UNIVERSITY OF CAPE COAST

PUBLIC AND PRIVATE EXTENSION SERVICES DELIVERY TO CASSAVA FARMERS IN SANNIQUELLIE AND SACLEPEA MAHN DISTRICTS IN NIMBA COUNTY, LIBERIA

MERCY KOU LAH

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BY

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Thesis submitted to the Department of Agricultural Economics and Extension of the 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 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.

Candidate's Name: Mercy Kou Lah

Signature…… Date…….

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on the 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: Mr. Martin Bosompem

Signature…… Date……

ABSTRACT

Public and private extension providers have been assisting farmers in Liberia but there has been no study done on services they deliver to cassava farmers. The purpose of the study therefore was to investigate the delivery system of public and private extension services on cassava farmers. The study used quantitative survey in which 318 proportionately randomly sampled cassava farmers in the Sanniquellie and Saclepea Mahn Districts were interviewed using an interview schedule.. The study revealed that the farmers were characterized by male dominance, large household sizes and married famers who have low level of education but vast cassava farming experiences. Majority (88.6%) of the cassava famers under public and private extension services were in their active working ages. Major sources of agricultural information were neighbouring farmers (88.4%), radio (86.8%) and other farmers outside their neighbourhood (71.4%). Nearly every farmer obtains their planting materials from their own saving (95.3%), relatives (94.0%) and other cassava producers (69.1%). Farmers receiving public and private extension regarded their involvement in extension services as very low, though public extension farmers were significantly more involved than the private. The level of adoption of improved cassava technologies by both public and private extension farmers was low. The perceived impact of extension services on farmers was regarded as low, but public extension was perceived to have a significantly higher impact on cassava farmers than private extension.

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DEDICATION

To my parents, Madam Doris N. Saywah, Mrs. Yah G. Lah, Mr. Patrick L. Lah and my husband Rev. Robert T.W Jally Jr.

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CHAPTER ONE

INTRODUCTION

Background to the Study

Cassava (*Manihot esculenta*) is the fifth most important crop after wheat, rice, maize, potato, yams as the primary staple food for more than 800 million people in the poorest tropical countries (Lebot, 2009).Cassava is an essential food security crop because the matured edible roots can be left in the ground for 36 months. Cassava is important not only as food crop but also as a major source of income for rural households. The crop therefore represents a household food bank that can be drawn on when adverse climatic conditions limit the availability of other foods. It can grow and produce high yields in areas where maize and other crops will not grow or produce well. The variety of foods that are made from the roots and the nutritious leaves are reasons why cassava cultivation is expanding worldwide (Lebot, 2009).

In Liberia, cassava is the second subsistence crop after rice and is grown by small-scale farmers for consumption and sale. Unlike rice, cassava can be planted all year round in Liberia and its annual production was estimated at four hundred and ninety five metric tonnes in 2007 (MoA, 2007). Cassava has become a staple food in many rural communities because of its acceptance of poor soil conditions. It can tolerate nutrient deficiency and therefore, can be grown on soils with a low nutrient capacity. Cassava also responds well to irrigation or high rainfall and fertilizer application. Cassava is

highly flexible in its management requirements, and has the potential of high-energy production per unit area of land (MOA, 2007).

Agricultural extension has a major role to play in ensuring high production of cassava by farmers in Liberia. Agricultural extension services worldwide have played critical role in making sure that farmers have access to improved technologies and that their concerns and needs are properly addressed. Nevertheless, the role of extension today goes beyond technology transfer. The role of extension also includes training of farmers on appropriate farming methods, assisting farmers to form groups so they can collectively deal with the market forces. Agricultural extension also educate farmers on issues such as food security, food safety, nutrition, family education, youth development and partnering a broad range of service providers and other agencies (Onyenkazi & Gana, 2009).

The effectiveness of agricultural extension services can be judged from the successful implementation of extension services using various extension approaches in extension methods (Onyenkazi & Gana, 2009). The effectiveness of extension also can be viewed not only by contacts made with farmers, but the demonstration conducted to teach skills and lectures delivered to teach and inform the farmers. Agricultural extension is seen as a service that assists farmers through educational procedures in improving farming methods and techniques, increasing production efficiency and income as well as improving the standard of living and lifting the social and educational standards of farmers. It is a means by which technical information is passed to the farmers for development of agriculture (Onyenkazi & Gana, 2009).

In any effort to improve the living conditions of the rural populace and agricultural production, an effective agricultural extension system has a significant role to play in attaining self-sufficiency in food production. It is not merely to inform but to keep people thinking about development and educating them with a view to raising the aspiration of the people in the right direction (Hycient, Onyenkazi & Gana, 2009). Many studies have revealed that the rural farmers have not been making use of the recommended farm practices to its fullest. This is attributed to the gap between information generation and the dissemination to the end users. The extension services are meant to fill this gap in communication (Hycient, Onyenkazi & Gana, 2009).

A variety of tools and methods to disseminate farm information and improved technologies to farmers are needed by extension agents. Extension workers should therefore be trained on where and how to use extension methods. The more the variety of channels and methods used in introducing new ideas, the greater the chances of accepting new innovations by farmers (Hycient, Onyenkazi & Gana, 2009).

Extension in Liberia finds itself in a transitional environment as the country moves from the period of post-war relief and rehabilitation to an environment of development and growth. The extension system in Liberia includes extension activities and Programmes delivered by NGOs, the Ministry of Agriculture Extension and a variety of emerging private sector actors (Ministry of Agriculture, 2008).

Statement of the Problem

Cassava is widely grown in Nimba County located in the Northern part of Liberia (MOA, 2010). One of the limiting factors in promoting the production and productivity of cassava in Liberia is the absence of effective agricultural extension services that enable farmers and others along the cassava value chain to get proper information to take advantage of the opportunities in the cassava industry (MOA, 2008).

Public extension service providers have implemented various services to increase the productivity of cassava in Liberia. However, public agricultural extension services are under pressure to change, because of growing economic pressures and questions about effectiveness and efficiency of the services rendered to farmers. Private sector, through contractual, outsourcing arrangements, cost recovery schemes or fee-based activities for services are being used to address technical and management problems to extension delivery (Sigman & Gbokie, 2013).

Research done in Liberia shows that, although the private and public extension services have been in existence over decade, the performances of cassava famers over the years have been poor as they persistently produce at subsistence level (Sigman & Gbokie, 2013).

According to IFAD (2011) Pluralistic Extension has tried but failed to become the driving force needed to activate the huge majority of the small and poor farmers in Liberia to improve food production. This has led to low production and productivity that are attributable to the lack of quality pluralistic extension services.

Despite decades of the highest priority given to agriculture by government and donors, the performance of the agriculture extension sector in Liberia has not been encouraging (IFAD, 2011). The performance reports fail to indicate the separate performances of Public and Private Extension services that have been rendered to farmers, especially cassava farmers, in the study area. It is against this backdrop that the study attempts to investigate public and private extension services to cassava farmers.

Objectives of the Study

General Objective: The general objective of the study was public and private extension services delivery on cassava farmers in Sanniquellie and Saclepea mahn districts in the Nimba County, Liberia.

Specific Objectives:

The specific objectives of the study are to:

1. Describe the socio-economic characteristics of cassava farmers under public and private extension organization
2. Describe the involvement of cassava farmers under public and private cassava extension organization
3. Determine the perceived level of adoption of improved cassava technologies disseminated by public and private extension services to cassava farmers
4. Determine the factors constraining the provision of public and private extension services to cassava farmers

5. Compare the impact of public and private extension services to cassava farmers
6. To determine factors influencing adoption of improved cassava technology

Research Questions

1. What are the socio-economic characteristics of cassava farmers under public and private extension organization?
2. What are the involvements of cassava farmers under public and private cassava extension organization?
3. What are the perceived levels of adoption of improved cassava technologies disseminated by public and private extension services to cassava farmers?
4. What are the factors constraining the provision of public and private extension services to cassava farmers?
5. What are the impacts of public and private extension services to cassava farmers?
6. What are factors influencing adoption of improved cassava technology?

Hypothesis

Hypothesis 1

H_0: There is no significant difference in the level of adoption of cassava technologies disseminated by public and private extension services to cassava farmers

H_1: There is significant difference in the level of adoption of cassava technologies disseminated by public and private extension services to cassava farmers

Hypothesis 2

H_0: There is no significant difference in the levels of production, income, yield of cassava, farming skills and management capacity, and standard of living between farmers who participated in public and private extension services

H_1: There is significant difference in the levels of production, income, yield of cassava, farming skills and management capacity, and standard of living between farmers who participated in public and private extension services

Hypothesis 3

H_0: There is no significant difference in the involvements of cassava farmers under public and private cassava extension organization

H_1: There is significant difference in the involvements of cassava farmers under public and private cassava extension organization.

Justification of the Study

Extension has been identified as a good practice to help farmers have access to information needed to help improve their farming business. However, the practice does not always serve the interest of farmers (Chowa, Garforth & Cardey, 2013). Access remains a challenge, as providers still emphasize pushing a particular technology to increase farm productivity rather than addressing the expressed needs of the farmers. Though the various service providers may have their own organizational goals to achieve, they may also have their identities, values, norms, capabilities and weaknesses

which will come to bear during their work; and this can put the farmers at a disadvantage.

This research work through its successful implementation will assess the gap between the public and private sector extension delivery services. This will go a long way to promote joint services among the private and public sectors. Investigating public and private extension services delivery has been a great step towards attaining government designed policies that has made technology adoption feasible for farmers and thereby improving production and food security. Extension service providers have designed policies that will promote service delivery and improve agricultural productivity and standard of living of farmers through the successful implementation of the research work.

Limitation of the Study

The work faced several challenges which to some extent due to the outbreak of Ebola virus in the study area during the time of the data collection. The dysphoria created by the virus attack could have affected the psyche of respondents. Other constraints were short period of time and the difficulty in obtaining the instruments from extension services. The agency responsible for transporting the instruments encountered delay because of the Ebola outbreak and had to transit in another country (North Africa, Morocco) before reaching Ghana and finding way eventually to Cape Coast.

Delimitations of the Study

All the cassava farmers in cassava farming communities in the Sanniquellie and Saclepea Mahn districts of Nimba County (obtained from AEAs) were used in the study.

Definition of Terms

Extension Delivery: This refers to the various means through which innovations on farming system and general development are communicated to the farmers.

Private Extension Service: is composed of non-governmental and not-for-profit organizations that are privately owned and not part of the government, who are involved in promoting agricultural innovations among farmers.

Public Extension Service: is composed of organizations that are owned and operated by the government to transfer innovations to farmers.

Participation in Extension Services: is described as act of getting farmers involved in the extension programmes. It involves the process of empowering the farmers to influence decision taken about the extension programmes designed to affect their lives.

Organizations of the Study

The study is organized into five chapters. Chapter one is the introductory chapters which focuses on the background to the study, statement of the problem, research objectives, research questions, hypotheses, justification of the study, limitation and delimitation of the study.

Chapter two looks at the review of theoretical and empirical literature relevant to the study. Chapter three presents the research methodology; it discusses the study area, research design, population, sample size and sampling procedure, instrumentation, data collection and data analysis. The results of the study are presented in chapter four. The study ends with summary, conclusions and recommendations in chapter five.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents the review of related literature in previous studies and reports. Topics discussed include: history of extension, concepts of agricultural extension, agricultural delivery system, types of agricultural delivery system, diffusion of innovation, methods of extension, demography and socio-economic characteristics of cassava farmers, farmers' participation in agricultural extension activities, effect of gender on the adoption of technology, impact assessment, cassava production, states of cassava production in Liberia, constraints to the production of cassava, and conceptual framework.

History of Agricultural Extension

The term extension was derived from the practice of British universities of having one educational Programme within the premises of the university and another away from the university buildings. The Programme conducted outside the university was described as ''extension education''. The expression connoted an extension of knowledge from the university to places and people far beyond. Extension education was first introduced by Cambridge University in England to describe a particular system dedicated to the dissemination of knowledge to rural people where they lived and worked. Within a short time, the idea had spread to other parts of Britain, Europe and North America. Extension work is an out of school system of education in

which adults and young people learn by doing. It is a partnership between the government, the land-grant institutions, and the people, which provides services and education designed to meet the needs of the people (Kelsey & Hearne, 1966).

Agricultural Extension was only adopted when the United States Federal Smith-Lever Act of 1914 formalized a nationwide cooperative federal-state-county Programme and gave operational responsibility for this to the Land Grant Colleges and Universities. In the beginning, agricultural extension was concerned primarily with the improvement of agriculture, using conventional teaching methods. As time went on, home economics, youth Programmes and rural community resource development were included. Agricultural extension spread to tropical Africa, the Caribbean, Asia and Latin America following the involvement of the United States of America (USA) in joint AID Programmes after the Second World War (Kelsey & Hearne, 1966).

Modern Agricultural Extension

In the early days, extension services were in their determining stage; they were relatively small in scale and limited in the scope of their work and contact with farmers, and their organization was often somewhat random even though based on legislation. They were organized mainly either by central or local governments, or by agricultural colleges, usually in close association with experiment stations, or by farmer's organizations or combinations of these extension services. As the century progressed, the organizations have matured. Changes have often occurred to their connection, government funding has become relatively more important, their objectives have become broader, extension workers have become better trained and more professional.

In addition, several other kinds of organizations have developed comparable work: agriculture related commercial companies; agricultural commodity marketing boards, concerned to assure the supply and quality of their specific product; agricultural development projects, many of considerable territorial scale; and a variety of nongovernmental organizations involved in agricultural and rural development (Garforth, 1993).

As agricultural extension organizations have grown and changed, they have invariably become more practical with diverse structures. The work of dispersed extension workers had to be administered and controlled so that one or more levels of intermediary structure have been created between the field-level agents and their headquarters. Thus the management of extension activities has become a major preoccupation, and many organizations have been open to the criticism of being top-heavy and top-down in their approach. However, with funding derived largely from national revenues or international donors), senior managers have necessarily had to account for and justify their organization's activities. Agricultural extension has now become recognized as an essential instrument for delivering information and advice as an input into modem farming. Since commercial farmers can derive direct financial benefits from these inputs, there is a trend towards the privatization of the extension organizations, with farmers being required to pay for services which they had previously received free of charge. The pace of change in the organization, functions, strategies, and approaches of agricultural extension is clearly accelerating (Garforth, 1993).

The Concepts of Agricultural Extension

Extension is a non-formal educational function that relates to any institution that disseminated information and advice with the goal of advancing knowledge, attitudes, skills and aspirations (Alex, Zijp & Byerlee, 2001). No matter what the name of the system, approach or Programme, for instance cooperative extension, advisory services, Special Programme for Food Security, technical assistance or technology transfer, the function remains that of extension: the transfer and exchange of practical information. At the same time, extension is a political and organizational instrument utilized to facilitate development. Its reasons may be different from technology transfer by companies organized around specific, usually mono-cropping farm systems to problem-solving educational approaches to participatory Programmes aimed at improve poverty and advancing community involvement in the process of development.

Extension has diverse influence which combines educational methods, communication and group techniques in support of agricultural and rural development. It includes technology transfer, facilitation, and advisory services as well as information services and adult education. It is dependent for success on other agricultural development processes such as marketing and credit services, not to mention economic policy and physical infrastructure (Anderson & Feder, 2003).

Despite the difficulty of isolating its impact on agricultural productivity and growth from that of other factors, many studies have demonstrated the high economic returns of investments in agricultural dissemination. Investment in agricultural research and extension is thus a

crucial input of agricultural growth (Anderson & Feder, 2003). However, agricultural extension services in developing countries are currently grossly under-funded to undertake the activities required for achieving food security while protecting the productive resource base in order to keep up with population and economic growth (Gallagher, 2002).

Agriculture Extension Delivery System

The efficiency of agricultural extension services can be viewed from the successful accomplishment of extension Programmes using a variety of approaches in extension methods. The effects of such Programme must be seen in the life of extension clientele group (farmers). Extension education is not only a matter of just giving farmers knowledge from research and technology to help raise their efficiency; it also helps them learn about change (Onyenkazi & Gana, 2009).

In Liberia, the national extension service was established as a sub-division of the Ministry of Agriculture in 1960 with responsibility of transferring of technology through training and propagation of agricultural information through extension agents. However, nearly five decades down the line agriculture extension remains a major challenge in improving agricultural production and food security in the Country. The National Extension Service has had little effect on farmers since its establishment. This is because most agricultural extension Programmes have been characterized by top-down approaches and only a few farmers have benefitted from the extension services.

Many technological packages taken to farmers end up in failure because they do not address the real needs farmers have and are not well coordinated; and existing extension services in the country are fragmented and many times, there is duplication of functions in service delivery, but the Ministry of Agriculture recognizes the immense contribution these services are making, however uncoordinated they might be. The Ministry of Agriculture further acknowledges that for agriculture extension to be successful in the country, it must adopt a pluralistic agriculture extension policy, that is, one that recognizes and bring together the complimentary roles of both the government and non-governmental organizations involved in rendering extension services (Assaf, 2008).

