

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI**

COLLEGE OF ART AND BUILT

DEPARTMENT OF PLANNING

***OPTIONS FOR FORESTRY EXTENSION SERVICE DELIVERY FOR SMALL
HOLDER FARMERS***

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DECLARATION

I, Adu-Sarpong Emmanuel, hereby declare that this thesis, “*options for forestry extension service delivery for small holder farmers*”, consists entirely of my own work produced from research undertaken under supervision and that no part of it has been published or presented for another degree elsewhere, except for the permissible excepts/references from other sources, which have been duly acknowledged.

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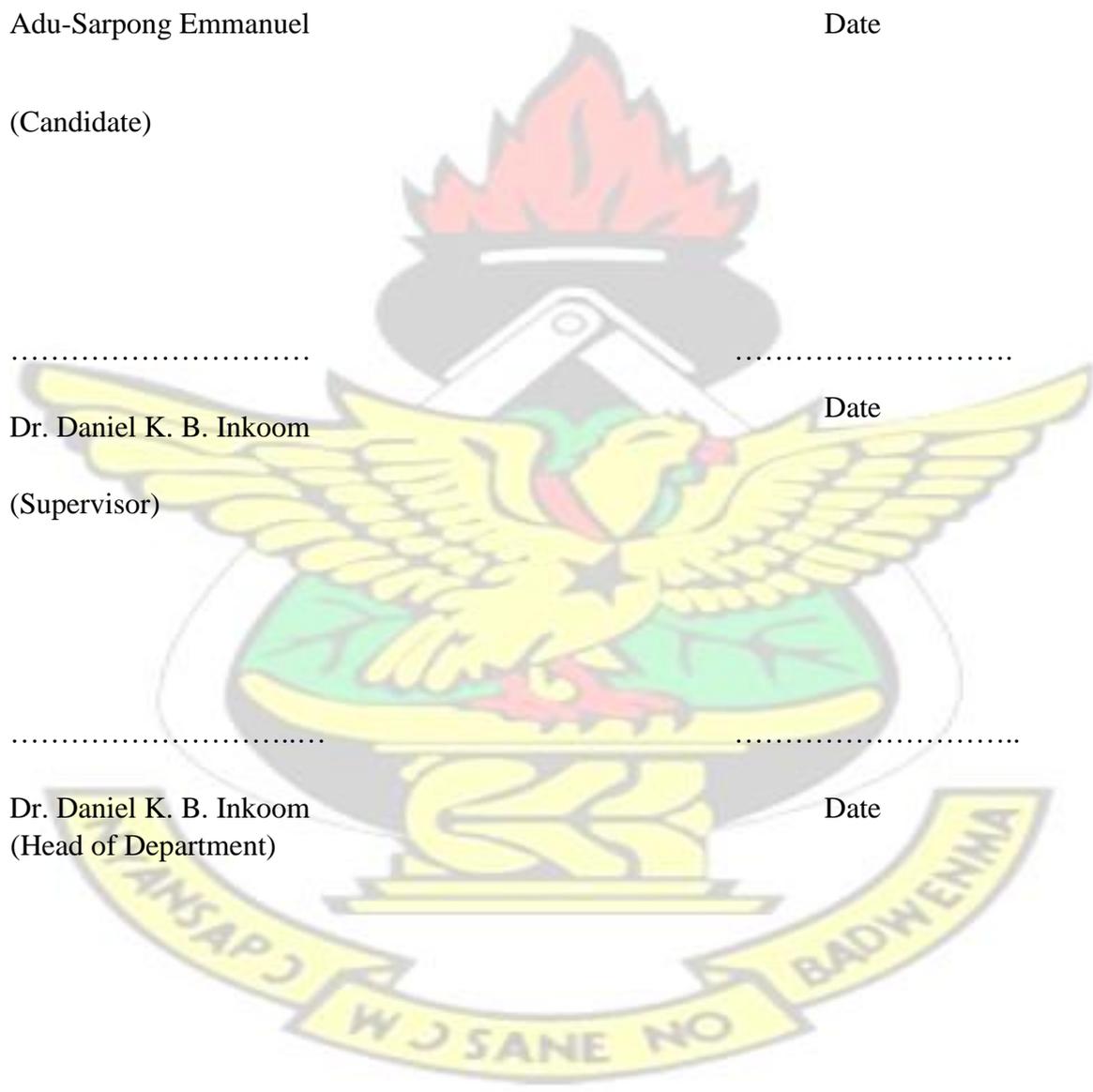
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ABSTRACT

Forestry extension models have the potential of improving landscape restoration in the off-reserve areas. Off reserve landscape restoration is purely dominated by small holder farmers who lack requisite knowledge to sustain tree planting activities. As a business, forestry extension provides a platform for knowledge sharing to small holder farmers in the area of forest management, silvicultural techniques, marketing and investment. Prescribing an appropriate option for forestry extension model has become a major challenge for most third world countries where publicly-led forestry extension services had failed due to funds. The current situation present lack of permanent institutional framework to carry out forestry extension services efficient and appropriate to small holder farmers in off reserve areas where landscape has deteriorated and requires restoration. This institutional deficiency is therefore seen as a gap affecting the contribution of small holder farmers in off reserve landscape restoration. Nketia (2014) confirm this gap by stating that forest plantation developer's especially small holder farmers lack adequate knowledge and support needs in their drive to establish and manage forest plantations. The type of knowledge gaps that farmers require through forestry extension services provision are; marketing, Technical, farmer associations and emerging purposes extension (Swanson, 2008).

This study was an attempt to access the appropriate models of options for forestry extension services delivery. Random and purposive sampling techniques were employed for the selection of respondents in nine communities of the three study areas as well as the key informants of the institutions that were involved in the delivery of forestry extension services.

The results revealed that the public led extension model was the most preferred model type as against the partnership, NGO and private extension type though the four were closely related. 24% of respondent preferred FC-led public extension model, 21.8% preferred partnership/hybrid type by FC-NGO and 19.8% had preference for NGO under privately extension model.

Accordingly, the FC-NGO led-partnership / hybrid forestry extension model was recommended as an appropriate model. This is because contemporary forestry extension model is shifting to partnership model and also NGO,s led field extension practiced have observable result compared with any other model type.

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LIS OF ABBREVIATION

FC-	Forestry Commission
FSD-	Forest Services Division
NGO-	Non-Governmental Organization
COCOBOD-	Ghana Cocoa Board
MMDA-	Metropolitan/ Municipal District Assemblies
NMMTDP	Nkoranza Municipal Medium Term Development Plan
OMMTDP	Offinso Municipal Medium Term Development Plan
DDMTDP	Diaso Medium Term Development Plan
MOFA-	Ministry Of Food and Agriculture
NFPDP-	National Forest Plantation Development Program
JICA –	Japan International Cooperation Agency
KEFRI –	Kenyan Forestry Research Institute
TBI –	Tropenbos International -Ghana
GhRRM-	Ghana Rural Reconstruction Movement
FORUM –	Forest Resource Use Management
SIPL –	Subri Industrial Plantation Limited
CSSVDU –	Cocoa Swollen Shot Virus Disease Control Unit
CFRTEC –	Cocoa Research Extension Technical Committee
CHE –	Cocoa Health and Extension Unit
FPP –	Forest Preservation Programme
FAO –	Food and Agriculture Organization
FIP –	Forest Investment programme
NSCCE-	National Steering Committee for Cocoa Extension
RMSC-	Resource Management Support Centre
CRMU -	Collaborative Resource Management Unit
BAT-	British American Tobacco
OR-	Off-Reserve
ASAL-	Arid and Semi-Arid Land
FFS-	Farmer Field School
ISFP-	International Social Forestry Project
IUFRO-	International Union of Forest Research Organization

FUG –	Farmer User Groups
FFMS-	Forestry Farmer's Management School
LHF-	Leasehold Forestry
VDC –	Village Development Committee
DDC –	District Development Committees
ITTO -	International Tropical Timber Organization
γ_i ,	Forestry extension services as a the dependent variable.
EST	Extension services Type
CITP -	Challenges in tree planting exercise.
EM	Extension models.
EA	Extension approach.
EM	Extension Methods
FF	Farmer funding extension services
EB	Expected benefits



CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background

Ghana has a total area of 238,533 km³ of which land constitutes about 227,533 km² (index Mundi, 2014) approximately 22,753,300 ha. U.N. FAO (2013) had stated that 21.7% thus about 4,940,000 Ha of the land is forested out of which 8.0% (395,000 Ha) is classified as primary forest, the most bio-diverse and carbon-dense form of forest and 260,000 ha of planted forest. According to the Ghana Forest Plantation Strategy 2015-2040 (Draft), prior the year 2002 the private sector had established an estimated area of 44,198 ha of the planted forest constituting: 35,000 ha by individuals and tree grower associations and the remaining established by private companies. Thus small holder farmers accounting for 79.2% of the total private sector contribution to off-reserve plantations. The Resource Management Support Centre (RMSC) of Forestry Commission quarterly reports on permits issued in 2014 on plantation harvesting also supports the immense contribution of off-reserve plantation to the overall plantation timber needs of the country. It reports that between 2010 and 2013 the off-reserve areas alone contributed for an annual average 34.7% of plantation timber resource out of the average annual total volumes of 248,252.56m³ of plantation timber resources.

Mau et al. (2003) stated that forestry has become a complex business, small holder farmers need to know about forest management, silviculture techniques, marketing and investment. Knowing all of these requires appropriate training through forestry extension services. Bliss and Martin, (1990); English et al., (1997) as cited in Rasamoelina, (2008) suggested that delivering forestry education and assistance to forest plantation owners must always been considered as one of the effective ways to encourage active forest management, together with technical and financial assistances. Farmers are likely to be motivated by easily accessible beneficial schemes to regenerate trees in the landscapes they control. According to Rasamoelina, (2008) recent research results in forestry and forest management generally tends to support a balance between benefits and costs considering at least three dimensions (economic, ecological, and social). The focus is no longer on highest economic returns to the disadvantage of any other dimensions. In other words, the emphasis is ensuring mutual attention on all the three dimension. The message usually conveyed through extension services to forest owners must be full of behavioral change in their way of managing their

forest. Different institutions have implemented different forestry extension models and approaches. Thus extension exists in a variety of forms and different authors have defined extension using different models, approaches and strategies. The forestry extension system implemented in the country has been mainly public and programme-based but with no permanently designed institutional framework to handle these services. Even though, the newly formulated 2012 Forest and Wildlife Policy make mandate FC to begin implementing a well structure forestry extension framework off reserves plantation developers.

Based on experience from the cocoa sector where small-holder farmers account for the bulk of the nation's cocoa production record, it has been argued that plantation development and indeed, forestry, can better be served by small-scale farmers as against large-scale developers (Nketiah, 2014). MOFA and COCOBOD on other hand have run extension services jointly and as individual institutions and have gained experience due to a number of successes and challenges. For instance COCOBOD runs the Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDU) now Cocoa Health and Extension Unit (CHE) as its extension unit whilst the Cocoa Research Extension Technical Committee (CRETEC), supported by the National Steering Committee for Cocoa Extension (NSCCE), has the responsibility of providing a framework for the participation of all stakeholders in the delivery of extension support to cocoa farmers.

Over the past ten years, population density of Ghana has increased from 79 to 102 persons per km² whilst natural resources and especially forest cover decreases at a rate of 2% (Mapping of Forest Cover and Carbon Stock in Ghana, 2013). As a result, the forest landscapes of Ghana have been heavily degraded due to a combination of factors, including inappropriate policies, illegal timber harvesting and agricultural expansion. Other factors are wild fires and unsustainable production/harvesting of fuel wood. The Forest Investment Project, FIP (2012) also confirms the deforestation rate of 2% leading to an annual loss of around 135,000 ha due to population increase and drivers of deforestation and degradation. To sustainably manage and improve the forest resources, the government embarked on a restoration (reforestation) programme in 2002 with an annual planting target of 20,000 ha in the next 25 years to rehabilitate the degraded forest landscape as well as providing multiple benefits to stakeholders. (Ghana Forest Plantation Strategy, 2015-2040 - Draft). Although a lot more emphasis has been placed on restoring degraded forest reserves, there is increasing emphasis on off-reserve landscapes restoration

in recent times, where minimal schemes have emerged. Both large/commercial and small scale plantation developers operate in off-reserves areas.

During 1990 the then Forestry Department piloted Rural Forestry Programme, in the three Northern Regions and some rural areas in the southern part of the country. This was followed by the formation of the Collaborative Resource Management Unit (CRMU) with the view of building the capacity of the communities in the management of forest resources (www.fcghana.com/publications). The role of civil society was clearly defined and incorporated in the operational manuals of the Forestry Commission. In recent times the focus of the forest management is tilted towards afforestation and the call for both community and civil society-led plantation inclusion. The country is now implementing the National Plantation Development Programme designed to rehabilitate landscapes in both on and off-reserve areas. According to National Forest Plantation Development Programme (NFPDP) (2010), the current forest restoration schemes/ programme is as a result of lessons learnt from combined strategies/ programmes implemented since 2002 which included Modified Taungya System, Community Forest Management Project, Government Plantation Development Programme, Commercial Plantation funded by Plantation Fund Board, Civil Society-led Community Projects (TBI project, 2012-2016), and Small Scale Tree Growers Programmes.

1.2 Problem Statement

Forestry extension framework is considered to have potential of improving landscape restoration in the off-reserve areas. Forest plantation developers“ especially small holder farmers lack requisite knowledge and support needs in their drive to establish and manage plantations (Nketia, 2014). This problem has resulted due to inadequate framework for the provision of forestry extension services towards landscape restoration. Asante (1998) alluded to this fact by stating that in addition to the Forestry Department (now Forest Services Division) direct activities in forest re-planting must function as a channel for providing extension services. This clearly confirmed that the legalized state institution mandated to carry out forestry extension services is not effectively performing its task as expected resulting in low involvement of small holder farmers in tree planting. This means there is a gap in the delivery of forestry extension services to small holder farmer most of whom have very little or no knowledge in modern forest plantation business.

Most farmers do not have knowledge on critical issues such: Marketing extension services, farmer associations“ services, technical extension services, emerging purposes services due to little or no forestry extension services delivery. It is therefore important to understand how forestry extension service to small scale tree planting could be improved.

1.3 Justification

There is a significant lack of information on forestry extension services structures and mode of operations despite recognition by 2012 Forest and Wildlife Policy. The national plantation initiatives lunched in 2002 by the government engaged both the private and non-governmental organisations in tree planting boosting the involvement of small-holder farmers in off-reserve areas. The provisions in the amended Timber Resource Management Act 617 guarantee ownership rights to individuals who plant timber trees on farmlands. Comprehensive information is therefore crucial for the development of forestry extension practise (Nketia, 2014). Plantation developers especially large/commercial and small scale and other interest groups have been encouraged in plantations establishment of varied dimension and interest since 1990“s when the then Forestry Department acknowledged the devastating trend of deforestation in the country. The sensitization drive was done without providing any permanent logistical and institutional support systems to ensure that tree planting is done in a manner that will ensure optimum benefits to developers and also address the wider landscape issues of concern. Equally important is also the question of permanent forestry extension institutions to provide reliable services for plantation developers especially in off-reserve areas to meet the divergent stakeholder expectations of tree products, environmental services and livelihood opportunities. The main goal of every extension service delivery is to empower clients (thus farmer receiving innovative information outside the scientific community for implementation at the local level) in a more simplified form and life situations by ensuring access to information and tools necessary for making so as to reach their own objectives (Boone, 1990).

The strategic objective 4 of the Draft National Forest Plantation Strategy 2015-2040 recommends an increase of investments in research, development, extension, training and capacity building for forest plantation development. It is critical that providing forestry extension service should go a long way to benefits small holder farmers financially, improve biodiversity, soil productivity and other ecosystem services of the entire landscape to foster ecological balance and mitigate climate change effects.

1.4 Research Objectives

The broad objective of the study is to assess forestry extension services delivery for landscape restoration in off-reserve areas. To achieve this broad goal, 4 specific objectives have been outlined, namely to;

i. Review past and existing forestry extension framework and practices; ii.

Identify models of extension required by various stakeholders;

iii. Determine the institutions that can provide effective framework for forestry extension services delivery;

1.5 Research Questions

i. What are the past and existing forestry extension service delivery farmers have received?

ii. What type of forest extension models and approaches do they prefer?

iii. Which institution in farmer's view provide best forestry extension services and why?

1.6 Scope

1.6.1 Geographical scope

The study was carried out in; Diaso (resource rich), Offinso (resource medium), Nkoranza (resource poor) where extension-led project in landscape restoration have been implemented by then Planning Branch of Forestry Department no RMSC of FC. The choice of these study area was to establish farmer's requirements in the delivery of forestry extension service at different ecological zones.

1.6.2 Contextual scope

The study was limited to options of models of forestry extension services in the restoration programme especially forest plantations in off-reserve areas. It attempts not to analyze all extension services delivery in sustainable forest management of natural forest.

Forest plantations have been established throughout the country by both public and private entities. According to the Forest & Plantation Development Act, 2000. Act 583, some

support is provided to private plantation developers. The study seeks to look into the type of extension framework employed in the delivery of the support to these developers for sustained rehabilitation programme. The study dwelled on the successes and failure of the past extension schemes with consideration on conditions necessary for socio-economic and technical acceptance of extension models to give economic returns to the tree growers.

