livelihoods conceptual framework looks at the interaction between people, their capabilities different types of assets or resources that they have access to, and the activities through which they gain their livelihood.

Livelihoods Conceptual Framework

A conceptual framework is a set of ideas that are put together in order to provide a coherent approach to analysing and understanding an issue or problem. The framework organises, clarifies and defines terms and concepts. It also spells out the assumptions and values which underlie the concepts. According to Mills and Huberman (1994), and Robson (2011) the conceptual framework of a study is the system of concepts, assumptions, expectations, beliefs and theories that support and inform the research work, and is a key part to the research design.

The livelihoods framework examines the different elements that contribute to people's livelihood strategies. It analyses how forces outside the household or community in 'the external environment' affect them (Brocklesby & Fisher, 2003). According to Brocklesby & Fisher, various livelihoods frameworks, including the ones used by Department for International Development (DFID), Corporative for Assistance and Relief Everywhere (CARE), Oxfam and United Nations Development Programme (UNDP) use similar concepts, but there are differences in how they organise and describe them. However, all these different livelihood frameworks have several things in common as in the following:

1. People are the starting point or the 'centre of development'
2. There are important differences among communities, among families and between members of the same family or household and that means no single 'solution' will benefit all households equally.
3. The poor increasingly depend on multiple sources of livelihood.

4. Strengthening livelihood security involves building on the assets, capabilities, and the activities which are the basis of household livelihoods.
5. Links must be made between micro (local) and macro (larger than local) levels. Holistic analysis involves seeing the 'big picture' that links people and their livelihoods, the natural environment and the structures, policies and systems which impact on them. Understanding key links between these elements makes it possible to target interventions to achieve the best effect.
6. Participatory analysis and planning is a way of understanding the livelihood priorities of the poor and the relative importance of the assets on which their livelihoods depend.

The DFID framework employs the various concepts namely; vulnerability context, livelihood assets, structures and processes, livelihood strategies and livelihood outcomes as the basic principles on which it operates. It demonstrates how these concepts are interconnected to provide livelihood for the individuals. The five livelihood capitals (natural, social, physical, financial and human) are provided by the available governments (public), private sectors, laws, policies and institutions. Meanwhile the vulnerability context affects these capitals either positively or negatively (DFID, 1999).

Structures are important because they make processes work. If structures can be likened to "hardware", then processes can be the "software". Absence of appropriate structures, especially in the rural areas retards development because many services (public and private) go undelivered. Thus, making such people vulnerable and affect their livelihood (DFID, 1999).

Livelihood Assets

Assets form a very important component in a livelihood of people. They are the different types of resources that together help people build their livelihood. The types and combinations of assets that people have, enable them to execute their planned livelihood strategies successfully (Chambers & Conway, 1992; Scoones, 1998). Assets are interdependent and relate with each other. For example, a cassava farmer's access to productive land (natural capital) can be used to produce cassava for income (financial capital), at the same time serve as security collateral to access agricultural credit. Again the income from sale of cassava or credit from the bank (financial capital) can be used to purchase agricultural equipment (physical capital).

As people are the foremost consideration in livelihood approach, it is necessary to accept that they require an array of assets to enable them to achieve positive livelihood assets. Carney (1998) therefore identified five core categories of livelihood capitals; natural, financial, social, human and physical. Natural capital entails the resources from which useful resources for livelihoods are derived. They include the stock of natural resources around us (land, clean air, trees, and water bodies) which people rely on for their livelihood.

Financial capital entails the resources that people use to achieve their livelihood objectives (DFID, 1999). These include savings (cash, bank deposits or liquid assets such as livestock, and jewelry), sources of credit, and remittances from relations abroad. Social capital entails the networks, as well as shared norms, values and understandings that foster cooperation within or among groups. These include the various social resources (formal and

informal relationships), interactions that promote people's ability to work together, membership of formalised organisation that are governed by accepted rules and norms, relations of trust that facilitates cooperation (Healy & Cote, 2001).

Human capital comprises the skills, knowledge, and capacity to work and good health that enables people to undertake different livelihood strategies in order to achieve livelihood outcomes. It assists in the achievement of the other five capitals (DFID, 1999). Physical capital includes the basic infrastructure, physical goods and facilities (both public and private) that people use in support of livelihood strategies. Examples of the public facilities are access to information, water and sanitation, affordable transport service and examples of the private facilities are shelter, agricultural equipment and vehicles, and household goods (DFID, 1999).

The extent to which people are able to access these assets to provide their livelihoods are strongly affected by their "vulnerability context" and also their "livelihood strategies" (DFID, 1999). Livelihood strategies are the various activities and decisions that people take to achieve their livelihood outcomes and goals. They emanate from happenings and realities that the individual or society find from the immediate surroundings or the environment (DFID, 2000). It is a constant process of decision-making and activities that take diverse forms.

Vulnerability context or livelihood insecurity on the other hand are the shocks, seasonality and trends that affect livelihoods. The shocks are sudden unexpected events that have significant and negative impact on livelihoods. They are irregular, and differ in intensity and events such as; natural disaster,

civil conflicts, and collapse of crop prices or ill-heath of livestock for farmers. Some shocks can look like trends, for example increase infection rate for Human Immune Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS) and malaria can have negative impact on livelihood at national or regional levels leading to death of family members (DFID, 1999).

Seasonality are seasonal changes that affect assets, activities, prices, productions, employment opportunities and health of the vulnerable. The poor tend to be more vulnerable to the adverse effects of seasonality than the rich in society. It can also affect the poor in the urban areas especially, those who spend large proportions of their income on food (DFID, 1999). Trends are forces or changes that take place over a longer period of time than those of the shocks and seasonality. They have either positive or negative effects on livelihoods. The effects of trend can be described as Economical (declining food crop prices that affect the farmers, and development of new markets); Population related (increasing population pressure); and Resources related (soil erosion and deforestation). Livelihood outcomes are achievements or outputs of an individual's livelihood strategies. The DFID's Sustainable Livelihood Framework (SLF) identified "five" types of livelihood outcomes. These are more income, increased well-being, reduced vulnerability, improved food security, and more sustainable use of the natural resources (DFID, 2000).

Principles of Perception

Perception, according to Van den Ban and Hawkins (1996), can be defined as a process by which an individual receives information or stimuli from an environment, and transforms them into psychological awareness.

Gamble and Gamble (2002) defined perception as a process whereby an individual selects, organises and subjectively interprets sensory data in a way that enables him or her to make sense of the world.

It can therefore be deduced from the definitions above that perception as a process involves the application of the senses of an individual to interpret the "world" or the environment in which he or she finds itself. However, there is a school of thought that perception transcends beyond application of the senses alone by an individual. For example, Gamble and Gamble 2002 reposed that what happens in the real world may not necessary be the same as an individual perceives a particular situation to be. In other words, an individual's interpretation of events may significantly not be the same as that of other people. In principle, perception is governed by relativity, selectivity, organisation, direction, and cognitive style.

Relativity

Van den Ban and Hawkins (1996) maintained that an individual's perception about an issue or object is not obsolete but rather relative. For example, an individual may not be able to judge the height of a standing tree but may be able to describe whether it is longer or shorter than another one. Therefore in the course of designing a message, an individual perception of any part of the message is influenced by the context that precedes the message. Therefore, perception in effect is influenced by an individual's surroundings.

Selectivity

According to Van den Ban and Hawkins (1996) an individual's perception is selective, in that at any point in time one's senses receive a host of stimuli from the environment around him or her. As the nervous system

cannot sensitise all the available stimuli, the individual responds only to a selection of those stimuli. One's choice of selection for an experience is reinforced by existing attitude, beliefs and values. Those experiences that are not significantly consistent to his or her existing attitudes, beliefs and values are ignored (Gamble & Gamble, 2002). In effect, capacity building and past experience of persons can also influence their perception.

Organisation

A person's perception can be described as organised in the direction that he or she can structure the sensory experience in a manner that makes sense to him or her. In a twinkle of an eye, an individual's senses process visual and aural stimuli into figures. A figure is easily attracted to a designer who wishes to incorporate that "figure" into a particular part of a message, depending on how "good" that figure is. "Closure" is another term used to describe perceptual organisation (whereby an individual perceiver tends to close what he or she perceives to be an open or incomplete figure).

Direction

An individual perceives what he or she is "set" to perceive. What an individual selects, organises or interprets is influenced by his or her mental set. An important perceptual concept mostly used by communication designers to limit the amount of alternative interpretations given to a stimulus is called "set". According to Van den Ban and Hawkins (1996), one set-back that affects communicators when expecting their audience to understand a situation in a new way is the audience's "perceptual set".

The age, motivation, past experience and educational level of a person influences his or her perceptual set (Gamble & Gamble, 2002). The authors however, reposed it that once past experience differs even among people of the same age, it implies then that experience affects the manner in which stimuli is perceived by an individual. In respect to education, Gamble and Gamble (1996) reported that it can be a barrier to communication instead of facilitating it. The implications are that individuals learn lesson in life differently from one another and in effect can perceive the same stimuli differently.

Cognitive Style

Due to the differences in cognitive style of individuals, their perceptions differ significantly from one another (Van den Ban & Hawkins, 1996). A person's mental process works remarkably in different ways depending on personality factors such as a tolerance for ambiguity, degree of "close" and "open" mindedness and authoritarianisms.

Once it is not practicably possible for an individual to design different messages by combining all cognitive styles among his audience, "message redundancy" is recommended. This is a term that is used to describe how an individual should adopt a strategy by which the same idea is presented in a number of different ways which will appeal to most cognitive styles (Van den Ban & Hawkins, 1996).

Evaluation in Agricultural Programmes

Evaluation is a system of judging, appraising, determining the worth, value or quality of a project, or activity in terms of its relevance, efficiency,

effectiveness and impact. Simply put, evaluation is a systematic process to determine what a programme is and how well the programme does it (Patton, 1990). Evaluation is used in many programme contexts and across many different disciplines. Even within one project there may be several evaluation initiatives underway. For this reason, in "good" evaluations the choice of evaluation approach needs to be context specific and take into consideration the purpose for which the study is being undertaken (Christie, Ross & Klein, 2004; Worthen, Sanders & James, 1997). Most evaluations are carried out for two main purposes: improve programme design and implementation, and demonstrate programme impact.

For improvement of programme design and implementation, it is important for project evaluators to periodically assess and adapt their activities to ensure that they are as effective as they can be. Evaluation can help them identify areas for improvement and ultimately help them realize their goals more efficiently (Hornik, 2002; Noar, 2006). Evaluation also enables project evaluators to demonstrate their programme's success or progress. The information that they collect allows them to better communicate their programme's impact to others, which is critical for public relations, staff morale, and attracting and retaining support from current and potential funders (Hornik & Yanovitzky, 2003).

There are various types of evaluation, but two main philosophical approaches are generally used; formative and summative evaluation. Formative evaluation is an on-going process that allows for feedback to be implemented during a programme cycle whereas summative evaluation is used at the end of a programme cycle so that it can provide an overall description of

programme effectiveness. It enables stakeholders to make decisions regarding specific services and the future direction of the programme that cannot be made during the middle of the programme cycle (Scriven, 1967).

Although there is a necessity for both formative and summative evaluation approaches, modern literature on programme evaluation tends to promote formative approach: that is, evaluation which is concerned with the process of programme development or improvement (Scriven, 1967). However, Voichick (1991) reports that many extension educators may place more emphasis on the summative evaluation due to the need for impact data to address accountability and progress. Chambers (1994) reiterates that it is not the timing that distinguishes formative from summative but the use of the evaluation data.

According to Pefile (2007) an impact-assessment study aims to determine causality and to establish the extent of improvement for the intended beneficiaries. Impact assessments are time sensitive and, therefore, there is the need for studies to be conducted periodically throughout the duration of the project that is being assessed (Pefile, 2007).

Principles of Basic Impact Evaluation Designs

There is no one straight jacket rule for conducting a good evaluation in agricultural extension. The term evaluation is subject to different interpretations and various individuals and organisations define it in various contexts. Agricultural extension officers and organisations adopt on-going and informal processes to evaluate their agricultural programmes and activities through casual feedbacks and observations. Useful results are obtained for relevant and efficient operation of the programme. On the other hand,

researchers can enhance the value of evaluation results by devoting sufficient, forethought and planning to the evaluation process (Lewis, Ritchie, Nicholls & Ormston, 20013).

Formal evaluation therefore refers to thoughtful process of emphasising questions and topics of concern, collecting relevant information and further analysing and interpreting the information for what it is designed and proposed for. In effect, evaluating agricultural programmes will require the researcher's fore knowledge of the programme and the types of questions to be answered (Lewis, Ritchie, Nicholls & Ormston, 20013).

Bennettt's Hierarchy in Extension Programme Evaluation

For extension programme evaluators to be able to successfully measure incremental changes, Bennett (1979) developed what has been commonly named as "Bennetts's hierarchy" that showed the causal links between the steps from inputs to outcome. It is such that stakeholders can follow the developments that take place in the cause of the funded life of extension programmes. Seven steps were identified: Inputs (staff time, costs, and resources used); Activities (newspapers or newsletters, articles, discussions groups, and workshops); People's involvement (number of people reached, characteristics of people, frequency and intensity of contact); Reactions (the degree of interest, like or dislike for activities, and the perception of projects); KASA (Knowledge-what the people know, Attitudes-how the people feel, Skills-what the people can do, and Aspirations-what the people desire); Practice (adoption and application of knowledge, attitudes, skills, or aspirations); End results (the social, economic, environmental and individual consequences of the programme).

The Rockwell and Bennett Model of Extension Programme Evaluation also called the Targeting Outcomes of Programmes (TOP) programme planning and evaluation was developed from Bennett's hierarchy in 1975 and reviewed by Rockwell and Bennett in 2004. The model purported to focus on encouraging extension programme planners to consider the outcomes they intended to achieve at each step of their programme planning process. The TOP model explains that programme planning and programme performances are mirror images of each other (Rockwell & Bennett, 2004); that separates the model from other development models such as the Logic Model.

The TOP model also has seven levels, namely; Resources, Activities, Participation, Reactions, KASA (Knowledge, Attitude, Skills, Aspirations) Practices and Social-Economic-Environmental conditions. Feedback is encouraged at each level of the divide; which is programme development on one side and programme planning on the other side.

The TOP model uses two types of evaluation techniques to determine programme performance; process and outcome evaluation (Rockwell & Bennett, 2004). Process evaluation measures the resources used, activities held, participation and participant's reaction. The first four levels (inputs, activities, people's involvement and reactions) evaluate implementation, and they are the easiest part of the programme evaluation process. Process evaluation results provide feedback needed by programme implementers to improve the mechanics of their programmes. Outcome evaluation measures changes in participants' knowledge, attitudes, skills and aspirations (KASA), participants' behaviour; and social, economic, environmental outcomes. The last three levels (KASA, practice and end results) measures outcomes and

focuses on the immediate, medium as well as long term benefits of the programme for individuals and communities.