Types of Extension System

The mixture of public and private extension activities which exists in most countries, and their relationships with surrounding communities, organisations and institutions, constitute an extension system. The distinction between extension types (public, private, and not-for-profit) can often become unclear in practice. Public extension staff may be paid by farmers for special services or they may routinely exchange their services for food, money and other goods. Private sector extension services generally focus on cash crops or on sale of inputs (seed, chemicals, fertilizer, & machinery). Extension specialists working for private agribusiness firms often serve multiple capacities (e.g. processor/exporter field staff provides production advice to out growers and enforce delivery of output, and input supply firm representatives combine education and marketing). In the private sector, extension activities are often part of a vertically integrated enterprise (Schwartz, 1994).

Agricultural Extension is now seen to consist of a range of services, providing knowledge and information to rural people to enable them to modify their behavior and use of technologies to improve their livelihoods. These services are recognized to be a function of both public and private agencies and institutions, and it has become clear that extension is not necessarily a government Programme, but rather the complex set of institutions whereby rural people obtain new knowledge and information. No matter what the changes in funding or management, public sector extension alone would never attend (to) the entire demand for extension service of world's farmers (Maalouf, Contado & Adhhikarya, 1991).

The reasons for the choice of pluralistic extension delivery in the agricultural sector have been given by various authors: Rivera (2002), the argument for pluralism in extension systems is based on the premise that the private sector (whether private companies, Non-Governmental Organizations (NGOs) or specialized consulting firms) can provide extension services more efficiently and effectively than public sector agencies, and that these advantages increase the likelihood of long-term and sustainable services. Furthermore, the transfer of funding for extension to private end-users provides them with greater ownership and thereby enhances a demand-driven service. Each type of private provider has its own niche and comparative advantages.

Private for-profit providers are motivated by profit and market forces that should provide more efficient and effective services where markets are competitive and function well. Private extension is becoming increasingly

important because the public sector is withdrawing from some service provision and states are privatizing areas deemed to be private goods.

NGOs are often quite flexible, committed to working with the poor and disadvantaged, able to provide intensive and integrated assistance to target grass-roots community organizations, and adapt approaches to local situations. They often have skills in building local organizations and linking them to markets.

Producer organizations empower farmers to express demands, contract service providers who meet their needs, and enhance accountability. It makes sense therefore, for an organization to engage in extension delivery if that organization's strategy is to improve the agricultural productivity of its members, if services have a clear commodity focus, if farming is viewed as a business, and the organization has the human and financial resources to do so.

Okorley (2009) identified that dwindling government funding of agricultural extension in developing countries and the call on extension organizations to support farm households' livelihood security initiatives, has made the practice of pluralistic extension a realistic option for ensuring efficient and effective use of available resources for extension and sustainable development.

The Role of Public Extension

Rivera and Alex (2004) recognized the dogmatic role by the public sector, quality control and enhancement, system coordination and promotion of extension reforms as some important concerns of government in pluralistic extension.

Regulatory role by the public sector

Even when funding and delivery of extension services are left to the private sector, the public sector retains important responsibilities for certain oversight and regulatory involvement to protect the public and minimize negative impacts on public welfare. This may be especially important in Programmes of contracting out service delivery

Quality Control and Enhancement

Extension services rely on key support services, especially the education and training of extension professionals and technical support from research and other sources of innovation. Ensuring quality of extension services relies on objective assessment of extension activities and on the economics of scope and scale that government can bring to extension support activities. Agricultural research, technology identification and technical support services are often relevant to all public and private extension services providers.

System Coordination

Extension services oversight is an inherent aspect of the public sector's responsibilities for policy formulation, safeguarding of public welfare, and development and design of reforms to promote pluralistic extension institutional arrangements. The government's convening authority enables it to bring different service providers and agencies together to exchange information and develop new partnerships.

Promoting Extension Reform

Globalization, inextricably linked to privatization, confronts countries with a new and. highly competitive global market. Major economic restructuring is taking place in both developed and developing countries, and has greatly changed the balance of responsibility between the public and private sectors. In many cases, trade liberalization puts developing countries at a disadvantage in the global market.

Extension services cannot use a single-sector approach, but rather, should operate as part of an integrated rural economy that incorporates agriculture and other sectors (e.g. education, health, finance, forestry, environment) to ensure sustainable development. Sustainable agricultural development in African can be improved through cross-sector pluralistic extension approach (Okorley, 2009). Extension can now be seen as a multi-sector network of knowledge and information support for rural people within the context of a wide rural development. Thus, it ensures that its agricultural extension Programme is coordinated with those of other organizations in the Agricultural Extension and Rural Development system and works in collaboration with stakeholders' organizations in the system (Okorley, 2009).

When public extension systems were established in most developing countries during the twentieth century, most were organized under ministries of agriculture. As a result, the majority of these agencies became top-down, multifunctional, resource-constrained systems that lacked adequate operational resources as well as competent technical specialists (Swanson & Rajalahti, 2010).

A critical turning point occurred that affected the way information transfer, considered the purview of public sector Agricultural Extension, was conceived and practiced. Not only did the Public Extension System come under public study and political attack, but was confronted by sensitive competitive interests from the private sectors. The confusion facing most public extension systems today is that due to their top-down organizational structure, continuing commitment to technology transfer, and their lack of adequate financial resources, most systems are neither prepared nor able to effectively increase farm income and improve the livelihoods of the rural poor. In addition, these public extension systems lack the necessary resources (especially training and Programme funds as well as information and communication technologies, ICTs, to keep their staff up to date and able to actually carry out more innovative extension Programme activities in the field. As a result, many development specialists have called for alternative service providers or recommend that these public services be privatized or turned over to NGOs (Swanson& Rajalahti, 2010).

Role of Private Agricultural Extension

Agricultural extension roles are being performed in partnership with the private sector, or they have been totally privatized over the past two decades and NGOs have become important institutional players in rural development. Giving declining public resources, some national governments have welcomed the opportunity to shift some extension responsibilities to NGOs. At the same time, international donors view NGOs as more effective in community mobilization, especially when contrasted with the bureaucratized government extension services. NGOs are a mixture between the public and

private sectors. Furthermore, NGOs appear to have a comparative advantage in working with small and marginal farmers, including women and ethnic minorities.

Private sector firms and non-governmental organizations (NGOs) have become important alternatives to public extension in providing technical inputs, information and training, and organizational support services to farmers and rural households. Private sector firms, including multinational seed and chemical companies, have become important contributors to agricultural technology transfer, especially to the commercial farm sector. In many cases, these private firms have access to superior technologies as a result of research and development activities carried out in other countries, (Swanson, 2002).

Private Sector Extension System in Liberia

Public and private extension systems in Liberia remain very underdeveloped and are still recovering from the war. Agriculture extension remains a major challenge to improving agricultural production and food security in the country (Assaf, 2011). The provision of extension and advisory services is noticeable in the areas of input supply to farmers; contract to provide extension services and technical advice to farmers associations, or in out-grower scheme method. In the out-grower scheme method, the private company works with the growers of a commodity to provide inputs on a contract basis, which is then paid off at the time these commodities are sold. Most private sector suppliers of agricultural inputs are based in Monrovia and most of their businesses are conducted with NGOs who purchase inputs on behalf of farmers.

Non-Governmental Organizations

Prior to 1990, there were only four major international NGOs operating in Liberia but currently there are more than 34 local NGOs in the country, working in four sectors: agriculture and food production, business development, education and sanitation. To support the Government effort in providing extension and advisory services to the largest possible number of farmers in Liberia, about sixty local and international NGOs currently assist farmers through funded projects in different counties and districts. These NGOs are actively involved in implementing different strategies to increase agricultural productivity and farm income among small-scale farm households both in urban and rural areas (Assaf, 2011).

The National Extension Service (NES) was established in 1960 as a sub-division of the Ministry of Agriculture (MOA) with responsibility for the transfer of technology through training and propagation of agricultural information through extension agents.

However, nearly five decades down the line agriculture extension remains a major challenge in improving agricultural production and food security in the Country. The National Extension Service has had little effect on farmers since its establishment; most agricultural extension Programmes have been characterized by top-down approaches and only a few farmers have benefitted from the extension services. Many technological packages taken to farmers end up in failure because they do not address the real needs farmers have and are not well coordinated; non-governmental organizations are at the fore-front of agricultural extension while government extension systems are still in need of revitalization and restructuring. Existing extension services in

Liberia are fragmented and many times, there is duplication of functions in service delivery. For agriculture extension to be successful in Liberia, it must adopt a pluralistic agriculture extension policy which is one that recognizes and brings together the complimentary roles of both the government and non-governmental organizations involved in rendering extension services. In addition, there are some issues and constraints facing agricultural extension in Liberia. These include; agricultural extension services in the past have been centrally controlled and supply driven with little attention to local knowledge, demands and participation, shortage of staff, inadequate funding and lack of new technologies have limited the scope and impact of extension activities. Lack of market, high post harvest losses, high cost of inputs, lack of value addition and the lack of access to suitable land have also undermined the effectiveness of extension services.

NGOs providing extension services are largely limited to distribution of seeds and hand tools, but very limited in building the capacities of beneficiaries. Private sector involvement in extension has always been minimal and inadequate capacities of farmers' organizations limit the extent to which they could be used in reaching farmers, especially women farmers, with technical assistance and services (Assaf, 2011).

Adoption of Innovation

The adoption of new skill can get to farmers through technologies transfer. Technology transfer refers to the general process of moving information and skills from information or knowledge provider such as research laboratories and universities to farmers (Chi and Yamada, 2002).

The adoption of improved technology by rural farmers is influenced by the extent the farmers feel their felt needs would be met by adopting such recommendations. Modern technologies are packaged by extension staff to farmers are neither useful nor readily adaptable, while many transferred to least developed countries proved to be very ineffective.

The need to overcome problems occasioned by over reliance on modern agricultural technologies to improve productivity has given greater impetus to the efforts aimed at developing technologies and methods of production that focus on the farmers' felt needs and use of local materials as well as the adaptation of foreign technology to local conditions **(**Agbarevo , Machiadikwa and Benjamin, 2012).

There are number of factors that influence the extent of adoption of technology such as characteristics or attributes of technology; the adopters or clientele, which is the object of change; the change agent (extension worker, professional, etc.); and the socio-economic, biological, and physical environment in which the technology take place. Regarding to adoption, farmers sometimes discover problems in putting recommendation into practice, the extent of adoption, adjustment or rejection depends on farmers' behavior.

Adoption of an innovation is the process by which a particular farmer is exposed to, considers and finally rejects or practices a particular innovation. The innovation decision shows the process through which an individual (or other decision making unit) passes from first knowledge of man innovation to forming an attitude towards the innovation, to a decision to adopt or reject, to

implement of the new idea, and to confirmation of this decision (Chi *et al*, 2002).

Diffusion of Innovation

Diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments (Medlin, 2001; Parisot, 1995). Technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome. Adoption is a decision of full use of an innovation as the best course of action available and rejection is a decision "not to adopt an innovation. Rogers (2003) defined diffusion as the process in which an innovation is communicated thorough certain channels over time among the members of a social system.

Adopter categories

The adopter categories are defined as "the classifications of members of a social system on the basis of innovativeness". This classification includes innovators, early adopters, early majority, late majority and laggards. In each adopter category, individuals are similar in terms of their innovativeness: Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system (Rogers 2003). Van Braak (2001) described innovativeness as a relatively-stable, socially-constructed, innovation-dependent characteristic that indicates an individual's willingness to change his or her familiar practices. Innovativeness helps in understanding the desire and main behavior in the innovation-decision process.

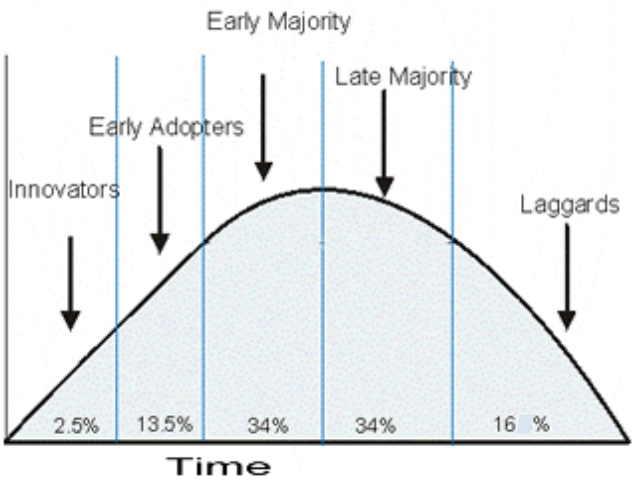

Figure 1: Categories of Adoption

Source: Rogers (2003).

Innovators

Innovators are willing to experience new ideas. Thus, they are prepared to cope with unprofitable and unsuccessful innovations, and a certain level of uncertainty about the innovation. Also, innovators are the gatekeepers bringing the innovation in from outside of the system. They may not be respected by other members of the social system because of their close relationships outside the social system. This requires innovators to have complex technical knowledge.

Early adopters

Compared to innovators, early adopters are more limited with the boundaries of the social system. Rogers (2003) argued that since early adopters are more likely to hold leadership roles in the social system, other members come to them to get advice or information about the innovation. Leaders play a central role at virtually every stage of the innovation process, from initiation to implementation, particularly in deploying the resources that carry innovation forward. Thus, as role models, early adopters' attitudes

toward innovations are more important. Their subjective evaluations about the innovation reach other members of the social system through the interpersonal networks. Early adopters' leadership in adopting the innovation decreases uncertainty about the innovation in the diffusion process. Finally, early adopters put their stamp of approval on a new idea by adopting it (Rogers, 2003).

Early Majority

The early majorities have a good interaction with other members of the social system; they do not have the leadership role that early adopters have. However, their interpersonal networks are still important in the innovation-diffusion process. The early majority adopts the innovation just before the other half of their peers adopts it. As Rogers (2003) stated, they are deliberate in adopting an innovation and they are neither the first nor the last to adopt it. Thus, their innovation decision usually takes more time than it takes innovators and early adopters (Rogers, 2003).

Late Majority

Similar to the early majority, the late majority includes one-third of all members of the social system who wait until most of their peers adopt the innovation. Although they are skeptical about the innovation and its outcomes, economic necessity and peer pressure may lead them to the adoption of the innovation. To reduce the uncertainty of the innovation, interpersonal networks of close peers should persuade the late majority to adopt it. Then, the late majority feels that it is safe to adopt (Rogers, 2003).

Laggards

Laggards have the traditional view and they are more skeptical about innovations and change agents than the late majority. As the most localized group of the social system, their interpersonal networks mainly consist of other members of the social system from the same category. Moreover, they do not have a leadership role. Because of the limited resources and the lack of awareness-knowledge of innovations, they first want to make sure that an innovation works before they adopt. Thus, laggards tend to decide after looking at whether the innovation is successfully adopted by other members of the social system in the past. Due to all these characteristics, laggards' innovation-decision period is relatively long.

Extension Methods

Based on nature of contact, extension methods can be categorized into three different groups: mass communication methods, individual methods and group methods. Mass communication methods can make contact at the same time with numerous amounts of people. Mass communication methods include for example radio, television, video, posters, newspapers and leaflets. For the Individual methods, the agent deals with farmers on a one-to-one basis while in the group method, the agent brings the farmers together. Since the three methods are suited to different purposes, it is important for the extension agent to consider the range of the methods at his disposal and select the method most appropriate for the situation. It is also important to remember the educational purpose of extension work, and to ensure that the method selected is used to promote the farmers' better understanding of the technology involved (Forssa, Luukainen & Lukainen, 2012).

Individual Methods of Extension

Individual or face-to-face methods are probably the most universally used extension methods in both developed and developing countries. The extension agent meets the farmer at home or on the farm and discusses issues of mutual interest, giving the farmer both information and advice. The atmosphere of the meeting is usually informal and relaxed, and the farmer is able to benefit from the agent's individual attention. Individual meetings are probably the most important aspect of all extension work and invaluable for building confidence between the agent and the farmer.

Learning is very much an individual process and, although group methods enable the agent to reach a greater number of farmers, personal contact with and the individual attention of the extension agent are important supports for a farmer. The personal influence of the extension worker can be a critical factor in helping a farmer through difficult decisions and can also be instrumental in getting the farmer to participate in extension activities. This individual contact between the extension agent and the farmer can take a number of forms.

Group Methods of Extension

The extension agent should consider the use of the group approach in his work with farmers. The use of groups in extension has become more common over the past decade and indeed a number of new ideas have emerged about how groups may be used most effectively. For example, the widespread Small Farmer Development Programme (SFDP) in Southeast Asia was based upon group methods and it has produced two manuals which detail the approach of group extension work. Furthermore, in Latin America, work

with extension groups in Brazil and Colombia has shown the usefulness to extension of the formation of extension groups, and how these groups can support extension activity. It has been seen that individual extension methods can be costly in both terms of time and scarce extension resources, and that they reach only a limited number of people. There is also the danger that too much emphasis upon individuals can lead to undue concentration on progressive farmers to the detriment of the poorer farmers.

The group method offers the possibility of greater extension coverage, and is therefore more cost-effective. Using the group method, the extension worker can reach more farmers and in this way make contact with many more farmers who have had no previous contact with extension activities (Forssa, Luukainen & Lukainen 2012).