1.6.3 Time scope

The study examined forest landscape restoration schemes (trees-on-farms, trees on cocoa farms, small/medium-holder plantations and forest tree plantations) and the model of forestry extension services framework used between the periods 1993 to 2013.

1.7 Organization

This study report was organized under six chapters. Chapter one consist of the background, problem statement, justification, objectives, research questions and scope of the study.

Chapter two constitute an in-depth review of forestry extension practices. The focusing on origin of extension services, extension as a profession and concept, characteristics of extension and approached in extension. The various forestry extension models and approaches across the sub-region as well as other continents especially Nepal. The institutional reforms for the provision of extension services. The various restoration programmes/strategy implemented especially as well as the past institutional arrangement.

Chapter three centered on Research Design, Procedures, Data Analysis & empirical models of the study. It encompasses the sources of data and collection techniques, sampling techniques, sampling frame, etc.

Chapter four embodies detailed analysis and presentation of the data collected from the field. It presents summaries of findings in graphs, tables and figures interspersed some explanations to identifiable trends and a discussions of key findings to identify their policy/planning implications.

Chapter five was focus on conclusions and recommendations in line with the objectives and the prevailing problem statement as well as other important findings on forestry extension from the literature review.

CHAPTER TWO

LITERATURE REVIEW

2.1 The origin of Extension

The Oxford and Cambridge universities in England first used the term *extension* to describe adult education programs organized in 1867; the work of universities were extended beyond the campus and into the neighboring communities to help educational programs thrive. (Swanson and Rajalahti, 2010). In the United States, extension was officially adopted alongside with the land grant universities that were originally established as teaching institutions during the 1860s. This institution later added on two main activities namely research and extension in 1887 and 1890s respectively and then formally combined in 1914 as part of each university's official mandate. During early twentieth century, the Ministry of Agriculture was made responsible for agricultural extension activities in the United Kingdom, hence agriculture became the first profession to adopt extension and their activities were then officially called *advisory services*. Extension was then welcomed by most developed countries as they developed and expanded the structures of similar advisory services within their respective ministries of *Agriculture and Rural Development*. Extension services is still being used as a term to describe non-formal education programs in the United States and Canada, while *advisory services* is use as the term to describe respective local extension programs and activities in many European countries. In most developing countries, donor agency often suggests the term to be use for establishing public extension or advisory institutions (Rivera, Qamar & Crowder, 2001).

2.2 Definitions of extension

Extension has been defined differently by various institutions and individuals. Christoplos (2010) defined extension as „systems that coordinate farmers access and organizations as well as other market actors to knowledge base information and technologies; facilitate their interaction with partners in research, education, agribusiness, and other relevant institutions so as to assist them to develop their own technical, organizational and management skills and practices“. FAO (1987) on other hand defined „extension as an informal educational process directed toward the rural population. This process focuses on solving problems of small holder farmers by offering advice and information to help them. The ultimate goal of

every extension services delivery is to increase the efficiency and production of the small holder farmers to impact on overall standard of living of the farmer's household.

However, in recent times donor organizations like World Bank have come to understand that basically extension services should be provided in a different manner emphasizing on the framework that provide effective services under current circumstances in developing countries (FAO 2005). Such framework of extension services is much broader and synonymous to the term "advisory services" which often includes many non-traditional tasks, such as market information, micro-finance and health issues (AIDS), farmer selforganization, etc.

2.3 Concept of Extension

According to FAO (2008) every extension must focus on four major concepts;

i. Technology Transfer concept

Under this concept, the focus is mainly to ensure farmer's adaptability to innovation. The mode of services delivery and the farmer willingness to adopt is most critical. In situations where there is closer cooperation between the private and public sectors, attention must be on input suppliers most of whom have sales personnel who are not technically competent to provide correct technical advice to farmers. Both public and private sectors must therefore function to complement each other rather than seeing themselves as competitors to provide most of the one-on-one technical advisory services.

ii. Concept of Human Resource Development;

To improve rural livelihoods of the poorly uneducated farmer, knowledge in technical and management skills needs to be enhanced. The motive here is to increase the ability of the farmers' access livelihood outside their reach. It involves differentiating among different types of farm households as well as differences among men, women and rural young people within the household.

iii. Building Social Capital or Organizing Producer Groups Concept

Formidable group formation has often been identified as an effective mean to carry out activities such as; supplying high-value tree crops to urban marketing. Most extension strategy has been purely based on technology transfer for the major food crops and so social capital did not play an instrumental role. But in recent times, there is priority in building

social capital by organizing rural youth groups as a long-term strategy of rural communities to continue receiving public extension systems.

iv. Concept of Sustainable Natural Resource Management

With increasing world's population and economic growth in the mix of limited natural resources, especially in many developing nations creating serious problems for the world's natural resources sustainability. Globally, there are initiatives towards the expansion of landscape restoration through REED+ programmes. Notwithstanding the effort made, there is an urgent call for extension and advisory services to educating farmers on how to use sustainable natural resource management practices as well as allocating more resources and effort to enable them adopt to the best practice for them to cope with the impact of climate change" (Swanson, 2008).

2.4 Rationale for Extension

The aim of every extension service among others is to actively promote innovation to the target group especially small holder farmers. Experience and evidence have shown that extension has returns on investment through technology development and could have very high and far reaching effects (Muzari, Gatsi & Muvhunzi, 2012). Most small holder farmers do not have formal education to improve their yield as well as assessing best market practises. To avert these challenges, capacity building through extension services delivery is critically needed. Since the target group have had little or no formal education extension services presents the best opportunity for the adult farmer population to build capacity in order to deliver improved livelihood development, sustainable forest management and technology transfer as well as groups organizational capacity. Extensionist must therefore works hard to identify technologies that require few assets, have a lower risk premium, and are less expensive and have a higher chance of being adopted by smallholder farmers.

2.5 Extension as a profession

Extension can be applied in all areas of life such as; education, industrial, health and agricultural sectors, rural and forestry. For instance, forestry can apply extension as a useful activity in knowledge system based within a broader confine to include research and education. Eicher (2001) stated that the knowledge system is often described in three pillars namely; research, extension and education (knowledge triangle) and suggest that since the

three pillars complement each other in investments they should be scheduled in sequenced as a system rather than as separate entities. Rivera, Qamar & Crowder (2001) went further to link the knowledge triangle with their common clientele who practices the innovations and send feedback to innovation for improvement, with each requiring logical planning.

2.6 Type of Extension

River, Qamar & Crowder (2001) explained that extension can exist as an expanded concept when it combines with more than two types of profession. For instance when rural extension combines with agricultural extension their goals change to function more widely in purposes. Examples of such expanded function of extension are:

Non-farm rural microenterprise development

The type of extension is more related to livelihood enhancement to support farmers engage in tree planting. In areas where majority of small holder farmers depend on petty trading, primary production, remittances, and casual employment as multiple sources of income. The best prospects for significant livelihood improvement for their survival may lies outside the natural resources sector to generation off-farm income, Carney (1998) as cited in River, Qamar & Crowder (2001). The non-farm microenterprise extension often absorbs pressure on the forest resource to enhance effective conservation practices. This can promote the development and management of natural resources especially in off reserve tree planting as well as enhancing related micro-enterprises in rural environment.

Marketing extension

Mau et al, (2003) had stated that forestry has become a complex business, small holder farmers need to know about forest management, silviculture techniques, marketing and investment. Market information services target improving the preparation and process of moving forest resource goods to market. Market extension according to FAO (1987) provides information on the post-harvest treatment of specific tree commodity by providing an important service to a country's timber trade, including market demand for that particular commodity. Different types of market extension services exist to provide varied information especially on commodity prices; knowledge about where to sell forest products; quality assurance problems; available prices inputs; as well as information on competition in the market in actual levels (Crowder 1997; Shepherd 1997) as cited in Rivera, Qamar & Crowder (2001).

Farmers' associations

Common forest resource needs and interests are often met by organising farmers into recognizable groups by means extension services. Promoting group organization has been prioritized as a long tradition of extension and the commitment from FAO's to promote people's participation through independent agricultural and rural /natural resource development to deliver development (FAO 2000). According to FAO (1995) financing economic self-reliance and the participation of the members in their organizational activities have been recognized as having central importance in promoting farmers' organizations. Most authors believe that extension can effectively carry out its dictate by working indirectly with and through farmers' groups or organizations but not by working directly with individual farmers (Byrnes 2000) as cited in FAO (2001).

Technical extension

It is mostly carried out by technical and service units responsible for extension activities. In forestry technical extension involves silvicultural operation of trees establishment often outlined in manual of procedures for performing task. Public sector institution often employs extension as a tool to address shortfalls whiles focusing on rural development and poverty alleviation (Swanson 2008). Technical extensions are directed towards addressing shortfalls in the area of Capacity building of farmer's organizations; Facilitation of access and interpretation of market information; Benefit sharing mechanisms and constraints; and Participatory market chain analysis for tree and forest products. Every option for forestry extension must be viewed as composing all the areas of concern.

Emerging purposes

This economic development type of extension emphasis on urban forestry extension and climate change mitigation. As issues of stable economy and urbanization is fast becoming a development agenda of most nations thus economic growth with high populations and rapid migration of rural peoples to the cities, extension may have to deal with urban and suburban clients (FAO 2000). This emerging situation may eventually leads to urban forestry extension with much emphasis on tree planting in open spaces as against the currently considered forestry. In most developed countries, urban forestry extension is currently been practiced by ensuring that urban areas receive adequate information and education, extending beyond technical rural development. To reflect on the world's rapid urbanization, urban extension has the potential for information transfer to addresses new

audiences and new programmes. This has become necessary because, more than half of the world's human population, 3.3 billion people live in urban areas (Osanjo, 2011). The process of urban extension would involve changes in socio-economic and demographic that has the tendency to affect natural resource base, as well as changes in epidemiological, institutional and socio-demographic. It is also evident that the attentions of governments are being drawn to the ability of the natural resources base industry to generate employment for the youth. Small urban businesses, food and agriculture-related programmes possess potential for engaging sound environmental practice.

Another emerging issues of concern is climate change and its effect. Extension as an activity could enhance the global effort of mitigating climate change effect by introducing technology/ innovation to building the capacity of these small holder farmers.

Rivera, Qamar & Crowder (2001) further concluded that it will be short-sighted and limited to perceiving an extension purely as a means of production, rather than an educational service.

2.7 Characteristic of extension services

According FAO (2001), well designed and effective extension services should have the following five key characteristics:

- i. Extension services should be demand driven;
- ii. Extension services should be pluralistic in nature (allow for the participation of a multiplicity of service providers);
- iii. Capacity building - in support of farmers groups and small forest owners associations;
- iv. Facilitation of access to information and technology (development communication approaches);
- v. Include benefit sharing mechanisms and access to markets.

2.8 Factors Affecting Development and Management of Extension Services

Various countries have practiced different extension models and approaches with varied success and failure (Swanson, 2008). However, most of these implemented extension

systems over the years are programme-led public extension type. Swanson's findings suggested that these types of extension often face some challenges which include;

- i. The difficulty in bringing institutional change. Thus government officials in public mostly run extension system bureaucratically resistant to change. Unless there is a major intervention in policy at the national level extension will continue to be run slowly.
- ii. The resource base under the control of public extension agencies
- iii. Inefficient national extension systems including operational, physical and communications infrastructure coupled with poorly equipped extension offices as well as lack of in-service training facilities at all levels.
- iv. Many public extension workers routinely carry out extension jobs to pleased senior-level managers and not the clientele farmers they served. This because little or no incentives reward for high levels performance as well as no sanctions for poor performance.

2.9 Effectiveness of Public Extension Systems and their Constraints

Swanson (2008) stated several operational challenges limiting public extension services and they include;

- i. Lack of adequate funds in most government agencies to cover the costs of extension operations and programmes at the field level. The reason been that senior managers who keep funds for operational and programme at the local and district levels often prioritized their right to transportation costs by routinely cutting the budgets.
- ii. Logistically, the extension worker is inefficient in terms of time management because accesses to government vehicles do not exist and uses commercial bus for transport. They also receive low salaries and so will not be in a positon to afford buying motorcycle or ant mean of private transportation.
- iii. As a critical need for demand-driven extension, field extension officer are unable to organized field visit to innovative farms in another district for farmers trips. Such trips often equips farmer to obtain knowledge to able to carry out their demonstration or non-farm trial to test potential varieties of a high-value

innovation. Often field officers are not allowed to keep funds on them to support organization of field trips resulting lack of observable features to facilitate adoption.

- iv. Additionally, as a transition from national extension systems to a more marketdriven approach, Internet access to market information must be regular because technical knowledge and management information are critical for different highvalue crops and enterprises. Therefore, extension field staffs require offices structures that have computers with Internet access, telephones and other communications equipment.

Every attempt to use extension as a tool must consider the under-listed issues (Rivera and Qamar 2003);

- i. **Determine who should pay:** Development of every extension should target at who should bear the communication cost as well as the cost for information services if the poor rural farmer was shielded.
- ii. **Equal access to information:** Poor people require right kind of information and extension advice delivered in a manner not to worsen existing inequities.
- iii. **Promote local content:** Efforts should be made to avoid bringing in new information from outside but rather concentrate on promoting useful information sharing between institutions locally.
- iv. **Strengthen existing policies and systems:** new systems which seek to build on existing systems is needed to further strengthen extension and communication policies.
- v. **Build capacity:** To develop and manage new systems capacity building is necessary at all levels. The uses of realistic technologies to enhance and add value to existing systems are preferred as most effective systems.
- vi. **Create knowledge partnerships:** new technologies cross national, ethnic and social boundaries should be an enormous opportunity to build knowledge partnerships.

2.10 Forestry Extension

Considering the contribution of small holder farmers in cocoa sector and the possibility of exploring similar approach in off reserve landscape restoration, the responsible agency would have to consider ways of strengthening and increasing coverage of forestry extension services delivery. According to the Draft National Forest Plantation Strategy (NFPS) 2015-2025, the potentials land areas in off-reserve is 600,000 Ha (2.6% of total land area of Ghana) compared 475,000 Ha (2.1 % of total land area of Ghana) in on reserve areas. To ensure stable supply of forest products for both economic and ecological benefits, small holder farmers would have to support with various extension schemes. The reality is that with enabling environment couple the farmer's willingness to manage their forests investment in partnership with other stakeholders will ensure sustainable forestry development.

Many definitions has been assigned to extension but it essentially involves various systematic processes of ensuring knowledge exchange and the transfer of technology to communicate information to various beneficiary of farmers, landowners and communities (Jacobson, 2012). Extension education uses terms in its content such as diagnosis and design, communication dissemination, advisory services, demonstration, delivery, diffusion and adoption,

FAO, (2005) defined forestry extension services as promotion of participatory approaches to solve problem by enhancing the contribution of trees and forests. This approach often results in sustainable land use and food security balanced with parameters of environmental sustainability. Forestry extension aims at improving forest and tree management and rural development using carefully systematic process of exchange of knowledge, ideas, values and practices (Anderson and Farrington, 1996) as cited in Nketia (2014).

For the purposes of this study, forestry extension would be operationally define as *providing sustainable tree planting modalities using knowledge transfer and adoptions schemes*. Generally, it involves "Technology transfer" and "Problem solving". Forestry extension are often demand driven in nature which often involves facilitating mindset for discussing, making decisions and action taking to meet local needs. The duty of an extension service in tree planting is to widen the knowledge based of clients beyond the immediate range of just planting trees but to understand more fully on the dynamics of trees or forests and how it fits into the pattern of rural life. With the help of extension service

experts are able to identify areas that needs specific knowledge and provision of items such as equipment, seeds, special tools and funds to meet the expected outputs marketing, etc. Extensionist then facilitates to ensure that needed resources are available in quantities to support particular needs.

Nature of forestry extension

Forestry extension does not hang on formal teaching or courses of study but rather relies mostly on informal self-development process. Small holder farmers have considerable indigenous knowledge and skills received informally from parents or family members. Extension also satisfies the needs of some young people whose academic education were thwarted and has placed them in unpreparedness for the life ahead after they had left school. These groups of people perceive extension service as a platform for receiving new knowledge and skills through sharing, adapting, adopting and with the assistance of a coworker rather than under the guidance of a teacher.

Conduct of Forestry Extension Staff

Jacobson (2012) outline four (4) properties of forestry extension staff and they;

- i. Field extension Officers should see themselves as both full-time learners and guides. This is because their work involves full co-operate with the public, to motivate and guide them and at the same time having responsibility of enforcing forestry laws and regulations. This is always hampered by shortages of staff, and may virtually be impossible to achieve but the aim must always be kept in view and revive as and when staff becomes available.
- ii. Extensionist should know the vital role that local leaders play in the spread of extension activities. Local leaders have special capabilities of spreading information on issues of importance within their locality, though they may not have requisite technically knowledge or may not be equipped with the tool for performing a task as trained extension staff. Such people possess status and caliber in their communities which makes them influential in spreading information of extension ideas.
- iii. Extension officers must always bear in mind that they function to serve the whole community and simply not the privileged few. The critical consideration is that the underprivileged people may initially have great problems in taking advantage

of what he/she has to offer in time, energy or available land which often imposes difficult decisions on extension staff. The question here is whether to focus on the more affluent and often able members of the community who have the requisite capacity to readily adopt extension innovations to achieve some early reckonable timelines, or concentrate on the underprivileged who may have particular problems in adopting new innovations but needs help most.

- iv. In addition, forestry extension organization should never relent on its obligation of always integrating sound forestry principles into any related extension programmes for every extension platform.