Incidentally, the outcome evaluation is progressively more difficult to conduct than the process evaluation (Rockwell & Bennett, 2004). This is because, in most cases extension evaluators develop the highest interest to assess the effect a programme has on changing practices and improvement in the social, economic and environmental conditions. However, the observed outcomes might have been contributed by other factors rather than the programme intervention. Using the TOP model to measure programme performance does not guarantee that an implemented programme was the sole cause of any programme outcomes, except that there is high likely association between programme and outcomes (Rockwell & Bennett, 2004).

Context, Input, Process and Product Evaluation Model

According to Stufflebeam and Shinkfield (2007) there are about 26 approaches that are normally employed to evaluate projects. These 26 may be grouped into five categories: Pseudo evaluation, quasi evaluation studies, improvement- and- accountability oriented evaluation, social agenda and advocacy, and eclectic evaluation.

Stuffflebeam and Shinkfield (2007) explained that when compared with professional standards for project evaluation and also rating by utility, feasibility, propriety and accuracy, the best evaluation approach that has emerged is the Context, Input, Process and Product (CIPP) evaluation model. The CIPP model of evaluation is identified under the improvement- and- accountability category and known to be one of the most widely used evaluation models (Stuflebeam & Shinkfield, 2007).

The CIPP evaluation model is an elaborate framework developed by Stufflebeam for conducting formative and summative evaluations. It is a framework for guiding evaluation of programmes, projects, personnel, products, institutions and evaluation systems (Stufflebeam, 2003). The CIPP model of evaluation is based on two major assumptions:

1. Evaluation plays an important role in initiating and bringing about change.
2. Evaluation forms a pivotal aspect of routine agricultural programmes.

In effect evaluation should not be regarded as special activity conducted only when agricultural projects are introduced (Stufflebeam, 2003). According to Stufflebeam (2003) evaluation is a process of explaining, assessing and providing needed information to judge alternative decisions. The CIPP is conducted as a process and each element represents a type of evaluation undertaken independently or as an integrated event (Gredler, 1996). In summary, the context evaluation represents planning decisions; input evaluation represents structuring decisions; process evaluation represents implementing decisions or recycling decisions to judge; and product evaluation represents reaction to programme achievements.

Context evaluation is a type of situational analysis undertaken by an evaluator. Based on the prevailing realities, an assessment is made with regards to what need to be done. It is a form of baseline information that leads to the operations and accomplishment of a whole system. The main purpose of context evaluation is to define the environment. This is to, identify the relevant conditions related to a particular environment, and then direct attention to unachieved activities, and lost opportunities in other to determine what need to

be achieved (Sufflebeam, 2003). The identified “gap (s)” forms the objectives of the evaluation.

Input evaluation forms the next stage of the model designed to provide information on how to use resources to achieve expected goals. Input evaluates specific areas of the programme by ensuring the following: that the programme objectives are met appropriately and the objectives are in line with expected outcomes. Again, the contents are in agreement with the goals and objectives of the programme and the various steps put in place to undertake the activities are appropriate. Above all, there are other activities that can help achieve planned objectives and also there are enough reasons to believe that the contents and steps chosen will successfully produce expected results. In effect, one of the main purposes of input evaluation is to assist clients to develop a workable plan based on their particular needs and circumstances (Stufflebeam, 2003).

According to Stufflebeam 2003, there are three stages involved in process evaluation. The first is to predict possible shortcomings during programme implementation stage, and then provide information for decision making and finally keep records of occurrences as they unfold. The main purpose of process evaluation is to provide feedback about needed changes that may come about if implementation is inadequate. Stufflebeam, (2003) indicated that process evaluation also ensures whether activities are on schedule; activities are implemented as planned; available resources are being used efficiently; and programme participants are comfortable with their assigned roles. Process evaluation also provides information to stakeholders

who want to learn about the programme and also assist stakeholders to interpret programme outcomes (Gredler, 1996).

Product evaluation is identified as an important segment of "accountability report" for evaluators (Stufflebeam and Shikfield, 2007). This evaluation is primarily used to determine whether an ongoing programme need to be continued, repeated and /or extended to other parts of the localities (Stufflebeam, 2003). The primary function of the product evaluation is to measure, interpret and judge achievements. It also provides directions for improving programmes to better serve the interest of beneficiaries so as to beat down cost.

Input and Credit Support to Farmers

Availability of credit and /or input is a very important factor in the successful adoption and utilisation of technology (Baryeh, Ntifo-Siaw, Baryeh, 2000). Once most cassava cultivation practices are done under rain-fed conditions, it will be appropriate that farm inputs are made available to farmers on time and at reasonable prices (Baryeh et al., 2000). Farmers can thus take advantage and use the resources for their productive farming enterprise.

A study conducted in Sekyere South District in the Ashanti Region of Ghana on improved cassava variety "Bankyehemaa," revealed that farmers' access to input had significant impact on area of cassava cultivated (Owusu & Donkor, 2012). Studies have also shown that when rural farmers have adequate credit to access inputs such as improved cassava planting materials, agrochemicals and hire labour, adoption of technology is enhanced and area under cultivation subsequently increases.

Demographic and Farm Related Characteristics of Cassava Farmers

The demographic and farm related characteristics of the cassava farmers is reviewed in terms of sex, educational background, family size, age and farming experience.

Sex of Cassava Farmers

Studies have shown that in sub-Saharan Africa women constitute between 60 and 80 percent of the labour for food production, both for household consumption and market (FAO, 1994). Predominantly, agriculture is being managed by women due to the fast out-migration by men (FAO, 1998).

The FAO (1985) asserted that women play a significant role in agriculture as they constitute two-thirds of the work force in agricultural production in Africa. This was supported by Sabo (2008) that about 70 percent of rural women constitute the total agricultural workers, 80 percent of food producers and over 90 percent of those who process basic food stuff are women, and they undertake 60 to 90 percent of rural marketing. The traditional roles of men farmers are changing. For example, in Kenya about 86 percent of farmers are women, 44 percent of whom represent their husbands in their absence (Saito, Mekonnen & Spurling, 1994). According to Prah (1996), Ghanaian women constitute about 52 percent of the agricultural labour force and produce about 70 percent of the total crop.

Cassava is labelled “woman’s crop”. This is evident from the fact that women undertake most of the processing activities (Nweke, Spencer & Lymann, 2002). Studies have shown that women are increasingly providing labour in the production of cassava (Nweke, 2002). Although men are still

playing a central role in land preparation, women play a major role in the post-harvest activities in the commercial production of cassava (Saito et al., 1994). Adewale, Oladejo and Ogunnyi (2003) opined that gender should not be hindrance to farmers in cassava production, however Oledeji, Oyedekun, Bankole (2001) observed that there is the general belief that men are naturally stronger than women and so the men are more qualified to accept energy demanding jobs such as cassava farming than the women.

Educational Background of Small-holder Cassava Farmers

Anyanwu, Kalio, Manila and Ojumba (2012) observed that when there is an increase in the educational levels of cassava farmers there comes an equal resultant increase in their orientation towards cassava production for the market. In that effect, poorly educated farmers tend to be conservative and are mostly found to resist new innovations. Another effect of poor level of education is the continuous use of traditional farming practices which normally lead to the vicious cycle of low productivity.

It can be accepted that acquisition of education is a measure of skills that promotes the individuals' chances of success in any given task or activity. Education thus, can positively influence clients' accessibility to extension services. Nzeulor (2002) however, begged to differ from the above assertion. He reported that when people attain higher levels of education, they accord low participation to farming.

Challenges that illiterate cassava farmers who cannot read and write encounter are widespread and there is high possibility that their understanding about information concerning the prospects of the improved cassava varieties can easily be hindered (Nwabueze & Odunsi, 2007). Research suggests that

the area cultivated under improved cassava varieties increases as the number of years of schooling of the farmer increases. Thus, education improves the managerial skills and human capital of farmers. It enlightens and imparts the necessary knowledge on new technological packages and provides skills and understanding on how to use the new technologies efficiently.

An individual's exposure to education tends to increase his/her ability to access, process and utilise information relevant to his/her technological needs (Kudi, Bolaji, Akinola & Nasal, 2001). When farmers are able to access information on improved technologies they become better sensitised and that leads to changing their attitudes towards adoption of recommended improved technologies (Caviglia & Kahn, 2001). Education has a positive influence on farm productivity by improving the quality of labour and the probability to adopt agricultural innovations successfully in a rapidly changing environment (Feder, Murgai & Quizon, 2003; Knight, Weir & Woldehana, 2003).

Farm Sizes of Cassava Farmers

Ojukaiye (2001) and Olayide, Ogunfowora, Essang and Idachaba (1984) classified farm sizes ranging from 0.1 to 5.9 hectares as small farm-holdings and indicated that such farms would not allow for meaningful investment and returns such that it can scale on food security. Report has also shown that increase in farm sizes had led to increase in gross income of cassava farmers (Anyanwu, 2009; Obasi, 2005). Meanwhile, Strong (1989) also opined that the average land holdings of small scale cassava farmers are often too small to provide efficient outputs. Implications from the relationship between farm sizes and gross incomes are that naturally, small farm sizes will lead to low outputs and consequently low productivity.

According to Alao (1971), a farmer may possess positive behaviour towards a new technology, however he might have limitations in respect to insufficient or non-availability of farm land. Rogers and Shoemaker (1997) suggest that when behavior, attitude and consistency are discussed, farm land is identified as one of the eight variables that are mostly necessary for determining the extent to which farmers perceive the acceptability of new agricultural intervention. If farmers in the communities desire to increase their productivity of the improved cassava varieties yet have the limitation of availability of land, little can be done apart from cultivating on subsistence which can also affect their incomes and livelihoods.

Household Sizes of Cassava Farmers

As reported by Ani (2004) and Nani (2005) household size in traditional farming community guarantees the accessibility of labour and possible increase in productivity. It therefore means that the higher the farm size, the higher also it is to source labour from within the household. Notwithstanding the fact that, an increased household size implies an increase in cost of feeding, Effiong (2005) believes that large household sizes enhance the availability of family labour so that there is reduction in labour cost for agricultural production. Omonona, Oni and Uwagboe (2006) asserted that larger household sizes tend to increase the area cultivated under improved cassava varieties.

In effect, higher household sizes promote agricultural productivity and also ensure food security. Studies such as Bassey and Okon (2008), Nandi, Gunn and Yukushi (2011) reported that larger household size impacted positively on cassava production in Nigeria.

Age of Cassava Farmers

Ogundari and Ojo (2006) reported that cassava outputs decrease with correspondent increase in age of the farmers, indicating that farmers' age impacted negatively on cassava output. This is expected, considering the rigorous and traditional nature of cassava production in our part of the world. The practice is such that aged farmers cannot cope, aside knowing them as risk averse, conservative and as such unproductive. Research has shown that the age of a farmer plays a pivotal role in informing his adoption decisions, and more youth respond to innovations than older ones (KSADP, 1997).

Onu and Madukwe (2002) asserted that the youth are more likely to accept and serve better as technology transfer in cassava production. Age is a factor in delivery and adoption of agricultural technology (Oluyole, Ogunlade, Agbeniyi, 2011). The younger the farmer, the higher his aspirations to accept new technologies than the conservative farmer. The conservation farmer in most cases seems to be more complacent with his or her traditional methods (Tsosho, 2004). Theories have suggested that adult learners seek information that meet their production needs and societal roles, hence they go to places where they feel comfortable, places that are non-intimidating and user friendly, and above all places that speak their language (Cerf & Hemidy, 1999).

Cassava Farmers' Working Experience

According to Bassey and Okon (2008), Gbigbi, Bassey and Okon (2010), when farmers have many years of experience they tend to have accumulated enough knowledge through several years of trial and error and this makes them more productive. Akorede (2004) reported that farming

experiences between seven and twelve years is encouraging enough to increase production of cassava.

Conceptual Framework

The conceptual framework of the cassava farmers' perception of impact of the West Africa Agricultural Productivity Programme on their livelihood systems (Figure 1) consists of five parameters. These are, perceived effectiveness of the WAAPP components; perceived effectiveness of the farmer groups; extension services delivery; and farmers' demographic and farm related characteristics.

Extensive review of literature revealed that farmers' demographic and farm related characteristics have a significant relationship with agricultural productivity. Studies by Obasi, Henri-Ukoha, Ukewuihe and Chidiebere-Mark (2013) among arable crop farmers in Imo State, Nigeria showed that the age, educational level, farming experience and farm sizes significantly affect agricultural productivity. Several authors (Teryomenko, 2008; Helfand, 2003; Yasmeen, Abbasian & Hussain, 2011; Gill, 2000) confirmed the ascertion.

The primary objective of WAAPP's intervention is to increase productivity of cassava, and that is evident in the main components (provision of improved planting materials, training and inputs support). Successful extension delivery in terms of technologies and processes are channeled through effective decision-making and behavioural change processes of the target clients (Rogers, 1995). These are expected to bring about optimal-level performance that should have positive influence on productivity (Wu, 2005).

The farmer groups play very useful complimentary roles to augment the technology delivery with respect to access to resources, improved

technologies, market information and empowerment of farmer groups (Bosc et. al., 2002). The expected outcome is to increase the productivity of improved cassava. The ability of the main components of the interventions to effectively increase productivity is determined from the view point of the beneficiary farmers.

The overall expected results are the achievement of the desired positive impact points of the programme's interventions on the livelihood systems of the cassava farmers. These include improved production of quality planting materials, ownership of mobile phones, decrease in debts owed to service providers, ability to pay wards' school fees, and improved access to extension services (DFID, 2000; Norton, 2004). There is significant and positive relationship between real impact and productivity. For instant, financial capital acquired can be invested back into the beneficiary farmers' farming enterprise.