Socio-economic Characteristics of Cassava Farmers

Age factor is very important as it influences one's behavior and broadens the vision of an individual through experience. It is generally believed that with the increase in age, the individual becomes mentally mature and takes rational decisions. It is believed that the younger the farmer, the more knowledgeable about new practices; adopt innovations early in respective life cycle (Rogers, 1995). Older farmers may have a shorter time possibility and be less likely to invest in new technologies. Adoption increases with age for younger farmers as they gain experience and increase their stock of human capital but declines with age for those farmers closer to retirement and also are expected to affect the technology adoption. As the age of the household head increased, the probability of adoption decreased because they

are inactive to participate in the new technology dissemination process, most likely due to being more influenced by culture (Alexander & Mellor, 2005).

The level of education is a factor that influences the level of adoption. The more educated the farmer is, the more he/she is adoption technologies. Educated farmers are expected to be more aware of the benefits associated with new technologies. In addition, if the farm operator has formal agricultural education it is assumed that he/she will be more likely to innovate due to the higher associated skill level (Alexander & Mellor, 2005). The agricultural system in which the farmer primarily specializes is likely to also influence the farmer's agricultural experience and human capital. Further, education is believed to improve the readiness of the household to accept new ideas and innovations, and get updated demand and supply price information which in turn enhances producers' willingness to produce more and increase market entry decision and volume of sale.

Education also increases literacy and may help farmers to acquire and understand information and to calculate appropriate input quantities in a modernizing or rapidly changing environment. Improved attitudes, beliefs and habits may lead to greater willingness to accept risk, adopt innovations, save for investment and generally to embrace productive practices (Appleton & Balihuta 1996; Cotlear 1990). Education may either increase prior access to external sources of information or enhance the ability to acquire information through experience with new technology. That is, it may be a substitute for or a complement to farm experience in agricultural production.

The number of years that the smallholder farmers have practiced farming activity after the technology transferred to the area may have farming experience and technology adoption. Farmers with high farming experience and willing to adopt a technology get information about the advantages of technology through different ways (Bellemare & Barrett, 2006; Ahmed, 2012). For example, in selectivity models, the decision to technology adoption can be seen as a sequential two-stage decision making process. Experienced farmers make a discrete decision whether or not to adopt new technology or not. These farmers are expected to have greater knowledge and awareness of innovation than farmers with shorter experience.

Farm production, in general and marketable surplus of dairy products in particular, is a function of labor. Accordingly, household with more family members tended to have more labor and to adopt dairy technology than household with less family members which in turn increased production and market participation of the households. A positive sign indicates that the larger the household size, the greater is the technical inefficiency. A reason for a positive sign is allocation of financial resources to family members for their education and health (Coelli, Rehman and Tirtle, 2002). On the other hand, larger household size might benefit from being able to use labour resources at the right time (Dhungana, Nuthall & Nertea, 2004).

Farmers' Participation in Agricultural Extension Activities

The concept of participation in general and farmer's participation in agricultural research in particular initially attained wide-scale use in the 1970's. Its emergence hinged largely on the move towards participation in social science research and the concept of farming systems research (FSR).

The concept of participation is defined as the organized effort to increase control over resources and regulative institutions in given social situations, on the part of groups and movements of those hitherto excluded from such control. It is evident from this definition that controlling and influencing decisions that impact ones well-being are critical aspects of participation (Farrington & Martin, 1988).

Given current approaches and practices, the recommendation that there is need for greater farmer involvement in extension and research is an understatement. Farmer participation encompasses both involvement in technology development and the dissemination of generated technologies. Thus, there needs to be greater farmer involvement in both research and extension. Extension and research Programmes have to be designed with farmers, not for them. In a way, farmers should be regarded as equal partners in the research and extension processes, in a context where farmers are considered as active and knowledgeable, people from whom one can learn and consult, rather than as clients or targets for the transfer of externally produced technologies. Farmer participation as a facet in rural development should also go beyond rhetoric, whereby farmers are involved in all stages of the technology generation and diffusion process in practice including Programme planning, implementation and evaluation.

It should be highlighted that actual farmer participation is critical for an efficient and effective extension system given that this is an issue that is still at preaching stage in most conventional and alternative extension approaches. Actual farmer participation can be evaluated against the background of sources of initiatives, efforts put in trying to solve real farmer

problems, the integration of indigenous knowledge, and the use of farmer's criteria in choosing technical innovations. Considering the long history of top-down extension approaches, complementary capacity building Programmes are a necessity to ensure farmer participation (Farrington & Martin, 1988).

Effect of Gender on Adoption of Innovation

Smallholder farmers currently produce 90% of food in Africa and around half of all food worldwide. In developing countries, between 60 and 80 % of these smallholder farmers are women. Yet, they are the ones who are most likely to go hungry. One key reason for this is that agricultural policies and agricultural aid at the multilateral, bilateral and national levels are neglecting smallholder farmers in general and women in particular (Ogunlela, & Mukhtar, 2009).

There are numerous reasons extension services are not reaching women. In many communities and cultures, contact between men and women is controlled and as a result, women are not able to attend trainings with men. The rural women play a key role in agriculture and share abundant responsibilities in maintaining the household, they attend to various farm-operations like seed bed preparation, clod breaking, sowing, transplanting, weeding, fertilizer application, watering, harvesting, threshing, winnowing, packaging and storage, attending to cattle, fodder collection, milking, etc. Women are loaded with these household tasks making it difficult to attend training Programmes.

In Liberia, women in rural areas produce most of the food crops and are largely responsible for household food security; they carry wood and water, care for children and homes, and undertake transport and marketing

activities for the family. They predominate in key segments of the value chains of major food and cash crops, especially in production, primary processing, product development, and marketing. Some women also serve as heads of their families and shoulder the corresponding responsibility. The civil crisis has accentuated the role of women in Liberian society, especially in food and nutrition security. The number of female-headed households and single-parent families has increased, as have the burdens of child and family care. However, women are often highly marginalized and need to be empowered to be able to improve on their roles and responsibilities in the sector (Ministry of Agriculture, 2010).

The role of women in the family, in society and in the work force varies across nations and cultures. In some, women are expected to stay at home, care for the children and specialize in home production. In others, women work outside the household almost as much as men and participate in various degrees in the production of income for the family and in other public and political activities. Female labor force participation has increased strongly in many countries in the last few decades and proximate causes of this dramatic change have been extensively examined (Alesina, Giuliano & Nunn, 2010).

Without basic education and literacy, women will be unable to read simple instructions. When farmers are unable to read and understand instructions on fertilizers or seed packages, directions on how to use tools or technologies, or even read a weather report, then it is their crops and afterward their families who will suffer (UNICEF, 2007).

Furthermore some factors that generate adoption of new technologies comprise of progressive, young and educated farmers. However, not all farmers adopted technologies introduced because they are new to them. They may feel uncertain to use new technology because they do not believe that the new technology can ensure the high yield. These farmers are usually old age and work based on their own experience. Despite the fact that farmers perceived technology as good thing to them, they still faced problems in application of technologies.

These comprise of lacking of capital, direction of the government and extension, lack of ensured yield by compensation policy (Chi & Yamada, 2002). In the developing world, where more than a third of the total population is rural and female, women produce most of the food for domestic consumption. The sustainable production of food is the first pillar of food security. Millions of women work as farmers, farm workers and natural resource managers (Onyemobi, 2000). In doing so, they contribute to national agricultural output, maintenance of the environment and family food security Evidence from throughout the developing world indicates that men and women do not adopt new technologies at the same rate or benefit equally from their introduction (Doss, 2001).

Women are the main food producers in Africa and, equal to that, development plan and Programmes have not given adequate attention to their needs to improve their food productivity without placing an unequal burden on them. There is a great need to strengthen development and to support them in their pursuit for improvements for themselves and their families. Training Programmes need to be well adapted to women's needs and have to take into

account the serious time limitation women face as a result of their triple responsibilities for agricultural production, family welfare and support to their communities as a whole.

Improved training opportunities need to be made available to rural women in order to improve their knowledge of improved agricultural practices and crop varieties, strengthen their leadership skills and abilities to participate better in peasant associations and administrative processes with regard to agricultural services and inputs; and support them in organizing their demand for credit, agricultural research on improved crop varieties, appropriate technology extension support and other services relevant for the food security and welfare of themselves and their families (Onyemobi, 2000).

Impact Assessment

Impact assessment in agricultural research is the effort to measure its social, economic, environmental and other benefits. Impact assessment is important because stakeholders expect research organizations to account for their use of resources, as well as learning from and adjusting to new challenges. These guidelines present major considerations to be addressed in designing and implementing Impact assessment. They are intended for partners in national agricultural research systems, universities, non-government organizations, or others who may have limited background in Impact assessment economics and who are charged with conducting projects and Programmes (La Rovere & Dixon, 2007).

Concepts of Impact Assessment

The ability to define and measure impact is essential to providing operational agencies with the tools to systematically evaluate the relative efficacy of various types of interventions. Combining lessons learned across organizations, operations, and time is critical to the creation of an evidence base which can continue to inform the sector about improvement.

Institutionalizing good practice in the systems and structures of relief organizations is critical to their ability to meet the growing demands on the sector and the needs of people made vulnerable by disasters and humanitarian crises. Similarly, communicating the effectiveness of impact is necessary for the humanitarian sector to respond to increasing pressure from donors and the general public to demonstrate the results of its efforts (Fritz & Menocal, 2007).

A well designed impact assessment can capture the real impacts of a project, be they positive or negative, intended or unintended on the lives of the project participants. An impact assessment can therefore demonstrate whether the money allocated to a project is actually having an effect on the lives of the project participants. This alone should create a greater demand from donors and greater incentives for implementing agencies to measure the results of their work (Fritz & Menocal, 2007).

Impact studies can be carried out to study the impact of a particular innovation/technology on a research Programme or on a research Programme plus complementary services (such as extension, marketing etc.). Impacts can also be measured at the individual household level, target population level, as

well as national and regional levels (primary sector, or secondary sector, or overall economy).

The direct product of an agricultural project/Programme may be an improved technology (embodied or disembodied), specialized information, or research results (reports, papers and publications). There is general consensus that an agricultural effort in addition to producing the direct product of research could potentially lead to five different types of impacts (see Figure 1). These are production impact, economic impact, socioeconomic impact, environmental impact and institutional impact. Institutional impact refers to the effects of Technology and Development Transfer (TDT) efforts on the capacity of the research and extension Programme to generate and disseminate new production technologies. These different impacts and the appropriate methods to measure them are discussed in the following section.

Based on the previous discussions, there are three broad categories of impact that form part of a comprehensive impact assessment exercise. The first is the direct outcome of the research activities Secondly the intermediate impact which is concerned with the organizational strategies and methods used by researchers and extension workers, and other actors in conducting more effective technology development and transfer. The third is the effects of the direct product(s) on the ultimate beneficiaries.

This is the so called people level impact. The people level impact can be economic, socioeconomic, socio-cultural, and / or environmental (Anandajayase keram, Martella & Rukuni. 2008).

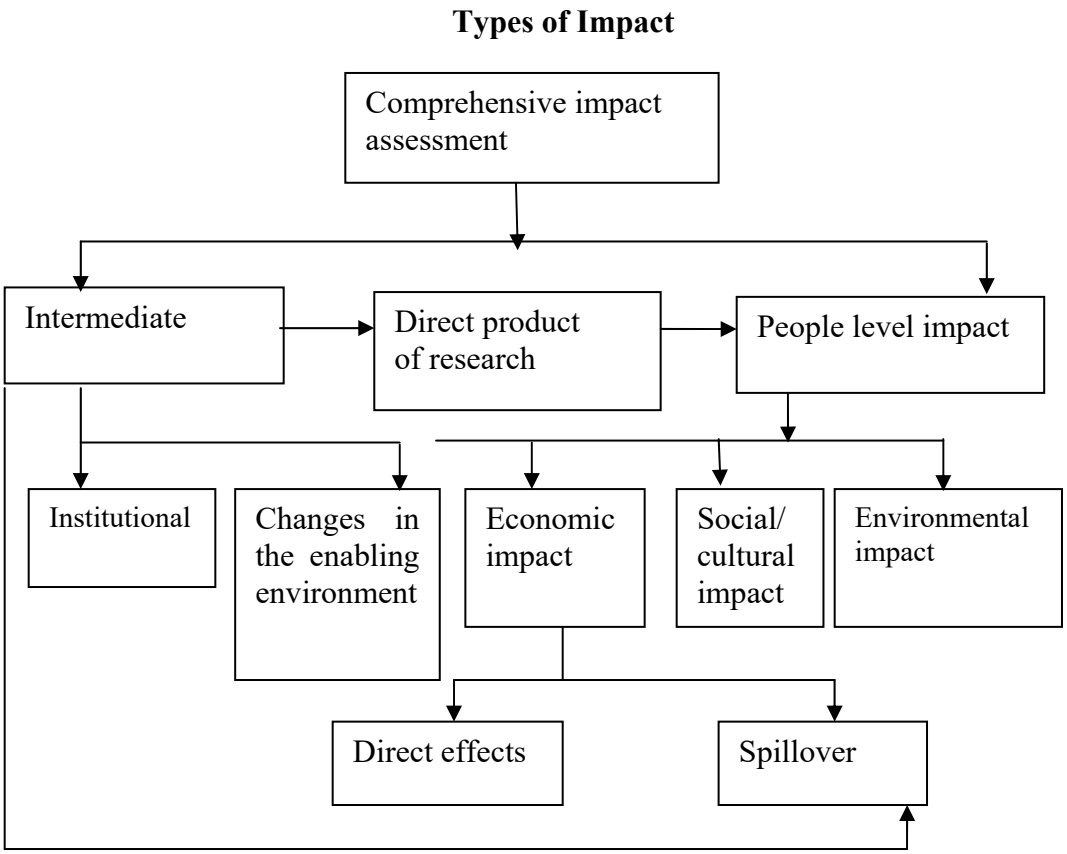

Figure. 2: Framework for Comprehensive Impact Assessment

Source: Anandajayasekaram *et al.,* (2008).

Direct product of research

The most commonly used approach for assessing the direct product is known as effectiveness analysis. A useful starting point for effectiveness analysis is the logical framework of the project. The logical framework permits the assessment of the degree to which the activities have made changes in the desired direction. The logical framework itself is a simple matrix that provides a structure for one to specify the components of a Programme/activity and the logical linkages between the set of means (inputs and activities) and the set of ends (outputs). This logical framework makes the impact assessment process transparent by explicitly stating the underlying assumptions of the analysis.

Evaluating the Impact of Intermediate Product(s)

The evaluation of the intermediate product is made difficult by the fact that the benefits of these products are not easy to quantify. Thus, most studies acknowledge the fact that having the organizational capacity to conduct agricultural research is of paramount importance. These studies, however, do not include the benefits in assessment of the impact. The costs that are easy to quantify are usually included. Thus, the assessment of the intermediate product has been a tricky issue. The practice has been to trace the changes in organizational capacity over time using either simple trend analysis or comparisons over time. This requires baseline information on these indicators and careful monitoring. The results from these analyses can be incorporated into the quantitative analysis through a multi-criteria analysis (Anandajayasekeram et al., 2008).

The Economic Impact

The economic impact initiatives can be traced through its effect on production and income. The approach used is called efficiency analysis. Efficiency analysis assesses the people level impact by comparing the benefits that society gets from the costs incurred in conducting Programmes. The benefits and costs are normally collapsed into a single number, the rate of return. There are two broad ways of calculating the rate of return to *ex ante* and *ex post.* The *ex ante* methods are useful as research planning tools as they aid in the selection of the research portfolio, priority setting and resource allocation. The *ex post* studies are useful for justifying past investments, and demonstrating the payoff of such investments.

Socio-cultural Impact

Socio-cultural impacts include the effects of research on the attitude, beliefs, resource distribution, status of women, income distribution, and nutritional implications, etc. of the community. These can be accessed through socioeconomic surveys and careful monitoring. To be cost effective, appropriate socio-cultural questions can be included in adoption survey questionnaires.

Environmental Impact

The adoption of modern agricultural technologies has often resulted in external benefits and costs largely through its effects on the environment. For example, the use of fertilizers or pesticides may lead to surface and ground water contamination by toxic chemicals and algae, resulting in significant environmental costs. On the other hand, adoption of minimum tillage technology and herbicides by farmers has probably had environmental benefits in the form of reduced soil erosion and nutrient loss.

The full assessment of environmental quality issues requires complex analysis of physical, biological, social and economic processes. This also leads into some measurement problems. Such a breadth of analysis is likely to be beyond the scope of most agricultural research assessment activities (Anandajayasekeram, Martella & Rukuni, 2008).