Forestry Extension Model

Sustainable finding and value-adding models for forestry services to poor communities has proved Problematic (Harrison et al, 2004). The practice of forestry extension is to ensure that the management of both private and community woodlands are improved. The contemporarily forestry extension practice dwells more on sustainable forest management. Ghana now faces implemental challenges due to inadequate existence of programmes and structures couple with inadequate funding. Nketia (2014) stated that determining an appropriate forestry extension model for Ghana remains a major challenge if sustainable forest management is a goal. Many authors have proposed multi-sectorial models with different conditions. Below are a section of them. However Jacobson (2012) had also proposed five models/strategies and they are: By national agency; (publicly funded); Privatization of extension services; Public private partnership funds; Contracting by local governments (district assembly level); and Contracting directly by clients e.g. farmer field school

Various models have practiced by different countries but the model prescribed by Jacobson (2012) best support my study. As part of theoretical review other works on options of forestry extension were also considered. Ideally there are 5 main options of forestry extension models for delivering extension services were reviewed and they;

- i. Public sector (traditional model);

Predominantly funded by government where technology is transfer from the messenger (extension worker) to the beneficiary (client) through top-down linear linkage. Under publicly funded scheme the centralized governments could shift its responsibility of the

providing extension services to local governments. The national government could also create a space that the service providers such as NGOs, private entrepreneurs and civil society organizations are expected to be filled by. The scheme empowers farmers by employing the use of local and indigenous knowledge to determine farmer needs as well as building community networks which is a key factor in planning extension programs. In such situations, extension workers become facilitators and brokers of knowledge and not just teachers; thus there is a two-way flow of information. ii. Public Private Partnership.

Due to bureaucracies and apathy in public service for extension programs there is a tendency to outsourcing of extension activities to the private sector. The purpose of the new extension approaches is to limit the role of the central government. Thus the inclusion of private sector entities to provide education and resources to enhance alternate ways of reaching out to farmers (Jacobson 2012).

Under model private sector could be funded by both public sector and donor institutions, thus closer collaboration between the public and private sector. In most developing countries partnership model is required because many private service providers do not have technically competent staff to deliver technical advice to farmers (Swanson 2008). This suggests that private sector should be viewed as partners and not competitors by public extension personnel, thus the top most function is to develop public-private partnerships with input supply dealers. Private firms must organize farmers into producer groups starting from the one-on-one technical advisory services. iii. Privatization.

This is often done with private sector with direct funding from private institutions (e.g. private sector contract farming or cooperatives). Jacobson (2012) was of the view that accountability and incentive structure changes by outsourcing extension services to farmers and so they should be made to share cost by paying for services received. To him, the key issue of consideration under this scheme is ensuring that services provided focus and meet the aspirations of the beneficiaries. There should be efficiency and effectiveness in competition for providing extension services among private entities as too many providers may weaken the overall objectives of the programme. The question now is how to mobilize resources for these providers to share innovative knowledge to farmers. This calls for a definitive role for stakeholders involved in the service delivery. Johnson (2012) finally concluded by stating that in contemporary forestry extension, there is more focus and emphasis on private sector approaches that are more demand-driven and interactive. For

instance, Uganda is experimenting publicly –funded but privately delivered forestry advisory services. Harrison et al. (2004) suggested that privatisation appears more viable with commodities or enterprises that can easily be converted into cash, and more difficult where it is concerned with the broad range of benefits that are sought from natural resource management (NRM) which range from the commercial, through the risk- and vulnerability-reducing, to the environmental, and frequently have „public goods“ components.

iv. Cooperative model

Current development in extension services are agitating for schemes involving farmer to farmer learning techniques, privatizing extension services and outsourcing of forestry extension activities (Rivera Qamar & Van Crowder (2001). Others like Samari et al. (2012) have also recommended a hybrid forestry extension model in the mix of privatized and cooperative extension system for the Zagros area in Iran. Though his study concluded that the cooperative model was the most preferred model by the farmers. Several factors have contributed this new trend which includes:

- a) Declining public sector budgets and less inflow of donor funding;
- b) Decentralization and Privatization of forestry sector services as a result of ensuring more political democracy and economic liberalization;
- c) Increasing number of privately funded NGO activities; and
- d) Growing participation of farmer organizations and small scale enterprise initiatives.

v. NGO model type

This is the type commonly found in developing countries. As part of strategy for bring social change to the rural areas adopt extension service delivery approach. Experience have shown that this type of model achieve most results on short basis because they are project in nature and also there less bureaucracy in the process. In Ghana, NGO“s are predominant in the resource poor regions to improve the wealth by impacting positively on social change. Most of these NGO“s employ the extension tool in their activities creating a change.

Above the five model individual models, Rivera, Qamar & Crowder (2001) went further to state that a country“s“ choice and/or association of a particular strategy/model should not be interpreted as exclusive but rather as indicative of undertaking reforms in that country. Thus a country is not tied to no one particular strategy but several different reform strategy

may be pursued at any point in a time. In Germany, three distinct extension model systems currently exist and run side by side.

Forestry Extension approaches

Various authors have suggested different extension approaches that have been tested and implemented in many countries based on desired objectives and outcomes. Axinn (1988) discusses eight different approaches which included: the general; the commodity specialized; the training and visit (TV); the participatory extension; the project; the farming systems; the cost-sharing; and the educational institution approaches. Many more different approaches have been propended by various.

In all the approaches, information/knowledge generated either at fields or by research institutions are expected to be disseminated across the necessary stakeholders and the resultant feedback used to improve the system. Davis (2008) grouped various scholars and their approaches into broad categories presented in table 2.1 to reflect on the purpose of implementation.

Table 2.1: Types of Approaches

<i>Levels</i>	<i>Rivera (1988)</i>	<i>Axinn (1989)</i>	<i>Gemo et al. (2005)</i>
Top-down	Conventional	General agriculture	Public
	Training and visit (T&V)	Commodity	Commodity
	University	T&V	T&V
	Technical innovation	Agricultural participatory approach	NGO
	Integrated agricultural development program	Agricultural participatory approach	Private sector
Participatory	Farmer information dissemination system	Farming systems research and extension (FSR/E)	Farmer field schools (FFS)
	Farming system research-extension	Cost-sharing	
Contract farming	Commodity development	Educational institute approach	
	Commodity focused		
Rural development	Community development		
	Integrated rural development programs		

Source; Davis, 2008

For the purposes of this study five approaches namely; Farmer information dissemination system; integrated rural development programs; NGO; Private sector and Farmer field schools (FFS) were considered. The choices of these five (5) approaches were based on information received from the farmers on the type of extension approaches used during project implementation.

- i. Farmer information dissemination system; this is where information spread to local people about technology and knowledge that are appropriate to cause behavioral change. The approach is usually government-controlled and fairly centralized
- ii. Integrated rural development programs; an extension approach characterized holistically at the local level. This type of extension often ensures development at grass-root level.
- iii. NGO / The project approach; under this approach type efforts are concentrated on a particular location, for a specific period of time with outside resources. Change in the short term is often a measure of success.
- iv. Private sector; this is where private individual/entity fund and deliver extension service on a fees bases paid by the recipient.
- v. Farmer field schools (FFS); a grassroots level approach to advance the principle of stakeholder participation with a view of making the stakeholders fully responsibility in programme decision-making. This approach type was initially linked with promoting Integrated Pest Management work (FAO 2000a). Quizon, Feder and Murgai (2000) also provides an interesting perspective on FFS. They are saying that FFS, an alternative learning or problem-solving approach should be perceived as an empowerment and citizenship opportunity and not as an information disseminating extension approach. In addition, the cost element of FFS and its relevance to the sustainable approach emphasized reasons why FAO's Forestry Policy and Institutions Branch adoption of the approach and changing its name to ***Farmers' Forest Management Schools (FFMS)*** to suit its community forestry development purpose. Nepal practices Community Forest Management and in CFM where the local communities have the vested rights to use and manage forest areas whiles government act passively. This approached is alternative to the Ghana's systems where government regulates the management of the resource. The CRM systems

embraces concept of triangular interface among community, resource and facilitators (NORMS 2002) as cited in (Singh 2003).

According to Tanaka (2001) as cited in Rivera, Qamar & Van Crowder (2001) Farmer Forest Management School (FFMS) approaches have two objectives.

- i. Forest users obtained multiple uses by using flexible community forest management tools. The operations of FFMS involves assisting forest users to gain knowledge, critical skills and self-confidence for decision making about forest resource based through experiments, observations and analyses to ensure sustainability whiles providing benefits suitable to their livelihood needs.
- ii. FFMS in the process of determining intended use of community forest would provide a platform for negotiation among forest users. Senses of ownership are built through delegation of decision-making and forest management.

Methods Used in Forestry Extension

Generally, Sim and Hilmi, (1987) recommended that all extension approaches employ various extension methods to reach out to its clients and these methods include; individual, group and mass extension methods.

Individual contacts

Individual contact is the one of the most effective way of bringing about change in a society especially home. Work place and in some cases informal contacts in markets or public places. Selection of suitable persons for this contacts type is the main weakness about this method because of the limited number of people who can be contacted within a given period and the likelihood that some people may feel neglected that could cause jealousy and disunity amongst ranks and file of the community members who cannot be included in the programme, Sim and Hilmi, (1987).

Group contacts

Under this contact methods, specific groups are often assisted, including farmers, producers or users of forest produce, women's or youth groups, etc. information be presented, and/ or techniques demonstrated to several people through this method, usually with a common interest as well as permitting discussions to take place. The method also allows for comments, suggestions and questions to be asked and answered if necessary by the individuals in group. This kind of method may stimulate group members to take joint action

on a problem to makes learning easier. This method is increasingly becoming important as an extension procedure, Sim and Hilmi, (1987).

Mass contacts

Various means of mass communication medium is often used in a different manner such as printed material, broadcasts or audio-visual presentations. Lack of direct contact to assess to determine whether the message has been properly received or not is the problem that this method present. Thus one wouldn't know whether audience understood by the in order to adjust to suit them, Sim and Hilmi, (1987).

None of these methods better qualifies to be singularly used; thus all of them have their strengths and weaknesses.

Sim and Hilmi (1987) concluded by saying that the various factors accounts for the choice of methods to be used and they includes;

- a. Resources available
- b. The tenure in the area, and
- c. Community organization.

However, combining of these methods has proven to be more efficient than just using one method. For instance, group methods are more likely effective than an individual method in a locality where tenure is communal (Sim and Hilmi, 1987).

Roles for stakeholders in developing extension programs

Since extension are development oriented various actors are involve. Table 2.2 outlines various actors involve in extension services delivery and their specific roles to ensure that responsibilities met.

Table 2.2: Specific roles for stakeholders in developing extension programs

Stakeholder	Responsibility
Government	Contract with private entities develop to ensure quality control by regulations monitoring and evaluation.
Private	Entrepreneurial skills and co-fund services.
Beneficiaries including farmers, women, community organizations	Identify types and services needed, cost share activities creation and ownership, carbon stock improvement and other environmental services can be achieved with landscape restoration schemes.

Source; Author's construct

2.11 Institutional reforms of Forestry extension service development

Recent extension reform strategies requires attention because of its distinct effects; longterm effect on economic growth; improving wealth by helping to reduce poverty on short term basis; as well as addresses the issue of climate change effects on environmental basis (Rivera, Qamar & Crowder, 2001). Van Crowder (1996) had earlier indicated that „several factors calls for a re-assessment of extension and they;

- a. Fiscal crisis that has made it difficult for governments to provide adequate resources for extension;
- b. Issue of more participatory approaches that allow farmers to take part in the design, implementation and evaluation of extension activities.

To him extension, service providers should include NGOs, farmer’s organizations and the private sector“. Efforts in decentralization should be considered in a context of extension re-conceptualizing and re-structuring to acknowledge that the supply–side of extension should be abandoned for demand driven approaches that are more responsive to farmer’s needs (Rivera, Qamar & Van Crowder, 2001). Table 2.3 specifies various countries that have employed several alternative options and institutional arrangements some of which includes;

Table 2.3: Options of forestry extension model other countries

Countries	Options of institutional arrangement
Chile, Estonia, Hungary and Venezuela	Promotion of multi-stakeholder extension, with emphasis on partnerships developed on an equitable basis
Finland and Norway	Cost recovery schemes or contractual schemes based on contractual provisions
Netherlands, New Zealand, England and Wales	Total privatization or commercialization of extension
Colombia, Indonesia, Mexico, Philippines, Uganda	Local authorities are empowered to act or otherwise grant some form of fiscal federalism thus enhancing decentralization arrangements with lower levels of government.
Bolivia, Ecuador and Peru	Devolvement or subsidiarity to farmers and farmer organizations directly
Chile, Estonia, Hungary and Venezuela, Tanzania	Promotion of multi-stakeholder extension, with emphasis on partnerships developed on an equitable basis
Finland and Norway	Cost recovery schemes or contractual schemes based on contractual provisions

Source; Author's construct

Currently there is a global response to natural resources depletion and more nations are becoming concerned about efficient use of land and water resources through achieving environmental sustainability. Rivera, Qamar & Crowder (2001) maintains that efficient land and water resource uses requires well planned landscape restoration schemes with knowledge-based systems through extension practice. This must be geared towards supporting market-driven income-generation.

With increasing population coupled with economic growth and development, national governments are being careful in managing their natural resources (Swanson and Rajalahti, 2010) and in responding to this new development, several countries in the world have adopted a variety of institutional reforms which is either market-oriented or non-market-oriented (Smith 1997) as cited in (Swanson and Rajalahti, 2010).

According Porter (2001) also said that an option for public sector to reform can be categorized into two different forms, namely; *market reforms* and *non-market reforms*.

Market reforms

The aim of the reform is to privatize the management of extension systems by the central government by means of contracting the delivery of extension field services to ensure cost recovery. This requires charging of fees for the services delivered or farmers' associations creating partnerships with service provider. It is distinct and involves four major strategies:

- Public sector extension systems revised to factor various forms of strategies. Thus concentrating more on an issues-oriented management approach to a discipline-oriented, management-by-objectives approach.
- Pluralism; under this strategy the private sector delivers extension services with funding from public sector and or NGO.
- Cost recovery thus reducing cost by down-sizing.
- Total privatization including commercialization. In this case, there is shifted to the private sector to provide funds as well as delivery of extension services activities, Netherlands is running this model .

Non-market reforms

This reform type involves two main strategies:

- Transferring central government authority to lower tiers of government. (Decentralization)
- Subsidiarity, removing government responsibility for extension entirely by transferring or delegating responsibility for extension to non-governmental organizations in lower level societies.

While market reforms aim at fully or partially privatizing the management of extension systems, non-market reforms aim at shifting central government's responsibility of funding and managing extension services to lower tier of government. This means that under the non-market reforms, government have an oversight role of ensuring that need are met.

The table 2.4 summarizes descriptive strategies for extension reforms. The commonly used strategies for reforms are Pluralism, subsidiary, partnership with farmers and private sector, decentralization, privatization as well as the cost recovery schemes



Table 2.4: Extension Reform strategy

Strategy	Description	Remarks
Pluralism	Funding private extension-providers to deliver field extension services or incorporating private extension provider into the public sector extension. This is government-led development.	NGOs and other non-public service providers receives support from government to deliver extension services.
Subsidiary	Lower level of society giving authorized to provide extension services to farmers' associations and viable programmes. rural community groups (Porter 2001).	Making local communities responsible for
Partnerships with farmers and the private sector	Under this strategy, equal authority is vested in the parties to it. The principle underlying establishing and provision of field services of partnerships are include; <ul style="list-style-type: none"> • Joint central management • Budget sharing, and • The joint management of field services, 	Private entities are funded by government to provide field services as in the case SADA, GYEEDA etc.
Decentralization	Swanson 2008, stated that there are four institutional arrangements and they are; <ul style="list-style-type: none"> • Deconcentration • Delegation • Devolution <p>Different Factors Affecting the Success of Decentralization</p> <ul style="list-style-type: none"> • Legal Framework • Stakeholder Participation • Strengthening Local-level Management Capacity • Improving Technical Capacity 	<p><i>Deconcentration</i> This is an administrative form of decentralization that seeks to shift extension administration from public to private entity.</p> <p><i>Delegation.</i> Semi-autonomous government agency assigned the responsibility of providing or coordinating extension services on a territorial basis</p> <p><i>Devolution</i> Programme planning, management and co-financing responsibilities are transferred to local and/or district-level governments</p>
Cost recovery schemes	The existence of cost recovery strategies offer both government and private organizations opportunities to charge for provision of extension services where farmers pay fees to work with extension technicians. Hanson and Just (2001) suggested that public schemes should be: <ul style="list-style-type: none"> • Fee-for-service based. • Private extension schemes with partially public fund • Policy-supported private extension schemes. 	
Privatization	No public support but private firms providing fee-for-service extension. This scheme of extension is not in the public interest. However, Hanson and Just (2001) argue for optimality calls for a mix of public, private, and paid extension with private extension policy support.	based on financial resources and payment in kind such as; portion of the crop produced

Source; Author's construct

2.12 Organizational Management and Extension Framework

Jeakins (2006) argued that a clearly quantitative and demonstrative extension to local and to some extent national and international communities on how forests resources are managed must be robust, credible, and comprehensive. Swanson (2008) also agreed to this assertion and said that structures and organizational management should follow a well-defined pattern. Below are example of patterns of organizational and management at all level.