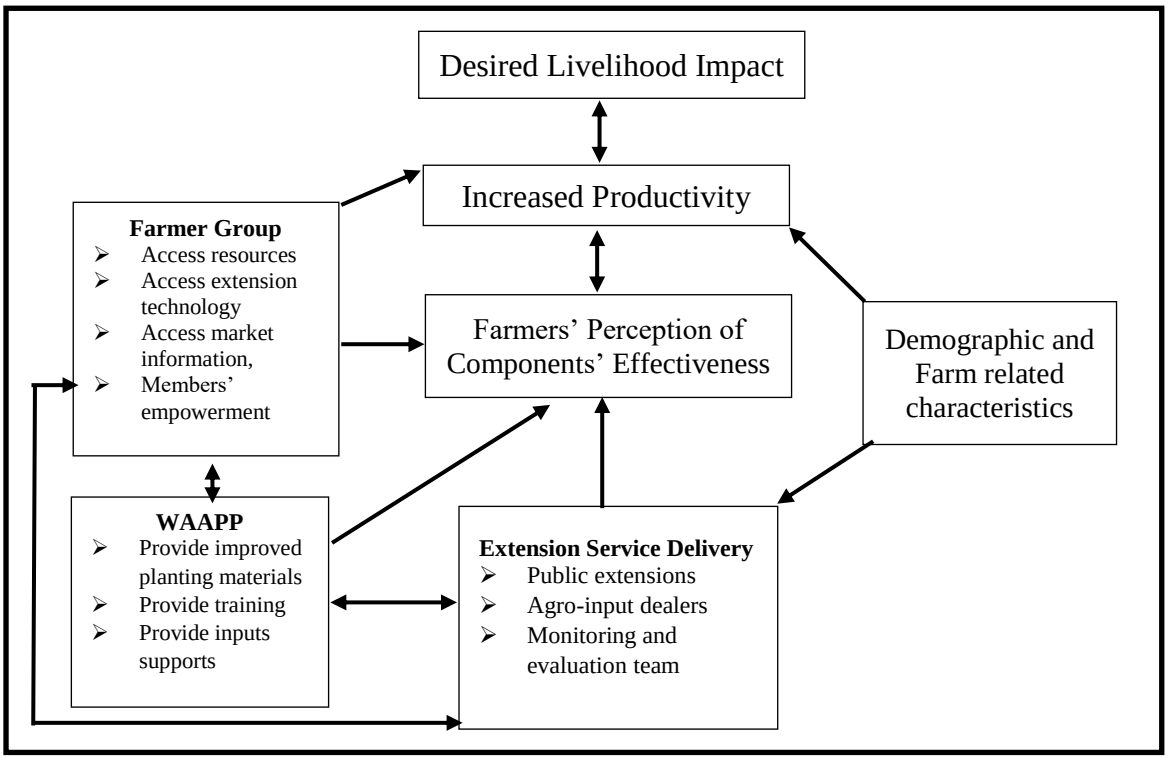

Figure 1: **Conceptual Framework of Cassava Farmers' Perceived Impact of WAAPP on their Livelihood Systems**

Source: Authors' construct 2014

CHAPTER THREE

METHODOLOGY

Introduction

Methodology in research provides the information that are needed by readers to help subject the entire study to ultimate judgement (Kallet, 2004). Research methodology addresses the question of how data was collected or generated and analysed.

This chapter covers the design, the population, the sample size, the sampling procedure, the research instrument, data collection and data processing and analysis that were used as well as the rationale for selecting these techniques for the study.

The Study Area

The study area is Brong Ahafo-Region of Ghana. It is the second largest region in Ghana, covering a land area of 39,558 square kilometres with 27 administrative districts/municipalities and metropolitans. It covers 16.6 percent of the country's total land area, and shares boundaries with the Northern Region to the north, the Ashanti and Western Regions to the south, the Volta Region to the east, the Eastern Region to the southeast and La Cote d'Ivoire to the west (Figure 3).

Demography

The 2010 Population and Housing Census estimated the Region's population was 2,280,128 (GSS, 2010) with an estimated growth rate of 2.2 percent (against 2.4 percent national average). The Region's labour force stands at 819,190; out of which 566,066 (69.1%) is from the agricultural sector [51.1% males and 48.9% females] (GSS, 2010). Nineteen thousand, one hundred and ninety persons, representing 79.2 per cent of the population are economically active, two-thirds (66.4%) of whom are in agriculture and related work. Agriculture and related work are the major occupation in all the districts. In the three most urbanised districts, Sunyani (45.9%), Berekum (50.9%) and Techiman (57.1%), agriculture and related work account for between 45-60 percent.

Climate

The Region has a tropical climate, with high temperatures averaging 23.9oC (750F) throughout the year. Relative humidity in the region is also quite high averaging over 75%. The Region enjoys double maxima rainfall pattern. The average annual rainfall range of the region is 1,088 mm-1,197 mm.

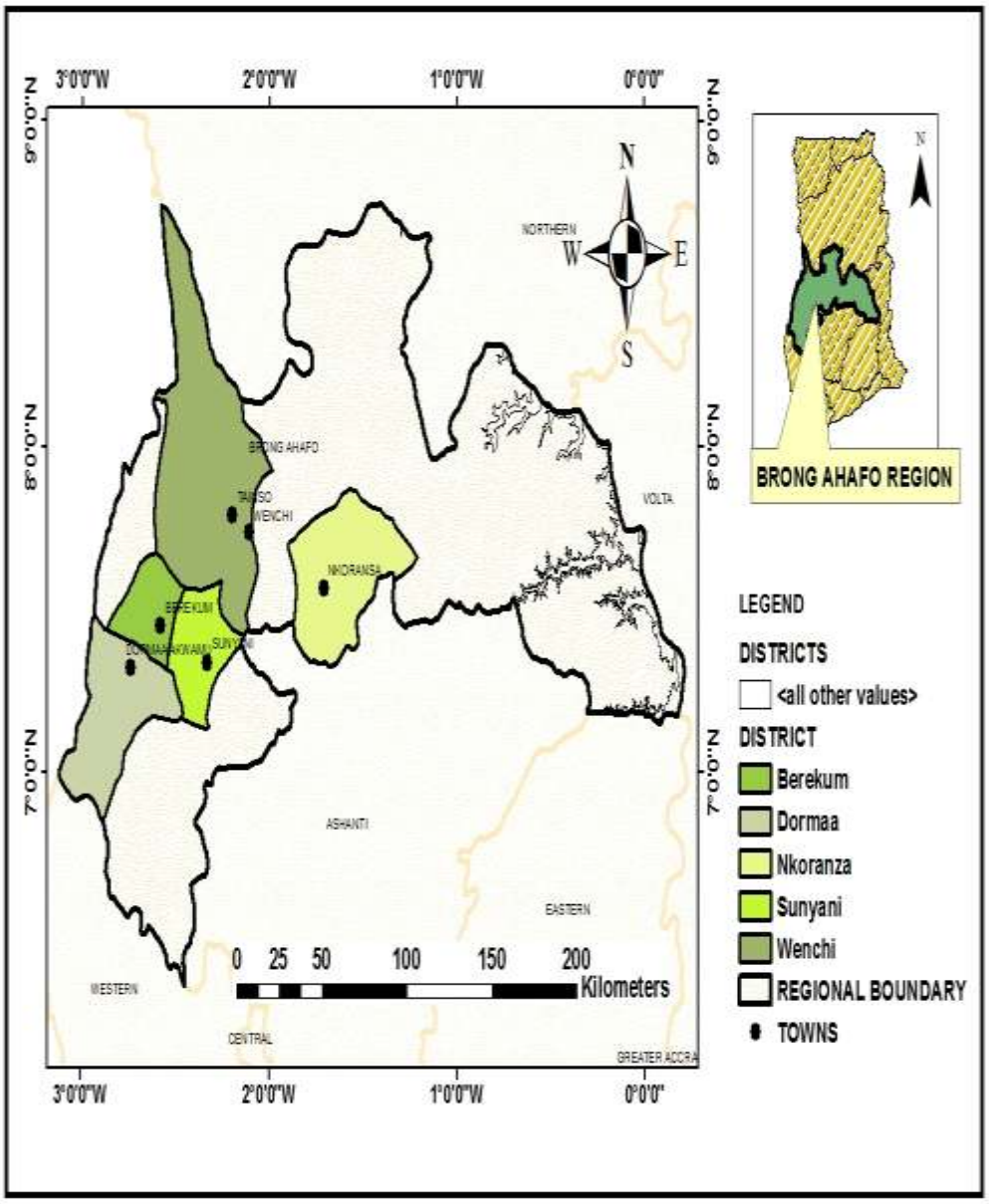

Figure 2: The Map of the Study Area

Source: Department of Geography-UCC

Soil and Drainage

The Region has two distinguished drainage systems: the Black Volta which dominates the northern parts of the region, whilst to the south the Tain, Bia, Pru and the Tano Rivers form the main drainage basins.

Land Use and Major Agricultural Activities

Crop production accounts for seventy percent of the Region's agricultural output whilst livestock production activities can mainly be located at Atebubu, Kintampo North and South, Pru and Techiman districts. Inland fishing or aquaculture activities can mainly be located at Yeji, Sunyani, Dormaa, Tano North and South districts. The Region is the second largest producer of cassava in Ghana in terms of total cultivated area accounting for about 23 percent of total cassava produced in Ghana (MOFA, 2010).

Agricultural Extension Services

There are vibrant public extension services in the region. The Region has 27 districts and MOFA has a district directorate in every one of them. The regional capital, Sunyani, in addition to the Municipal directorate, is also home to the Regional Directorate of Agriculture. A number of Non-Governmental Organisations as well as private agro-input dealers can be located in almost every district in the region.

Study Design

A descriptive-correlational survey design was used for the study. In a descriptive study, information is collected without changing the environment (Brickman & Rog, 1998). Descriptive studies can answer the questions such as "what is" and "what was" and provide information about the naturally occurred health status, behavior, attitudes and other characteristics of a particular group (Brickman & Rog 1998).

According to Gravetter and Wallnau (2000), correlational techniques are often used by researchers who are engaged in non-experimental research

designs. Unlike experimental designs, variables are not deliberately manipulated or controlled; variables are described as they exist naturally. These techniques can be used to:

i. explore the association between pairs of variables (correlation);
ii. predict scores on one variable from scores on another variable (bivariate regression);
iii. predict scores on a dependent variable from scores of a number of independent variables (multiple regression) and
iv. identify the structure underlying a group of related variables [factor analysis] (Gravetter & Wallnau, 2000).

The choice of the descriptive-correlational study design was to help the researcher in the description of the demographic and farm related characteristics of the farmers and find out the relationship between the perceived impact of the WAAPP on the livelihood systems of the farmers and the various components of the WAAPP. Also to be able to determine the best predictor (s) of impact from the components.

The Study Population

The population of the study comprised of cassava farmers within the groups who benefited from the WAAPP's interventions in the selected districts within the Brong-Ahafo Region of Ghana during the pilot phase of the programme. They were strategically selected by WAAPP across eight districts originally, based on their comparative interest in cassava production.

Sampling Procedures and Sample Size

A census was used because the entire population was not too large and so the researcher found it reasonable to include the entire population. It is called a census because data is gathered on every member of the population (Patton, 1990).

Table 1: Population and Census Size Used for the Study

Districts	No. of groups	Membership	Location of groups
Sunyani West	1	12	Nsuatre
Tain	1	20	Nassana
Berekum	2	10	Nsapor
		10	Nanasuano
Wenchi	2	11	Nkonsia
		11	Subinso No.2
Dormaa East	1	11	Kyeremasu
Nkoranza North	1	27	Boama
Total	**8**	**112**	

Source: Field data, 2013

In all a total of 112 respondents were interviewed from the six (6) districts for the study as shown in Table 1.

Eight districts were originally selected from the Brong-Ahafo Region during the first phase of the programme implementation; namely Wenchi, Tain, Asutifi, Sunyani West, Berekum, Dormaa East, Nkoranza North, and Attebubu. The list of groups which were selected to participate in the programme during the first phase and the membership were obtained from the National Monitoring and Evaluation Directorate of WAAPP in Accra. The Brong-Ahafo Regional Extension Officer (B/A REO) who happens to be the Desk Officer of the WAAPP in the Region was contacted. He confirmed the existence of the groups and further linked the researcher to the District Directors of Agriculture (DDAs) in the participating districts. The DDAs of

the respective districts were contacted and they, in turn introduced the Desk Officers (DOs) of the WAAPP in the various districts to the researcher. The DOs led the researcher to the Contact Persons (CPs) or Group Motivators (GMs). The CPs led the researcher to the individual group members.

In all, eight districts were identified but the district directorate of agriculture could not provide adequate information about the cassava production activities of Attebubu and Asutifi districts. Therefore, locating the group members and gathering information about their cassava production activities became difficult for the researcher to include them in the census. In effect, Attebubu and Asutifi were excluded from the study due to lack of adequate information about their groups' activities at the time of conducting the reconnaissance survey. Thus, a census of all the group members from the remaining six (6) districts were conducted for the study.

Data Collection

Primary data were collected through the use of structured interview schedule for the analysis in the study. According to Leedy and Ormrod (2005) datum is said to be primary if it is collected first-hand by an inquirer for a determinable purpose.

Two Agricultural Extension Agents (AEAs) working in the respective Operational Areas where the farmer groups were located, were selected from each of the six districts and trained on how to administer the instrument. The training covered the manner in which they had to facilitate the interpretation and meaning of each of the items on the interview schedule to the respondents, especially those who might have difficulty of understanding the questions due to low educational background.

A total of 106 out of the 112 participants, accounting for 95 percent of the targeted census were interviewed. The shortfall of six was as a result of a deceased group member and five other members who had relocated from the communities at the time of the data collection. The data collection lasted for four weeks, between 8th of December, 2014 and 5th of January, 2015. The long period was as a result of the respondents' unavailability in the communities. Though the period was supposed to be the off season of the farmers, the opposite was rather experienced in the field. The farmers were still visiting their farms.

Instrument Design

Primary data were collected from the cassava farmers through the use of structured interview schedule. (Appendix B). The instrument had five parts: A, B, C, D and E. The part "A" was designed to collect data on the demographic and farm related characteristics of the respondents. It contained closed and open ended questions.

The choice of Likert-type scale by the researcher was primarily due to how it has been widely accepted and extensively tested in social science literature to measure people's attitude, preferences, images, opinions and conceptions (Likert, 1932 cited in Gob, McCollin, Ramalhoto, 2007). The five point scale was preferred because research assumes that the provision of the mid-point enables respondents to make choices of options that best align with their views and not necessarily pose harmful to the measurement of reliability and validity, and also avoid "forcing" respondent to choose a direction (Adelson & McCoach, 2010; Losby & Wetmore, 2012).

Part “B” was designed to collect data on the respondents’ perceived effectiveness of the main components of the WAAPP. There were four sections in this part, namely; provision of inputs, provision of improved planting materials, provision of training, and provision of extension services. Five (5) points Likert-type scale ranging from Very Effective (5) to Very Ineffective (1) was provided for respondents to rate the effectiveness of the main components of the WAAPP.

Part “C” was designed to collect data on the respondents’ perceived effectiveness of the farmer groups. There were five sections in this part, namely; groups’ access to resources, groups’ access to market information, groups’ access to improved technology and group members’ empowerment. Five (5) point Likert-type scale ranging from Very Effective (5) to Very Ineffective (1) was provided for the respondents to rate their perception on the effectiveness of the farmer groups.

Part “D” was designed to collect data on the respondents’ perceived impact of the WAAPP on their livelihood systems. There were five sections in this part, namely; access to natural capital, access to physical capital, access to financial capital, access to human capital and access to social capital. Five (5) points Likert-type scale ranging from Very High (5) to Very Low (1) was provided for the respondents’ to rate their perception of impact of the WAAPP on their livelihood systems.

Part “E” was designed to collect data on the perceived acceptability of the cassava varieties by the respondents. There were mainly closed ended questions with some few open ended questions for respondents to provide their perception on the acceptability of the improved cassava varieties.

Both face and content validity were ensured. Face validity was ensured by the researcher while the content validity was proved by the lecturers in the Department of Agricultural Economics and Extension, University of Cape Coast and the Coordinator of WAAPP in Accra.