States of Cassava Production in Liberia

Cassava (*Manihot esculenta*) is second to rice as the most important food crop in Liberia and plays a significant role in the farming system. It supplies the population with more than 25% of their daily caloric intake and

besides the roots, the leaves are consumed extensively as vegetables. Cassava is a crop that is particularly close to the hearts and culture of the Liberian people. It has the potential to contribute substantially to social and economic development both in the rural and urban areas. Agriculture presently accounts for 61% of GDP and is the primary source of livelihood for two-thirds of Liberia's 3.5 million people. Close to 331,000 households are engaged in agriculture, primarily small holder and subsistence farming, as well as cash crop plantation (rubber, oil palm, cocoa, sugarcane and coffee). About 82.7% of these households are engaged in rice production, and 79.6% in cassava production (Ministry of Agriculture, 2009).

In 2008, the Agricultural Commodities Programme (ACP) was initiated jointly by the EU and the ACP Secretariat. The Programme main objective was to reduce poverty, while improving and stabilizing revenues and living conditions of agricultural commodity producers in ACP countries.

Liberia's involvement in this Programme, and the subsequent focus on the cassava sector, came as a result of a joint initiative of the Ministry of Agriculture, Ministry of Commerce and sector stakeholders in collaboration with the International Trade Centre (ITC) in Geneva, Switzerland. The selection of cassava is in line with the Poverty Reduction Strategy and is justified by the importance from a food security point of view (second staple crop and first staple protein) and from an industrial and value addition potential point of view. The Cassava sector strategy process was started as part of Liberia's National Export Strategy in 2009. Private sector stakeholders and Government Authorities agreed that the process would be jointly championed by the Ministry of Agriculture and the Ministry of Commerce and Industry.

Based on the experience of ITC in other countries, where similar projects have been developed, this process emphasized on a participatory market-led approach and focused on domestic, regional and international market opportunities (Ministry of Agriculture, 2009).

The Importance of Cassava in Liberia

Cassava is the second most consumed staple food crop in Liberia, but the first staple-protein (consumption of roots and leaves) food consumed in the country. It is grown throughout the country although the cultivated area varies considerably by counties. The following facts relating specifically to cassava show that it is produced by over 60% of farming households in Liberia, a main provider of calories in the diet of Liberians and an important contributor to the GDP (550 000 metric) in 2007 (Ministry of Agriculture, 2009).

Furthermore, in the near future, cassava will play a very important role in the Liberian economy by making the transition from staple-protein food to a high value product and raw material for the processing industry. This process will result in fresh cassava roots being processed into added value products within a market-driven commodity chain approach.

The promotion of Liberia's cassava sector can lead to a significant boost in the following areas: agro-food industry (cassava flour, chips, etc), non-food industry (glue, starch, etc.), poultry and livestock industries (chicken feed, pig feed, etc) and even ethanol. From a buyer and industrial user point of view, the intrinsic characteristics of cassava that make it interesting as a commodity and as a major economic driver can be expressed as the greater clarity and viscosity than other comparable starches that remains very stable in acidic food products and has excellent properties for use in animal feed, non-

food products, such as pharmaceuticals and others which can contribute significantly to the empowerment of women, who make up the majority of small holder producers and carry out over 80 percent of trading activities in the rural areas. Cassava is also important due to its being an income-generating crop that can guarantee food for poor rural households (Ministry of Agriculture, 2009).

The Role of Stakeholders in Cassava Production in Liberia

The role of the Liberia National Cassava Sector Strategy (NCSS) is a long term plan of action by Liberian cassava sector stakeholders and the government of the Republic of Liberia, for the development of the nation's cassava sector. It identifies and articulates specific time bound actions and measures to be taken to enable the sector to reach its full potential through a coordinated approach that involves all sector stakeholders. Most importantly the strategy has enabled the creation of a public private platform through the stakeholder led coordinating committee (Ministry of Agriculture, 2009).

Impact and beneficiaries

The cassava value chain strategy will impact one and a half million of Liberian people growing cassava in 264 009 h ouseholds distributed in 15 provinces. Three of these provinces hold 55% of households embracing 43% of the total cassava growers. The implementation of the strategy will be oriented to impact initially those areas and provinces with more feasible readiness and potential from a commercial, social and human point of view followed by those where the strategy needs more investment to significantly reduce indicators of poverty. The strategy coordinating committee will be

mandated to evaluate proposals and decide on the order and priority for implementation.

Constraints to the Adoption of Cassava Technologies

A number of constraints limit the use of the technology, especially among farmers growing cassava for the roots. Optimal yields of roots are not achieved as the emphasis is usually on enhancing yields of stems instead of fresh roots. As a result, a substantial quantity of fresh roots is lost in the process. It also requires high usage of external inputs such as inorganic fertilizers and agrochemicals which are scarce, costly and inaccessible to some farmers. The challenges associated with procurement of such inputs also cause farmers to shun the technology. A number of cassava varieties also do not respond very favorably to the technology, possibly because of the size of the 2- or 3-nodes stakes. In such cases, the multiplied stems usually have low vigor and may not be ready for harvest after the initial 6 months after planting.

Famers are faced with the problem of land tenure system. This is because land for agricultural production is predominantly acquired through inheritance or within the extended family. This problem of land tenure as observed by Adofu, Orebiyi and Otitilaiye (2013), robs a lot of people who are interested in the cultivation of cassava the opportunity to do that which now shift their interest to non- agricultural trade. In another thought, some land owners feel that it is unjust and immoral to sell their land to farm users since this may deprive their future generation of their inheritance.

Cassava is an important staple food crop and source of calorie for many people in sub-Saharan Africa (SSA). Cassava yields are poor (10 Mg/ha fresh storage roots in farmer fields against an attainable yield of more than 60

Mg/ha), due to many constraints at plant, field, farm and community and regional levels. At the field level, lots of evidence exists to show that poor soil fertility is the major constraint to crop production in SSA, because most soils are inherently poor, added to the fact that few smallholder farmers use fertilizers in cassava production systems. Poor soil fertility is likely to reduce water and light use efficiency of the crop. Several studies showed that nitrogen and potassium are the most limiting nutrients to cassava production. While nitrogen plays an important role in the vegetative development of the crop and biomass production, potassium is known to be more important in partitioning of photosynthesis substrates from leaves to stem and storage organs of the crop. Potassium is also known for playing an important role in efficient water use by crops, especially against drought spells. So, in order to formulate proper fertilizer recommendations to replenish the soil in cassava production systems for better resource use efficiency and increased productivity of the crop, it is important to understand more how potassium supply affects resource use efficiency of cassava (Issaka, Buri, Asare, Senayah, and Essien, 2007).

Cassava is known for its ability to produce fair yields where other crops fail. This has led many to believe that soil fertility is not important in cassava production. Field trials have shown that this is a misconception. On the contrary, using improved varieties but no fertilizer, low soil fertility was the principal constraint to production and caused farmers an average loss of 6.7 t/ ha with respect to an attainable yield of 27 t/ha. Drought caused a loss of 5.4 t/ha and poor weed control 5.0 t/ha, whereas pests and diseases caused an average loss of 3.8 t/ha (Hillocks, 2003).

The use of available and cheaper soil improvement materials may help resource-poor farmers to improve on the production since most farmers are not able to purchase inorganic fertilizers due to their relatively high cost. Fast growing leguminous trees play a significant role in improving soil productivity and can therefore be used to improve cassava production. It is expected that when prunings of Gliricidia sepium and Senna siamea are used to fertilize the soil, they will significantly increase the yield of cassava. Data are abounding on the effect of inorganic fertilizer on cassava (Hillocks & Jennings, 2003). Issaka, Buri, Asare, Senayah and Essinen, (2007) and Howeler (1987) however reported the effect of organic materials on the growth and yields of cassava as well as the impact of root formation on soil nutrient stores are inadequate or lacking. As already mentioned, cassava is known for its ability to produce good yields where other crops fail. This has led many farmers to believe that soil fertility is not important in cassava production. Experience and research have shown that this is a misconception.

On the contrary, it is important to improve the nutrient availability of the soil by adding amounts of organic matter to the soil in order to maintain a good nutrient balance. This is particularly important at the early growth stage of cassava, as the root system of cassava develops slowly and has limited uptake. The type and quantities of fertilizers required by a cassava crop depend on several conditions, such as the type of soil. Organic farmers use different strategies to improve soil fertility in cassava production. These strategies aim at preventing the loss of nutrients and organic matter on one hand and at maximizing the nutrient cycles on the other hand (Egwu, 2003).

Agricultural inputs are very expensive and beyond the reach of most smallholder farmers because of high business cost in procurement. As a result, fertilizer use in Africa remains the lowest in the world and well below the most favorable levels of use with possible soil mining and general soil degradation effects. In addition to the poor input use policies is the lack of output markets. Private extension agents often undertake to facilitating access to distributing of inputs. Many smallholder farmers have inadequate and costly access to these basic services. These private sectors has a bias towards servicing larger commercial farms and those located in areas favored by good agro-climatic conditions and market access. Recent years have seen new innovations in developing public-private partnerships farmer cooperatives, NGO involvement in social enterprise, credit and training Programmes for small seed and fertilizer distributors, and use of smart subsidies (CIMMYT, 1993).

Table 1: Fertilizer Nutrient Consumption per Hectare of Arable Land in Selected Countries in the Year 2000

Country	Kg of Nutrients/Hectare	Country	Kg of Nutrients/Hectare
Uganda	1	Cuba	37
Ghana	3	South Africa	51
Guinea	4	India	103
Mozambique	4	USA	105
Tanzania	6	Brazil	140
Nigeria	7	France	225
Burkina Faso	9	China	279
Mali	11	UK	288
Ethiopia	16	Japan	325
Malawi	16	Vietnam	365
Benin	18		

Source: FAOSTAT, July 2002

Financial resources may be available through loans. In particular in the case of smallholder farmers, limited access to credit may provide an important constraint to technology adoption as lenders may be unwilling to bear the high transaction costs of small disbursements. Also, the seasonality of agriculture and climatic variability can hinder regular repayments. At times, access to credit may also be linked to the use of particular inputs, thus limiting technology choices (CIMMYT, 1993).

Access to credit reduces the opportunity cost of capital intensive assets relative to family labour, as a result encouraging labour saving technologies and raising labour productivity, a crucial factor for agricultural development, especially in many African countries. Access to credit affects household welfare by increasing its risk bearing ability and alters its risk-coping strategy and that households may therefore be willing to adopt new and more risky technologies. These risky technologies and coping strategies are most times very productive and profitable. Most small scale farmers are poor and lack savings and investment culture besides having limited access to credit. According to Olomola (1990), a study conducted in Nigeria showed that credit is a major militating factor against agricultural production and development in the country. The lack of access to credit causes setbacks to the productivity of farmers as a result of the fact that, farmers do not have the resources to procure improved seedlings, chemicals and hired labour, as well as transport and market their produce which would have improved their productivity, welfare and ultimately help in achieving economically sustainable production. Agricultural credit enhances productivity and promotes standard of living by breaking vicious cycle of poverty of small scale farmers. Agricultural credit is

the process of obtaining control over the use of money, goods and services in the present in exchange for a promise to repay at a future date (Adebayo & Adeola, 2008). Ngigi (1999) views finance as an issue crucial to entering processing and buying of farm inputs like herbicides, insecticides and fertilizer in farming of which cassava is inclusive. Effective management of cassava farmers toward higher productivity is a function of the availability and level of finance or credit facility at the cassava farmers' disposal.

Yield stability and environmental development of cassava largely depends on the quality of planting materials that are clean, high vigor and with no pest or pathogen infestation/infection (Hillocks, 2002). Cassava being a root crop depends on stem cuttings for propagation and production. These vegetative planting materials are required in large quantities hence bulky for large scale production. In addition, their multiplication rate is lower than seed propagated plants. This therefore threatens the production of high quality planting materials for most smallholder farmers. A study conducted in Malawi showed that most farmers use virus infected cuttings for planting due to lack of knowledge on cassava pests and diseases and scarcity of healthy planting materials despite the availability of a well developed system of multiplication and distribution of planting material (Moyo, Benesi, Sandifolo, & Teri 1999). This in turn contributes to low production output by smallholder farmers.

Good quality planting material usually results in better germination and yield of cassava. It is necessary to properly select and prepare the planting material lack of improved varieties. A majority of farmers plant local varieties which are characterized by low yields and susceptibility to diseases. As a

result, although farmers may plant large land area to cassava, low yields result in low output. However, several Programmes to improve varieties resulted in improved cassava varieties which have been or are being distributed to farmers. Apart from the poor soil types in some parts of the country, another problem is the deteriorating soil fertility as a result of continued use of the same land. Furthermore, poor methods of cultivation have led to increased soil erosion, thereby reducing productivity. There is therefore, need for improved agricultural techniques and increased use of fertilizers whose prices are prohibitive to most farmers.

Insect pests and diseases are a major threat to cassava production in Sub-Saharan Africa as evidenced by several researchers (IITA, 1990). In sub-Saharan Africa, diseases and arthropod pests causing economic losses continue to take their toll on the cassava crop, occasionally in epidemic proportions in both traditional and new areas of production. The most important diseases and pests are the cassava mosaic virus disease (CMD), transmitted by the ubiquitous whitefly (*Bemisia tabaci*), cassava brown streak virus disease (CBSD), cassava bacterial blight (CBB), cassava mealybug (CMB), green spider mite (CGM), African root and tuber scale (ARTS), and the larger grain borer, which attacks dry chips of cassava in storage. Others are termites, anthracnose (CAD), root rots, rodents, and stem girdlers. These diseases and pests as well as adverse agronomic conditions combine to reduce storage root yields.

The presence of scale insects can reduce the sprouting percentage and yield of cassava. However treatment of stakes with insecticide before planting or planting horizontally minimized the yield reduction (Evangelio, 2000).

Most cassava producers do not have information regarding the business value of the crop. There is also limited knowledge on value addition to cassava through processing into various products in addition to the fact that the marketing of cassava is not characterized so that during production farmers do not have precise information regarding the size of the market, the range of prices to expect and how to locate such markets (Mataya, 2002).

Postharvest Losses

Cassava has a short shelf life compare to other crops most especially when proper care is not giving generally after harvest which cause deterioration (Westby, 2002). This postharvest deterioration is indicated by internal discoloration and this causes loss in market acceptability of the product. The poor post harvest storage life of fresh cassava tubers is a major economic constraint in its utilization. The highly perishable nature of harvested cassava roots and the presence of cyanogenic glucosides in bitter cultivars call for immediate processing of the storage roots into more stable and safer products. The hydrocyanic acid content of cassava tubers can be removed by either washing, exposure to air, heating or pressing. Poor postharvest handling leads to uneven quality of the processed cassava and results in contamination by fungi. Poor and inadequate infrastructural facilities for milling and storage, and poor access to roads, which are vital for adding value, further increase the postharvest handling challenges. However, cassava remains a desirable crop because of its many advantages. It is easy to produce,

adaptable to many environments, has minimal labour requirements and is comparatively less susceptible to pests and diseases than most other crops. This implies that there is need to address the above challenges in order to increase productivity, marketing opportunities and profitability of cassava production. The following organic practices can contribute to achieving these goals (Evangelio, 2000).

Given the huge potential of cassava as livestock feed, and in textile, paper, brewing, chemical and pharmaceutical industries, it suffers from postharvest losses as it deteriorates rapidly after harvest. In this regard, timely harvests and efficient postharvest operations such as peeling, grating, boiling, fermenting, drying, frying and milling are said to play a crucial role in the lives of farmers.

Therefore, there is need to provide farmers with appropriate equipment to carry out these operations in order to reduce crop waste and thereby enable more complete utilization of the food crops grown (Hillocks, 2002). There is also need to improve the storage techniques of cassava after harvest in order to reduce physiological deterioration. Cassava contributes to poverty alleviation and improvements have to be made in the postharvest sector (Westby, 2002).

The common means of transporting cassava among producers are hired vehicles, motorbikes (IITA/SARRNET, 2003). Due to poor roads infrastructure, vehicle breakdowns are common, this in turn increases transport costs but also reducing the market value of the crop as they deteriorate before reaching the intended market.

Cassava plays an important role in the farming systems where it acts as a food security crop as well as a cash crop in the rural farming communities. There is need to provide short term and long term credit support for the small scale and medium scale operators to go into the production of cassava for industrial and household consumption (animal feed, starch, cassava meal, glue) (Mataya, 2002).

Conceptual Framework

This framework is formulated on the fact that developing countries have very limited resources available to invest in public sector and private institutions. Therefore, these publicly supported organizations should have a clear Programme focus and mandate. Each set of public and private sector institutions should capitalize on their respective comparative advantage in providing farm families with useful educational Programmes and technology transfer activities. These organizations should avoid overlapping and duplicative activities that will likely result in inter-organizational conflicts.

The Socio economic variables of farmers such as experience, age family size, education, marital status, inputs and credit are significantly variables related to extension services and Level of adoption which is the dependent variable. Public and private extension services such as, increased number of training, improved level of technologies transfer, and improved marketing services, kind of adoption, level of adoption, are directly linked with constraints of adoption (inadequate size of farm land, inadequate finance and credit facilities, non suitability of extension services and inadequacy of extension services) which are also directly leading to the depend variables.

If the intervening variables such as government policy, extension policy, environment, weather and soil are well taken care of, farmers will effectively adopt new technology which will lead to the high yield of cassava, higher income and living condition of cassava farmers.