The figure 2.1 looks at patterns and management of forestry extension practices. Extension service programmes should be responsive, well planned at all levels and must set out an advisory committee / boards at the district and sub national levels with adequate funding mechanism at the operational and national levels.

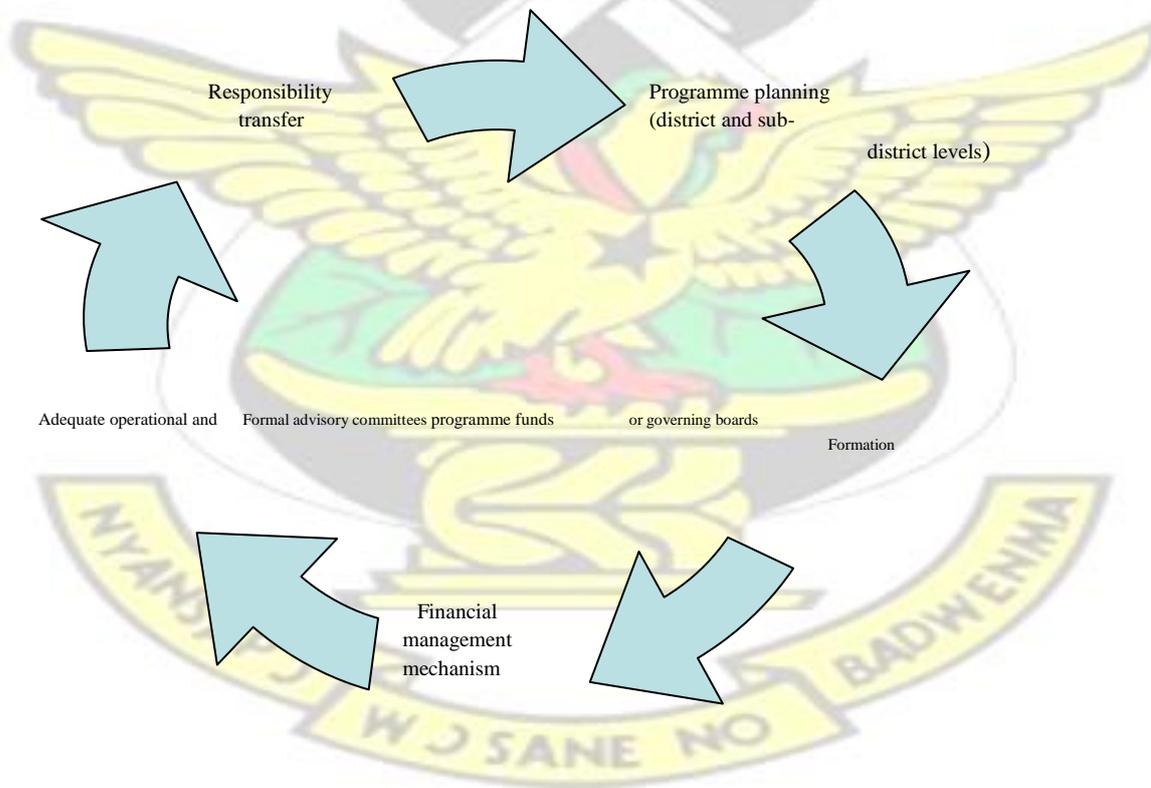


Figure 2.1: Organizational and management forestry extension practise at all level

Source; Author's construct

2.13 Legislations, Policies, Plans and Programmes for Restoration in Ghana

Various interventions Legislations, Policies, Plan and Programmes laws, formulating policies and embarking on programmes and project for plantation development are presented in Table 2.5. For instance, the provisions in Forest Plantation Development Fund (Amendment) Act, 2002, Act 623 items (iii), (iv) and (v) support public and private investment in forest plantation development.

Table 2.5: various interventions Legislations, Policies, Plan and Programmes

Year	Policy/legislation
	Forestry Development Master Plan
1994	Forest and Wildlife Policy
1998	Ghana: Biodiversity Conservation Strategy. MEST, 1998 Natural Resource Management Programme (NRMP I) Phase I, the World Bank,
1999	The High Forest Development Component inter alia established a Forest Plantations Development Centre (FPDC) to promote and encourage private forest plantation development
2000,	Forest Plantation Development Fund (FPDF) Act, Act 583
2002	Forest Plantation Development Fund(Amendment) Act, 2002, Act 623 (items (iii), (iv) and (v) support public and private investment in forest plantation development
2002	The Timber Resources Management (Amendment) Act, 2002, Act 617 (Excludes Private Forest Plantations From Being Allocated By Government Under A Timber Utilization Contract (TUC)
2012	Ghana Forest and Wildlife Policy
2012	National Climate Change Policy, 2012 (CDM, REDD+)

Source; National Forest Plantation Strategy 2015-2040

2.14 Historical perspective of Plantation initiatives in Ghana

Table 2.6: Historical highlights various strategy establish forest plantation to increase timber stocks dating back to the late 1989 and early 1990s. According Foli et al, 1997 as cited in National Forest Plantation Strategy 2015-2040, 150 trials of species in various ecological zones have under taken.

Table 2.6: Historical highlights of plantation initiatives in Ghana

Year	Plantation programme
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Before	Private sector Forest plantations
2002	<ul style="list-style-type: none"> ➤ Subri Industrial Plantations Limited (SIPL) established 4,000 ha of <i>Gmelina arborea</i> for paper and pulp ➤ British-American Tobacco - 5,198 ha of teak ➤ Dupaul Wood Treatment Ltd (667 ha) ➤ Ashanti Goldfield Company Ltd. – 100 ha ➤ Global Green (1,315 ha) and ➤ individuals and tree grower associations established 35,000 ha (mainly teak)
2002 to 2012	National Forest Plantation Development Programme (NFPDP, 2002-2012) Private Funds, FPFB Private Commercial Plantation Development GoG/NREG Model Plantations GoG, EDAIF, FPFB, FC Expanded Plantation Program
2002 to 2009	Establishment of plantations through F Modified Taungya System (MTS) and funded by Forest Plantation Fund Board (FPFB), FC, GoG support
2004 to 2010	Establishment of Plantations through MTS funded through Community Forestry Management Project (CFMP) funded by GoG/ AfDB
2003 to 2009	Establishment of plantations through contract labour funded by GoG with HIPC funds) Government Plantation Development Project (GPDP)
2010?	Establishment of FC-Industry Plantations through Timber Export Levy

Source; National Forest Plantation Strategy 2015-2040

2.15 Species Planted

The most commonly planted species was *Tectona grandis* (Teak) constituting 70% of the plantations established. The remaining 30% comprises of other species including *Cedrela odorata* (*Cedrela*), *Senna siamea* (*Cassia*), *Terminalia* spp. (*Ofram* and *Emire*), *Triplochiton scleroxylon* (*Wawa*), *Gmelina arborea* (*Gmelina*), *Eucalyptus* spp., *Khaya ivorensis* (*Mahogany*), *Heritiera utilis* (*Nyankom*), *Aucoumea klaineana* (*Aucoumea*), *Nauclea diderrichii* (*Kusia*) and *Mansonia altissima* (*Opronon*) (NFPS 2015-2025)

2.16 Institutions Implementing Forestry Extension Services

According to Nketia 2014, there have been numerous institutional arrangements to deliver forestry extension services, some of which includes; Forestry Commission (FC), Ministry of Food and Agriculture (MoFA), COCOBOD, Non-Governmental Organizations (NGOs) and commercial plantations developers.

2.16.1 Forestry Commission

The Act 571, 1999 which re-establishes the Forestry Commission with mandate to management, protection, development, and regulation of forests and wildlife resources and to provide for related matters. Asante 2005 emphasized the professionals of the Forest Services Division (formerly Forestry Department) of the Forestry Commission have practiced forestry extension through programmes/departments such as;

- Rural Forestry Department
- FORUM
- Collaborative Resource Management Unit(CRMU)
- Plantations Division now Plantations Unit

Rural Forestry Department

This Department was one of the initial departments created during establishment of Forestry Department. Thus the four divisions were administrative, development and working plans, and rural forestry (Asante 2005. Pp 162-169), each of them administered by a deputy chief conservator. The rural extension division handles research, education, and training in rural forestry. The division in addition administered the then School of Forestry in Sunyani and coordinated the activities of the department with those of other agencies involved in forestry.

Collaborative Resource Management Unit

CRMU explores methods to develop collaborative resource management systems to bring forest stakeholder group into the main stream management and development of forest and wildlife resources. (www.fcghana.com/publications)

The Forest Resources Use Management Project (FORUM)

According to www.fcghana.com/publications, the project was geared towards increased biodiversity and agricultural productivity, improved water quality, soil and wildlife and diminished pressure on on-reserves, with stakeholders taking a center-stage in the economic, ecological and social management of forest resources. The project had three components;

- i. The rehabilitation of degraded forests,
 - ii. Protection of natural forests
- and

- iii. Intensification of the Establishment of private woodlots.

The project was implemented in Volta Region from 1993-2008 (15-years) specifically in Kpandu-West block, Adomi River, Kpandu-Dayi block, Kabo River, and Abutia hills forest reserves. The aim of the project was to promote, protect and sustain forest resources management on on-reserves, with special emphasis on off-reserves and then replicates the gains made to other regions. It used the concept of community involvement and other stakeholders in the ownership and management of forest resources through forestry extension to check the perennial illegal activities such as bushfires, indiscriminate logging and encroachment of forests. According to Forest Project Manager as report on 14 August 2004 edition of GNA 2014, the achieved the following underlisted success;

- a. A total of 14,212 hectares of degraded forest was restored in 2006 as against 6,400 hectares in 1996.
- b. Woodlots from small-scale plantation increased from 600 hectares in 1993 to 5,817 by 2007.
- c. Employment was generated alongside acquisition of forest conservation techniques. Thus close to 10,000 farmers and 3,500 households in the project areas benefited and now have knowledge in improved agricultural practices.
- d. Legal framework of Collaborative Resource Management on ownership, management and benefit sharing in the sector had been developed.

Plantation Unit

The plantation unit of Forest Services Division of the Commission has been tasked with responsibility of restoring degraded areas on country's lands has recently incorporated extension services delivery in its operations. According to the Forestry Commission's memo on internal job filling Ref. FC/C.01/SF.2/50 dated 21th November, 2014, FC advertised for recruitment of a manager for Plantation Investment and Extension services within the Plantation unit of the FSD whose oversight responsibility would be to;

- i. Coordinate training and capacity building of field staff in forest plantations development and extension services

- ii. Undertake effective dissemination of scientific and innovation knowledge and best practice to plantation developers (large and small) nationwide.
- iii. Coordination production and distribution of good quality literature (Manual, Journals, flyers, posters, field guide etc.) in the best practise in plantation development.
- iv. Liaise with relevant NGO's, Research and Education Institution and development partners to secure support for forest plantation
- v. Process application for tax exemption and other reliefs for plantation developers
- vi. Coordinate the preparation of project proposal for investments in plantations.

Just like any public institution, FC has the strength to carry out effective and reliable extension service delivery (Draft National Forest Plantation Strategy 2015-2040) as evidenced by;

- Favourable policy and legal framework
- Technical expertise
- Existing practice, though informal
- Geographical reach

2.16.2 Ministry of Food and Agriculture (MOFA)

MOFA, another public institution has relied on extension as a method for its operations and has chalked many success and failure in this field. It has well-structured department called Department of Agricultural Extension Services DAES on extension with field officer all over the country with the ultimate aim of increasing farmers' productivity and household income. The use of extension as methodology is to the answer the question of how farmers can gain access to knowledge and information on improving practices along the value chain. The adopted knowledge helps to increase yield and farmer income. The DAES have oversight responsible of diffusing agricultural technology to farmers through regulation and management of an extension delivery service in the country (MOFA, 2009). The specific responsible includes the following activities:

- Collaborate with other MMDAs
- Providing technical advisory service

- Possess and deliver information on NGOs and CBOs involved in agricultural development
- Farmer Based Organisations (FBOs) information Provided
- agricultural technological information Provided

Agroforestry Unit under MoFA

In the late 1980s, most agroforestry projects were geared towards tree seed nurseries establishment to produce readily available seedlings to enable farmers to adopt agroforestry technologies. The enactment of National Agroforestry Policy, among others aimed was to establish and maintain 350 demonstration centres, 400 nurseries and 30,000 hectares of agroforestry systems nationwide. At 1992, achievement rate stood at 119 demonstrations, 131 nurseries and 1,642 hectares of agroforestry systems representing an achievement percentage of 34%, 33% and 5% respectively (Anim-Kwapong, 2004). Most of these NGOs including Ghana Rural Reconstruction Movement (GhRRM), Adventist Development and Relief Agency (ADRA), CARE-Denmark, and Conservation International supported this success drive. Farmers were empowered to engage in sustainable agriculture through agroforestry by the above mentioned NGOs who were so influential had support from the government.

2.16.3 Non –Governmental Organization

In Ghana, NGOs have use extension services as a tool to empowering farmers in the practice of sustainable forest management. The NGO's are influential and have supported government's effort of rural development. Some of these NGO are; Rural Reconstruction Movement (GhRRM), Adventist Tropenbos international (TBI) Ghana Development and Relief Agency (ADRA), CARE-Denmark and Conservation International.

Ghana Rural Reconstruction Movement (GhRRM)

In the Eastern Region, GhRRM successfully introduced agroforestry to farmers between the year 1991 and 1994 through "farmer-scholar" approach. During that period of training methodology, farmer constraints, adaptations, perceptions were evaluated (Asare, 2004). GhRRM further supported the evaluation report in 1994 which was published

„Agroforestry in Ghana: a technology information kit“ (1994). Loose-leaf information kit contains information on how to improve food security and raise farmer's incomes by detailing agroforestry techniques, soil and water conservation, raising and planting

seedlings, managing multipurpose trees and other useful information. The tool kit was used for teaching and as extension material, intended for extension personnel and NGOs. Thus serving dual purpose.

Development and Relief Agency (ADRA)

Collaborative Community Forestry Initiative (CCFI) was launched by ADRA in 1989. Under the programme, households were supported to establish nurseries and produce tree seedlings for themselves and market. Within 10 years period 20 nurseries were established producing more than 4 million assorted tree seedlings. The species raised included Cashew, Mangoes, Orange, Sweet and Soar Sop and Guava (all fruit trees). Teak Eucalyptus spp., Neem, and Albizia Lebbeck also forms the woody trees species raised (Djarbeng and Ameyaw, 2002) as cited in Asare 2004. In addition to the above ADRA-Ghana initiated 5-year development programme in 1997 to ensure food security which was carried out 3 regions in the North, Brong-Ahafo, and Volta. This agroforestry programme also promoted access, availability and utilization of food produced. In all over 24800 acres were planted and 11 nurseries were established. Timber species covering acreage of more than 5 million have planted with assorted fruit trees (Asare, 2004).

CARE-Denmark, Conservation International

Conservation International (CI) has created an enabling climate to support agroforestry practice using participatory training and extension methodology approach in the country. In 1998, CI implemented cocoa agroforestry promotion in collaboration with the government of Ghana and farmer groups which contributed to sustainable cocoa farming Asare (2004). The programme formed part of cocoa conservation strategies designed to promote cocoa agroforestry as an integral land use systems to join fragmented cocoa farms into continues block using conservation corridors in the south-western parts of the country. Through these activities, farmers were provided with the platform to diversify carrying capacity of their land to crops resulting in high yields in cocoa thereby reducing encroachment into nearby forests.

Tropenbos International (TBI) Ghana

Tropenbos International (TBI) Ghana has continually sensitized farmers on their right to sustainable forest management and has provided logistics to support their involvement in this endeavor. Since its inception in 1998, TBI-Ghana has provided technical and logistical

support services to communities to aid their involvement in forest management of the country.

There are other producer organizations like BOPP, TOPP, GREL, and COCOBOD that employ extension as tool for its operations but for the purposes of this study emphasis was placed on four NGO's discussed above mention

2.16.4 Small tree growers/ Farmers

According to Swanson 2008, small scale farmers are individual farmers that grow trees on their small piece of lands with little or no pattern of coverage. For the purposes of this study small holder famers was defined as group of farmers with less than 5 acres of plantations farms often inter-cropped with other food crops. The aims of most farmers are to establish through cultivation and long-term management of trees on marginal agricultural land to cover large enough area to provide goods and services to yield a suitable return on investment. Though such farmers cumulatively larger and mostly difficult farm group in forestry practise coupled with least education and lacked selfconfidence to seek out new information making communication with them more problematic, farmers ought to have the extension advisory services.

Attributes of small scale farmers;

- i. Mostly possess limited knowledge to utilize readily technical and management. Thus they lack cognitive skills necessary to information.
- ii. Have smaller and more marginal land resources often located far away from their settlement.
- iii. They are limited physical and economic resources so turn be "risk averse" in trying new innovations or product.