Table 2: Likert- type Scale and their Interpretation

Ratings	Intervals	Perceived effectiveness of the farmer groups	Perceived effectiveness of the WAAPP components	Perceived impact of WAAPP components on livelihood systems
5	4.45-5.00	Very Effective	Very Effective	Very High
4	3.45-4.44	Effective	Effective	High
3	2.45-3.44	Moderately Effective	Moderately Effective	Moderately High
2	1.45-2.44	Ineffective	Ineffective	Low
1	1.00-1.44	Very Ineffective	Very Ineffective	Very Low

Source**:** Author's construct, 2014

Pre-testing

A pre-test of the instrument was conducted in the Sunyani East district of the Brong-Ahafo Region. The group used for the pre-testing had similar characteristics with the study population. According to Pilot, Beck and Hugler, (2001) pre-testing is necessary to test the adequacy of the research instruments, assess the feasibility of the study, design the necessary research protocol and assess whether the research protocol is realistic and workable. The idea is to possibly establish whether the sampling framework is effective and above all identify any potential research challenges during the main study.

The exercise was conducted to pre-test the instrument to determine its reliability and validity with the help of SPSS (Statistical Product and Service Solutions) version 21. According to Miller (2005) validity and reliability are the most important criteria for assessing the quality of an instrument.

Cronbach's alpha co-efficient was used to determine the internal consistency of all the Likert-type scales. Two (2) Agricultural Extension Agents (AEAs) were selected and trained to facilitate the administration of the interview schedule for the pre-testing. The key observations made in the exercise were that, administering one interview schedule lasted for an average of forty-five minutes and most of the interviewees provided information from their memory recall. Also there were no documented records for reference.

Twenty interview schedules were administered to twenty subjects in the selected area. The composition was made up of twenty members of cassava farmer group who participated in the RTIMP but were not part of the target population. The pre-testing lasted for seven days, between 27th November and 4th December, 2014.

Table 3 shows the reliability co-efficient of the sub-scales of the research instruments.

Table 3: Reliability Co-efficient of Sub-scales of the Research Instruments

Sub-scales	No. of items	Cronbach's alpha
Perceived effectiveness of the farmer groups	18	0.70

Perceived effectiveness of the WAAPP components	23	0.72
Perceived impact of the WAAPP on the livelihood systems of farmers	23	0.87

N = 20

Source: Field data, 2014ded

The three main sub-scales of the study had Cronbach's alpha coefficients as follows: perceived effectiveness of the farmer groups 0.70, perceived effectiveness of the WAAPP components 0.72, and perceived impact of WAAPP on the livelihood systems of farmers 0.87. According to George and Mallery (2003) when reliability co-efficient (r) is 0.7 and above it is acceptable and thus, the variables were reliable.

Ethical Procedures

With the assistance of the Agricultural Extension Agents (AEAs) in the respective communities where primary data were collected, prior consent was sought from the respondents. The purpose and anticipated benefits of the study were communicated to them in their local languages. The essence was to allow them the chance to decide whether to be part or decline. They were also assured of confidentiality in relation to any information provided. To ensure anonymity their names and contact numbers were not demanded. The researcher diligently took into consideration the gender, cultural, religious and social class of the respondents

Data Analysis

Tools like frequencies, percentages, means, mode, and standard deviations from the Statistical Product and Service Solutions (SPSS) version 21 were used to analyse the data. Pearson's product moment correlation coefficients and stepwise multi regression were also used to compare relationships and determine best predictor (s) of impact. Each of the specific objectives was analysed as follows:

Objective one: To describe the demographic and farm related characteristics of the farmers, frequencies, percentages, means, modes and standard deviation were used. Objective Two: To determine the perceived effectiveness of: i. the components of WAAPP in terms of provision of improved cassava materials, inputs support, training and extension services. ii. Farmer groups' access to resources, extension technology, market information and members' empowerment; and iii. Determine the perceived acceptability of the improved cassava varieties frequencies, percentages, means, weighted means and standard deviation were used. Objective three: To ascertain the impact of WAAPP's components on the cassava farmers in terms of their livelihood assets (natural, physical, financial, human and social capital) frequencies, percentages, means, weighted means and standard deviation were used.

To determine the best predictor(s) of the perceived impact of WAAPP's interventions on the livelihood systems of the cassava farmers (as set in objective 4) Pearson's product moment correlation coefficient was used to compare the relationship between the perceived effectiveness of the WAAPP's components and the perceived impact of the livelihood systems of the farmers. Davis' Convention was used to describe the magnitude and

direction of all correlation coefficients because of its detailed nature and efficiency (Miller, 2005). Subsequently, stepwise multiple regressions was used to determine the best predictor(s) of the impact of the interventions on the livelihoods of the cassava farmers from the perceived effectiveness of the main components of the WAAPP.

The choice of stepwise regression was to determine the best combination of the independent (predictor) variables that predicted the dependent (predicted) variables. The stepwise regression model has been proven useful in evaluating the order of importance of variables and also select useful subsets of the variables (Huberty, 1989). All hypotheses or significance of difference and relationship were tested using 0.05 alpha levels.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents results and discussions of the study. Section one describes the demographic and farm related characteristics of the cassava farmers. Section two has three sub-objectives: the perceived effectiveness of the components of the WAAPP in terms of provision of improved cassava planting materials, inputs support, training and extension services; perceived effectiveness of farmer members' access to resources, agricultural technology, market information and members' empowerment; to determine the perceived acceptability of the improved cassava varieties. Section three presents the perceived impact of the WAAPP on the livelihood systems of the cassava farmers. Section four discusses the best predictor(s) of perceived impact of WAAPP on the livelihood systems of the cassava farmers.

Demographic and Farm Related Characteristics of the Farmers

The demographic and farm related characteristics of the cassava farmers were discussed in terms of sex, age, educational background, years of farming experience, household size, farm size, and years of working with farmer groups.

Sex of Cassava Farmers

Figure 3 presents the sex of the cassava farmers. Gender roles in cassava production, processing and marketing are very crucial in ensuring productivity in the cassava value chain. Insight into gender roles facilitates the process of resource allocation and defining of responsibilities.

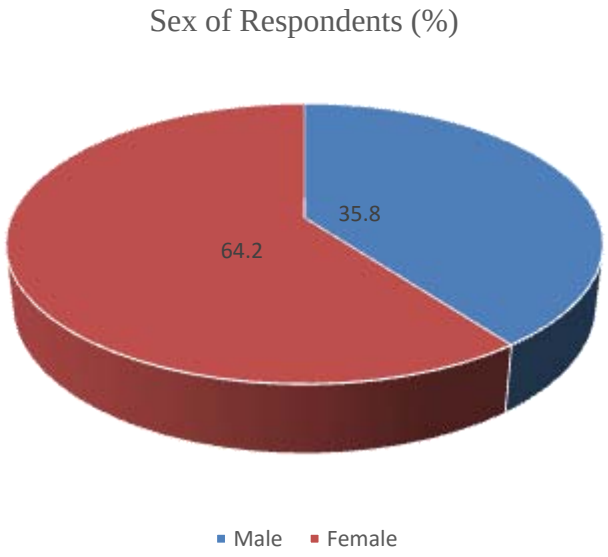

Figure 3: Sex of Cassava Farmers

Source: Field data, 2014

The results show that majority (64.2 %) of the farmers are females and 35.8 percent were males. This confirmed the observation made by the FAO (1994) that in sub-Saharan Africa, women constitute between 60 and 80 percent of the labour for food production, both for household consumption and marketing. That is also in consonance with the assertion of FAO (1985) that women play significant role in agriculture and they constitute two thirds of the workforce in agricultural production. However, the percentage of women in the report is far higher than the percentage of women farmers reported under the baseline survey of the WAAPP in 2009 (Sam & Dapaah, 2009).

The sensitisation activities carried out by the personnel of the Agricultural Extension Service concerning the prospects of the improved cassava varieties might have accounted for the increase in the women's participation. The high number of women involved could also demonstrate their interest to add value to their harvested fresh cassava roots by processing them into other forms; an activity mostly handled by women.

Age of Cassava Farmers

The age distribution of farmers is presented in Table 4. Age of famers play a significant role in the production function of cassava, considering the drudgery involved in the production, processing and marketing of the crop.

Table 4: Age of Respondents

Age (years)	Frequency	Percentage
Less than 34	13.0	12.3
34 – 44	26.0	24.5
45 – 54	33.0	31.1
55 – 64	21.0	19.8
Above 65	13.0	12.3
Total	**106**	**100**

Mean age= 48.00, SD= 11.92 Min. age = 24.00, Max. age = 74.00
Source: Field data, 2014

The results show that majority (55.6%) of the cassava farmers fall within the age bracket of 34 and 54 years. This implies that a greater percentage of the cassava farmers fall within the productive age, and can adopt innovations introduced by WAAPP. The age of the respondents is important because most of the operations undertaken by smallholder farmers such as planting, fertilizer application, weed control and harvesting are done manually requiring physical strengthen. Hence, mean age of 48 years is ideal to cope

with the farm management practices (Oluyole, Ogunlade, Agbeniyi, 2011). The mean age of the respondents (48 years) is slightly higher than the mean age (45 years) of respondents reported by the baseline survey of WAAPP in 2009 (Sam & Dapaah, 2009).

Educational Background of Cassava Farmers

Table 5 presents the educational background of the cassava farmers. Educational level of farmers has a propensity to influence the choice of technologies that crop farmers may adopt in a production programme (Aryeetey, 2004).

Table 5: Educational Background of Respondents

Level of Education	Frequency	Percentage
No formal education	50	47.2
Primary	15	14.2
Middle/JHS	35	33.0
Secondary/Vocational	2	1.9
Tertiary	4	3.8
Total	**106**	**100**

Source: Field data, 2014

The results show that majority (over 90%) of the respondents have education below the senior secondary school level. Out of this 47.2 percent of them have not acquired any formal education. This trend can pose a great challenge to improved technology dissemination and subsequent adoption. Ali and Shara (2008) believe that when farmers are exposed to education it increases their ability to obtain, process and use information relevant to the adoption of improved technology. In effect, education is thought to increase the farmer's probability to adopt improved technologies.

Anyanwu, Kalio, Manilla and Ojumba (2012) also opined that as the educational level of smallholder cassava farmers increase, it results in the increase of their orientation towards cassava production for the market or commercialization index. Again, most often, poorly educated farmers show up to be very conservative as they resist new innovations. The effect of this poor level of education is continuous adoption of traditional farming practices resulting in low productivity. The percentage of the farmers (47.2%) who have not got any form of formal education is higher than what was reported by WAAPP in the 2009 baseline survey (Sam & Dapaah, 2009).

Cassava Farmers Farming Experience

Years of farming experience of cassava farmers are very essential for ensuring increase in productivity (Gbigbi, Bassey & Okon, 2010). Table 6 presents the years of farming experience of the farmers.

Table 6: Farming Experience of Respondents

Experience (years)	Frequency	Percentage
1 – 10	46	43.4
11 – 20	32	30.2
21 – 30	20	18.9
31 – 40	6	5.7
41 - 50	2	1.9
Total	**106**	**100**
Mean= 16.00, SD= 10.12	Min. exp. = 2.00,	Max. exp. = 50.00

Source: Field data, 2014

As shown in Table 6, over 73 percent of the farmers have had farming experiences between one and 20 years. That number of years of experience is long enough to guarantee productive cassava cultivation. Akorede (2004)

submits that farming experience of between seven and 12 is long enough to encourage successful establishment and management of cassava farms.

Household Size of Cassava Farmers

Cassava farmers' household size is a form of human capital that can be used as a source of labour to increase productivity of cassava among farm families (Nandi, Gunn & Yukushi, 2011). Table 7 presents the household sizes of the cassava farmers.

Table 7: Household Size of Respondents

Household (range)	Frequency	Percentage
1 – 5	35	33.0
6 – 10	55	51.9
11 – 15	12	11.3
16 – 20	3	2.8
Above 20	1	0.9
Total	**106**	**100**

Source: Field data, 2014 Mean= 7.42, SD= 4.28

The results show that majority of the cassava farmers (about 52%) have household sizes varying from six to ten. The result is similar to what was reported by WAAPP baseline survey in 2009 (Sam & Dapaah, 2009). Since cassava production is traditionally a labour intensive activity, members in the household can provide additional labour to household heads. Ani (2004) and Nani (2005) explained that the larger the household size, the higher the possibility of sourcing labour from within the household. All things being equal, the presence of household members in any traditional farming community guarantees the availability of labour and productivity.

Omonona, Oni and Uwagbo (2006) asserted that larger household sizes tend to increase the area cultivated under improved cassava varieties. The implication is that rural household tends to have available family labour for their farm work which promotes adoption and increases area under cultivation of improved cassava varieties. Effiong (2005) ascertained that a relatively large household size will enhance the availability of family labour and that bbwill reduce constraint on labour cost in agricultural production.

Farm Sizes of Cassava Farmers

Farm sizes of an individual cassava farmer determines which category of production scale he or she is placed. It can either be a large scale, medium scale or small scale. The size of farm also classifies a household production either as commercial or subsistent. Table 8 presents the farm sizes of the cassava farmers.

Table 8: Farm Sizes of Respondents

Farm size (acres)	Frequency	Percentage
1 – 3	71	67.6
4 – 6	27	25.7
7 – 9	2	1.9
Above 9	5	4.8
Total	**106**	**100**

Source: Field data, 2014 Mean= 3.77, SD= 5.17

The results show that majority of the cassava farmers (approximately 68%) have farm sizes between one and three acres. Ojuekaiye (2001) classified farm sizes between 0.25 of an acre and 14.8 acres as small scale. The figure is slightly lower than the baseline report of WAAPP in 2009 (Sam & Dapaah, 2009) which gave approximately 80 percent of respondents owning farm sizes between one and five acres. Only about percent of the respondents

have cassava farm sizes between seven and nine acres, and about five percent have farm sizes above nine acres. The implications are that a large number of the farmers in the study area are producing cassava at the subsistence level and have not yet taken advantage of the prospects of producing cassava for commercial or industrial purposes.

Alao (1971) however, opined that a farmer may have positive attitude towards a new technology but might be constrained due to insufficient or non-availability of farm lands.

Farmers' Group Working Experience

The farmer group members' working experiences are presented in Table 9. The individual farmers with common objective of increasing productivity in cassava came together to form a working group to access the WAAPP's intervention. However, there were some of the farmers who were already existing in groups before accessing the interventions.

Table 9: Group Working Experience of Respondents

Experience (years)	Frequency	Percentage
Less than 3	5	47.0
Three	73	68.9
Four	11	10.4
Five	11	10.4
6 and above	6	5.7
Total	**106**	**100**

Source: Field data, 2014

The results show that majority of the farmers (approximately 69%) have three years working experience with their farmer groups. The years of experience in this instance is referring to the period the individual farmers came together to promote interpersonal relationship and collaboration. The

farmers did not only get interconnected and enjoyed mutual help systems when they worked in groups but also shared production and marketing challenges together.

Effectiveness of the WAAPP Components

The farmers' perceived effectiveness of the WAAPP's component were discussed in terms of provision of improved planting materials, inputs support to the farmers, training and extension services.

Effectiveness of WAAPP on Provision of Improved Planting Materials

Table 10 shows the perceived effectiveness of the WAAPP on the various characteristics or qualities of the improved cassava planting materials that were supplied.