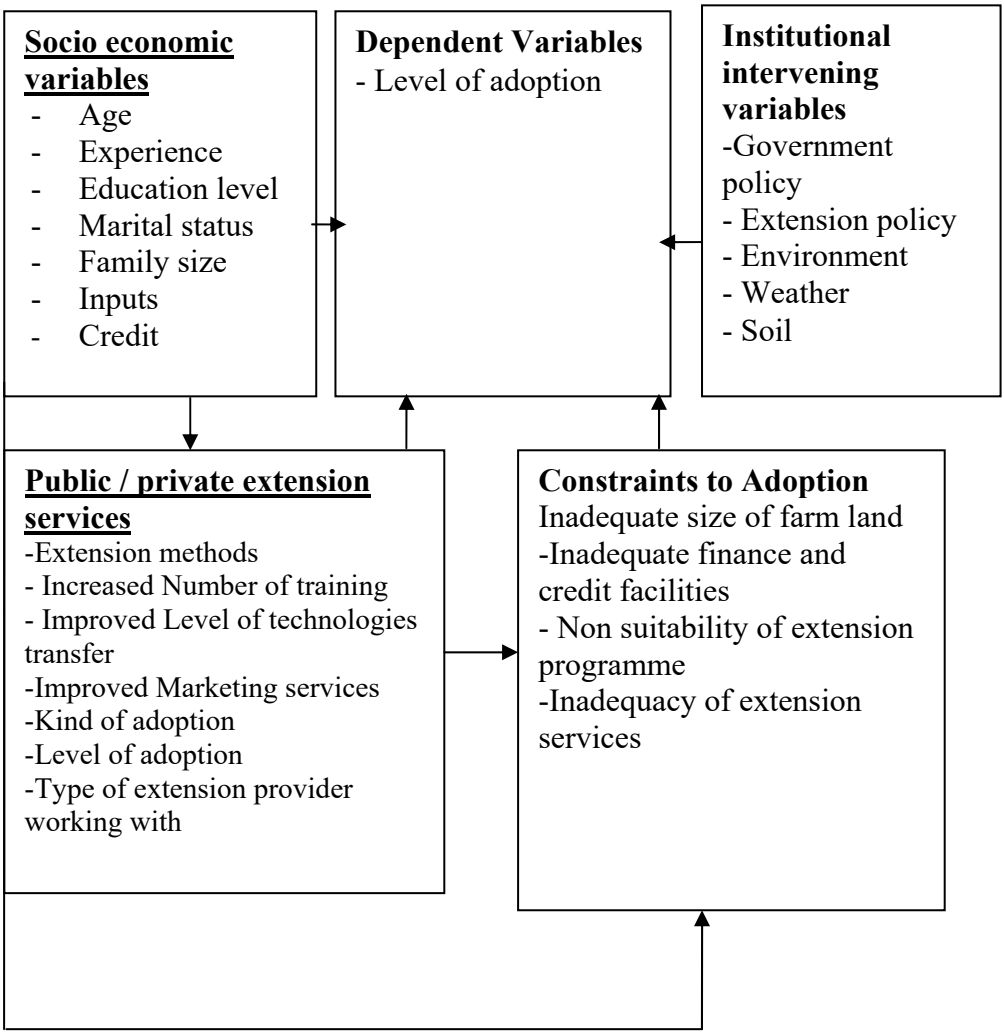

Figure: 3. Conceptual Framework on Public and Private Extension Services Delivery on Cassava Farmers.
Source: Author's construct, 2015

CHAPTER THREE

METHODOLOGY

This chapter discusses the methodology of the study which includes research design, study area, population of the study, sample size and sampling procedures, instruments, data collection and analysis.

Research Design

The study was a survey. According to Neuman (2003), survey design systematically asked many people the same questions about situation of Programme or project. Researchers who employ survey design measure many variables, test multiple hypotheses and infer temporal order about past behaviour, experience or characteristics. Survey design describes and interprets what exits. It focuses on conditions or relationships, opinions, processes, effects, evidence or tends that are developing an issue or a programme. Survey design deals with present event. Moreover, it often considers past events as they relate to current conditions (Kotrlik & Higgins, 2001). The objectives of the research fell within these hence the survey design was deemed appropriate.

Study Area

Nimba is located on the north-central of Liberia. It is one of the 15 counties that constituted the first-level of administrative division Liberia. It has six districts with Sanniquellie as the capital. The 2008 census indicated

that the county has a population of 462,026, making it the second most populous county in Liberia. The county occupies an area of 298 kilometers from Monrovia, capital of Liberia. The total geographic area (land and water) of Nimba is 2,300 square kilometers; from North to South, the county stretches 230 kilometers and East to West, 100 kilometers; out of the 11,551 square kilometers (4,460 sq mi) for the country making it the largest in the nation. Nimba shares common boundaries Bong, Grand Gedeh, River Cess, Sinoe, and Grand Bassa.

Small scale farming is currently the main source of income of the people of Nimba. However small agricultural projects undertaken by some youth and women's associations, NGOs such as Liberia Community Initiative Programme (LCIP) and Agriculture Relief Services (ARS). The typical farming pattern is slash-and-burn and annual bush fallowing. The main food products are rice, cassava, plantain, banana, yam and sweet potatoes with some 75% of farm produce being consumed by the family (Nimba County Development Agenda, 2008). Sanniquellie Mahn District is one of the 17 districts of Nimba County, Liberia. It has the total population of 116 947 and its capital lies at Sanniquellie. Saclepea Mahn District is also one of the 17 districts of Nimba County with a total population of 160 424 and Saclepea as its capital (Nimba County Development Agenda, 2008).

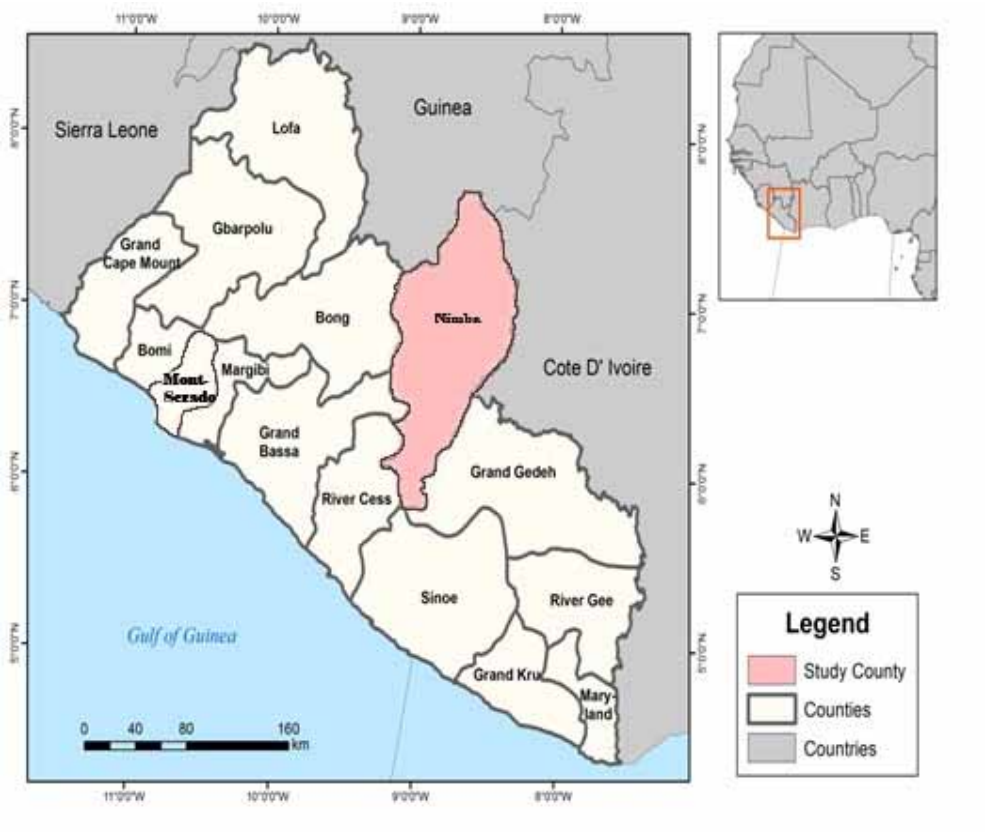

Figure 4: Map of Nimba showing the Study Area

Population of the Study

The population of the study was all extension contact cassava farmers in Sanniquellie and Saclepea Mahn districts in Nimba county of Liberia. The total number of cassava framers working with extension agents in Sanniquellie was estimated at 2000, while those from Saclepea were estimated to be 800 (Nimba County Development Agenda, 2008).

Sample Size and Sampling Procedure

According to Krejcie and Morgan (1970), for a population of 2800 a sample size of 338 was representative to justify the results on sample to the population. A list of all contact farmers was compiled by both private and public AEAs in the two study districts, Sanniquellie and Saclepea to serve as

the sampling frame. A proportionate random sampling procedure was used to select 241 famers from Sanniquellie and 97 from Saclepea to get the 338 respondent farmers required to represent the population. Table 2 below shows the numbers of farmers selected from each district.

Table 2: Sample of Farmers Selected from Public and Private Extension Organizations in each Districts.

Districts	population	Public	Private	Total
Sanniquellie	2000	120	121	241
Saclepea	800	48	49	97
Total	2800	168	170	338

Source: field survey, 2015

Instrumentation

A structured interview schedule was used to interview farmers who were targeted by private and public extension in the study area. The interview schedule was constructed according to the objectives of the study. Section A of the interview schedule focuses on socio economic characteristic of farmers such as age, sex, educational level, marital status, other agricultural enterprise, source of agricultural information and planting materials of the farmers were considered.

Section B of the interview schedule looks at the involvement of cassava farmers in extension (public and private) services such as training on agro-technology, adult literacy programme, innovation souring, supervision of advisory services, financing cassava production, marketing of cassava, dissemination of general information and farming system improvement were considered. A five point Likert-type scale ranging 1= Not at All, 2= Very

Low 3= Low, 4= High 5= Very High was used to measure farmers perceived involvement in extension activities. Items in section C determine the adoption levels of cassava technologies. Farmers were asked to rate clearing of land, soil preparation, soil fertility, laying of ridges/mound/flat bed, improve seed/cuttings supply, special planting of cassava, pest control, fertilizer application and timely harvesting on A five point likert-type scales ranging from 1=Not at all, 2 =Not frequently use, 3=moderately use, 4= frequently use and 5 = most frequently use.

Section D identified factors limiting the production of cassava. They include poor soil fertilizer, inadequate size of land, inadequate farm input, inadequate finance, high cost of farm input, non suitability of extension programme, inadequate extension programme, lack of transport, absence of processing facilities, shortage of labour and non availability of market. Farmers were asked to indicate perceived constrain on A five (5) point Likert-type scale ranging from 1=Not at all, 2=Very low, 3=Low, 4= High and 5 =Very high was used.

Section E compared the impact of public and private extension services on cassava farmers. The following impact indicators were considered, increase in production, increase in yield, increase in income, farm management skills and general living. Farmers were asked to indicate their level of impact on a likert-type scale ranging from 1=Not at all, 2=Very low, 3=Low, 4= High and 5 =Very high.

Section F measured factors influencing adoption of improved cassava technologies. The following factors were considered, inadequate farm input, poor soil fertilizer, type of extension provider working with, shortage of

labour, non suitability of extension programme and inadequate extension programme, Farmers were asked to indicate perceived factors influencing adoption on a five (5) point Likert-type scale ranging from 1=Not at all, 2=Very low, 3=Low, 4= High and 5 =Very high.

Pre-testing

The instrument was pretested on 30 farmers in Gbehlageh district of Nimba County, Liberia since it had similar characteristics as the study area. According to Ogunleye (2000), reliability of an instrument refers to the degree of consistency and precision (accuracy) with which the test on instruments measures what it is purposed to measure. According to Haynes, Richard & Kubany, (1995), a Cronbach's alpha value of 0.65 is minimally acceptable, 0.70 is acceptable and 0.80 as optimal acceptable. The Cronbach's alpha values of scaled items namely level of adoption and level of impact ranged from 0.70 to 0.77 (Table 3). Hence the subscales were considered reliable.

Table 3: Reliability Coefficients of Subscales of Items on the Questionnaire

Subscales	No. of items	Cronbach's Alpha
Level of Involvement	24	0.70
Level of Impact	5	0.74
Level of Adoption	12	0.77

Source: Field survey, 2015

Data Collection

The data were collected using trained enumerators (agricultural extension agents), two each from the selected districts. They were trained on how to administer the instrument, meaning and interpretation of each item in

the local language. Twenty farmers selected out of the 338 were not available after several visits to interview them giving the response rate of 94 present.

Data Analysis

The data collected was cleaned and coded into the Statistical Product and Service Solutions (SPSS version 21). Descriptive statistics such as frequency, mean, standard deviations was generated to clean errors in data entry. The appropriate statistics based on the objectives of the study was generated. Pearson chi-square, frequency, percentages, means and standard deviations were used to describe the socio-economic characteristic of cassava farmers targeted by public and private extension services as set in objective 1. For objective 2 which sought to compare the involvement of cassava farmers in public and private extension services offered to cassava farmers, frequency counts, percentages, means, standard deviations and independent t-test were used to analyze the data. For Objective 3, 4 and 6, which sought to determine the level of adoption of improved cassava technologies, factors constraining the provision of public and private extension services to farmers and factors influencing levels of adoption of improved cassava technologies, Pearson product moment correlation, point bi-serial, Spearman rho, bi-serial and stepwise multiple regression analysis were used to examine the relationship between variables. For Objective 5, independent sample t-test analysis was used to compare the extent of impact of cassava farmer's participation in public and private extension programme.

To determine the factors associated with the levels of adoption of improved cassava varieties by farmers served by public and private extension services, a stepwise regression model of $Y = \alpha + \beta_i X_i + \varepsilon$ was used. Where,

Y = mean adoption levels

α = Constant or the intercept, which describes the mean response value when all predictor variables are set to zero.

β_i = parameters of the independent variables (X_i). These variables are presented in Table 4.

ε = error terms

Table 4: Variables and Scales of Measurement

Variables	Measurement of variables
Poor soil fertility	5 likert-type scale
Inadequate size of farm land	5 likert-type scale
Inadequate farm input	5 likert-type scale
Inadequate finance and credit facilities	5 likert-type scale
High cost of farm input	5 likert-type scale
Non suitability of extension Programme	5 likert-typescale
Inadequacy of extension Programme	5 likert-type scale
Lack of transport facilities	5 likert-type scale
Absence of processing facilities	5 likert-type scale
Shortage of farm labour	5 likert-type scale
Non-availability of market for produce	5 likert-type scale
Age of farmer	Ratio level (in years)
Sex of farmer	Dummy (0 male, 1 female)
level of education	Ordinal level
Number of people in your household	Ratio level
Experience in cassava farming	Ratio level (in years)
Type of extension provider working with	Dummy (0 public, 1 private)

Source: Field survey, 2015

The degree of association was described based on Davis (1971), Convention reports relationships and relative association value where .01-.09 = negligible, .10- .29 = low, .30-.49 = moderate, .50-.69 = substantial, and ≥ .70 = very strong association.

CHAPTER FOUR
RESULTS AND DISCUSSION

Introduction

This chapter presents the discussion of results from data analysis according the objectives.

Socio-economic Characteristics of Cassava Farmers under Public and Private Extension

This section discusses the extent to which the socio-economic characteristics of farmers such as age, sex, education, marital status, household size, farming experience, type of agricultural enterprises, major sources of agricultural information and planting materials influence levels of adoption.

Age of Farmers

Farmers within different age range demonstrate special attribute regarding goals setting and interest, which may have direct impact on agricultural productivity. This shows that the age of farmer plays a significant role in his adoption decision (Alexander & Mellor 2005).

Out of the 318 farmers interviewed, 62.0 percent were below 50 years. More of the farmers private extension compare to farmers who received public extension (65.8%) were in this category. This implies that majority of the cassava famers under public and private extension services within the two districts are in their active working ages. Nevertheless those in the private

extension service have more farmers in the working age groups than those in public extension. The private extension farmers are slightly younger than those in public extension. However, there was no significant difference between the average ages of public and private extension receiver farmers (t-value = 1.094, p = 0.275).

In view of the fact that majority of the farmers interviewed were in their working age, the prospects for increasing cassava production is high as posted by Ramat, Akinwumi & Victor, (2013).), that farmers within the active age are more receptive to innovation, more technically efficient, effective and could withstand the stress and strain involved in cassava production.

Table 5: Age Distributions of Cassava Farmers under Public and Private Extension

Age category	Type of extension organization				Total	
	Public		Private			
	Freq.	(%)	Freq.	(%)	Freq.	(%)
20-29	9	7.3	15	7.8	24	7.6
30-39	23	18.7	33	17.1	56	17.7
40-49	37	30.1	79	40.9	116	36.7
50-59	37	30.1	47	24.4	84	26.6
60-69	17	13.8	17	8.8	34	10.8
70-79	-	-	2	1.0	2	0.6
Total	123	100.0	193	100.0	316	100.0
Minimum	24		22		22	
Maximum	68		78		78	
Mean	47.03		45.782		46.285	
Standard Dev	10.68		9.955		10.229	
Mean diff.	1.291					
t-value	1.094					
Significance	0.275					

Source: Field Survey Data. 2014.

n = 318

Numbers in the parenthesis are percentages

Adofu, Shaibu and Yakubu (2011), and Alexander, Mellor and Langdale (2005) also indicated that older farmers may have a short life span and less likely to invest in new technologies.