2.16.5 Large scale tree growers/Farmers

They are developers that establish large scale plantation with the aim of generating interest on their investment. Most of the large-scale commercial developers already have access to FSD staffs who provide technical services within the districts. Also, these developers frequently invite to meet FSD, Research bodies, Communities around and other stakeholders to settle dispute as well as gaining information from these bodies which the

small scale holder lacked. In Ghana, some of these large scale developers includes; Foam Ghana, Nicol Plantations, Mere Plantations, etc. (NFPDP Annual Report, 2013)

2.17 Forestry Extension Practice in other Countries

Kenya's Experience

According to the www.kenyaforestservice.org, medium potential areas such as farm lands and the communal land trusts in the Arid and Semi-Arid Land (ASAL) regions are under the operation of the Forest Extensions Service Division (ESD) of KFS. The main objective of the division is to provide support by creating platform to enable farmers raise trees seedlings in their farms to increase forest resources in the ASALs in order to ease pressure on gazetted forests (KFS, 2011). The activities undertaken by ESD include:

- Providing countrywide extension services;
- Promoting farm forestry and dry land forestry;
- Capacity development of all stakeholders;
- Creating awareness on tree planting and forest conservation;
- linkages between producers of forest products with market and research information on best practices are created; and
- Technical information produced and disseminated.

Table 2.8 summaries some forestry extension programme implement in Kenya. The Kenyan government with some external support has made a series of attempts to rectify land degradation problems through the promotion of local tree planting but has not been much successful as most villagers perceive that such tree planting is just an additional burden without tangible short-term benefits (project Document, 2005 to 2008). JICA is one such external organization that has assisted the Kenyan government to address these challenges. In 1987, JICA decided to work with Kenya Forestry Research Institute (KEFRI) under the Ministry of Environment and Natural Resources to find innovative solutions to nurture/preserve forests and at the same time increase income. Since the launch, JICA and KEFRI have jointly looked for enduring trees/plants practices using appropriate methods and approaches of forestry extension, notable innovation was the application of Farmer Field School (FFS) which was popularly called farmer forestry field school (FFFS); The KEFRI decided not to replicate in other areas of Kenya but also disseminate the social forestry approach with FFFS to other SSA countries facing similar de-forestation issues in semi-arid areas through triangular cooperation.

Farmers who gained knowledge in Farm Forestry based production systems often encountered serious constraints in scaling up their production due to lack of (i) investment capital (ii) opportunities to learn from the experiences of other groups and (iii) the long gestation period for tree based enterprises leading to longer planning and investment horizon. In addition the FFS which benefited from capacity building activities under Intensified Social Forestry Project (ISFP), have consistently indicated their wish to form FFS socio economic networks, focusing on Farm forestry based Micro Enterprises.

Kenya Forest Service (KFS) as an extension service provider is much aware that resource-poor farmers require investment capital to help them break away from the poverty trap and so the need for practical interventions so as to achieve sustainably improved livelihoods of the people in these areas, KFS (2011).

Nepal's Experience

In Nepal, the government owns most of the country's forest land but the management of the resource on daily basis is done by the communities under the provision of the Forest Act of 1993 which gives power and authority communities to manage their local forest area through the creation of Forest User Groups (FUGs) (Dust and Victor (ed.), 2000). Both the Leasehold Forestry (LHF) and Community Forestry (CF) uses participatory forestry development programs within forestry sector (Bhattarai and Dhungana, 2005). The CF constitute social and biophysical element, all the two elements are equally important. Under the biophysical both local knowledge and forestry science effectively use to provide clear understanding of forest management, while the social provides understanding of the relationship between society, resource and institution to it. According to Bhattarai and Dhungana (2005), studies have shown that both of these participatory approaches have not been able to provide the expected benefits to forest users even though it empowers FUG. The composition of FUG: the District Forest Office and the Range Post and the locally elected government organizations such as Village Development Committee (VDC) and District Development Committee (DDC). Under these arrangements, UGs are entitled to 100 percent of the benefits flowing from forests under their protection even though the government owns the land. Forest Department register and motivate UGs and also provide extension work. Operational plan detailing the management area is produced by UG. This plan must follow and agrees to protect practices for forest management and harvesting. Dust and Victor (ed.), (2000) on other hand has also emphasised that the FFMS as an

enviable process encourages the triangular pattern of interactions and development as well as implementing management plans and strategies and resource use for effective forest management.

Summaries forestry extension models implemented in Kenya and Nepal are presented in table 2.7. Kenya's model is similar to the some model implemented in Ghana where extension practises are donor funded. The Nepal's model is different from both Kenya and Ghana. Thus the cooperative model which legal backing from the forest act of 1993.

Table 2.7: Summary of forestry extension practices in Kenya and Nepal

Description	Kenya	Nepal
Implementing Agency	Forest Services Division	Forest User Groups(FUG's)
Division/Programme	Forest Extensions Services Division/ KEFRI/JICA	Leasehold Forestry (LHF) and Community Forestry (CF)
Area of operation	Medium potential areas and on farm lands and in the communal lands trust in the ASAL's regions	Daily management of forest land
Forestry extension Model used	Public model	Cooperative model
Forestry extension approaches	Farmer Forestry Field School	Forest Farmer Management School (FFMS)
Funding	Kenyan government, JICA	User Groups (UG'S)
Legislation/ policy	-	Forest Act of 1993

Source: Author's construct

2.18 Land Tenure

Bruce and Fortmann (1988) state that land tenure systems that do not guarantee continued ownership and control of land are not likely to be conducive for the adoption of long-term practices such as forest plantations. In determining the adoption and long-term maintenance of land reforms technologies, land tenure is considered as a critical factor (Mercer, 2004; Pattanayak *et al.*, 2003). Ehrlich *et al.*, (1987) as stated in Wireko (2011) prove that secure land rights is pivotal in determining whether the benefits of restoration schemes reach intended beneficiaries. Lawson (2013) highlights the challenge encountered in forest management promotion in areas with insecure property rights, and the inhabitants' recognition of growing need to protected community forests by themselves. Until inhabitants have secure right to their land and able to benefit from it, individuals will continue to rush the extraction of resources as early as possible to maximum personal

benefit. As Again, Kurtz (2000) relates renter and owner adoption problems to agroforestry and states that it is difficult to make an investment if the operator is not certain about returns during the period of harvest. Several empirical studies of forest management adoption by Pattanayak *et al.*, (2003) as cited in Wireko reviewed that more secure land tenure always had a positive impact on adoption. However, high rates of deforestation in Ghana's could largely be attributed to unclear land tenure security or the sharing of forest benefits as a result of undocumented rights in traditional areas according to the Rainforest Alliance (Lawson, 2013). In contrast,

Lawson's article present an interesting case in Cameroon, in which traditional leaders have considerable authority and control over their forest resources and so implement their own monitoring activities to weed out illegal loggers and promote conservation to generate greater benefit sharing within customary communities. But (Adesina *et al.*, 2000) as cited in Wireko (2011) also argues that in few cases land tenure is an insignificant predictor of adoption. At the small scale tree growing level, one of the most important institutional arrangements affecting forest plantation development could be land title rights.

2.19 Conceptualised Framework for Forestry Extension Service Delivery

Experience and evidence indicate that extension has returns on investment to technology development and could have high and far reaching effect (Muzari, Gatsi & Muvhunzi, 2012). Most small scale farmers lack formal education to improve yield as well as assessing best market practises and order to forestall this challenges capacity building is critically needed. According to Eicher (2001), an extension is a system that operates within broader confines which includes research and education. This means that extension cannot thrive in isolation and so works perfectly in knowledge triangle. The three pillars that make the knowledge triangle are; Research, Extension and Education. Rivera, Qamar and Van Crowder (2001) further suggested institutionalisation with idea to link the farmer (tree grower). An institutionalisation of the systems demands framework of effective linkage and management. Options of forestry extension have often been anchored on three critical models and these are done institutional framework and reforms. They are; public, private partnership, NGO and cooperative models in all three levels of governance. The operational modalities and approaches as well as secured funds mechanism are equally important. Thus the call for forestry extension management policy to outline institutional framework and modalities for operations. For instances forest plantation unit, FC (the operator, FORIG/other research institutions, and the Universities are urge in the Draft National

Forest Plantation Strategy 2015 to ensure effective transfer of technology and feedbacks to promote the adoption of best practices generated by research. Such policy would provide for the creation of national forestry extension secretariat, regional and district coordinators and extension field officers. The implementation of extension practices has relationship with four concept of development; the concept of technological transfer; human capital /rural livelihood development; sustainable natural resource management and social capital.

The concept of technological transfer introduces farmer to innovative ways of performing task to achieve the needed result over time. The more the extension services are introduced the better the chances of transferring technology. This is because every innovation comes with technology. The human capital /livelihood development concept also impact positively with extension services delivery because the target group is the farmer whose knowledge capacity must be built to improve rural livelihood options. Another output of organizing producer group which is to enhances farmers' ability to fight for/ achieve a common goal. The sustainable natural resource management concept purely looks at the restoration aspect of the environmental cover. Every forestry extension is expected to add more forest cover which must be used sustainably. The figure 2.1 presents conceptualized framework for forestry extension service delivery diagrammatically

To prescribe options of forestry extension for small holders' farmer knowledge on the origin, definition and concept of extension, forestry extension models, approaches and methods, institutional reforms of forestry extension services and development, extension reforms strategy, organisational management and extension framework, various institutions, policy, plans and programmes are required. Some institutions that have potential of implementing forestry extension were also identified. The chapter three focuses on the method used for the study.

KNUST



KNUST

Regional level

Community level

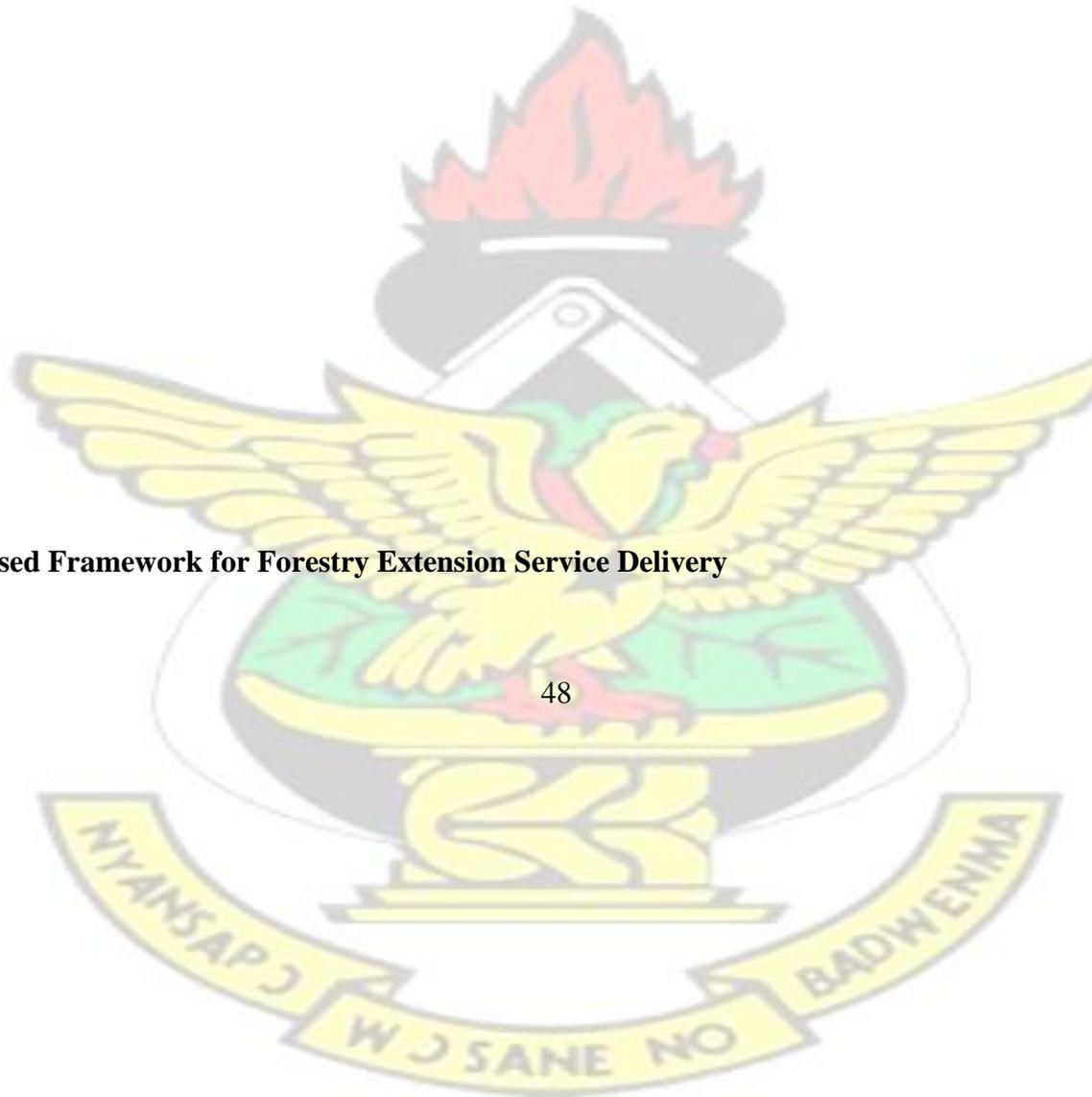


Figure 2.2: Conceptualised Framework for Forestry Extension Service Delivery

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Having provided detailed description theoretical basis for the study, this chapter would focus on logical framework for realizing the research objectives.

3.2 Profile of the Study Areas

Nkoranza Study Area

Nkoranza South Municipal is one of the twenty-seven (27) administrative districts/municipal assemblies in the Brong Ahafo Region of Ghana and located in the middle portion of the Region. It lies within longitudes $1^{\circ}10''\text{W}$ and $1^{\circ}55''\text{W}$ and latitudes $7^{\circ}20''\text{N}$ and $7^{\circ}55''\text{N}$ in the transitional zone of Ghana between the savanna woodland of northern and the forest belt of the south. The municipal has a total land area of $1,100\text{km}^2$ covering about 126 settlements and traditionally headed by one paramount chief. The mean annual rainfall ranging 800-1200mm with bio-modal pattern. The months of March to June are seasons for major rains, minor season is experienced during September to November. Virtually little or no rain are recorded during dry season. The average annual temperature in the municipality is about 26°C . Since farming in the municipality is rain fed agricultural /forestry activities may adversely be affected by the variation in rainfall patterns. The soils in the Municipality are fertile and are suitable for the production of crops and livestock production. Other crops like Cotton and tobacco also grow well in some parts of the Municipality. There are several natural resources in the municipality which provide good potentials for development some of which are being have already been exploited whilst others remain intact. Gold deposits, land, water bodies and clay are among natural resources in the municipality. The slash and burn method of clearing is predominate farming practice in the municipality. This method exposes the soil to erosion which gradually destroys the vegetation changing the ecology of the Municipality (NMMTDP, 2013).

Offinso Study Area

The municipality share borders with the Brong Ahafo Region in the North and West, to the East with Ejura-Sekyere Dumasi District, on the south by Kwabre, Afigya Sekyere, Ahafo Ano South and Atwima Districts. North-Western part of Ashanti Region is the exactly location of the municipality. Longitude $1^{\circ}65\text{W}$ and $1^{\circ}45\text{E}$ and latitude 6.45N and 7.25S are

the coordinates of the municipality. The land area of the district is 1255km². The climate of the municipality is semi-equatorial conventional climate with two rainfall seasons occurring during April to July as major rains and September to Mid-November also experiencing minor rain. The annual rainfall ranging from 1500mm in the north to 1700mm in the south. The municipality has maximum temperature of 30°C during March to April and near monthly temperature of about 27°C with relative humidity reaching its peak of 90% as high during the major rainy season. Moist semi-deciduous forest vegetative interspersed with thick cover dominates the municipality. Wawa, Mahogany, Odum are amongst tree species found in the municipality. The parent materials from which soils developed is called Kumasi-Offin, Adjuemso series which is developed from deep, well-drained and permeable granite. Cultivation of crops such as cassava, yam, maize, legumes, tobacco, food crops and vegetables are supported by this soil. Main economic activity in the municipality is agriculture thus over 70% of the active populations are farmers of which 35% of this number constitutes the youth. The remaining 5% comprises industry (OMMTDP, 2013).

Diaso Study Area

The District is one of the new districts created out of the Upper Denkyira East Municipality and lies within latitude 5° 30” and 6° 02” north of the equator and longitudes 1° W and 2° W of Greenwich Meridian. The common boundaries of the district are to North Babiani-Awhwiaso-Bekwai District to the East Amansie West and Central Districts to the West West Assin Amenfi East and West Districts and lastly to the South Upper Denkyira East Municipality. The total land area of the district is 850sq km representing 3% of the total land area of the Central Region. cultivation of crops like cocoa, food crops (plantain, cassava, maize), oil palm, horticulture, citrus are supported by the good nature of the vegetation and soils properties. The main occupation of the people is agriculture thus providing a major means of poverty alleviation. Thus the cultivation of the above crops generates to income the farmers. Valuable tree species, such as Mahogany, Wawa, Sapele, Odum and Afram prevalent in the district. This is because the district is found in evergreen rain forest area with rich resource such as timber making logging an economic activity that goes on throughout the year. However, there is high ascendency of small scale miners in recent times whose activities need to be regulating to minimize harm they impose to the environment. All the three major economic activities take place in the district; Primary, Manufacturing and Service. However, the agriculture activities far dominate manufacturing

and service activities and thereby creating an imbalance in the local economy. (DDMTDP, 2013).

3.3 Research Design

This research work is an applied research. An applied research seeks to find solution to real life problem requiring an action or policy decision (Adarkwa, lecture notes March, 2014). This study therefore seeks to provide options for forestry extension for small holder farmers in degraded landscape restoration. According to Kincaid (2001), a research design is a plan outlining how information is to be gathered for an assessment, the instruments to be used, how the instruments will be administered, and how the information will be organised and analysed. Gregor (2002) also defined research design as a structure that shows how all the major parts of the research such as the samples, and methods of data collection work together to address the main research questions. Under the study emphasised was on how to ensure that accurate and requisite data collected seeks to fully answer the research questions.