Table 10: Perceived Effectiveness of WAAPP on Provision of Improved Planting Materials

Characteristics	Frequency	Percentage	Mean	SD
High yielding varieties	78	73.6	4.41	0.73
Early maturing varieties	82	77.4	4.08	0.95
Highly suitable for fufu varieties	83	78.3	3.97	0.92
High starch content varieties	83	78.3	3.95	0.85
Disease tolerant varieties	74	69.8	3.95	0.85
Weighted mean			**4.07**	**0.86**

Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective
Source: Field data, 2014

The results show that majority (over 69%) of the farmers had the opportunity to access the improved cassava planting materials supplied by WAAPP. They generally perceived the efforts put in place by WAAPP to supply them with the materials as effective (M= 4.07, SD= 0.86). However, they perceived the high yielding varieties to be very effectively delivered (M=

4.41, SD= 0.73) followed by the early maturing varieties (M= 4.08, SD= 0.95). The highly suitable for fufu varieties where "somehow" effectively (M= 3.97, SD= 0.92) delivered as well as the high starch content varieties (M= 3.95, SD= 0.85) and the disease tolerant varieties (M= 3.95, SD= 0.85), in that order. The implications were that the planting materials were supplied on time, and the quantities requested for, were also delivered. Rusike et al. (2014) had similar results from a study to evaluate the impact of a cassava-research-for-development on farm level outcomes in the Demographic Republic of Congo.

Effectiveness of WAAPP on Provision of Inputs Support

Table 11 shows the cassava farmers' perceived effectiveness of WAAPP on the various inputs support provided to augment their efforts in producing improved cassava varieties.

Table 11: Perceived Effectiveness of WAAPP on Provision of Inputs Support

Inputs	Freq. (%)	Mean	SD
Timely remittance for initial cost of land preparation	76 (71.7)	4.99	0.77
Timely supply of improved planting materials	74 (69.8)	4.38	0.84
Timely supply of insecticides	55 (51.9)	4.02	0.62
Timely supply of weedicides	72 (67.9)	3.97	0.86
Timely remittance for cost of planting	70 (66.0)	3.94	0.80
Timely supply of inorganic fertilizer	58 (54.7)	3.76	0.73
Weighted mean		**4.18**	**0.77**

Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective
Source: Field data, 2014

The results show that majority (over 51 %) of the farmers were able to access the various types of inputs support provided by WAAPP for their improved cassava production. Generally, they perceived the support as

effectively (M= 4.18, SD= 0.77) executed. They were quite consistent in the expression of the opinion. Among the various inputs support disbursed by WAAPP, the farmers rated timely remittance for initial cost of land preparation as very effectively (M= 4.99, SD= 0.77) delivered, similar to supply of improved planting materials (M= 4.38, SD= 0.84), and timely supply of insecticide (M= 4.02, SD= 0.62). The other inputs support namely; timely supply of weedicides (M= 3.97, SD= 0.86), timely remittance for cost of planting (M= 3.94, SD= 0.80), and timely supply of inorganic fertilizers (M= 3.76, SD= 0.73) were also "somehow" effectively delivered in that order.

The probable implications were that the inputs were delivered at the time they were required to be used by the farmers. Once the farmers depended on the natural rain for their crop production, when inputs are not delivered on time it normally results in crop failure (Baryeh, Ntifo-Siaw & Baryeh, 2000).

Effectiveness of WAAPP on Provision of Training

Table 12 shows the perception of the cassava farmers on the effectiveness of WAAPP in the provision of training needs to assist them in the group formation and production of their improved cassava. The results show that majority (over 64%) of the cassava farmers were able to access training from WAAPP. They generally rated the various thematic areas that the Agricultural Extension Agents (AEAs) selected to meet their training needs as effective (M= 3.64, SD= 0.76). They perceived the training on weed control (M= 4.28, SD= 0.66), and site selection and land preparation (M= 4.27, SD= 0.66) as very effectively delivered.

Table 12: Perceived Effectiveness of WAAPP on Provision of Training

Topics	Freq. (%)	Mean	SD

Weed control	98 (92.5)	4.28	0.66
Site selection and land preparation	102 (96.2)	4.27	0.66
Pesticide application	70 (66.0)	4.13	0.61
Timely harvesting	82 (77.4)	4.06	0.89
Pests and diseases control	68 (64.2)	3.96	0.72
Fertilizer application	72 (67.9)	3.90	0.77
Group dynamics	83 (78.3)	3.87	0.85
Reduction in postharvest losses	71 (67.0)	3.49	0.81
Farm record keeping	83 (83.0)	3.41	0.89
Weighted mean		**3.64**	**0.76**

Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective
Source: Field data, 2014

Similarly, training on pesticides application (M= 4.13, SD= 0.61), timely harvesting (M= 4.06, SD= 0.89), pests and diseases control (M= 3.96, SD= 0.72), fertilizer application (M= 3.90, SD= 0.77), and group dynamics (M= 3.87, SD= 0.85) were "somehow" effectively delivered. Training on farm record keeping was rated the least effective (M= 3.41, SD= 0.89) compared to the rest, it was considered moderately effective, just as reduction in postharvest losses.

The most probable implications were that the farmers realised the training topics were useful and relevant to their cassava production needs. "It is very important to train farmers on improved practices in agriculture so that they can minimise waste and instead utilise the resources at their disposal in the best ways possible" (Nweke, 2002).

Effectiveness of WAAP on Provision of Extension Services

Table 13 shows the perception of the cassava farmers on the effectiveness of the WAAPP on the various organisations that were used to provide extension services. These organisations basically transfered technologies and provided advice and technical backstopping activities to the farmers.

Table 13: Perceived Effectiveness of WAAPP on Provision of Extension Services

Service provider	Frequency	Percentage	Mean	SD
Public Extension	106	100	4.32	0.79
Monitoring and Evaluation	88	83.0	3.78	0.89
Agro-input dealers	63	59.4	3.14	0.84
Weighted mean			**3.75**	**0.84**

Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective
Source: Field data, 2014

The results show that entire (100%) of the cassava farmers accessed extension and advisory services provided by the public extension, whilst 83% and 59.4% accessed from the monitoring and evaluation team and agro-input dealers respectively. The farmers' generally perceived the performance of the various organisations which delivered services as quite effective (M=3.75, SD =0.84). Public extension services delivery was rated very effective (M= 4.32, SD= 0.79), indicating the pivotal role that public extension play in the pluralistic extension system. Their interaction effectiveness with the agro-input dealers was perceived as moderate (M= 3.14, SD= 0.89). The implications are that, the agricultural extension staff in the study area paid due diligence in technology transfer to the beneficiary farmers. Nweke (2002) asserted that if technologies are developed and are not moved to the ultimate users, it becomes a waste of resources.

Perceived Effectiveness of the Farmer Groups

The perceived effectiveness of the farmer groups were discussed in terms of the group members' ability to access resources, agricultural technology, market information, and group members' empowerment.

Group Members' Access to Resources

Table 14 shows how the farmer groups have been effective in assisting the members to access resources to improve their agri-business, using the group as security collateral.

Table 14: Perceived Effectiveness of Group on Access to Resources

Resource	No. of farmers who accessed Frequency(%)	Level of effectiveness Mean	SD
Agricultural machines and equipment	42 (39.6)	4.26	0.77
Agricultural credit	50 (47.2)	3.30	1.53
Weighted mean		**3.78**	**1.15**

N= 106, Multiple Response
Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective
Source: Field data, 2014

The results show that the farmers rated the groups' overall ability to access resources for their cassava production business as quite effective (M= 3.78, SD= 1.15). Some of the groups (39.6%) were able to access agricultural machines and equipment particularly to process fresh cassava into gari. Over 47 percent of the members accessed agricultural credit for the expansion of their cassava production business. Bernard and Spielman (2009); Kruijssen, Memo and Giuliani, (2009) spelt out some roles that are expected of effective farmer groups. They are of the belief that through the farmer groups, an improvement in the membership can help the group to access resources (like

input, credit, training, transport and infrastructure) using the group as collateral.

The farmers perceived that the effectiveness of the programme on the roles played by their farmer groups as security collateral, has been more effective (M= 4.26, SD= 0.77) in accessing agricultural machines and equipment than accessing agricultural credit (M= 3.30, SD= 1.53). There were however, some variations in their opinions.

Group Members' Access to Agricultural Technology

Table 15 shows the farmers' perception about how effectively the farmer groups assisted them to access agricultural technology and how each individual technology contributed to their cassava production. The results show that majority (over 60%) of the farmers were able to access the various aspects of the available agricultural technologies to produce their cassava.

The group members also generally perceived that their ability to access the available technologies has been quite effective (M= 3.92, SD= 0.86) in improving on their farming enterprise, though they were not consistent in their views. Meanwhile, their ability to practise simple farm record keeping has been "moderately" effective (M= 3.71, SD= 0.84). They however, managed to effectively (M= 4.17, SD= 0.83) access improved cassava planting materials from the extension officers. They realised that their ability to identify certain common cassava diseases that affect the plants was somehow "effective" (M= 3.81, SD= 0.86) yet they had to rely on the AEAs for advice. It is exactly the same way they rely on the AEAs for identifying certain improved cassava varieties because their ability to identify them was somehow "effective" (M= 3.88, SD= 1.02).

Table 15: Perceived Effectiveness of Group on Access to Agricultural Technology

Technology	Freq. (%)	Mean	SD
Ability to practice proper farm sanitation	104 (98.1)	4.19	0.76
Ability to access improved planting materials	97 (91.5)	4.17	0.83
Ability to apply pesticides to cassava	67 (63.2)	4.05	0.69
Ability to apply recommended fertilizers to cassava	72 (67.9)	4.03	0.83
Ability to identify certain improved cassava varieties	89 (84.0)	3.88	1.02
Ability to identify common cassava diseases	91 (85.8)	3.81	0.86
Ability to practice simple farm record keeping	86 (80.2)	3.71	0.84
Ability to identify simple soil fertility problems	87 (82.1)	3.72	0.98
Ability to use recommended planting population to cassava	95 (89.6)	3.76	0.92
Weighted mean		**3.92**	**0.86**

Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1=Very Ineffective
Source: Field data, 2014

An important requirement for successful cassava production is the ability for the farmer to identify the nutrient status of the soil (Issaka, Buri & Asare, 2008). The farmers confessed that they had moderate (M= 3.72, SD= 0.98) skills to identify simple soil fertility problems. However, after the AEAs had assisted them to know the stage that the plants need to be fertilized, they had effective skills to apply the recommended fertilizers (M= 4.03, SD= 0.83).

Their ability to practise proper farm sanitation and also apply pesticides on cassava fields were both effective (M= 4.19, SD= 0.76) and (M = 4.05, SD = 0.69) respectively. However, they perceived their ability to use recommended planting population as "less" effective (M= 3.76, SD= 0.92), compared to the other technologies.

Group Members' Access to Market Information

Table 16 shows the perceived effectiveness of the cassava farmer group members' access to information, especially to enable them market their fresh cassava roots.

Table 16: Perceived Effectiveness of Group on Access to Market Information

Information	Freq. (%)	Mean	SD
Ability to access information on current market pricing of fresh cassava	80 (81.1)	3.99	0.80
Ability to access market for fresh cassava	89 (84.0)	3.88	0.83
Ability to access information on glut situation and sales timing of fresh cassava	85 (80.2)	3.84	0.84
Weighted mean		**3.90**	**0.83**

Scale: 5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective
Source: Field Data, 2014

The results shows that the respondents rated their perception on access to the various components of market information that were required to enable them make informed decisions as generally effective (M= 3.90, SD= 0.83). Thus, information needs on current market pricing, glut situation and sales timing, and access to market were perceived effective in improving on their farming enterprise. The probable challenge was that the market for fresh cassava roots was not controlled by the cassava producers, therefore, market information alone did not afford them the needed satisfaction (Ikwuakam, Iyela & Akinbile, 2015).

Group Members' Level of Empowerment

Table 17 shows the cassava farmer group members' perception on how effectively their groups empowered them to be able to perform certain important skills which directly help to improve on their agricultural enterprise.

Table 17: Perceived Effectiveness of Group on Levels of Members' Empowerment

Areas of Interest	Freq. (%)	Mean	SD
Ability to participate in group decision-making	105 (99.1)	4.27	0.78
Ability to bargain for transport services	81 (76.4)	4.00	0.80
Ability to practice farmer-to-farmer technology	94 (88.7)	3.96	0.69
Ability to bargain with cassava buyers for better price offer	82 (77.4)	3.84	0.78
Ability to bargain with input dealers for supplies	69 (65.1)	3.62	0.77
Weighted mean		**3.94**	**0.76**

Scale: 5=Very Effective, 4=Effective, 3=Moderately, 2=Ineffective, 1=Very Ineffective
Source: Field data, 2014

The results show that majority (over 65%) of the farmers benefited from the various skills available to empower them. The general perception on how their farmer groups empowered them with bargaining and other important skills to improve on their farming enterprise has been effective (M= 3.94, SD= 0.76). The probable implication was that the group did not lack the necessary cohesion to undertake those activities (Benard and Spielman, 2009). The members indicated that they were more empowered to participate in group decision-making effectively (M= 4.27, SD= 0.78) than any other activity. The implications were that the group members exhibited equal rights and justice among themselves, and views of individual members were respected. The results also meant that the group had the ability to bargain for transport

services, practice farmer-to-farmer technology, bargain with cassava buyers for better price offer and with input dealers for supplies.

Adequately empowered farmer group members are able to survive during difficult moments and also keep the group sustained. Farmers and rural communities need to be organised and empowered for their growth. Chamala (1990) posited that "telling adults what to do provokes reaction, but showing them triggers the imagination, involving them gives understanding, and empowering them leads to commitment and action". Manalili (1990) also reiterated that, empowered farmer groups can act as point of contact or conduit for solving local problems, and mobilizing financial and human resources for sustainable development.

Acceptability of the Improved Cassava Varieties

According to Oledeji (2011), the farmers' perceived acceptability of improved cassava varieties does not only depend on their perception about the superior yields of the fresh roots, but also on the general socio-economic benefits. In the following discussions, the respondents' perceived acceptability of the improved cassava varieties was discussed with respect to their estimated yields before and after the WAAPP intervention, processed products of cassava, assessment of quality of processed products, the dietary forms in which fresh cassava is consumed by households, and the various sales outlets of the fresh cassava.

Estimated Yields of the Improved Cassava Varieties

Table 18 shows the mean estimated yields (kg per acre) of the improved cassava varieties produced by the farmers. Paired t-test was used to

show the difference in their mean estimated yields in the study area prior to the introduction of WAAPP's interventions and after.

Table 18: Paired t-test showing the Difference in Mean Estimated Yield of Cassava Production Before and After WAAPP Interventions

Estimated Yield of Cassava	N	Mean (1000kg/ac.)	SD	Mean Difference	t-ratio	Sig.
Before WAAPP	106	5.02	2.21	3.28	2.263	*000
After WAAPP	106	8.30	3.33			
$p < 0.05$			**Weighted mean (M= 6.66, SD= 2.77)**			

Source: Field data, 2014

The results shows that the mean yield before the introduction of WAAPP's interventions was 5,020 kg per acre and mean yield recorded by the farmers in the study area after the introduction of WAAPP's intervention was 8,300 kg per acre. The improvement in yield could be attributed to the use of the improved technologies (Sam & Dapaah, 2009).