Sex of Farmers

The results reveal that majority of the respondents were males (58.2%) compared to females (41.8%). Within the public extension, 63.4 percent of the farmers were males while 36.6 percent of them were females. Similarly, about 55 percent of the farmers who received private extension services were males while the rest were females (45.1). This finding conforms to the report of Ayansina, (2011).) who declared that women have been found to be neglected in agricultural extension activities. Therefore, there is an urgent need to guard against that syndrome in order to make a balance within the context of agricultural development Programmes.

Table 6: Sex Distributions of Cassava Farmers under Public and Private Extension

	Public		Private		Total	
	Freq.	**(%)**	**Freq.**	**(%)**	**Freq.**	**(%)**
Male	78	63.4	107	54.9	185	58.2
Female	45	36.6	88	45.1	133	41.8
Total	**123**	**100.0**	**195**	**100.0**	**318**	**100.0**

Chi-Square =2.262 Significant .diff=0.133

N=318. Numbers in the parenthesis are percentages
Source: Field Survey Data. 2014.

According to Alesina, Giuliano & Nunn (2010), the role of women in the family, in society and in the work force varies across nations and cultures. Women are often busy with household responsibilities such as caring for

children and had no time to attend the training. Furthermore, women do not have access technical training and often not invited due to their low level of education. Regarding to this study, male farmers are mostly involved in cassava production. Female farmers are usually busy because of the numerous responsibilities which limit their involvements in production and adoption of new technologies.

Though it was observed that men were more than women in the production of cassava, there was no significantly difference between males and females targeted by public and private extension services providers (chi-square = 2.262, $p > 0.05$). This is in agreement with (Saito, Mekonnen, & Spurling (1994) that ratio of female-to-male marginal products of 0.64 indicates that men contribute more to total farm output at the margin than women.

Educational Level of Cassava Farmers under Public and Private Extension

Table 7 reveals that different levels of education existed among the respondents. Among the respondents, only 3 out of every 10 farmers have not had any formal education. This was representative of public and private extension receivers (29.3% and 33.5% respectively). The results show a high illiteracy level among public and private farmer extension receivers in the study areas. It is expected that the higher level of education will contribute significantly to decision making of a farmer. Research done by Pandey (1989) showed that the level of education of farmers plays a vital role and accelerates adoption of technologies by farmers. Obinne and Anyawu (1991) therefore suggested that education is capable of helping to develop managerial skills

which lead to enhanced adoption index and adoption is positively related to education.

Table 7: Educational Level of Cassava Farmers under Public and Private Extension

Educational level	Public		Private		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
No formal education	53	43.1	92	47.4	145	45.7
Adult literacy class	34	27.6	37	19.1	71	22.4
Primary School Completed	32	26.0	54	27.8	86	27.1
Secondary Completed	4	3.3	11	5.7	15	4.7
Degree						
Total	**123**	**100.0**	**194**	**100.0**	**317**	**100.0**

Chi-Square =3.799 Significant diff.=0.284
N = 318**.** Numbers in the parenthesis are percentages
Source: Field Survey Data. 2014.

A report by Moyib *et al.* (2013) stated that higher level of education determines the quality of skills of farmers, their allocative abilities and efficiency, and how well informed they are of the innovations and technologies around them. It also supports the result of Onubuogu and Onyeneke (2012) also indicated that individuals with higher educational attainment are usually faster in adoption of improved farming technologies. The low level of education among the public and private extension farmers may serve as a limitation for smooth and faster adoption of cassava technologies introduced to them by the various extension organizations. More effects and strategies are therefore needed by the change agents to be able impact on the adoption of the cassava technologies dissemination to them. Education is believed to improve the readiness of the farmers to accept new ideas and innovations, and get updated extension information which in turn enhance farmers' knowledge and skills to produce more and increase productivity and volume for sale Onyeneke (2012). There was no significant

difference between farmers who received public and private extension services. (X^2 =3.799, p>0.05).

Marital Status of Cassava Farmers under Public and Private Extension

Marital status determines an individual's resolve to indicate a corresponding source of labour input (Kuponiyi, Ogunwale and Oladosu, 2003). The results on marital status of the farmers revealed that about three quarters of the respondents were married. More than 80 percent of the farmers who benefitted from public extension services were married while about 70 percent of those farmers who received private extension services were also married. The few that were not married were single, divorced, widowed or separated. The percentage distribution of the respondents among the various martial statuses between public and private extension cassava farmers were significantly different (x^2=12.79, p<0.05).

Table 8: Marital Status Cassava Farmers under Public and Private Extension

	Public		Private		Total	
	Freq.	**(%)**	**Freq.**	**(%)**	**Freq.**	**(%)**
Single	8	6.5	18	9.3	26	8.2
Married	102	82.9	135	69.6	237	74.8
Divorced	2	1.6	9	4.6	11	3.5
Widowed	2	1.6	20	10.3	22	6.9
Separated	9	7.3	12	6.2	21	6.6
Total	**123**	**100.0**	**194**	**100.0**	**317**	**100.0**

Chi-Square =12.791
Significant diff.=0.012, P<0.05
N=318. Numbers in the parenthesis are percentages
Source: Field Survey Data. 2014.

Studies by Adefarasin (2000) and Kuponiyi (2003), found larger percentages of the farmers from public extension services to be married. This also found similar revelations from both public and private extension

receivers. Ayansina (2011) declared that small scale farmers could only be successful if they were married especially when they had to rely on family labour.

Household Size of Cassava Farmers under Public and Private Extension

Table 9 shows the household size of cassava farmers' of public and private extension services. The result shows that 17.6 percent of the farmers had below 7 household sizes. About two-thirds of them had 7 to 9 members in their households while the rest of them (19.3%) had 10 or more members in their houses. While 1 out of every 5 private extension service receivers had household sizes of 1 to 3, just about 14 percent of their counterpart public extension service receivers had the same household sizes. On the other hand, while about 8 out of every 10 public extension farmers had from 7 to 9 members in their households, 53.6 percent of the private extension farmers had the same range of household size. About a quarter of the public extension farmers had more than 9 members in their households and 16.4 percent of the private extension farmers had household size of more than 9 members. While the minimum household size for both public and private extension farmers was 2 each, their maximum household sizes were 19 and 29 respectively. Notwithstanding, the average household size for public extension farmers was higher that of the private extension farmers (Means = 7.07 and 6.72 respectively). Nevertheless, the differences between these two groups of farmers was not significant (t-value=0.769, $p > 0.05$

The result had demonstrated that farmers from public and private extension services have slightly higher household sizes compared to that of the Nimba county's average household size of 5.9 and that of the country's average of 5.1 (Assaf, 2011). As argued by Dhungana, Nuthall and Nertea,(2004), households with more family members tend to have more labour than household with less family members which in turn will increase production. The larger household size might benefit from being able to use more labour resources at the right time.

Table 9: Household Size of Cassava Farmers under Public and Private Extension

Household size	Public		Private		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
1-3	17	13.8	39	20.0	56	17.6
4-6	46	37.4	80	41.0	126	39.6
7-9	30	42.4	44	22.6	74	23.3
10-12	21	17.1	18	9.2	39	12.3
13-15	7	5.7	4	2.1	11	3.3
16-18	1	0.8	5	2.6	6	1.9
19-21	1	0.8	2	1.0	3	0.9
Above 21	0	0	3	1.5	3	0.9
Total	123	100.0	195	100.0	318	100.0
Minimum	2		2			
Maximum	19		29			
Mean	7.0732		6.7179			
Standard Dev.	3.47867		4.31462			
T-Value	.769					
Significant	.428					

N=318. NTA=Not at all,
Numbers in the parenthesis are percentages
Source: Field Survey Data. 2014.

Farming Experience in Cassava Farming

Individual experiences in any enterprise play very vital role in harnessing innovations for increasing impact, most especially, among farmers. Experiences in cassava farming among the various groups of farmers could improve the competencies of farmers leading to increased productivity and

income. The results presented in Table 10 reveal that, about a third of the farmers had less than 10 years experience in cassava production. About 4 out of every 10 farmers had farming experience ranging 10 to 19 years. The rest 27.5 present had being cassava production for at least 20 years. The proportion of public extension farmers who had experience above 19 years is almost about twice as the proportion of the private extension farmers who fall within the same category. Through the average experience of public and private extension farmers were 16.5 and 13.3 years respectively. There was no significant difference between them (t-value = 3.055, p= 0.82). This result suggests that most of the cassava farmers from both public and private extension services have long experience in farming.

The experience of farmers will also have implication for adoption of new information and technologies. This implies that more experienced farmer's stand a chance to increase production since farming experience can lead to increase in efficiency of knowledge.

Table 10: Cassava Farming Experience in Public and Private Extension Services

Years	Public		Private		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
<5	4	3.3	21	10.8	25	7.9
5-9	23	18.7	64	32.8	87	27.4
10-14	29	23.6	47	24.1	76	23.9
15-19	25	20.3	24	12.3	49	15.4
20-24	18	14.6	15	7.7	33	10.4
25-29	12	9.8	11	5.6	23	7.2
30-34	9	7.3	5	2.6	14	4.4
35-39	0	0.0	4	2.1	4	1.3
40-44	3	2.4	2	1.0	5	1.6

Table 10 continued

Above 44	0	0.0	2	1.0	2	1.3
Total	123	100.0	195	100.0	318	100.0
Minimum	2		2			
Maximum	42		66			
Mean	16.528		13.2718			
Std Dev.	8.82278		9.51954			
T. Value	3.055					
Significant	.823					

N=318. Numbers in the parenthesis are percentages

Source: Field Survey Data. 2014.

According to Onyeneke & Iruo (2011) and Onubuogu & Onyeneke, (2012), more experienced cassava farmers tend to know more about the problems associated with cassava production and they stand a better chance of overcoming these problems to improve on their yield than those that had little or no experience in the sector. Ewaonicha (2005) posited that farmers with more experience would be more efficient, have better knowledge of farming conditions and situation. Other studies (Onyebinama, 2004; and Esiobu, Onubuogu & Okoli, 2014) also showed that previous experience in farm management enables farmers to set realistic time and cost targets as well as allocate, combine and utilize resources efficiently, and identify production risks.

Type of Agricultural Enterprises of Public and Private Extension Services

Farmers diversify farming business by engaging in different type of on-farm and off-farm activities as livelihood strategy therefore the study investigated into alternative agricultural production activities in the study area. The result presented in Table 11 reveals that most of the respondents were

involved in vegetable production (87.7%) and marketing of agricultural produces (86.1%). Other activities performed by farmers include tree crop production (46.9%), processing of agriculture produce (13.9%). and livestock production (12.9%). The highest percentage of public extension farmers were engaged in these activities more than their private extension counterpart except processing of agricultural produce. The major vegetables produced by the respondents include bitter-ball, cabbage, garden egg, pepper and tomatoes. The tree crops mostly produce by the cassava farmers were rubber, cocoa, oil palm and coffee. The main livestock produced by the farmers are goat, sheep, chicken, duck and pig. The study showed that those cassava farmers who are into processing as alternative activity are mainly into palm oil and rubber processing. Some are also into the processing of cassava into gari. Those into marketing were mostly the women who have easy access to marketing centers.

Table 11: Type of Agricultural Enterprises of Public and Private Extension Services

Agricultural Enterprises	Public		Private		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
Vegetable Production	118	95.9	161	82.6	279	87.7
Tree crops production	58	47.2	91	46.7	149	46.9
Livestock Production	19	15.4	21	10.8	40	12.6
Processing	9	7.3	35	18.0	44	13.9
Marketing	114	92.7	159	82.0	273	86.1

N=318. Numbers in the parenthesis are percentages
Source: Field Survey Data. 2014

Major Sources of Agricultural Information to Cassava Farmers under Public and Private Extension

Apart from the public and private extension, the cassava farmers received information from other sources such as neighbours, other farmers from other communities, radio and research institutions. This finding is presented in Table 12. The study shows that most of the farmers receive information from neighboring fellow farmers (88.4%), radio (86.8%) and other farmers outside neighborhood (71.4%). Only a few (8.8%) receive information from research institutions like the Central Agricultural Research Institute of Liberia.

While more of the private extension farmers received information from fellow farmers than the public extension farmers, more public extension farmers tend to receive agricultural information through the radio than the private extension farmers. Blench, Kranjac-Berisavljevic, and Zakariah, (2003) conducted a study in Northern Ghana on the use of radio in agricultural extension to disseminate and concluded that radio is a very important source for effective dissemination of extension information.

Table 12: Major Sources of Agricultural Information to Cassava Farmers

Sources of Information	Public		Private		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
Neighborhood	103	83.7	178	91.3	281	88.4
Other Farmers Outside	82	66.7	145	74.4	227	71.4
Extension Agent	81	65.9	169	86.7	250	78.6
Radio	107	87.0	169	86.7	276	86.8
Research Institute	10	8.1	18	9.2	28	8.8

N=318. Numbers in the parenthesis are percentages

Source: Field Survey Data. 2014.

The low number of public and private extension farmers who receive agricultural information from research institutes implies that the research institutes and universities in Liberia need to do more in extending expertise and services to farmers through research training and community outreach. Links between agricultural research institutes, farmers and technology transfer agencies are essential for successful technology development and delivery. Direct links with farmers, developed through on farm research; ensure relevance and rapid feedback (Blench *et al.*, 2003). Agricultural extension depends to a large extent on information exchange between and among farmers on one hand, and a broad range of other actors (Adesoji & Aratunde, 2012).

Sources of Planting Materials to Cassava Farmers

Source of healthy planting materials is very important when growing cassava (Adelekan, 2013) and source of planting materials have become an important consideration in recent years. This study investigated into the main sources that cassava farmers obtain their planting materials. The findings presented in Table 13 revealed that most farmers obtain their planting material from their own saving and relatives (more than 90%. Majority of them also obtain their cassava planting materials from other cassava producers (69.1%) and other projects or organizations (61.8%). Less than a quarter of the farmers obtain planting materials from the AEAs and only 4.1 percent obtain planting materials from research institutions. Thus most farmers tend to rely on own sources, relatives or other farmers than other source due to the cost implications and accessibility of the planting materials from other sources.

This observation is very similar between both public and private extension farmers in the study areas.

Table 13: Sources of Planting Materials to Cassava Farmers

Sources of Planting Materials	Public		Private		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
Own source	117	95.9	185	94.9	302	95.3
Cassava producers	80	65.0	139	71.3	219	69.1
Relatives	112	91.8	186	95.4	298	94.0
Extension agent	13	10.7	63	32.3	76	24.0
Research institution	6	4.9	7	3.6	13	4.1
Projects/organization	66	54.1	130	66.7	196	61.8

N=318. Numbers in the parenthesis are percentages
Source: Field Survey Data. 2014

Understanding the multiplication and selection of good cuttings can make a crucial difference in cassava production. In agriculture, the quality of the planting materials such as seeds, cuttings, shoots are crucial for obtaining a healthy crop and good results. The source and quality of cassava cuttings are significant in integrated management of diseases and pests.

Level of Involvement of Cassava Farmers in the Extension Services Provided by Public and Private Extension Organization

Table 14 shows the level of involvement of farmers in provision of extension services by public and private extension services. The study shows that the level of involvement of farmers in public and private services was very low in training on agro-technology, adult literacy programme, financing cassava production, and farming system improvement technology (mean ranging from mean of 1.11 to 1.44). However, the t-test shows a significant (0.00) difference at 0.05 alpha level between public and private in training on agro-technology, financing cassava production, and farming system

improvement technology. This indicates that the ministry of agriculture and extension agents should provide training in these areas that Farmers involvement are very low especially those targeted by public services. Furthermore, innovation sourcing to and from other farmers, marketing of cassava and dissemination of general information was regarded to be low. There were significant differences between the involvement of public and private extension farmers in all the extension activities except adult literacy Programme low (mean ranging from 2.32 to 2.51) by farmers who benefited from public and private extension services.

Table 14: Cassava Farmers Level of Involvement in Extension Services

Technology	Type of extension provider					
	Public (n=123)mean	Std. Dev.	Private(n=195) Mean	Std. Dev.	t-value	p-value
Supervision of advisory services for farmers	3.46	0.64	2.62	0.91	9.60	0.00
Innovation sourcing from farmers and extension providers	2.39	0.67	2.05	0.52	4.02	0.00
Innovation sourcing to farmers and extension providers	2.51	0.76	2.19	0.77	3.57	0.00
Marketing of cassava	2.32	0.97	2.71	0.02	3.45	0.00
Dissemination of general information	2.32	0.67	1.98	0.58	4.60	0.00
Training on agro-technology	1.18	0.48	1.41	0.74	3.39	0.00
Farming system Improvement technology	1.44	0.59	1.75	0.75	3.89	0.00
Financing cassava production	1.31	0.59	1.50	0.72	2.62	0.00
Adult literacy programme	1.11	0.43	1.16	0.74	0.77	0.44
Composite involvement	2.00	0.27	1.93	0.33	2.15	0.03

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=very low (VL), 2.5-3.4= low (L), >4.4= high (H) and>4 = high (VH) p>0.05
Source: Field Survey Data, 2015

The t-test shows significant difference amount farmers who benefited from public and private extension services at 0.05 alpha levels. Nevertheless, public extension Farmers involvement in supervision of advisory services was rated as high (mean = 3.46). On the other hand the private extension farmers perceived their involvement as low (mean= 2.62). The t-test shows a significant (0.00) difference between farmers targeted by public and private extension providers at 0.05 alpha levels. This implies that supervision of advisory services for public farmers is relatively better compare to private.