3.4 Sampling Techniques

According to Grandhi (2004), a sample is further defined as a small subset of the population that has been chosen to be studied. Lunsford and Lunsford (1995) however warned that “the sample must be a good representation of the population and have sufficient size. Saunders et. al, (2009) also alluded to the fact that results of the study may be fairly generalised back to the entire population from which the sample was chosen. This means that the selected techniques for the studies must ensure a more representative sample size. For the purpose of this study both random and purposive sampling techniques were employed for the selection of respondents in nine communities of the three study areas as well as the key informants of the institutions involved in the provision of forestry extension services. The sample population were purposively selected to identify those that were engaged in the ITTO project after which random sampling was employed. This was to ensure equal chance of being selected into the sample poll as well as exploring judgment base on knowledge or experience. The desirable sample size for each community was arrived at taking into consideration the proportion of the individuals involved in the ITTO’s project.

3.5 Rationale for selection of Study Area

Three forest districts were selected for the study and they include; Dunkwa, Offinso and

Kintampo. In each of these forest districts three communities engaged in „Piloting Innovative Forest Management Schemes for Off-reserve Areas in Southern Ghana“ which was implemented between November 1996 and June 2000 and supported by International Tropical Timber Organization (ITTO). The intent and purpose for selection of the study areas for the ITTO’s project was based on the result of an off-reserve inventory carried out by the then Planning Branch of the Forestry Department. These were resources poor, medium and rich areas represented by Nkoranza, Offinso and Dunkwa respectively. The selected study areas have varied profile and characteristics. The rationale for using these study areas was purely based on availability of information on ITTO project on extension services delivery in off-reserve plantation development. This is due to the fact that in the implemented ITTO/FD project these study areas serves as demonstration areas where people could go and learn for replication and expansion (Project completion report, 2001). Table 3.1 presents an overview and characteristics of the study sites. Three hundred and nine (309) small holder farmers were involved in the ITTO project. The table also details the specific forest district, study areas, population, sample size, administrative district and eco-zone.

Table 3.1: Characteristics of the study sites

<i>Forest district</i>	<i>Study sites</i>	<i>Population</i>	<i>sample</i>	<i>Administrative district</i>	<i>Eco-zones</i>
Kintampo	Asuano	110	62		
	Donkronkwanta	50	28	Nkoranza Municipal	Dry semi-deciduous (FZ)
	Kyiradeso	45	25		
Total		205	115		
Offinso	Kayera	30	17		
	Samproso	15	8	Offinso Municipal	Moist semi deciduous(NW)
	Anyinasusu	20	11		
Total		65	37		
Dunkwa	Ntom	15	8		
	Bethlehem	15	8	Diaso District Assembly	Moist semi deciduous(SW)
	Amobakar	9	5		
Total		39	22		
GRAND TOTAL		309	174		

Source; Author’s construct

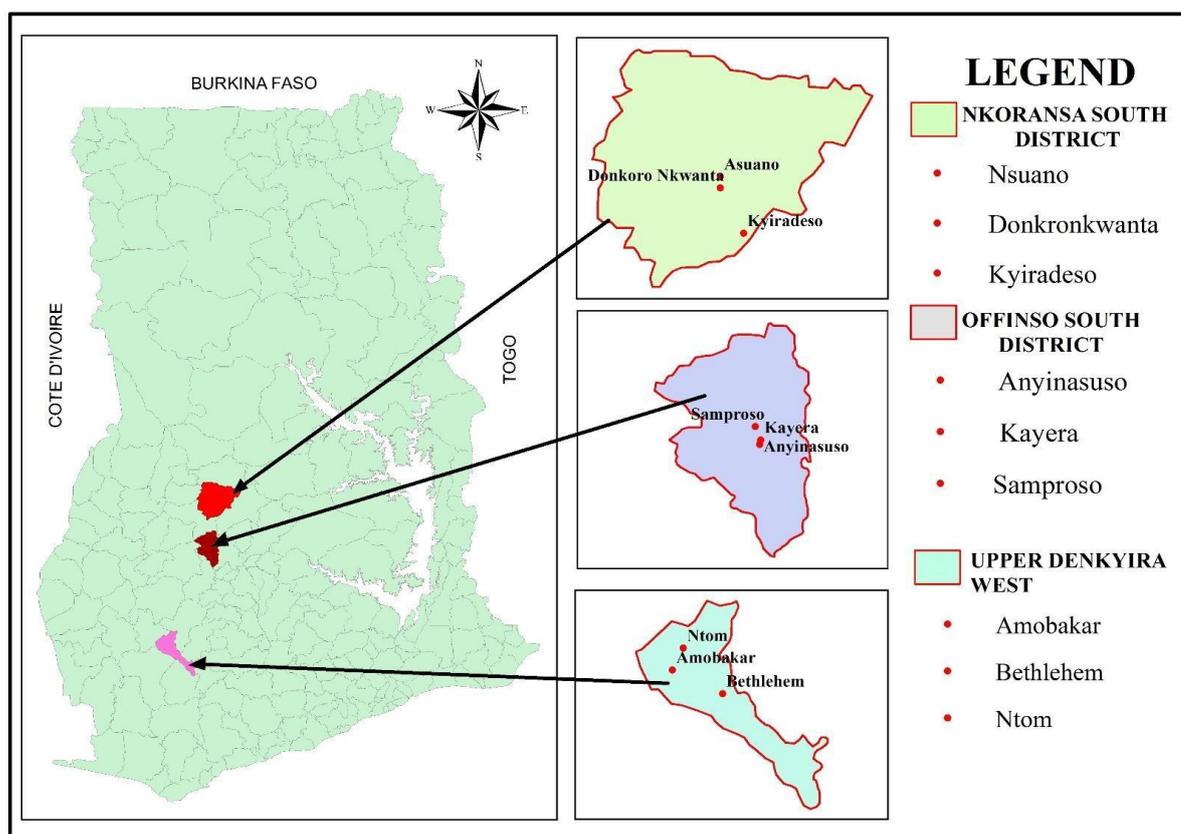


Figure 3.1: Map showing the study area Source:

GIS unit, Dept. of Planning

3.6 Selection of Respondents

Bernard (2002) stated that data collection is crucial in every research as the data is meant to contribute to a better understanding of the research and therefore makes it necessary that in selecting the respondent for obtaining data much consideration would have to observe. The main respondent for the study was the small holder farmers engaged in tree planting/plantations. The key informants to be purposively selected and interviewed includes are; FSD, COCOBOD, MOFA and NGO's. To effectively select the deserving respondents for this studies proper sampling frame was developed. Table 3.2 details the sample frame.

Table 3.2: Sample frame

Unit of analysis	Specific individual/ institutions	Population	Sample size
Individuals/Communities	Smallholder farmers/tree growers	309	174
Private Organizations	APSD, Form Ghana, MIRO	-	3
Institutions	FC	-	6

	COCOBOD	-	6
	MOFA,		6
NGOs	ADRA,		1
	CARE International		1
Total			196

Source; Author's construct

3.7 Determination of Sample Size

The formula for the determination of the sample size was adopted from Miller and Brower (2003) as indicated;

$$n = \frac{N}{1 + N(\alpha)^2}$$

Where

□ n is the sample size, that is number of respondents to be considered □ N is the population (total number of individual in the study areas (309), □ α is the level of significance.

Taking the confidence level at 95% (that is α as 0.05).

$$\begin{aligned} \text{Then } n &= 309 \\ &\frac{309}{1 + 309 (0.05)^2} \\ n &= 174 \end{aligned}$$

The sample size to be used for the Farmer involved in the study is 174. This formula above was used for the study because the study population was relatively small and for “n” to reflect on the study population much larger the sample size was required.

3.8 Data Collection Procedure

The data collection procedure employed in the study was the administration of pre-coded questionnaires and interviews to elicited information from the respondents. The researcher with the help of two field assistant administered the questionnaires. The field assistant were given orientation in two days to expose them to the content of the questionnaires with respect to the objectives of the research and also to demonstrate to them the skills involved in the administration of the questionnaires in order to collect the required data needed for the study. A time table was drawn for each of the communities in which the questionnaires were administered. Respondents in the selected communities were interviewed according to the

time table. As a demand for effective formulation of questionnaire and schedule for the studies, reconnaissance survey and socio-economic survey (Babbie, 1992) was employed. A reconnaissance survey was undertaken on 18th to 20th March, 2015 to familiarize with the respondent and solicit their views on their farm operations and the practise of forestry extension.

The data collection started on the 23rd, April 2015 and ended on 23rd May 2015. Seven days each was used in each of the three study area. The questionnaires and the check list for the farmers involved in ITTO/FD tree planting project and interpreted in the local language to identify respondents to be contacted. The questioning was done face-to-face during the data collection. This was necessary because the respondents though experienced in tree planting were largely illiterates, and also to ensure that the responses came from the respondents themselves. Weisberg, Krosnick & Bowen (1989) states that for questionnaires to be reliable, respondents must answer question the same way each time. The different questionnaires designed for various institutions such as the FSD, MOFA, COCOBOD and the NGO's were self-administered

3.9 Data collection techniques

Observation

Observations were made on the field to establish the effectiveness of the forestry extension provision. The selection of farms was done on random basis. Field observation was gone to get the overview of how farmers manage their farms based on knowledge received as a result of provision of extension services on plantation management. Observation was including choice of species planted, mode of planting, application of silvicultural systems and other activities. Where appropriate sample plots were laid in the plantation stands to determine the stand intensity.

Interviews

An interview, according to Barbie (1975) is a data collection encounter in which one person (interviewer) asks questions of another (interviewee). This is done by telephone or face to face. The type of interview conducted for the study was a face-to-face interview, which was one-on-one. The interview was generally conducted to obtain as much credible information as possible for the study on the challenges and the success of the some implemented projects with forestry extension service delivery component.

Questionnaire

The study explored the use of semi-structured questionnaire as one of the instrument for collection data. A Semi-structured questionnaire is a questionnaire consisting of both open-ended and closed questions (LeCompte, Millroy, & Preissle, (Eds.), 1992). According to Leung, (2001) semi-structured questionnaire facilitates the collection of a wide range of information than a structured questionnaire and can also be used for describing a large sample, making it possible to ask many questions on a given topic. Gillham (2008) stated that questionnaire is a series of questions for the purpose in the form research instrument to gather statistically useful information from respondents. Administering a questionnaire is a valuable method of collecting a wide information from the respondents. However, research can be made valueless if incorrect ordering of questions, inappropriate questions, or bad questionnaire format is used, as the views and opinions of the respondents may not accurately reflected (Bryman, 2001).

The questionnaires were designed based on the following issues;

- Past and existing forestry extension practices.
- Models of extension used and required by stakeholders.
- Institutional requirements, Framework and funding for forestry extension services delivery.

3.10 Data Sources

The study used secondary and primary data source.

3.10.1 Primary source

Primary data will be collected using questionnaire, field observation as well as interviews.

3.10.2 Secondary source

The main source of information for this study was guidelines/manuals used by DAES and CRIG, and operational guidelines for Rural Forestry and Collaborative Resource Management Manual. The study also targeted key literatures on forestry extension practise on the basis their relevance to feasible implementation across the study area, documents on the then Rural Forestry Department, Agroforestry Unit within MOFA, Collaborative Resource Management Unit, Plantations Division, Plantations UNIT, and Role of FSD. Other documents from countries where the tool for community-managed forestry extension

exists, especially in Kenya and Nepal was used as a benchmark for Ghanaian perspective. Other secondary source of information for the provision of various forestry extension services from FAO, MOFA, FC, CRIG TROPENBOS-Ghana, FORIG, CARE international, ADRA, was used especially reports (annual or reviewed), circulars, newsletters.

3.11 Reliability and Validity

The purpose of the study was to gather an accurate data that will help to generate empirical evidence from the study for policy decision in natural resource management and add knowledge to the subject area of forestry extension services delivery in small scale tree planting scheme. For reliability of the work, the researcher made sure that the information obtained from individual farmers through the interviews were cross-checked with project completion reports and other journals relevant for the study.

For errors minimisation, pre-testing of questionnaire was done to remove ambiguity in the questions. This ensured consistency, reliability, validity as well as logical flow in the questions posed and the information obtained from the respondents

Fowler 1993 again stated that Pre-testing of a questionnaire generally means administering a questionnaire to respondents selected from the target population using the procedures that are planned for the main study. This often helps to permanently reduce error.

3.12 Data Analysis

According to McDonald (2009) data analysis is a process performed to extract the required information in diagrams, reports, or tables form from a given set of data. Joliffe (1986) states that most researchers recommend using a computer to help sort and analyse data. The obvious reason for this is to ensure that the data analysed are correct and complete. Cross tabulation was used to evaluate the descriptive statistics- bar charts and pie charts, while STATA 5.0 version was used for the estimation of the Logit regression model specified.

3.13 Empirical Estimation

The Logit Regression Model

Let γ_i , (Binary Dependent Variable), represents the observed response of each sample population (ith observation). Therefore, $\gamma_i = 1$ for options of forestry extension for small holder farmer (γ_i); and $\gamma_i = 0$ for NO forestry extension. Given this above statement; it follows that:

Prob ($\gamma= 1/X$) = $f(X, \beta)$ Prob

($\gamma= 0/X$) = $\{1- f(X, \beta)\}$ f

(X,β) = $X' \beta$

Where X = parameters

β = is the relevant effects

The Linear Probability Model:

$\gamma_i = E(\gamma/X) + \{\gamma - E(\gamma/X)\} = X'\beta + \varepsilon$, where ε represents the random disturbance term.

McFadden (1974), Williams Green (2003).

The Logit regression was used because the dependent variable is a dummy or a binary variable; alternating between zero(0) and one (1), where one (1) takes the level YES and zero (0) takes NO.

The General Models $\gamma_i = f(\text{EST, CITP, EM,}$

TE, EM, FF and EB)

Where f is the functional form of the model. This shows the relationship between the option for forestry extension and the factors influencing the farmer's involvement in small scale tree planting. This is specified as shown in Gujarati Damodar (2003) and H Stock and Watson (2007).

Variables Description γ_i , - options of forestry extension services for small holder farmer is the dependent variable in the model specified.

The choice of variable for this estimation was informed by literature reviewed for the study.

- γ_i , - options of Forestry extension services as a the dependent variable.
- EST =Extension services Type.
- CITP = Challenges in tree planting exercise.
- EM = Extension models.
- EA = Extension approach.
- EM = extension Methods

- **FF** = Farmer Funding extension services
- **EB** = Expected benefits. Specification of the Logit Regression Model

$$\gamma_i = \beta_0 + \beta_1 \text{EST} + \beta_2 \text{CIPT} + \beta_3 \text{EM} + \beta_4 \text{EA} + \beta_5 \text{EM} + \beta_6 \text{FF} + \beta_7 \text{EB} + \epsilon$$

γ_i , the binary dependent variable, is a dummy variable which equals to one (1), if farmers received forestry extension services takes the level “YES” and zero (0) if response if “NO”.

EST = Extension services type, is a dummy variable equal to one (1); if type of forestry extension service takes the level YES and zero (0) if the response is NO.

CIPT= Challenges in tree planting exercise, is a dummy variable equals one (1) if Challenges encountered in land restoration process takes the level YES, and zero (0) otherwise.

EM = Extension models available for farmers to access is a dummy variable equals one (1) it takes the level YES, and zero (0) otherwise.

EA = Extension approach type available for farmers is a dummy variable equals to one (1) if it takes the level YES and zero(0) otherwise.

EM = Extension Methods types for farmers, is a dummy variable equals one (1), if Methods of providing extension services to farmers takes the level YES, and zero(0) otherwise.

FF= Farmer funding mechanisms adopted for extension services is a dummy variable equals one (1), if Methods of providing extension services to farmers takes the level YES, and zero(0) otherwise.

EB = Expected benefits from extension services, is a dummy variable equals one (1), if it takes the level YES, and zero (0) otherwise.

ϵ = Error-term, all other factors influencing the choice/option for forestry extension services but were not included in the estimation of the regression model.

Expected signs of coefficient of the variable in the model

The expected signs of coefficient of the variable in the model (i.e. from β_2 , β_5 to β_7 were positive, implying that the demand for forestry extension framework by farmers improves

with an increase with these variable in three planting activities of the farmers; all things being equal.

However the coefficient of β_1 β_3 and β_4 cannot be determined apriori (can take a negative of positive sign).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and analysis of data obtained from the field. Data was obtained on past and existing forestry extension received, type of forestry extension services practised, success and challenges encountered. Information was also gathered on the forestry extension models, approaches and methods used and preferred by farmers, the duration of services provided and venues used for the delivery of extension services, the land title type used for tree planting, question on who to fund forestry extension services as well as the institution that farmers believe could provide the best forestry extension. For orderly presentation of the analyses, the chapter is divided sub titles based on the specific objectives. The result and analysis of each subtitle were in two main sections, namely descriptive and quantitative (i.e. parametric) analyses.

4.2 Descriptive and Quantitative Analysis

Under parametric analysis, one model was estimated, using the Logit regression estimation: And the coefficients standard errors and P-values reported for analysis.

A positive sign of an estimated coefficient implies that there is the likelihood for the dependent variable to increase, given the fact that the independent variable has increased.