Paired sampled t-test was conducted to determine whether significant difference exist between the mean estimated yield of cassava produced by the farmers before and after the WAAPP intervention. The results show that there were significant difference between the mean estimated yield of cassava produced before WAAPP (M= 5.020, SD= 2.21) and mean estimated yield of cassava produced after WAAPP (M= 8.300, SD= 3.33). The implication is that the farmers' practices (including the use of local cassava varieties) before the WAAPP interventions, gave them lower yields as compared to their yields after the intervention of WAAPP (which includes use of improved technologies). However, they had varying views about the results.

By the result the null hypothesis which states that there is no significant difference in the farmers' estimated yields in cassava before and after WAAPP's interventions was rejected and the alternative accepted.

Processed Products from Cassava

In Africa, cassava is largely grown for human consumption while Thailand has transformed it into the world's leading export business. Between January and September 2000, Thailand exported 3 million tons of cassava chips and pellets and over 700,000MT of cassava starch with an estimated earning of U$350 million (Bokanga, 2001) and MOFA (2005) reported that 70 percent of root crops from Africa is processed into a variety of food products including cooked pastes, beverages, roasted chips, flour and starch. Processed cassava products, especially those that are consumed can basically be divided into two main groups: The dry products include chips, gari, tapioca, flour, and kokonte and the moist products include akyeke and fufu. Table 19 shows the various products in which the respondents process their cassava.

Table 19: Various Products in Which Respondents' Process Cassava

Processed Product	Frequency	Percentage
Gari	41	70.7
Kokonte	14	24.1
Cassava dough	2	3.4
Akyeke	1	1.7
Total	**58**	**100**

Source: Field data, 2014 Multiple response

The results show that majority (70.7%) of the farmers process their fresh cassava into gari. The result is in consonance with the assertion made by Simonyan (2014) that 70 percent of cassava processed as human food is in the form of gari. A few of the farmers (24.1%) process fresh cassava into kokonte and 3.4 percent process into cassava dough (agbelima). Only 1.7 percent is

processed into akyeke. “Akyeke” is a fermented and gelatinized cassava meal which originated from Ivory Coast (Diop & Calverley, 1998) and popularly eaten by people in Western Ghana. It is generally eaten with fried meat or fish, garnished with vegetable source or mixed with milk. Production processes involved in akyeke is almost similar to gari. Akyeke is a delicacy in some parts of the Brong-Ahafo Region, especially central parts of the Berekum Municipality.

Quality of Processed Products

The largest market for cassava is in food, and gari is the most commercialised of all cassava products (Oduro & Clarke, 1999). Results of a study carried out by Oduro and Clark reported that the quality of gari sampled from selected gari processing centres in three regions of Ghana was “good” and most of the samples met both international and specifications of good quality gari processing. These results were confirmed by Ankrah (2000) in a similar study carried out on gari samples from various markets in Accra. Table 20 shows the farmers’ perception on the quality of products from processed improved varieties of fresh cassava as assessed mainly from processed food.

Table 20: Perceived Quality of Products from Improved Cassava Varieties

Quality	Frequency	Percentage
High	46	79.3
Average	11	19.0
Low	1	1.7
Total	58	100

Source: Field data, 2014

The results show that majority (79.3%) of the respondents described the quality of the products obtained from processing the improved cassava varieties as very high. Their judgement is based on the comparison between

the local and improved cassava varieties. This confirms the results of studies carried out on gari samples in three regions in Ghana which indicated that quality of gari was good and many of the samples met both international and national specifications (Oduro, Ellis, Dziedzoave & Nimako-Yeboah, 2000). It also fulfils the expectations of Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR) and other private entrepreneurs' who are making the effort to produce new convenient foods made from cassava such as fufu flours to promote consumption of cassava and add value to the roots (MOFA, 2005).

The higher the quality of the processed product, the more enhanced its value. The more the value of the product, the higher it's economic potential, and therefor are more income for the processor. According to FAO (2008) the bulk of the global cassava utilisation is in the form of food and in Africa 17 percent of cassava utilisation is accounted for by food. Also Oduro et al., (2000) reported that 70 percent of cassava processed as human food is gari.

When discussing the quality of gari as a product of processed cassava, four different quality types can be referred to, depending on how it is processed and its grain size. These are; Extra Fine Grain Gari (EFGG), the type where more than 80 percent of the grain passes through a sieve of less than 350 micro metre aperture; Fine Grain Gari (FGG), the type where more than 80 percent of the grains pass through a sieve of less than 1000 micro-meter aperture; Coarse Grain Gari (CGG), the type where not less than 80 percent of grains pass through a sieve of 1400 micro metre aperture; Extra Course Grain Gari (ECGG) the type where not less than 20 percent of grains is

retained on a sieve of 1400 micro metre aperture (Veggeland & Borgen, 2005).

The quality of a processed cassava product is normally determined in reference to the end-use. In certain instances the human sensory organs help in the assessment process (Ogiehor & Ikenebomeh, 2005). Sight defines colour quality, smell defines aroma quality, feeling defines texture quality, taste may define fermentation quality and hearing may define crisp quality. Quality of processed products can also be defined by the suitability of the intended purpose. In some cases the processed product can be subjected to chemical determinations and specifications, as in HQCF processing (Ogiehor & Ikenebomeh, 2005).

Cassava Consumption Habits of Farm Households

Table 21 shows the farm households consumption habit of the improved cassava varieties. Most of the improved cassava varieties introduced by WAAPP to the farmers in the study area have been accepted to contain high levels of starch. They are therefore known to be very good for industrial purposes and can also be consumed in other dietary forms apart from fufu. The results (Table 21) show that majority (over 73%) of the farmers process their fresh cassava into fufu for consumption with their households.

Table 21: Dietary Forms in Which Cassava is Consumed by Farm Households

Dietary Forms	Frequency	Parentage
Fufu	67	73.6

Kokonte	2	2.2
Kokonte and Fufu	22	24.2
Total	**91**	**100**

N= 106, Multiple response
Source: Field data, 2014

The results are almost twice of what was obtained by Jumah, Johnson, Quayson, Tortoe and Yeboah (2008) that traditional fufu accounts for 40 percent of the Ghanaian household budget. Again, Jumah et al. (2008) observed again that over 70 percent of Ghanaian household consume cassava products

Sales Outlets for Fresh Cassava

The various sales outlets available for the cassava farmers to market their harvested fresh cassava roots is presented in Table 22. Most cassava farmers normally take decision on where to sell their fresh cassava roots, only after the maturity of the crop. This could be attributed to inadequate readily available market opportunities for the commodity. Some of the farmers sell at the farm gate whereas some sell at the urban market centers.

Table 22: Sales Outlets for Fresh Cassava

Buyers	Frequency	Percentage
Gari processors	59	57.3
Market women	23	22.3
Akyeke processor	18	17.5
Chop bar operators (Local restaurants)	3	2.9
Total	103	100

Source: Field data, 2015

The results show that majority (57.3%) of the cassava producers sell their fresh cassava to gari processors. Okezie, Proctor and Numfor, (1988) reported of a little lower result in the Western Region of Cameroun that 50% of cassava produced was sold fresh to processors. Only a few 2.9 percent of

the farmers accessed market from the chop bar operators (local restaurants). The low patronage by the chop bar operators could be attributed to a wrong misconception by a section of the consuming public concerning the poundability of the improved cassava varieties (Adjekum, 2002).

According to Mr. Kwasi Adjei Adjekum (National Programmes Coordinator of RTIP of MOFA), all improved cassava varieties introduced to rural communities by MOFA are suitable for human consumption when processed into any form. Improved varieties such as Tekbankye, Abasafitaa and Nkabom have been found to be suitable for fufu and ampesi (Adjekum, 2002).

Impact of WAAPP on the Livelihood Systems of Cassava Farmers

The impact of WAAPP on the livelihood systems of the cassava farmers is discussed in terms of their natural, physical, financial, social and human capitals.

Impact of WAAPP on Natural Capital of Cassava Farmers

Natural capital refers to land and the natural resource base. Table 23 shows the perception of the cassava farmers about the WAAPP on the various aspects of their natural capital namely; production of quality planting materials, increase in productivity (yield per unit area) and access to productive land.

Table 23: Perceived Impact of WAAPP on Natural Capital of Cassava Famers

Natural capital	N	Mean	SD
Production of quality planting material	81	4.22	0.67
Increase in productivity (yield per unit area)	86	4.15	0.78
Access to productive land	86	4.10	0.81
Weighted mean		**4.16**	**0.75**

Scale: 5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low
Source: Field data, 2014

The results show that the farmers generally perceived the impact of WAAPP on the various aspect of their natural capital as high (M= 4.16, SD= 0.75), and they were somehow consistent in their opinion. The farmers perceived the quality of cassava planting materials they obtained as very high (M= 4.22, SD= 0.67), meaning that they were good enough to be used as planting material to expand the acreages on the farmers' own fields or sell to other farmers who are in need of planting materials. Yahaya and Olayide (2006) reported that improved varieties of cassava have been distributed throughout the African belt by research institutions. They are varieties with resistance to major diseases and give sustained yield of 50 percent more than the local varieties. Similarly, increase in productivity (yield per unit area) of the improve cassava varieties they planted was perceived as high (M= 4.15, SD= 0.78). After harvesting the roots, the quality of the sticks were "high" (M= 4.22, SD= 0.67). Ability to access productive land to cultivate cassava and other food and cash crops was also perceived to be high (M= 4.10, SD= 0.81).

Impact of WAAPP on Physical Capital of Cassava Farmers

Table 24 presents the perception of the cassava farmers of WAAPP's impact on the various aspects of their physical capital. Physical capital includes farm equipment, shelter and infrastructure. For example clinics, schools, roads, dams, water and sanitation services.

Table 24: Perceived Impact of WAAPP on Physical Capital of Cassava Farmers

Physical Capital	N	Mean	SD
Ownership of mobile phones	84	3.88	0.99
Access to transport services	65	3.85	0.76
Ownership of knapsack sprayer	80	3.71	0.98
Ownership of livestock (sheep, goats, pigs)	59	3.49	1.32
Ownership of tricycle, motorcycle, bicycle	47	3.28	1.10
Weighted mean		**3.64**	**1.03**

Scale: 5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low
Source: Field data, 2014

The results show that the general perception of the cassava farmers on WAAPP's impact on their physical assets was quite high (M= 3.64, SD= 1.03) however, they had divergent views on the rating. They perceived ownership of mobile phones as the highest (M= 3.88, SD= 0.99) among the various aspects of their physical assets. The use of mobile phones in agricultural communication has become very vital in the 20th century. According to the WAAPP baseline report 2009, 42.8 percent of farmers own mobile phones which they use to communicate with their colleagues, service providers including extension officers and buyers. Impact on the access to transport on livelihood was "high" (M= 3.85, SD= 0.76). The farmers hold the perception that they are in better position to hire the services of transport to cart their proceeds to the market outlets for sale.

The perception of the respondents indicated that there was "high" impact (M= 3.71, SD= 0.98) of WAAPP on ownership of knapsack sprayer which led to their ability to acquire the equipment individually. Previously

they had to either hire or borrow from others and that resulted in crop failure since certain pesticide applications require timely execution.

Livestock keeping plays an important role in the lives of smallholder crop farmers (Carney, 1998). During seasons of unfavourable rainfall and possible crop failure, livestock keeping serves the following purposes to the crop farmer: “Buffering-making” or savings refers situations where the farmers keep livestock during abundant crop harvest and draw later during seasons of scarcity. “Savings-keeping” refers to crop farmers who keep livestock to provide major expenditure in future. “Insurance-keeping” refers to crop farmers who keep livestock against unexpected events. Livestock keeping serves as collateral against borrowing, and also serves as social integration to confer one’s status. In the light of the above reasons, most cassava producers and processors use the residues; particularly the peels to feed their livestock. The respondents perceived the impact made on their physical capital in terms of ownership of livestock as “moderate” (M= 3.49, SD= 1.32). The implications are that they keep livestock but not as an integral component of their farming business. In practical terms through the WAAPP their physical capital has highly improved. They now own substantive access to mobile phones, transport services, knapsach sprayer, livestock but ownership of any of the “cycles” was perceived as moderate (M=3.28, SD= 1.10).

Impact of WAAPP on Financial Capital of Cassava Farmers

Financial capital is basically assets and entitlements that have a cash value. For example income, remittances from family members working away from home, sources of credit, stores of seed and livestock. Table 25 presents

the perception of WAAPP's impact on the financial capital of the cassava farmers.

Table 25: Perceived Impact of WAAPP on Financial Capital of Cassava Farmers

Physical Capitals	N	Mean	SD
Decrease in debt	94	3.63	0.84
Increase in income	98	3.61	0.85
Increase in savings	83	3.59	0.73
Increase in livestock (goats, sheep, pigs)	51	3.26	1.36
Access to credit facilities	65	3.08	1.36
Weighted mean		**3.43**	**1.00**

Scale: 5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low
Source: Field data, 2014

The results show that the general perception of the farmers on WAAPP's impact on their financial capital was moderate (M= 3.43, SD= 1.00). Most of the farmers believed that debts they owe to their service providers have highly decreased (M= 3.63, SD= 0.84); they have improved income (M= 3.61, SD= 0.85) and savings (M= 3.59, SD= 0.73) as a result of the WAAPP. Most of them were also able to moderately (M= 3.26, SD= 1.36) increase the stock of their livestock.

Probably, due to the long term investment in agricultural production (especially, cassava production), coupled with unstable market opportunities most cassava farmers are not attracted by financial institutions for loans. Access to credit had the "least" moderate impact (M= 3.08, SD= 1.00) compared to the rest. Those who accessed credit were given at commercial interest rates by the financial institutions and were not beneficial to the farmers.

Impact of WAAPP on Social Capital of Cassava Farmers

Social capital includes social networks, organisations, relationships of trust and reciprocity within and between families. It also refers to relationships within social networks, in communities as well as supports provided by religious, cultural and informal organisations. Table 26 shows the perception of the cassava farmers on WAAPP's impact on the various aspects of their social capital.

Table 26: Perceived Impact of WAAPP on Social Capital of Cassava Farmers

Social Capitals	N	Mean	SD
Ability to pay school fees	96	4.07	1.00
Membership to farmer groups	102	4.05.	0.67
Ability to feed family members	101	4.05	0.91
Ability to access health care (NHIS)	95	4.03	1.00
Other social obligations (pay funeral dues, basic rate, church/mosque dues)	96	3.98	1.01
Support from farmer group	77	3.86	0.76
Ability to support other family members	88	3.66	0.87
Ability to support friends	87	3.32	0.84
Weighted mean		**3.88**	**0.88**

Scale: 5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low
Source: Field data, 2014

The results show that the general perception of the farmers on WAAPP's impact on their social capital was quite high (M= 3.88, SD= 0.88), and they were not too varied in their views. The ability of the farmers to pay school fees of their wards recorded the highest impact (M= 4.07, SD= 1.00) among the various aspects of the social (livelihood) assets. This outcome is positive and highly commendable as the farmers are becoming more conscious

of the need to invest in the education of their wards. Membership to farmer groups was also remarkably high (M= 4.05, SD= 0.67). Probably, what might had contributed to this was the healthy interactions among group members; particularly during the practice of farmer-to-farmer technology transfer.