Level of Adoption of Improved Cassava Technologies Disseminated by Public and Private Extension Services to Cassava Farmers

Table 15 shows the level of adoption of improved cassava technologies disseminated by public and private extension services to cassava farmers. One of the often reported (Ennin, Otoo, and Tetteh, 2009; Howeler and Tan, 2001) benefits of ridging is its effectiveness in erosion control and high yields of crops. Odemerho & Awunudiogba (1993) compared ridging, mounding and flat ground seed bed preparations under monoculture of cassava for reduced soil erosion. They reported that ridging across the slope was the most effective in reducing soil loss, and planting on flat ground was the least effective. The slope of the land appears to affect the effectiveness of ridges to control soil erosion and increase cassava yield. However, farmers from public and private extension perceived soil fertility or conservation technology, improved seed/cutting supply and pest control to be not frequently use. While timely harvesting was regarded by private extension as moderately used (mean=2.79) and public as not frequently use. Fertilizer use significantly leads to increases

to cassava output and the quantity of fertilizer used impact cassava production. Okezie & Okoye, 2006; Oladeebo & Oyetunde, 2013; and Onubuogu, Esiobu; Nwosu & Okereke 2014. The inability of these farmers to use fertilizer may have a negative impact on their yield hence farmer may not be able to derive optimum benefit from the cassava production. There were significant difference between the public and private farmers' level of adoption of new technologies in the area of clearing of land, soil preparation, soil fertility, special planting of cassava, weeding, hand picking and timely harvesting. However there was no significant difference of laying of ridges/mound/ flat bed, improve seed/ cuttings supply, pest control, crop rotation and fertilizer application. Public and private extension farmers were virtually did not adopt fertilizer application by cassava farmers, farmer's level of adoption of soil fertilizer or conservation, improve seed/ cuttings supply and pest controls were very low. Again, where was low adoption of soil preparation, laying of ridges/ mound/ flat bed, weed control and crop rotation innovations. The composite levels of adoption of the technologies were low among both public and private extension farmers (mean= 2.43 and 2.52 respectively).

And there is no significant difference in the level of adoption between public and private extension farmers (t-value=2.58, $p<0.05$). However, the overall level of adoption by the private extension farmers was significantly higher than that of public extension farmers (mean= 2.52 and 2.43 respectively). The study therefore agree with Swanson (2002) who noted that private sector firms and nongovernmental organizations (NGOs) have become important alternatives to public extension in providing technical inputs, information and training, and organizational support services to farmers and

rural households. Indeed private sector extension providers have become important contributors to agricultural technology transfer. In many cases, these private organisations have access to superior technologies as a result of their extensive involvement of in research and development for improving livelihoods of rural poor including cassava farmers. Farmers therefore stand to benefit more from such private outlets.

Table 15: Level of Adoption of Improved Cassava Technologies Disseminated by Public and Private Extension Services to Cassava Farmers

Technology	Type of extension provider					
	Public Mean	St. Dev	Private mean	St. Dev	t-value	Sig.
Clearing of land	3.33	0.57	3.52	0.81	2.57	0.011
Special planting of cassava	3.68	0.64	3.47	0.85	2.51	0.01
Laying of ridges/mount/flat bed	2.98	0.64	3.01	0.45	0.26	0.79
Weed control	2.86	0.55	2.66	0.84	2.64	0.01
Hand picking	2.86		2.09		7.79	0.00
Soil preparation	2.81	0.59	3.11	0.87	3.71	0.00
Crop rotation	2.67	0.49	2.78	0.56	1.31	0.10
Pest control	2.14	0.83	2.01	0.96	1.27	0.19
Improve seed/ cuttings supply	2.10	0.73	2.08	0.89	0.225	0.82
Timely harvesting	2.33	0.77	2.79	0.98	4.73	0.00
Soil fertility or conservation technology	1.51	0.67	2.39	0.11	9.10	0.00
Fertilizer application	1.27	0.64	1.40	0.79	1.30	0.10
Composite adoption	2.43	0.23	2.52	0.40	2.58	0.11

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=Not frequently use (NFU), 2.5-3.4= moderately use (MU), >4.4= frequently use (FU) and>4 =Most frequently use (MFU). P>0.05
Source: Field Survey Data, 2015

Factors Constraining the Provision of Public and Private Extension Services to Cassava Farmers

Considering the low level of adoption of the new technologies, the farmers were asked to indicate the extent to which some identified factors that affected them in adopting their technology. Table 16 reveals that the public extension farmers' agreed that poor soil fertilizer, high cost of farm input shortage of farm labour and non-availability of market for produce highly constrained their ability to adopt the various technologies. On the other hand, the private extension farmers identified poor soil fertilizer, inadequate size of farm land, high cost of farm input, lack of transport facilities, absence of processing facilities, shortage of farm labour and non-availability of market for produce highly affected their ability to adopt the new technologies. Other factors that the public extension farmers indicated to be affecting their level of adoption were inadequate size of farm land, Inadequate farm inputs, inadequate finance and credit facilities, non-suitability of extension Programme, lack of transport facilities and absence of processing facilities. The farmer indicated that though these factures affect them, they are to a lower extent similarly; private extension farmers also regard inadequate finance and credit facilities, non-suitability of extension Programme and inadequacy extension Programme to be affecting them but a low extent. There were significant difference between public and private extension farmers the extent to which the factures are constraining their level of adoption except in high cost of farm input, non-suitability of extension Programme and inadequacy extension Programme. In general, though both the public and private extension farmers saw the constraining factors affecting their level of adoption as high

(mean=3.45 and 3.66), there was significant difference between them. Thus private extension farmers perceive the factors to be affecting their adoption more than their public extension counterparts.

Table 16: Factors Constraining the Provision of Cassava Farmers under Public and Private Extension

Factors	Type of extension provider					
	Public	St. Dev	Private	St. Dev	t. value	p. value
Non-availability of market for produce	4.38	0.66	4.16	0.87	2.43	0.02
Poor soil fertilizer	3.85	0.65	4.01	0.71	1.92	0.07
High cost of farm input	3.77	0.59	3.88	0.63	1.54	0.13
Shortage of farm labour	3.71	0.62	3.90	0.72	2.46	0.02
Lack of transport facilities	3.39	0.72	3.84	1.01	4.57	0.00
Inadequate size of farm land	3.32	0.56	3.48	0.88	1.83	0.07
Absence of processing facilities	3.19	0.78	3.67	1.18	4.34	0.00
Inadequate finance and credit facilities	3.19	1.09	3.68	1.22	3.72	0.00
Inadequacy of extension programme	3.14	0.84	3.24	0.91	0.99	0.33
Non suitability of extension programme	3.07	0.66	3.18	0.87	1.34	0.18
Inadequate farm inputs	2.92	0.59	3.24	0.59	2.33	0.02
Composite limitation to adoption	3.45	3.31	3.66	0.59	4.11	0.00

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=Not frequently use (NFU), 2.5-3.4= Moderately use (MU), >4.4= Frequently use (FU) and>4 =Most frequently use (MFU)

Source: Field Survey Data, 2015

Nweke and Akorhe (2002) indicates that if farmers are expected to have high level of adoption of cassava technologies in the study area, these factors must considered seeing how they can be reduced. For instance, soil improvement programmes must be added to any training on cassava technology transfer in addition to provision of inputs and capital at affordable levels. According to Nweke and Akorhe (2002) adoption of technological innovation in agriculture has attracted considerable attention among developing economies because majority of the population of less developed or developing countries derive their livelihood from agriculture and agricultural products, and because new technology apparently offers opportunity to increase production and income substantially.

Ngigi (1999), views finance as an issue crucial to entering processing and buying of farm inputs like herbicides, insecticides, and fertilizer in farming of which cassava is inclusive. Effective management of cassava farmers toward higher productivity is a function of the availability and level of finance or credit facilities at the cassava farmers' disposal.

Perceived Impact of Public and Private Extension Services to Cassava Farmers

One of the main aims of agriculture extension is to transform the level of production and income of farmers in such a way that it will improve their living standards. The study therefore sought to find out whether the extension services received by the farmers from both public and private extension organizations had any impact on selected areas of livelihoods of these farmers. Further, the study tried to find out whether there are differences in the impact

between public and private extension receivers. This finding is presented in table 17. The results indicated that, farmers from both public and private extension services through the impacts of the extension services on selected aspects of their production and living standards were generally low (mean = ranging from 2.80 to 3.42) except public extension farmers who perceived their impact on increased production to be high (mean = 3.59) as a result of the public extension interventions services. Nevertheless, there were significant differences between the public and private extension service farmers. In the area of increased production (t-value=2.729, p=0.007), increased yield (t-value=2.652, p=0.008), farm management skills (t-value=4.41, p=0.000) and general standard of living (t-value=3.059, p=0.002), except that of increase in income (t-value=0.401, p=0.688).

Table 17: Perceived Impact of Public and Private Extension Services to Cassava Farmers

Impact	Type of extension organization					
	Public (n=123)	St. Dev.	Private (n=195)	St. Dev.	t-valve	p- valve
Increase in production	3.59	0.67	3.35	0.84	2.729	**0**.007
Increase in yield	3.42	0.65	3.19	0.82	2.652	0.008
Increase in income	2.84	0.64	2.81	0.78	0.401	0.0688
farm skills management	3.42	0.72	3.02	0.85	4.262	0.000
standard of living	3.38l	0.79	3.09	0.90	2.973	0.002
Composite impact	3.33	0.50	3.09	0.67	3.59	0.000

P<0.05
Means were calculated from scale of 1 = Not at all (NAL), 2 = Very low (L), 3 = Low (L), 4 = high (H), 5 = Very high (VH)
Scale: <1.5=NAL, 1.5-2.4=VL, 2.5-3.4=L, 3.5-4.4=H, > 4.4=VH
Source: Field Survey Data, 2015.

The perceptions of public extension farmers among all the indicators were higher than that of private extension farmers. This indicates that public extension workers tend to impact more in their clients than their private counterparts. This is because even though farmers received limited services from extension providers (for instance planting materials in Table 17), they make use of these limited services information to improved their level of production, income and living standards.

In order to raise farmers' income and production in the study area, government of Liberia and the county authorities must aggressively promote public and private agricultural extension services through collaboration and partnerships. According to Birkhaeuser & Evenson (1991), extension services have contributed to some extent to raising the amount of information and thus the production levels of farmers. This however did not concur with a study done by Haq *et al* (2003) who found that the extension contact with farmers had positive impact on the income of farmers. This is in agreement with a study done by Obisesan & Omonona (2013) that says adoption of improved agricultural technologies is a tool needed to improve agricultural productivity which serves as the key to global food security. Farmers try to make use of the insufficient extension Programmes by adopting more to be able to have adequate knowledge on cassava production.

Correlations between Level of Adoption and Factors Contributing to Level of Adoption

Table 18 shows the relationship between level of adoption and factors constraining levels of adoption. The result shows that poor soil fertilizer, shortage of farm labour, and non-availability of mark for produce had positive relationship with level of adoption while the rest had negative relationship. Thus most of the constraining factors farmers perceived to be affecting them tend to reduce levels of adoption. Apart from all the selected constraining factors had significant relationship with level of adoption, on the demographic characteristics, age and household size do not have significant relationship with level of adoption. The point bi-serial correlation between sex, and level of adoption indicated that, males tend to adoption technologies than females (x^2=-0.217, $p<0.05$). Also farmers with low level of education also tend to have higher level of adoption them those with higher level of education.

Using the Davis convention (Davis, 1971), number of people in household, experience in cassava farming and high cost of inputs had a negligible relationship with level of adoption. In addition inadequate inputs, inadequate finance and credit facilities, and non availabilities of market had moderate relationship with level of adoption. The rest of the factors (poor soil fertility, inadequate size of farm land, non-availability of extension Programme, inadequacy of extension Programme, lack of transport facilities, absence of processing facilities, shortage of farm labour, sex of gender, Level of education and type of extension provider working with), had low relationship with the level of adoption.

Table 18: Pearson Correlation Matrix between Level of Adoption and Factors Contributing to Level of Adoption

Variables	Measuring of variables	Correlation	p-value	Type of correlation
Poor soil fertility	5likert-type scale	0.181**	0.001	Pearson Correlation
Inadequate size of farm land	5likert-type scale	-0.191**	0.001	Pearson Correlation
Inadequate farm input	5likert-type scale	0.479**	0.000	Pearson Correlation
Inadequate finance and credit facilities	5likert-type scale	0.329**	0.000	Pearson Correlation
High cost of far input	5likert-type scale	0.027	0.630	Pearson Correlation
Non suitability of extension Programme	5likert-type scale	-0.293**	0.000	Pearson Correlation
Inadequacy of extension Programme	5likert-type scale	0.175**	0.002	Pearson Correlation
Lack of transport facilities	5likert-type scale	0.254**	0.000	Pearson Correlation
Absence of processing facilities	5likert-type scale	0.289**	0.000	Pearson Correlation
Shortage of farm labour	5likert-type scale	0.209**	0.000	Pearson Correlation
Non-availability of market for produce	5likert-type scale	0.323**	0.000	Pearson Correlation
Age of farmer	Year	0.055	0.332	Pearson Correlation
Sex of farmer	0 male, 1 female	-0.217**	0.000	Point bi-serial
level of education	Ordinal level	0.154**	0.006	Spear man
Number of people in your household	Scale level	0.064	0.252	Pearson Correlation
Experienced in cassava farming	Year	0.085	0.130	Pearson Correlation
Type of extension provider working for	0 public, 1 private	-0.186**	0.001	Rho bi-serial

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=very low (VL), 2.5-3.4= low (L), >4.4= high (H) and>4 =very high (VH)

Source: Field Survey Data, 2015

Note: Using conventions established by Davis (1971), **indicates moderate associations and All other associations were either strong, low associations or negligible.

Multi-collinearity Table of Factors Influencing Farmer's Level of Adoption of Improved Cassava Technologies

The variance inflation factor (VIF) indicates whether a predictor has a strong linear relationship with other predictors (Field, 2011). Although there are no hard and fast rules about what value of the VIF should cause concern, Myers (1990) suggest that a value of 10 is a good value at which to worry.

Table 19 Multi-collinearity Table of Factors Influencing Farmer's Level of Adoption of Improve Cassava Technologies

(Constant)	Collinearity Statistics	
	Tolerance	VIF
Inadequate farm inputs	.627	1.595
Poor soil fertilizer	.746	1.340
Type of extension provider working with	.960	1.042
Shortage of farm labour	.739	1.353
Non suitability of extension Programme	.543	1.842
Inadequacy of extension Programme	.537	1.863
Sex of farmer	.921	1.085

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=very low (VL), 2.5-3.4= low (L), >4.4= high (H) and>4 =very high (VH)
Source: Field Survey Data, 2015

Related to the VIF is the tolerance statistics, which is the reciprocal of the VIF. As such values below 0.1 indicates serious problems although Menard (1995) suggests that values below 0.2 are worthy of concern. Since the tolerance statistics for all the predictors are above 0.2 (ranging from 0.54 to 0.96) and the VIF for these predictors are below 10 (ranging from 1.04 to 1.86), this assumptions of multi-collinearity are not violated in this study. Hence, the regression model for the factors influencing level of adoption can

be said to be a valid model. Thus there is no cause for concern about strong correlation among the predictor variables in the regression model.

Stepwise Regression of Factors Influencing Farmer's Level of Adoption of Improve Cassava Technologies

All the independent variables that had significant relationship with level of adoption (Table 20) were entered into the regression analysis. The results of the stepwise regression indicated that only seven (7) variables are the best predicators of the levels of adoption. The seven variables use fitted into the regression were inadequate farm inputs, poor soil fertilizer, type of extension service provider, shortage of farm labour, non-suitability of extension Programme, inadequacy of extension Programme and gender of farmer. Between these twelve variables, inadequate farm input, type of extension provider with for, poor soil fertilizer and non-suitability of extension Programme were the best predicators. Thus, inadequate farm inputs and type of extension provider predicates about 6.6 percent of the variations in levels of adoption. Those farmers', who perceived inadequate farm inputs to be inadequate, will not adopt a high level of the technologies introduced to them by the extension services providers. On the other hand farmers who think their poor soil fertilizer are adequate for their cassava production business tend to adopt the technologies higher than those who think they do not have enough poor soil fertilizer.