A negative coefficient reduces the likelihood of the dependent variable to increase given that the independent variable has increase.

Past and Existing Forestry Extension Services

Table 4.1: Farmers Participation in the ITTO programme on tree planting

Response	No. of Respondents	Percentage of Respondents
Yes	147	84.5

No	27	15.5
TOTAL	174	100.0

Source: Researcher's Survey Data (2015)

The table 4.1 shows the percentage of responses by farmers who received forestry extension services and those who did not received direct service provided on tree planting programme during ITTO project implementation.

From the table, majority of the farmers interviewed received the extension services from the project which was made up of 84.48% of the respondents while 15.52% of answered „NO“ of the question; meaning though they are in tree planting business but did not receive their extension service from the ITTO project. It may be inferred that the 15.52 % of farmers either learnt from those who participated in the ITTO project implemented or had training from elsewhere. One of the objectives of the original project which was to serve as demonstration area where people could go to learn for replication and expansion and 15.52% be could attribute this anticipated aim at the time. Most of the farmers in „NO“ response said that they collected seedlings from those on the project. However, the 84.48% of farmers responding YES also indicated that though the projected was implemented in about fifteen (15) years ago it had greater impact on them. This is because farmers could recall all the activities they were engaged in.

The signing of coefficient of forestry extension received, (0.529766**) was not determinate apriori, however after estimation it was revealed that the coefficient has a positive sign and was statistically significant at 0.05 significance level, given the P-value of 0.001, which is less than 0.05. The positive coefficient implies that the probability of small holder farmers to adopt for forestry extension services techniques increases, when the individual receives the services compared to when there is no service received, all things being equal.

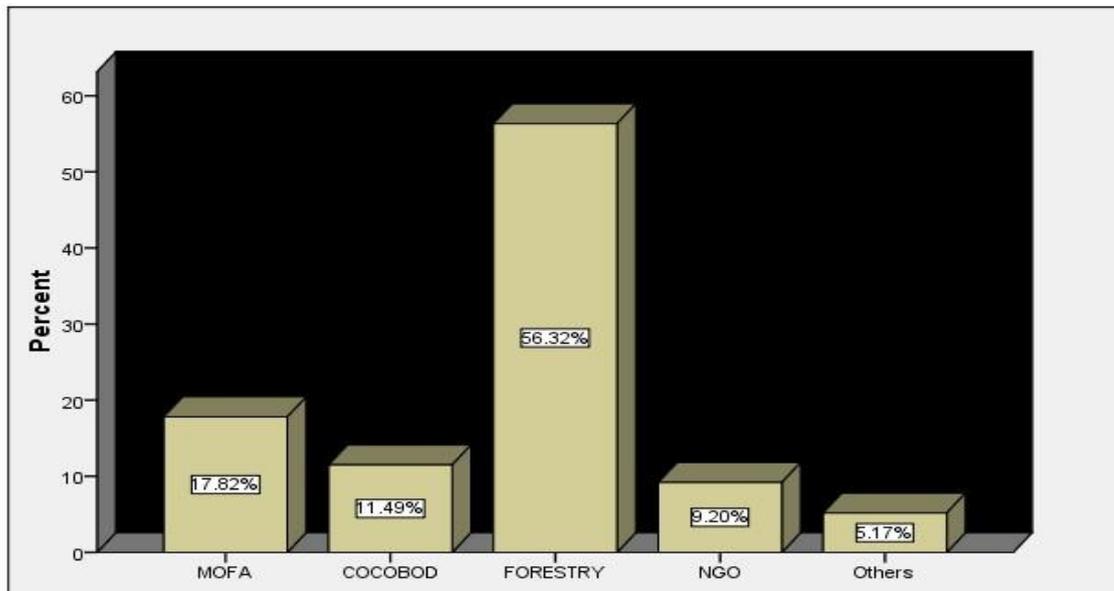


Figure 4.1: The Organizations Providing the Forestry Extension Services

Source: Researcher's Survey Data (2015)

The figure 4.1, illustrates the various organizations that provided the forestry extension services to farmers in the communities sampled. The study revealed that Forestry commission (FC) has been providing major forestry extension service in the sampled communities; thus 56.32% of the sampled population received their extension services from FC. This was followed by MOFA with 17.82%, COCOBOD with 11.49% and NGOs with 9.20%. However, there were others who received extension services from farmergroups, families and friends in the various farming communities; these categories of farmers constituted 5.17%. The funding confirms the constitutional obligation of the Forestry Commission as tree planting institution. This agrees with Asante (1998) which states that the Forestry Department (now Forestry Commission) has the sole mandate and in addition to its direct activities in forest re-planting must function as a channel for providing extension services. The farmers admitted that other sectors like MOFA, COCOBOD, NGOs have also provided some level of forestry-based extension programme which also could mean that the ITTO project either engaged the services of these sectors or the sectors themselves had implemented other projects that had tree- planting components.

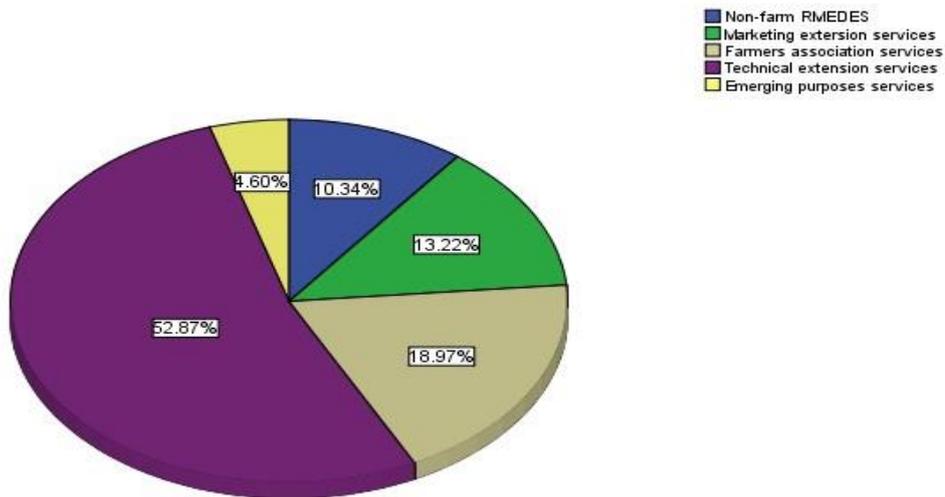


Figure 4.2: Farmers Response on Types of Forestry Extension Services Provided

Source: Researcher's Survey Data (2015)

The figure 4.2 shows farmers responds with respect to the types of forestry extension services they received from service providers. It could be observed that majority of the famers received services on Technical Extension which constituted about 52.87% of the respondents. This was followed by Farmers Association Services/group organisation 18.97%, Marketing Extension Services with 13.22%. Emerging purposes Services had the lowest response with 4.60%, according to the data collected from the farming communities for this study.

The 52.87% of technical extension services delivered indicate the focus of the project. Swanson (2008) stated in most developing countries, extension services emphasis mostly on technological transfer to produce yield high to the detriment of other services like marketing, livelihood development, social capital or organising producer group. But ones the farmers lack knowledge timber trade and could not market their produce to make money; their interest is likely to dwindle towards tree planting. This motive has made most farmers reluctant in pursuing tree planting as a profession and rather looks for other livelihood options to support their existence. Thus farmer are not well benefit.

However the r^2 of 0.5297664 **and** P-value of 0.001 indicates the over concentration of the technical extension services to other extension type on small scale tree planting in offreserve areas which contradict with the work of Rivera Qamer & Crowder (2001) which states that extension as a concept should combine more than two types of forestry extension with mutual emphasis. But the p-value of the result of this study suggests that the project employed mostly technical extension services type.

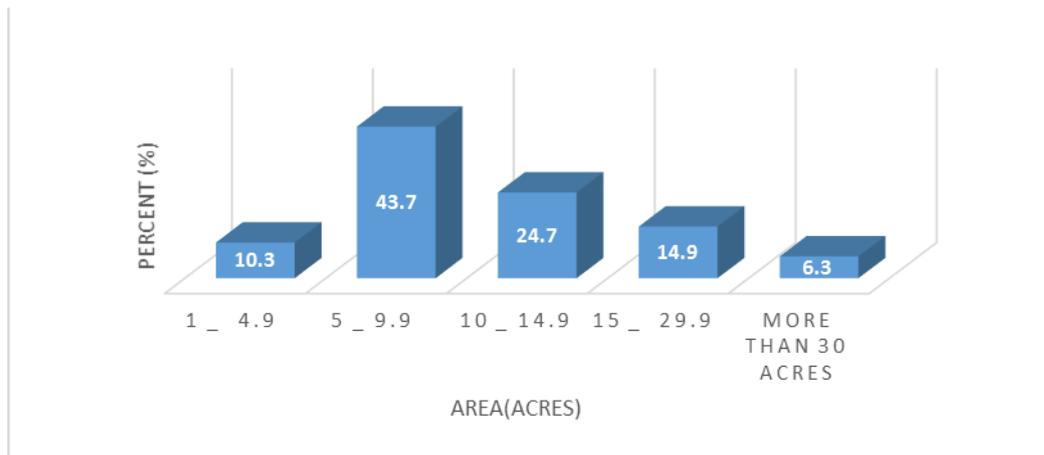


Figure 4.3: Range of Acres established by farmers

Source: Researcher's Survey Data (2015)

The figure 4.3 above shows the responses on number of acres that farmers were able to establish under the programme. It can be observed that 43.7% have been able to establish between 5-10 acres with the support of the programme. This was followed by 24.7% who established between 10-15 acres. Those who established between 15- 30 acres were made up of about 14.9%. Farmers with ability to establish between 1-5 acres constituted 10.3% and more than 30 hectares had 6.3% of the responses. All this were done during the project implementation phase using provision of the forestry extension service. It can also be inferred that one's ability to establish hinges on how large or small the land is, available planting material support, etc.

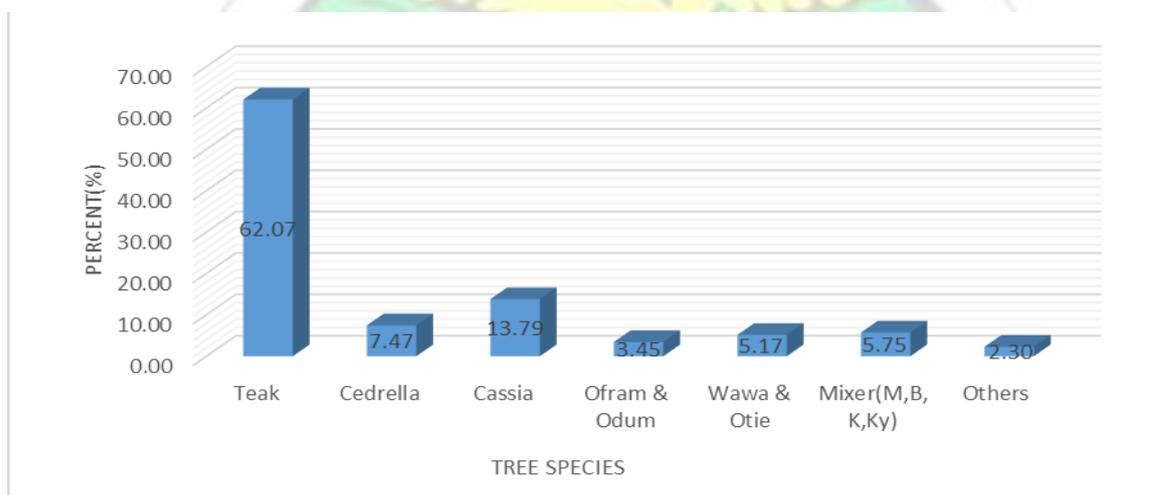


Figure 4.4: Types of Tree Species planted by the Farmers

Source: Researcher's Survey Data (2015)

The figure 4.4 represents the type of tree species planted by the farmers under the ITTO programme in the communities selected. From the study it came up that 62.07% of the

respondents mostly plant teak, this was predominant in two study area, specifically in Nkoranza and Offinso. Cassia with 13.79% followed and Cedrella 7.47%. Some farmers in cocoa growing area preferred two species mixing with others. Those with mixture of species were 5.75 and two species; thus Ofram and Odum with 5.17% and 3.45% for Wawa and Otie respectively. The respondents gave a number of reasons for their choice of species and these have been outline in Table 4.2

Table 4.2: Reasons for Planting a Particular Species Selected

Reasons	Frequency	Percent
Resistance to disease	26	14.9
Boundary maintenance	28	16.1
Income generation	100	57.5
Roofing material	11	6.3
Others	9	5.2
Total	174	100.0

Source: Researcher's Survey Data (2015)

From the responses gathered, Teak had highest respondents of 57.3% from the total. Another major reason given was boundary, this constituted 16.1% of the respondents and 14.94% for disease respondents. Using the species for raw materials and others were cited as some reasons for also selecting species. The roofing and others constituted 6.3% and 5.2% respectively. The majority of the farmers based their selection on the fact that the teak species is fast growing and has high return on investment. This means teak has higher potential for generating income faster than others. The farmers in Diaso study area mainly planted mixture on indigenous on cocoa farm.

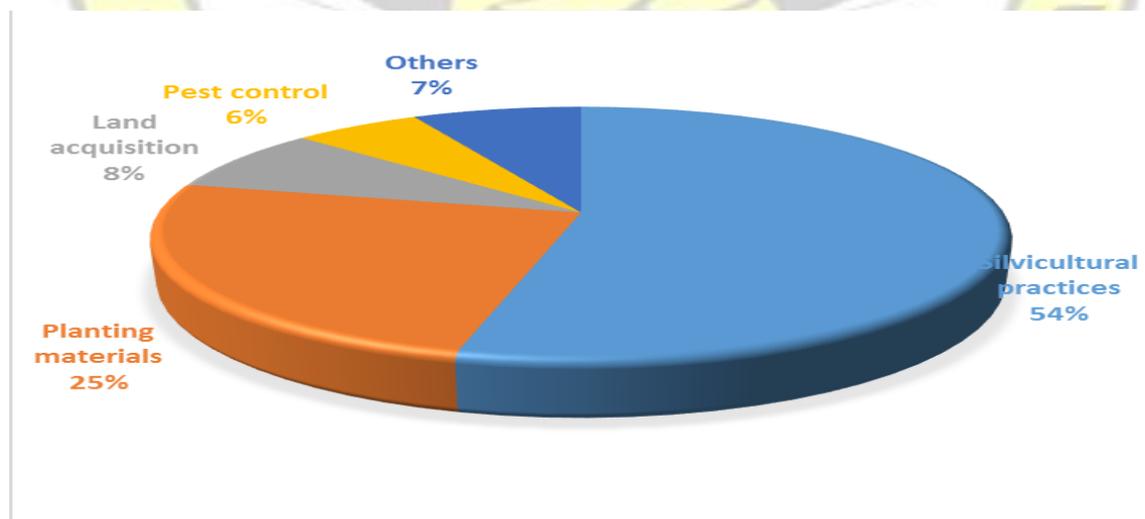


Figure 4.5: Challenges in Tree Planting Exercise *Source:*

Researcher's Survey Data (2015).

The figure 4.5 illustrates the challenges mostly encountered by farmers in the selected districts of the study. From the study it came up that inadequate extension agent providing silvicultural practices constituted the main challenge in the tree planting exercise by the farmers. This constituted about 54% of responses gathered from farmers. The next challenge faced by farmers was planting materials availability; this constituted about 25% of the farmers responses gathered from the communities. Land acquisition and pest control followed with 8.05% and 6% respectively. Other challenges such as little or no provision of livelihood, delays and fluctuation in rainfall also constituted 7%.

The coefficient of silvicultural practices as a challenges in tree planting, (0.330865***) was expected to be positive and this expectation was met and was statistically significant at 0.001 significance level, given the P-value of 0.000, which is less than 0.05. The positive coefficient implies that the probability of farmers to demand for silvicultural practice increase as extension services delivery also increase. Thus farmer would demand forestry extension services to address silvicultural practices needs than any other needs. This finding goes to confirm why the technical extension type was favored to the detriment of other extension type. But a balance for all the extension type has been recommended (River, Qamer & Crowder 2001).

The Forestry Extension Models, Approaches and Methods

Table 4.3: Forestry Extension Model Practices in the Selected Districts

Forestry extension model	Offinso Municipal (n=37)		Diaso district(n=22)		Nkoranza Municipal (n=115)	
	Freq.	%	Freq.	%	Freq.	%
Public	23	62.2	14	63.6	81	50.4
NGO/Project	6	16.2	3	13.6	20	37.4
Hybrid	4	10.8	2	9.1	7	6.1
Cooperatives	3	8.1	2	9.1	4	3.5
Private	1	2.7	1	4.5	3	2.6
Total	37	100	22	100	115	100

Source: Researcher's Survey Data (2015).

The table 4.3 shows the forestry extension models that have been practiced in the selected districts for the study. From the table it can be observed that majority of the farmers have been working with the Public Model. The Public Model constituted 62.2%, 63.6% and

50.4% in Offinso District, Diaso District and Nkroanza District respectively. This was followed by the NGO/Project model which constituted 16.2% in Offinso District, 13.6% in Diaso and 37.4% in Nkroanza District. The Hybrid, Cooperatives, and the private models were less practiced in the selected with 18.8% (Offinso), 9.1%(Diaso), 6,1%(Nkoranza) for hybrid model type and 8.1%(Offinso), 9.1%(Diaso), 3.5%(Nkoranza) for cooperative type and 2.7% (Offinso) 4.5% (Diaso) and 2.6% (Nkoranza) for private respectively.