Equally, the WAAPP had highly positive impact on their ability to feed family members (M= 4.05, SD= 0.91); ability to access health care (M= 4.03, SD= 1.00); meet other social obligations (M= 3.98, SD= 1.01); get support from farmer groups (M= 3.89, M= 0.76) and ability to support other family members (M= 3.66, SD= 0.87). In effect, most of the beneficiaries can now meet most of their social obligations. Through the WAAPP they can pay their wards' school fees, feed and support other family members, and access health care very well. Support to friends, is however moderate (M= 3.32, SD= 0.84).

Impact of WAAPP on Human Capital of Cassava Farmers

Human capital includes skills, knowledge, ability to labour, education and health status of household members and the community. Table 27 presents the perception of the farmers on WAAPP's impact on their human capital.

Table 27: Perceived Impact of WAAPP on Human Capital of Cassava Farmers

Human Capital	N	Mean	SD
Access to public extension services (AEAs)	102	4.11	0.87
Access to labour (unskilled)	89	3.80	0.73
Access to labour (skilled)	88	3.78	0.73
Access to agro- input dealers	67	3.28	0.83
Weighted mean		**3.74**	**0.79**

Scale: 5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1= Very Low

Source: Field data, 2014

The results show that the overall perceived impact of WAAPP on the farmers' human capital was quite high (M= 3.74, SD= 0.79). The main contributory factors are access to public extension services which was perceived very high (M= 4.11, SD= 0.87), and that is commendable to the Extension Directorates of the districts where the WAAPP is located. This is in consonance with a report from Fanteakwa, Asante Akim South and East, and the Gonja Districts of MOFA that 100 percent of the farmers in the operational areas claimed they had access to public extension services (Sam & Dapaah, 2009). The other factors were unskilled labour (M= 3.80, SD= 0.73) and skilled labour (M= 3.78, SD= 0.73).

The skilled labourers are mainly engaged by the processing groups to either operate the cassava mills or process the cassava into gari. In most cases they are accommodated by the entrepreneur for a period of time and at times with their families. The unskilled labourers on the other hand are engaged to weed the farms, apply some fertilizer, plant new farms and harvest when the roots were matured. Family labour was normally used for the execution of those activities. According to the respondents, the programme's impact on their human capital made it possible for them to hire labour for a fee.

Some Production Challenges among the Cassava Farmers

The cassava farmers mentioned some problems that they encountered in the course of executing the WAAPP's interventions (Table 28). Most of these problems were related to their cassava production activities. As shown in the most prevalent and widespread problems the farmers expressed are inadequate access to ready market (30.2%); delays in receiving inputs from

WAAPP (12.3%); inadequate access to agricultural credit (10.4%) and unfavourable rainfall (8.5%).

Table 28: Cassava Farmers' Production Challenges

Challenges	Frequency	Percentage
In adequate access to ready market	32	30.19
Delay in receiving inputs from WAAPP	13	12.26
Inadequate access to agricultural credit	11	10.38
Unfavourable rainfall	9	8.49
Ampong variety being too woody	5	4.72
Inadequate training for group members	4	3.77
Inadequate resources to process fresh cassava	3	2.83
Lack of cohesion among group member	3	2.83
Failure to supply inputs by WAAPP	3	2.83
Premature cassava root rottening	2	1.89
High cost of labour	1	0.94
Low soil fertility	1	0.94
Consumers' apathy	1	0.94
Difficulty to harvest cassava during dry season	1	0.94

Source: Field data, 2014 N = 106

The least prevalent problems are premature cassava root rottening (1.9%); the rest are high cost of labour, low soil fertility, consumers' apathy to improve cassava variety for fufu, and difficulty to harvest fresh cassava during dry season.

Suggested Solutions to Respondents' Production Challenges

The suggestions represent views of majority of the respondents. In relation to access to ready market, the respondents suggested that there is the need to organise the various actors in the cassava value chain to map out strategies that will strengthen their linkages. In the case of accessing

agricultural credit they suggested a special scheme by the government to advance them loans at lower interest rates using the group as collateral. With the lack of resources to process cassava, they appealed to WAAPP to provide them with processing units. They said delays in providing inputs by WAAPP could be solved by improving communication between the farmers and WAAPP.

The farmers suggested the need for periodic training as the solution for the lack of cohesion among their group members. The famers thought that strengthening their communal spirit and the use of pesticides can reduce the cost of labour. In the case of unfavourable rainfall, the farmers suggested early planting as the solution. The problem of low fertility could be solved by the use of fertilizers according to the farmers. The farmers asked the extension officers to intensify their sensitisation on the uses of the improved cassava varieties. The farmers asked WAAPP to conduct further research into the performance of the Ampong variety. In the case of those farmer groups which were denied the supply of inputs, they said WAAPP should ensure that it is not repeated because when it happened their farm activities were adversely affected.

Predictors of the Perceived Impact of the WAAPP on the Livelihood Systems of Cassava Farmers

In order to predict the best predictors of impact of the WAAPP on the livelihood systems of the cassava farmers, Pearson's product-moment correlation was used to explore the relationships between the mean perceived impact and the perceived effectiveness of the WAAPP (Table 29).

The Pearson's product-moment correlation coefficient (r) indicate a direct (positive) and a range of low and substantial significant relationship between the cassava farmers' perceived impact on livelihood systems and the effectiveness of each of the components of the WAAPP at the 0.05 alpha level.

Table 29: Pearson's Correlation Matrix of Mean Perceived Impact and Perceived Effectiveness of the Components of WAAPP

Variable	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Y	-								
X_1	.308**	-							
X_2	.450**	.318**	-						
X_3	.468**	.237*	.156	-					
X_4	.296**	.141	.145	.387**	-				
X_5	.399**	.142	.058	.378**	.194	-			
X_6	.529**	.401**	.397**	.296**	.287**	.277*	-		
X_7	.321**	.186	.448**	.310**	.228*	.384**	.216*	-	
X_8	.369**	.159	.208**	.476**	.350**	.138	.458	.200	

*p < 0.05 (2- tailed) **p < 0.01 (2- tailed)
Source: Field data, 2014

Keys:

Y = Mean perceived impact on livelihood of cassava farmers

X_1 = Provision of improved planting materials

X_2 = Provision of inputs

X_3 = Provision of training

X_4 = Provision of extension services

X_5 = Access to equipment

X_6 = Access to agricultural technology

X_7 = Access to market information

$\mathbf{X_8}$= Members' empowerment

As shown in Table 29, a direct and significant relationship exist between impact on livelihood and effectiveness of provision of improved planting materials (r = 0.308), direct and significant relationship between impact on livelihood and effectiveness of provision of inputs (r = 0.450), direct and significant relationship between impact on livelihood and effectiveness of provision of training (r = 0.468). There is however, direct and low significant relationship between effectiveness of extension service (r = 0.296). There is direct and significant relationship between impact on livelihood and effectiveness of access to resources (r = 0.399), direct and significant relationship between impact on livelihood and effectiveness of access to agricultural technology (r = 0.529). There is also direct and significant relationship between impact on livelihood and effectiveness of access to market information (r = 0.321) and direct and significant relationship between impact on livelihood and effectiveness of members' empowerment (r = 0.369).

The results indicated a direct and significant relationship that all the components had with the impact on the farmers' livelihood, with the exception of extension services which showed a low but significant relationship. These results therefore indicate that the null hypothesis which stated that there is no significant relationship between perceived impact of the WAAPP on farmers' livelihood systems and farmers' perceived effectiveness of each of the main components of the WAAPP" was therefore rejected. Hence the alternative hypothesis was accepted.

Collinearity Diagnostic Test

Collinearity diagnostic test (Table 30) was conducted to determine the possible linear relationships among the independent variables.

Table 30: Collinearity Diagnostic Test

Independent Variables	Tolerance Value	VIF
Provision of improved planting materials	0.75	1.34
Provision of inputs	0.81	1.23
Provision of training	0.59	1.62
Provision of extension services	0.61	1.65
Access to resources	0.75	1.26
Access to agricultural technology	0.54	1.86
Access to market information	0.58	1.72
Members' empowerment	0.72	1.39

Source: Field data, 2014

According to Greene (2000) the Variance Inflation Factor (VIF) shows us the extent to which the variance of the coefficient estimate is being inflated by multicollinearity. Any variable with VIF above 10.0 is a course for concern and tolerance value close to 1.0 implies that there is little multicollinearity. A value close to 0 also suggests that multicollinearity may be a threat. Hence, the VIF and Tolerance values indicated that the study was not affected by multicollinearity. Therefore all the eight independent variables were used for the prediction.

Stepwise Regression of the Main Components of WAAPP

Table 31 provides the results of the stepwise regression of the main components of the WAAPP on the livelihood systems of the farmers. It shows that three out of the eight independent variables used for the prediction contributed significantly for the cassava farmers perceived impact of the WAAPP on their livelihood systems. The three best predictor variables are the farmers' perceived effectiveness of the group members' access to improved

technology, WAAPP's provision of training needs of the farmers and provision of inputs support.

Table 31: Stepwise Regression of the Components of WAAPP on Livelihood Systems of Cassava Farmers

Predictors	Step of Entry	Beta	R^2	Adjusted R^2	Adjusted R^2 Change	S.E.E	F Change	Sig
X_6	1	.415	.375	.362	.362	.194	29.40	.001
X_3	2	.317	.473	.451	.089	.180	21.53	.004
X_2	3	.260	.530	.500	.049	.172	17.66	.021

n= 106, $p < 0.05$
Source: Field data, 2014

Y= Perceived impact on livelihood systems

X_6 =Access agricultural technology

X_3 =Provision of training

X_2 = Provision of inputs

Regression Equation (from unstandardized Beta)

$$\mathbf{Y = 0.684 + 0.188\ X_6 + 0.144\ X_3 + 0.092\ X_2}$$

The results (Table 31) showed that the three components together contributed a total of 50.0 percent of all the variance in the farmers' perceived impact of the WAAPP on their livelihood systems (as indicated in the last row of the adjusted R^2 column in Table 31). The amount of contribution that each of the three components made towards the attainment of the 50.0 percent variance in the farmers' perceived impact on livelihood systems is indicated in the adjusted R^2 change column (Table 31). The farmers' perceived effectiveness of the group members' access to improved technologies was the overall best predictor, which accounted for 36.2 percent of the variance in the farmers' perceived impact of the WAAPP on their livelihood systems. The farmers' perceived effectiveness of WAAPP's provision of training was the

next best predictor, contributing 8.9 percent of the variance in the farmers' perceived impact on their livelihood systems. That is followed by the farmers' perceived effectiveness of WAAPP's provision of inputs support, contributing 4.9 percent towards the farmers' perceived impact of the programme on their livelihood systems.

The first overall best predictor (group members' perceived access to agricultural technology) which accounted for the highest (36.2%) explanation in impact on farmers' livelihood seemed to be the main strength of the WAAPP. The most probable implication is that, the improved technologies directly affected the productivity of cassava (Nweke, 2002). It can be deducted that improved technologies can contribute significantly to enhance the livelihood of the farmers.

The second variable in the steps of entry which accounted for 8.9 percent was the farmers' perceived effectiveness of WAAPP's provision of training. The trend is understandable because farmers need to be educated on the use of the improved technologies to derive the maximum benefits from them (World Bank, 1999).

The third variable in the steps of entry was the farmers' perceived effectiveness on WAAPP's provision of inputs support which accounted for 4.9 percent in the prediction. This trend can also be understood because inputs support accessed by farmers augments their efforts to increase productivity.

In effect, the discussion on the regression results identified the farmer group members' perceived effectiveness of: access to improved technology, WAAPP's provision of training and inputs support as the best predictors of

impact on the livelihood systems of the cassava farmers in the Brong-Ahafo Region of Ghana.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents the summary, conclusions and recommendations of the study. Whereas the summary presents a brief overview of the research problem, objectives, methodology and key findings of the study, the conclusions capture the overall outcomes regarding the findings of the study in

relation with the research questions. The chapter further provides policy recommendations, limitations, and directions for further study.

Summary

The West Africa Agricultural Productivity Programme (WAAPP) is part of the World Bank's instrument for the implementation of Africa Action Plan (AAP) aimed at supporting regional integration and making agriculture more sustainably productive. WAAPP was initiated in 2007 with implementation starting in Ghana, Senegal and Mali as part of 10-years World Bank funded programme. Eight districts were selected in the Brong-Ahafo region to participate in the pilot stage of the programme implementation in 2007.

Available records from WAAPP and MOFA indicate that remarkable achievements were made in the first phase of the programme between 2007 and 2012. The investigations carried out by the implementing agents (WAAPP and MOFA) were mainly to assess the project's success in terms of planned objectives. However, there is limited empirical information on the impact of WAAPP on the livelihoods of the farmers who participated in the programme.

The study therefore sought out to assess the perceived impact of the WAAPP on the livelihood systems of cassava farmers who participated in the programme. Specifically, it described the demographic and farm related characteristics of the farmers and also determined the perceived effectiveness of the main components of the WAAPP. The perceived impact of the WAAPP on the livelihood systems of the farmers was also ascertained and finally determined the best predictors of perceived impact of the programme on the livelihood systems of the farmers.

Descriptive-correlational survey design was used to explore relationships and identify the predictors of impact. Census of 106 group members were involved and interview schedule was used to collect required information from cassava farmers who participated in the WAAPP from six districts in the Brong-Ahafo Region of Ghana. Tools like frequencies, percentages, means, modes, standard deviation and stepwise regression from SPSS were used to analysis the data. Five point Likert-type scale ranging from Very Effective (5) to Very Ineffective was used to rate the respondents perception of effectiveness of the main components of the WAAPP.

The summary of the major findings as they relate to the objectives of the study were as follows:

The results of the study revealed that more females (64.2%) than males participated in the first phase of the WAAPP in the Brong-Ahafo Region of Ghana. Most (55.6%) of them were in their active working age (48yrs). A great majority of the farmers had education below senior secondary school, with almost half (47%) of them not having any formal education at all. They have average farming experience of 16 years, and most of them (51.9%) had household sizes between six and ten. Most (67.6%) of them are small land holders cultivating between one and three acres farm sizes. Only few (about 2%) of them cultivate between seven and nine acre land sizes.

At least 51.9 percent of the cassava farmers benefited in one way or the other from the four main components of the WAAPP namely; provision of improved planting materials, training, inputs support and extension services. Generally, the farmers rated the effectiveness of WAAPP on all the components as effective. The provision of inputs support was the most

effective (M= 4.18, SD= 0.86), followed by the provision of improved planting materials (M= 4.07, SD= 0.86), provision of extension services (M= 3.75, SD= 0.84), and provision of training (M= 3.64, SD= 0.76) in that order.