Thus farmers who work with private extension agents will have higher levels of adoption than those working with public extension organizations. The main thrust of this study is to compare the impact of public and private extension in the study area. Thus revelation therefore indicates that though

public extension farmers perceive impact of extension services on selected aspects of the cassava farming business and living standards to be higher than those in the private extension services (Table 20), they tend to have less level of adoption than private extension farmers. To elaborate further, the model equation for the stepwise regression is presented to show the functional relationship between the dependent variable (level of adoption) and the two independent variables (inadequate farm size and type of extension service provider) which fit into the model.

Table 20. Stepwise Regression of Factors Influencing Farmer's Level of Adoption of Improve Cassava Technologies

Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	3.32	.224	14.83	.000
Inadequate farm inputs	-.204	.028	-7.282	.000
Poor soil fertilizer	.180	.048	3.754	.000
Type of extension provider working with	-.205	.059	-3.447	.001
Shortage of farm labour	.133	.048	2.788	.006
Non suitability of extension Programme	-.187	.049	-3.838	.000
Inadequacy of extension Programme	.118	.044	2.678	.008
Gender of farmer	-.133	.060	-2.218	.027

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=very 'low (VL), 2.5-3.4= low (L), >4.4= high (H) and>4 =very high (VH)
Source: Field Survey Data, 2015

The best predictor variables to level of adoption were Inadequate farm inputs, Poor soil fertilizer, Type of extension provider working with, Shortage of farm labour, Non suitability of extension Programme, Inadequacy of extension Programme, Sex of farmer. These variables together explained about 36 present variance in the level of adoption. Of the 36 present total

variance explain, inadequate farm inputs contributed 22.8 present indicating it is the overall best predictor variable. Poor soil fertilizer explained the second contributing 5.3 present explaining the level of adoption. the rest (Type of extension provider working with 2.3 present, Shortage of farm labour 1.3 present, Non suitability of extension Programme 1.5 present, Inadequacy of extension Programme 1.6 present, and Gender of farmer 1.0 present) contributed 7.7 present explaining to the level of adoption of cassava farmers.

Table 21 Regression Model Summary of Factors Influencing Farmer's Level of Adoption

Predictors	Step of Entry	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
						R Square Change	F Change	df1	df2	Sig. F Change
Inadequate farm inputs	1	.478	.228	.226	.54817	.228	92.936	1	314	.000
Poor soil fertilizer	2	.530	.281	.277	.52989	.053	23.038	1	313	.000
Type of extension provider working for	3	.552	.304	.298	.52220	.023	10.283	1	312	.001
Shortage of farm labour	4	.563	.318	.309	.51802	.013	6.064	1	311	.014
Non suitability of extension Programme	5	.577	.333	.322	.51298	.015	7.144	1	310	.008
Inadequacy of extension Programme	6	.590	.348	.336	.50778	.016	7.381	1	309	.007
Sex of farmer	7	.599	.359	.344	.50459	.010	4.919	1	308	.027

Means were calculated from scale of <1.5=Not at all (NAL), 1.5-2.4=very 'low (VL), 2.5-3.4= low (L), >4.4= high (H) and>4 =very high (VH)
Source: Field Survey Data, 2015

Model Equation:

$$Y = 3.328 - 0.204X_1 + 0.118X_2 - 0.205X_3 + 0.133X_4 - 0.187X_5 + 0.118X_6 - 0.133X_7$$

Where $X_{1=}$ Inadequate farm inputs, X_2= Poor soil fertilizer, X_3= Type of extension provider, X_4= Shortage of farm labour, X_5= Non suitability of extension Programme, X_6= Inadequacy of extension Programme, X_7=Gender of farmer

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary, Conclusion, Recommendations and Suggestions for further studies

Summary

Extension services delivery has been identified to be one of the most effective ways of improving farming business. The study was undertaken to evaluate public and private extension service delivery among districts in Nimba county of Liberia.

The study was conducted using the following specific objectives:

1. Describe the socio-economic characteristics of cassava farmers under public and private extension
2. Describe the involvement of cassava farmers in the provision of public and private extension services
3. Determine the level of adoption of improved cassava technologies disseminated by public and private extension services to cassava farmers
4. Determine the factors contrasting the provision of public and private extension services to cassava farmers

5. Compare the impact of public and private extension services to cassava farmers
6. To determine factors influencing adoption of improved cassava technologies.

Summaries of major findings as they relate to the specific objective of the study are presented below.

The study used a survey design in the form of structured interview schedule to interview 338 cassava farmers in two districts in Nimba County, Liberia. The respondents were selected using a proportionate random sampling technique. Frequencies, means, standard deviation, Pearson chi-square, independent t-test, Pearson correlation matrix and stepwise multiple regression were the statistical tools used to analyze the data.

Age of Farmers

Most of the cassava famers under public and private extension services within the two districts were in their active working ages (88.6%). Nevertheless those in the private extension service have more farmers in the working age groups (90.2%) than those in public extension (86.2%). The study found out that there were more male (58.2%) than female (41.8%) farmers in public and private extension services.

Educational Level of Farmers

There was a high illiteracy level among public and private extension cassava farmer in the study area (95.3%). However, there was no significant

difference between farmers who received public and private extension services (Chi-square = 3.8, $p > 0.05$).

Household Size

The average household size for public extension farmers was higher (mean = 7.07) than that of the private extension farmers (mean = 6.72). Nevertheless, the difference between these two groups of farmers was not significant (t-value = 0.77, $p > 0.43$).

Farmers' Years of Experience

Majority of the cassava farmers from public and private extension services have long experience in cassava farming (78.0% and 56.4% respectively), though there was no significant difference between public and private extension (t-value = 3.06, $p > 0.82$).

Farmers Source of Agricultural Information

Apart from the public and private extension (78.6%), the study shows that most of the cassava farmers receive cassava production information from neighbouring farmers (88.4%), radio (86.8%) and other farmers outside their neighbourhood (71.4%). Only a few receive information from research institutions like the Central Agricultural Research Institute of Liberia.

Farmers Source of Agricultural Planting Materials

Most farmers obtain their planting materials from their own saving (95.3%), relatives (94.0%) and other cassava producers (69.1%). Less than a quarter of the farmers obtain planting materials from the AEAs. This observation is very similar between public and private extension farmers in the study areas.

Level of Involvement of Farmers

The level of involvement of farmers in public and private extension services was very low in training on agro-technology, adult literacy programme, financing cassava production, and farming system improvement technology. Farmers' involvement in innovation sourcing to and from other farmers, marketing of cassava and dissemination of general information was low. However, farmers' perceived their involvement in supervision of advisory services to be high. On the other hand the private extension farmers perceived their involvement in training on agro-technology, adult literacy programme, financing cassava production, dissemination of general information and farming system improvement technology to be very low while their involvement in innovation sourcing from farmers and extension provider, innovation sourcing to farmers and extension provider, supervision of advisory services and marking of cassava was regarded to be low. There were significant differences between the involvement of public and private extension farmers in all the extension activities (t-value ranging from 2.62 to 9.60, p values < 0.05) except adult literacy programme (t-value = 0.77, $p > 0.44$). In general, the private extension farmers were more involved in extension activities than public (t-value = 2.15, $p < 0.05$).

Farmers' Level of Adoption

There were significant differences between the public and private farmers' level of adoption of new technologies in the area of clearing of land, soil preparation, soil fertility, special planting of cassava, weeding, hand picking and timely harvesting. However there was no significant difference of laying of ridges/mound/flat bed, improve seed/cuttings supply, pest control, crop rotation and fertilizer application. In general, there were low levels of adoption of the technologies among public and private extension farmers. There was no significant difference in the overall level of adoption between public and private extension farmers (t-value = 2.58, $p > 0.05$), though that of private extension farmers was slightly higher (mean = 2.52) than public extension farmers (mean = 2.43).

Factors Constraining Public and Private Extension Services

There were a lot of factors constraining public and private extension farmers' adoption of cassava innovations in the study area. Prominent among these factors are poor soil fertilizer, high cost of farm input, shortage of farm labour, non-availability of market for produce, inadequate size of farm land, lack of transport facilities, and absence of processing facilities. There were significant difference between public and private extension farmers on the extent to which the factors are constraining their level of adoption except in high cost of farm input (t-value = 1.54, $p > 0.05$), non-suitability of extension programme (t-value = 1.34, $p > 0.05$) and inadequacy extension programme (t-value = 0.99, $p > 0.05$).

Impact of the Extension Services on Cassava Farmers

There were significant differences between the public and private extension service farmers on the impact of the extension services on their production, yield, farm management skills and living standards (t-value ranging from 2.65 to 4.26 with p-values < 0.05). All the constraining factors had significant relationship with the levels of adoption (r ranging from 0.18 to 0.48) except high cost of input (r = 0.03). Type of extension organisation, sex and level of education were the other factors which have significant relationship with level of adoption (r = 0.19, 0.22, 0.15 respectively).

Factors Influencing Level of Adoption of Improve Cassava Technologies

The stepwise multiple regression analysis presented seven predictors of level of adoption among the public and private farmers in the study area. The best predictor among them was inadequate farm size (r^2 = 0.23) followed by inadequate farm input (r^2 = 0.05), poor soil fertilizer (r^2 = 0.02), type of extension provider working with (r^2 = 0.01), non-suitability of extension programme (r^2 = 0.02), inadequate extension programme (r^2 = 0.02), and gender of farmers (r^2 = 0.01) in that order.

Conclusions

Based on the findings of the study, the following conclusions are drawn:

- Cassava production in the selected districts in Nimba county of Liberia was characterized by male dominance, large household sizes and married

famers who have low level of education but vast cassava farming experiences.

- The main sources of agricultural information to cassava farmers receiving public and private extension services in the study area were neighbours, radio, extension agents and other farmers outside their neighbourhood. Most of the cassava farmers used planting materials from their own farms, relatives, other cassava producers and projects or organisations.
- The level of involvement in public and private extension services by cassava farmers was very low, though farmers were more involved in public extension than private extension. The null hypothesis of no significant difference in farmers' level of involvement in extension services between public and private extension is therefore rejected and the alternative accepted.
- The level of adoption of improved cassava technologies by farmers in public extension was very low and those farmers in private extension was low. There was no significant difference in their level of adoption of improved cassava technologies between farmers under public and private extension services.
- Extension services were perceived to have had significantly higher impact on yield, income and living standards of farmers' under public extension than those under private extension.
- The main factors influencing level of adoption of improved cassava technologies were inadequate farm inputs, poor soil fertilizer, type of

extension service provider, shortage of farm labour, non-suitability of extension Programme, inadequacy of extension Programme and sex of farmers.

Recommendations

Based on the conclusions of the study, the following recommendations are made.

- The level of involvement of public and private extension was very low, though public extension was comparatively better with regards to private. To improve on the level of farmers, Ministry of agriculture, research institutes and other extension service providers should intensify training in these areas that farmers have very low levels of involvement and improve on those areas that farmers were high.
- To increase the level of adoption among public and private extension cassava farmers, government of Liberia, researchers and extension managers should develop and provide appropriate farm inputs to cassava farmers in the study area. These bodies should also assist in improving the soil conditions by providing appropriate soil correction methods to these farmers.
- To overcome the constraint of lack of improved cassava cuttings, Ministry of Agriculture and the Central Agriculture Research Institute (CARI) should establish a lot more cassava cuttings multiplication farms to supply improve planting materials to these farmers.
- In order to raise farmers' income and production in the study area, government of Liberia and the county authorities must aggressively promote

public and private agricultural extension services by involving farmers in their extension activities.

- Since the study result shows similar activities and involvements of public and private extension providers, it is recommended that both extension organizations should found a partnership in order to improve on their involvements

Suggestion for Further Studies

Based on this study, it is suggested that

1. Further investigations should be made into public and private extension services covering the whole of Liberia and including the extension agents and other stakeholders in the study.
2. Similar study should also be conducted on other sectors of the agricultural production in the county.
3. Further study should also be conducted to evaluate research extension and farmer linkages, and how it influences adoption of improve technologies in the study area.

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APPENDICES

APPENDIX A

Dear Respondents,

The purpose of this interview schedule was to investigate public and private extension services delivery to cassava farmers in Sanniquellie and Saclepea Mahn districts in Nimba County of Liberia. Kindly feel free to provide the right information; any information provided will be treated as strictly confidential. Please fill or cycle your choice of answer (s).

Thank you for your corporation.

SECTION A:

SOCIO-ECONOMIC CHARACTERISTICS OF Cassava FARMERS

14. District _____

15. Community _____

16. What is the name of your extension organization?_____

17. Which type of extension service provider are you working for?

(0) Public extension

(1) Private extension

18. Age of farmer_____

19. Sex of farmer

(0) Male

(1)Female

20. What is your level of Education?

1) No formal education

2) Adult literacy class

3) Primary School Completed

4) Secondary Completed

5) Degree

21. Marital Status (Please tick)

(1) Single

(2) Married

(3) Divorced

(4) Widowed

(5) Separated

22. Please indicate the number of people in your household _____

23. How long have you been in cassava farming? _____Year (s)

24. What is your major occupation?

(1) Farming

(2)Off farming

(3) Non-Farming

25. What other forms of agricultural enterprises do you engage in apart from cassava production?

(1) Vegetable Crops Crop Production

(2) Tree crops production

(3)Arable crops production

(4) Livestock Production

(5) All of the above

26. Apart from cassava production what other type of cassava enterprises do you engage in? (1) Processing

(2) Marketing

(3) Any other (specify) _____

27. Please indicate your sources that you receive agricultural information

Sources of agricultural information		Yes 1	No 2
1	Neighborhood		
2	other farmers outside		
3	Extension agent		
4	Radio		
5	Research institute		

28. Please indicate your sources of getting planning materials?

Sources of getting planning materials		Yes 1	No 2
1	Own source		
2	Cassava producers		
3	Relatives		
4	Extension officer		
5	Research institution		
6	Projects/organization		

SECTION B: farmers Level of involvement

Pleases indicate the level of involvement of in the following extension Programmes by using the scale below.

Rating scale 5 = Very high 4 = high 3 = Low 2 = Very low 1 = Not at all

Components of extension Programmes		VH 5	H 4	L 3	VL 2	NL 1
1	Training on agro-technology					
2	Adult literacy Programme					
3	Innovation sourcing from farmers and extension providers					
4	Innovation sourcing to farmers and extension providers					
5	Supervision of advisory services for farmers					
6	Marketing of cassava					
7	Financing cassava production					
8	Dissemination of general information					
9	Farming system Improvement technology					

SECTION C:

LEVEL OF ADOPTION OF IMPROVED CASSAVA TECHNOLOGIES DISSEMINATED BY PUBLIC AND PRIVATE EXTENSION SERVICES TO FARMERS Please indicate the level in which the following technologies have improved your level of adoption in cassava production.

Rating scale 5 = Most frequently use (MFS) 4= frequently use (FU) 3=Moderately Use (MU) 2= Not frequently use (NFU) = 1= Not at all (NTA)

Technology		MFU-5	FU-4	MU-3	NFU-2	NTA-1
1	Clearing of land					
2	Soil preparation					
3	Soil fertility or conservation technology					
4	Laying of ridges/mount/flat bed					
5	Improve seed/ cuttings supply					
6	Special planting of cassava					
7	Pest control					
8	Weed control					
9	Hand picking					
10	Crop rotation					
11	Fertilizer application					
12	Timely harvesting					

SECTION D

FACTORS CONSTRAINING THE PROVISION OF PUBLIC AND PRIVATE EXTENSION SERVICES TO FARMERS

37. Please indicate to what extend the following constraints affect your level of adopting cassava technologies

Rating scale 5 = Very high 4 = high 3 = Low 2 = Very low 1 = Not at all

FACTORS		VH-5	H-4	L-3	VL-2	NT-1
1	Poor soil fertilizer					
2	Inadequate size of farm land					
3	Inadequate farm input/chemical/fertilizer					
4	Inadequate finance and credit facilities					
5	High cost of farm input					
6	Non suitability of extension Programme					
7	Inadequacy of extension Programme					
8	Lack of transport facilities					
9	Absence of processing facilities					
10	Shortage of farm labour					
11	Non-availability of market for produce					

SECTION E: Perceived impact of public and private extension services to cassava farmers

30. Please indicate the level of impact on the following aspect of farming, from the extension services you received using the scale below

Rating scale 5 = Very high 4 = high 3 = Low 2 = Very low 1 = Not at all

Extension services had helped me in:		VH-5	H-4	L-3	VL-2	NT-1
1	Increase in production					
2	Increase in yield					
3	Increase in income					
4	farm management skills					
5	standard of living					

SECTION F: DETERMINE FACTORS INFLUENCING ADOPTION OF IMPROVED CASSAVA

39. Please indicate to what extend the following factors influencing your level of adopting of cassava technologies

Rating scale 5 = Very high 4 = high 3 = Low 2 = Very low 1 = Not at all

FACTORS		VH-5	H-4	L-3	VL-2	NT-1
1	Inadequate size of farm land					
2	Poor soil fertilizer					
3	Type of extension providers working with					
4	Shortage of farm labour					
5	Non suitability of extension Programme					
6	Inadequacy of extension Programme					