With respect to the farmer groups, as few as 39.6 percent and at most as 99.1 percent of the members accessed one component or the other namely; access to resources, agricultural technology, market information and empowerment of members . The general perception was that all the four components of the group were effectively executed. The empowerment of group members was most effective (M= 4.27, SD= 0.78), followed by access to agricultural technology (M= 3.92, SD= 0.86), access to market information (M= 3.90, SD= 0.83), and access to resources in that order.

Perceived Effectiveness of the Improved Cassava Varieties

The farmers estimated mean cassava yields increased from 5,020 kg per acre to 8,300kg per acre after WAAPP's interventions. This was attributed to the introduction of improved technologies in cassava production. Significant difference existed between the estimated yields. Majority (70.7%) of the farmers process fresh cassava into gari. Again majority (79.3%) described the quality of processed cassava as "high", whilst majority (57.3%) sell their fresh cassava to gari processors.

The study revealed that the farmers generally perceived that the WAAPP has impacted positively on all aspects of their five main livelihood systems namely, natural, physical, human, financial and social capitals. The observed impact range between effective and moderate. The most effective livelihood impact was on their natural capital (M= 4.16, SD= 0.75), followed

by their social capital (M= 3.88, SD= 0.88), physical capital (M= 3.64, SD= 1.03), and financial capital in the order.

Pearson product-moment correlation coefficient (r) that was presented indicate a direct (positive) significant relationships between the cassava farmers' perceived impact on livelihood systems and the effectiveness of each of the eight main components of the WAAPP under 0.05 alpha level. The implications are that all the components can significantly improve livelihood of the cassava farmers at varying levels with extension services being the least.

Stepwise regression used to determine predictors of impact revealed that group members' access to improved technology (36.2%), WAAPP's provision of training (8.9%), and WAAPP's provision of inputs support (4.9%) were the best predictors of impact of the WAAPP. The best predictors of impact and the three independent variables together contributed a total of 50.0% of all the variance in the respondents' perceived impact of the WAAPP on their livelihood systems.

Conclusions

There were more females than males who participated in the WAAPP. Many of the participants were relatively young and had large family sizes. The farm sizes were small and they had quite extensive farming experience. They were mainly people of low levels of formal education.

Provision of improved cassava planting material was effective. However, they perceived the high yielding varieties as very effectively delivered. The input support was also effectively executed. The programme also effectively met the training needs of the farmers. Meanwhile, the public extension staff

provided outstanding technical advisory services to the farmers. The farmer groups were effective in accessing resources, agricultural technology, and market information. They were also able to effectively empower their members with skills to improve their agricultural enterprise.

The farmers' average estimated cassava yields per acre increased after the WAAPP's intervention. The general perception of quality of processed end-products of improved cassava varieties was high compared to the local varieties. The fresh improved cassava varieties were mostly processed into gari, accordingly, the producers mainly sold their fresh improved cassava roots to gari processors.

Generally, the programme impacted positively on the livelihood systems of the farmers. They were able to produce quality improved cassava planting materials and own mobile phones which they used to communicate with their fellow farmers, agricultural extension agents and other clients. They were more able to pay the school fees of their wards and effectively accessed improved technical advice for their agricultural enterprise.

Inadequate market opportunities was perceived as the most prevalent and widespread constraint affecting the WAAPP farmers in the Brong-Ahafo Region. Meanwhile, the group members' access to improved technology, WAAPP's provision of their training needs and inputs support were the factors which largely contributed to the improvement in their livelihoods in the Brong-Ahafo Region.

Recommendations

Based on the findings and conclusions, the study makes the following recommendations:

1. The women cassava farmers should request the Departments of Agriculture (DOA) to collaborate with the Metropolitan, Municipal and District Assemblies for the establishment of processing units in the catchment areas so that they can be engaged in processing of the fresh cassava roots to add value before selling.

2. MOFA in collaboration with WAAPP should resource the Agricultural Extension Agents to intensify their education on benefits of farmer groups, and also develop and strengthen the groups along their various commodity value chains. This, it is believed will increase the farmers' potentials to benefit from the economics of scale and also ensure cost effectiveness in service delivery.

3. The implementation period of the WAAPP, especially in the area of cassava production should be extended. Further extension would help to sustain WAAPP's expected impact on the livelihood systems of the farmers along the cassava value chain.

4. For improvement in livelihood systems of cassava farmers in the study area, WAAPP and MOFA must pay more attention to improved agricultural technology delivery, provision of training needs of the farmers and inputs support.

Limitations of the Study

The study had some limitations as follows:

1. The study assessed the impact of the programme on livelihoods of farmers who benefited from the interventions but not those who did not. Hence, the "with" and "without" situations were not considered.

2. The study focused mainly on the linear relationships between the main components of the programme and the perceived impact. The relationships between the perceived impact and the livelihood assets of the farmers were not determined.

Suggestions for Further Research

This study is not exhaustive. There were some limitations; therefore the following suggestions are made for further research.

1. It is suggested that the study should be repeated after the end of the programme implementation period to determine the trend of effectiveness as well as 'post programme' impact on the livelihood systems of the participants.
2. Similar studies should be done "with" and "without" methods to determine the impact on livelihood systems.
3. A study should be undertaken using the mixed methods (both qualitative and quantitative) to collect certain aspects of the data for purposes of running triangulations of the responses.
4. Other studies should be undertaken to capture the hypothesis to determine the relationships between the farmers' livelihood assets and the predictor(s) of impact of the progamme.

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APPENDIX A

DAVIS CONVENTION FOR DESCRIBING MAGNITUDE OF CORRELATION COEFFICIENTS

Coefficient	Description
1 1.0	Perfect
2 0.70 – 0.99	Very High
3 0.50 - 0.69	Substantial
4 0.30 – 0.49	Moderate
5 0.10 – 0.29	Low
6 0.01 – 0.09	Negligible

APPENDIX B

STRUCTURED INTERVIEW SCHEDULE FOR CASSAVA FARMERS' PERCEIVED IMPACT OF THE WEST AFRICA AGRICULTURAL PRODUCTIVITY PROGRAMME ON THEIR LIVELIHOOD SYSTEMS IN BRONG AHAFO REGION, GHANA.

INTRODUCTION

The main purpose of this study is to assess how you perceived the effectiveness of the West Africa Agricultural Programme (Cassava Project) and how the programme has impacted your livelihood systems.

It is hoped that the result from the study would be useful to the directorate of the Ministry of Food and Agriculture (MOFA), Crop Research Institute (CRI) of the Council for Scientific and Industrial Research (CSIR), West Africa Agricultural Productivity Programme (WAAPP) and other collaborating organizations to make decisions for the improvement of the programme in the future.

CONFIDENTIALITY: You are assured that the information you provide on this paper would be treated as confidential and would not be disclosed to any individual or institution. Therefore be as open and sincere as possible; believing that your anonymity is assured. THANK YOU.

PART A

DEMOGRAPHIC AND FARM RELATED CHARACTERISTICS OF CASSAVA FARMERS

I. a) District ……

b) Name of Village/Town……..

2. Sex: Please tick [√]

a) Male [ ] b) Female [ ]

3. Please indicate your age at your last birthday (in years)……

4. Kindly indicate your highest educational qualification. Please tick [√]

a. No formal schooling / education [ ] b. Primary Education [ ]

c. MSLC/JHS [ ]

d. SHS/ GCE "O"/Technical/ Vocational [ ] e. Tertiary [ ]

5. How long have you been working as a cassava farmer (in years?)

…….

6. Please indicate the size of your family (household size)?

……

7. What is the size (in acres) of your cassava farms? .....

8. Please, indicate the estimated yield (kg/ acre) of your cassava production before and after the WAAPP intervention. **Before WAAPP**……..**After WAAPP**……

9. How long have you been with the group?.....years

PART B

PERCEIVED EFFECTIVENESS OF THE FARMER GROUPS

Please indicate whether your farmer group enabled you to acquire the under listed knowledge, attitudes, skills, and aspirations (KASA) by ticking [√] YES or NO against each activity.

If your answer is YES, please rate how effectively each activity has contributed to improvement in your farming enterprise; by using the following ratings:

5 = Very Effective [VE] 4 = Effective [E] 3 = Moderately Effective [ME] 2 = Ineffective [IE] 1 = Very Ineffective [VI]

Please put a tick [√] where appropriate

	Farmer Group Performance	**Activity**		**Rating**				
		YES	**NO**	**5 VE**	**4 E**	**3 ME**	**2 IE**	**1 VI**
A.	**Access to Inputs/Resources**							
i.	Access agricultural credit with the group as collateral							
ii.	Access agricultural machines and equipment with the group as collateral							
B	**Members Empowerment**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Ability to bargain for transport services.							
ii.	Ability to bargain with input suppliers.							
iii.	Ability to bargain with cassava buyers for better price offer.							
iv.	Ability to participate in group decision-making.							
v.	Ability to practice farmer-to-farmer technology transfer.							
C	**Access to Agricultural Technology**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Ability to practise simple farm record keeping.							
ii.	Ability to access							

	improved cassava planting materials							
iii.	Ability to identify common cassava diseases.							
iv.	Ability to identify certain improved cassava varieties.							
v.	Ability to identify simple soil fertility problems.							
vi.	Ability to apply recommended fertilizers.							
vii.	Ability to practise proper farm sanitation							
viii.	Ability to use recommended planting population.							
ix.	Ability to apply pesticides							
D	**Access to Market Information**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Ability to receive information on current market pricing of fresh cassava							
ii.	Ability to receive information on glut situation and sales timing on fresh cassava.							
iii.	Ability to access market for fresh cassava produce							

PART C

PERCEIVED EFFECTIVENESS OF THE COMPONENTS OF WAAPP

1. Please indicate first whether you took part in the under listed activities in the cassava productivity programme (WAAPP) by ticking [√] YES or NO against each activity.

If your answer is YES please rate how effectively each activity has contributed to increase in your yield per unit area or your income by using the following ratings:

5 = Very Effective [VE] 4 = Effective [E] 3 = Moderately Effective [ME]

2 = Ineffective [IE] 1 = Very Ineffective [VI]

Please put a tick [√] where appropriate

	Pogramme Components	**Activity**		**Rating**				
		YES	**NO**	**5 VE**	**4 E**	**3 ME**	**2 IE**	**1 VI**
A	**Provision of improved planting materials**							
i.	Early maturing varieties							
ii.	Disease tolerant varieties							
iii.	High yielding varieties							
iv.	High starch content varieties							
v.	Highly suitable for fufu varieties							
B	**Provision of inputs**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Timely supply of weedicides							
ii.	Timely supply of Insecticides							
iii.	Timely supply of inorganic fertilizers							
iv.	Timely supply of improved planting materials							
v.	Timely remittances for initial cost of land preparation							
vi.	Timely remittances for cost of planting							
C	**Training**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Site selection and land preparation							
ii.	Weed control							
iii.	Pesticide application							
iv.	Fertilizer application							
v.	Pests and Disease control							
vi.	Timely harvesting							
vii.	Reduction in postharvest losses							
viii.	Farm record keeping							
ix.	Group dynamics							
C	**Provision of extension services**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Public extension (AEA)							
ii.	Agro input dealers							
iii.	Monitoring and evaluation team (Regional/National)							

PART D

PERCIEVED IMPACT OF THE COMPONENTS OF THE CASSAVA PRODUCTION PROJECT (WAAPP) ON THE CASSAVA FARMERS' LIVELIHOOD SYSTEMS

1. Please identify from the under listed livelihood assets whether or not it has improved your livelihood as a cassava farmer under the cassava project (WAAPP). Please tick [√] YES or NO against each livelihood asset.

If yes, indicate the extent to which the cassava production project (WAAPP) has impacted on the various aspect of your livelihood system by using the following ratings:

5 = Very High [VH] 4 = High [H] 3 = Moderately High [MH]

2 = Low [L] 1 = Very Low [VL]

Please tick [√] where appropriate

	Livelihood Assets	**Activity**		**Ratings**				
		YES	**NO**	**5 VH**	**4 H**	**3 MH**	**2 L**	**1 VL**
A.	**Natural Capital**							
i.	Increase in productivity (yield per unit area)							
ii.	Production of quality planting material							
B.	**Physical Capital**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Ownership of knapsack (spraying machines)							
ii.	Ownership of tricycles, motor cycles, bicycles etc.							
iii.	Access to vehicles (tractors, trucks, etc.)							

iv.	Ownership of mobile phones.							
v.	Ownership of livestock (cattle, sheep, goats etc.)							
C.	**Financial Capital**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Increase in income							
ii.	Decrease in debt levels							
iii.	Increase in savings							
iv.	Access to credit facilities							
v.	Increase in number of livestock							
D	**Human Capital**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Access to labour (skilled)							
ii.	Access to labour (unskilled)							
iii.	Access to public extension service (AEAs)							
iv.	Access to private extension service (NGOs, Agro-input dealers, etc.)							
E	**Social Capital**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Membership to association / farmer group							
ii.	Support from association / farmer group							
iii.	Ability to feed family members							
iv.	Support to other family members							
v.	Support to friends							
vi.	Ability to pay school fees							
v.	Other social obligations (pay funeral dues, basic rate, church/mosque dues.)							

1. What is / are the major production challenge (s) that you encounter as a cassava farmer in the WAAPP (Cassava Production ……

…….....

2b. What do you think is/are the major strength (s) of the cassava production project (WAAPP)?.....

2c. What do you think should be done to solve the problems of the WAAPP (Cassava Production Project) you encountered as listed above?.....

PART E

PERCEIVED ACCEPTABILITY OF THE IMPROVED CASSAVA VARIETIES

1. Please, do you process part of your fresh cassava? YES [ ] NO [ ]

2. If yes, what quantity (kg/acre) of your fresh cassava do you process? .....

3. Please, what product (s) do you process cassava into?.....

4. Who are the end-users of your processed products?

a. General public [ ] b. Educational institutions [ ] c. Factories [ ] d. Exporters [ ]

5. Please, do you consume part of your fresh cassava? YES [ ] NO [ ]

6. If yes what quantity (kg/acre) of your fresh cassava do you consume?.....

……..

7. In what form do you consume your fresh cassava? a. Fufu [ ]

b. Ampesi [ ]

8. Do you sell part of your fresh cassava? YES [ ] NO [ ]

9. If yes, what quantity (kg/acre) of your fresh cassava do you sell? …….....

10. Who do you sell your fresh cassava to? a. Gari processors [ ] b. Chop bar operators [ ] c. Market women [ ] d. Industries [ ] e. Exporters [ ]

11. Do you meet with Agricultural Extension Agents (AEAs) in your community for advice?

a. YES [ ] b. NO [ ]

12. If your answer is yes, how often do you meet the AEA in the community?

a. Weekly [ ] b. Fortnightly [ ] c. Monthly [ ]

d. Others (specify)……

THANK YOU VERY MUCH FOR YOUR TIME