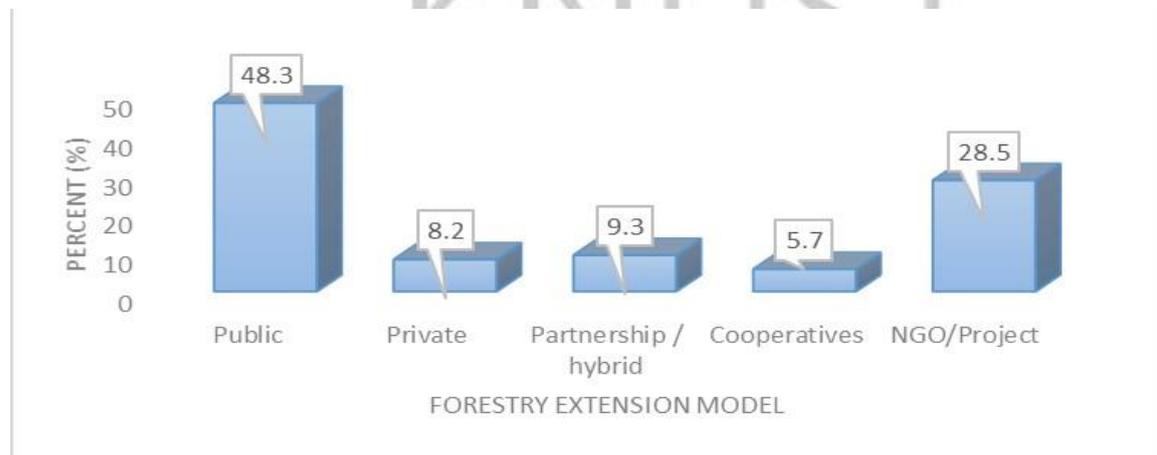


Figure 4.6: Preferred Extension Models by Farmers

Source: Researcher's Survey Data (2015)

The figure 4.6 above shows the responses on preferred forestry extension models. From the sampled population, 48.3% of the respondents agreed that the Public Model is most preferred by famers in tree planting. Next to Public Model was the NGO/ Project Model (28.5%), followed by partnership/ hybrid (9.3%), Private Model (8.2%) and finally Cooperatives (5.7%). The general preference for public led extension shows the role of government in all facet of our development. Tree planting just like agriculture is deemed to have high risk so most corporate entities are not willing to invest giving the government the sole responsibility of performing this task. The 28.5% of some farmers preferring NGO led-extension type is as a result of ADRA Ghana's model in Nkoranza study area. Most famers interviewed were pleased with that system and wants similar approach to be followed. The results of this study do not agree with Samari et. al. (2012) work in Zegros in Iran which stated that the beneficiaries of extension services preferred the cooperatives model as most appropriate model to other model. Harrison et al (2012). also had also suggested that in contemporary forestry extension, there is a distinct swing to private sector model that are more demand –driven, pluristic and interactive. The opinions from the beneficiary suggested a swing to NGO/Project led extension type.

However, the opinions with the key informants; FSD, COCOBOD, MOFA and NGO's agree with Harrison et al. (2012).

The signing of coefficient of forestry extension model, (0.871485*) was indeterminate apriori, however after estimation it was signed positive and was statistically significant at 0.05 significance level, given the P-value of 0.050. The positive coefficient implies that the likelihood of farmers to opt for forestry extension services framework increases, when there is available public led extension models, compared to when there is no improvement in the public led extension models available for farmers.

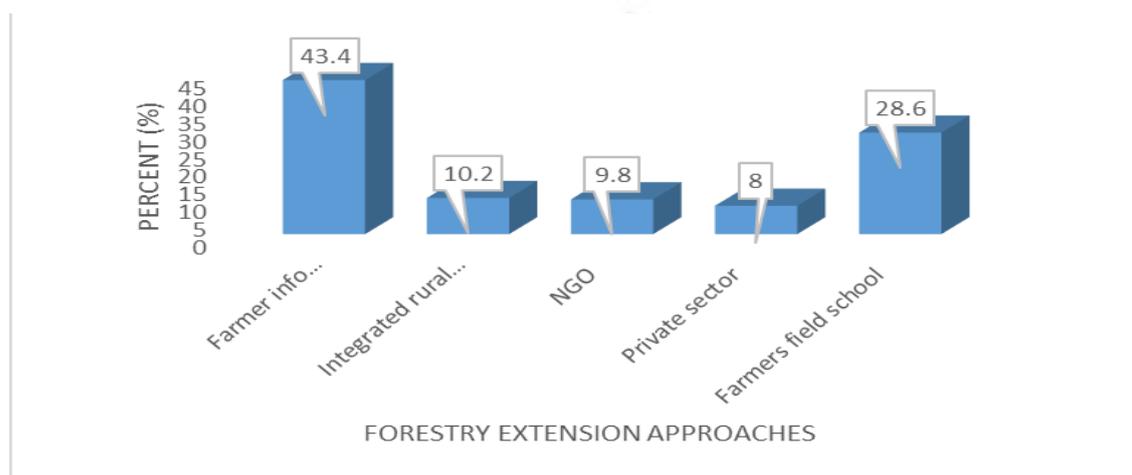


Figure 4.7: Forestry Extension Approaches Received by the Respondents

Source: Researcher's Survey Data (2015).

The figure 4.7 above shows that farmers' response with respect to the forestry extension approaches received. Here, farmer information dissemination programmes topped the chart with 43.4%, followed by farmers field school (FFS) with 28.6%, integrated rural development NGO, and Private sector programmes followed with 10.27%, 9.8%, and 8% respectively according to the data collected from the selected communities. This where information was given to farmers during meeting hours without necessary going to the field to demonstrate to Farmers as it occurs in farmer field school

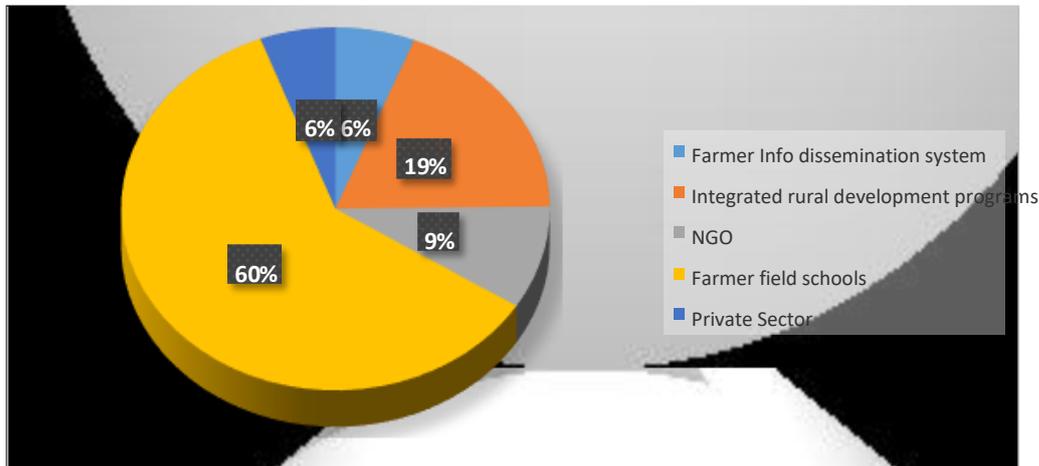


Figure 4.8: Forestry Extension approaches Preferred by Farmers

Source: Researcher's Survey Data (2015)

The figure 4.8 illustrates the extension service approaches that farmers preferred to operate with should the forestry extension framework be strengthened. Here, farmer field school with 60.30% was the most preferred programme by the farmers. Following this was integrated rural development programme with 19% and NGO approach with 9%; farmer information dissemination system approach and the private sector approaches were the lowest on the chart with 6% each according to the data gathered. The view of the farmers corresponds with the FAO 2000 which has adopted farmer field school as outstanding participatory approach. Quison, Feder and Murgai (2000) have also provided an interesting argument on Farmer Field School as an alternative learning or problemsolving approach. They see FFS not as an extension approach for disseminating information, but as an empowerment and citizenship opportunity. Here most of the farmers interviewed believed that the FFS provides platform for ownership and equal participation. This however agrees with Tanako (2001) as cited in Rivera, Qamer and Crowder (2001) one of the objectives of FFS (FFMS in Nepal) is to provide a platform for negotiating among various forest users in the process of determining intended use of community forest to build the sense of ownership. FFS has the tendency to assist farmers to gain/generate the knowledge, critical skills and self-confidence to make decisions about forest management. Farmers often use their own experiments and observations so that forest can sustainably provide them benefits suitable to their livelihood needs (Rivera, Qamar & Crowder). FFS also promote cost efficiency and sustainability relevance (Singh, 2003).

The signing of coefficient of forestry extension approaches (0.446049**) was indeterminate apriori, however after estimation it was signed positive and was statistically

significant at 0.05 significance level, given the P-value of 0.007. The positive coefficient implies the likelihood of farmers to opt for farmer field school increases, when the forestry extension service improves, compared to when there is no improvement in forestry extension for farmers in the tree planting exercise.

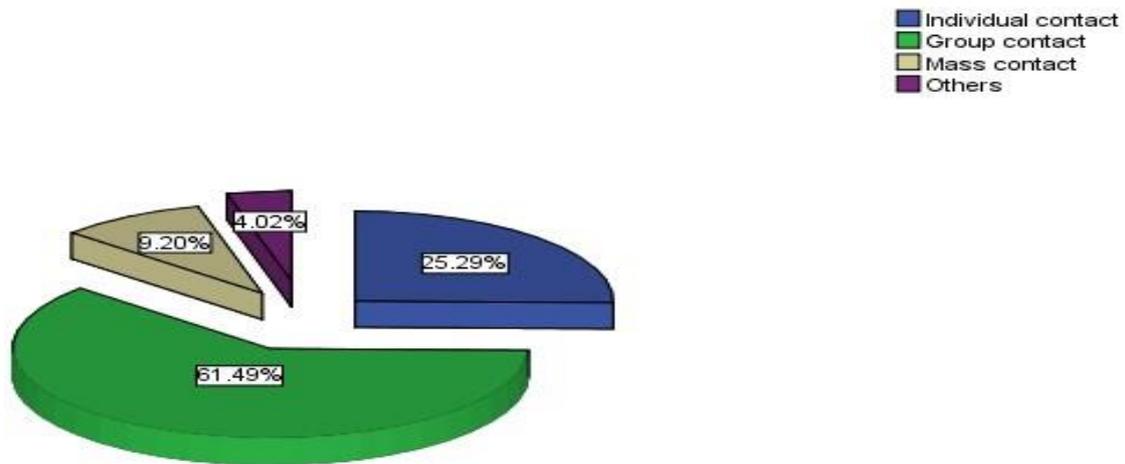


Figure 4.9: Extension Methods preferred by Farmers

Source: Researcher's Survey Data (2015)

The figure above shows farmer's choice of methods to employ in forestry extension approaches. Sim and Hilmi (1987) had recommended that all extension approaches employ various methods to reach out to its clients and they are; Individual, Group and Mass extension methods. Group contact was the most preferred methods farmers will like to recommend to operate with. This topped the chart with 61.49%. This was followed by individual contact with 25.29% of the responses. Mass contact was next with 9.2% and other means which constituted 4.02%. The reason provided by the farmers include; ability to learn from each other, access to clarifications, ability to divide the group into smaller groups for specification, ability to learn from other farmers if absent at meeting time.

Sim and Hilmi (1987) further suggested that none of the methods can be singled out as the best; all of them have their strengths and weaknesses. But the results do agree with this statement because the overwhelming preference of Group contact -61.49% as against Individual - 25.29%, mass contact-9.2% and others -4.02% suggest farmers' preference for Group contact in the study area. This division could be due to the fact that Sim and Hilmi had proposed that the choice of methods depends on various factors such as; the tenure in the area, Community organization, and Resources available. The responds from farmers under studies show commonality in these three factors. Use for recommendations

The coefficient of (0.385880*) was expected to be positive and this expectation was met and was statistically significant at 0.05 significance level, given the P-value of 0.016. The positive coefficient implies that the probability of farmers to opt for group contact method increases, when the extension Services level improves, compared to when there is no improvement in the forestry extension services delivery, all thing being equal. Institutional Requirements and Framework for Extension Service Delivery

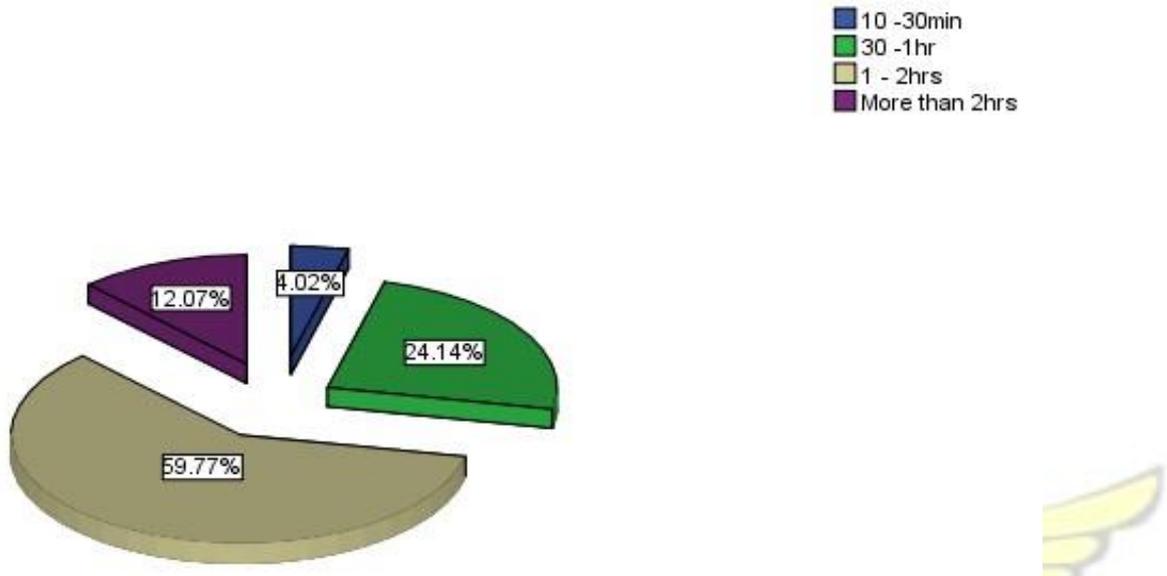


Figure 4.10: Duration for forestry Extension Services Delivery

Source: Researcher's Survey Data (2015)

Figure 4.10, shows the period of time that respondents prefer for the delivery of forestry extension services to farmers. This preference for period of time is as a result of experiences gain from the ITTO project and other projects. Famers believe that duration was critical in the extension delivery because most of them are aged and could not sit for a longer period. The study revealed that, on average a service programme should takes 1- 2 hours to complete a section. This constituted about 59.77% of the total respondents. This was followed by 30min – 1hour programmes which constituted 24.14% and programmes with more than 2 hours taking 12.07%. More than 2 hours programmes have only 4.02% of the total responses from farmers.

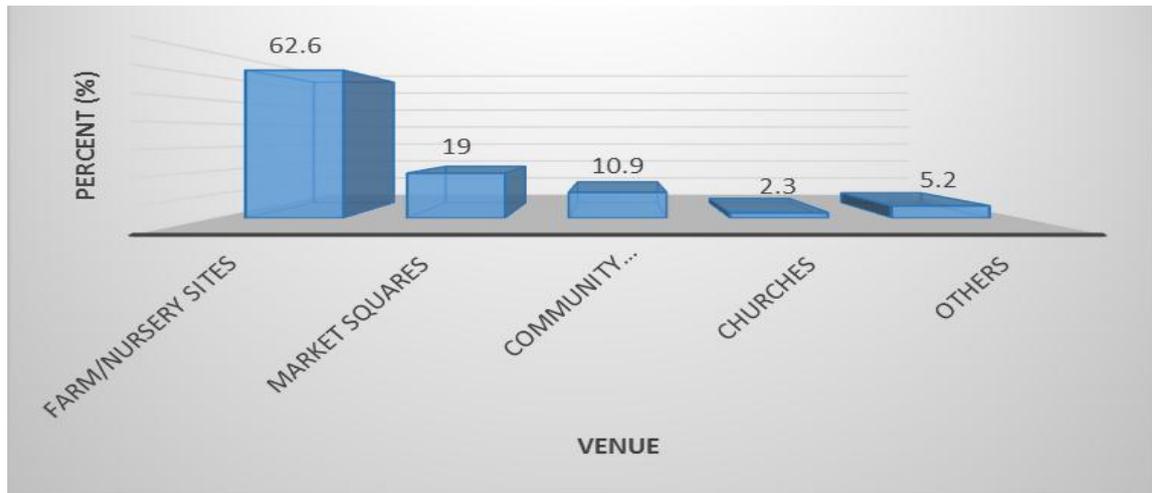


Figure 4.11: Locations for receiving forestry Extension Services *Source: Researcher's Survey Data (2015).*

Figure 4.11 shows various locations for extension meetings. Farmers often converge at a particular venue to receive forestry extension training provided to them by service providers. Here, it can be observed that farm and nursery sites topped the chart with 62.6%. Those venues highlight the farmers' choice for Farmer Field School approach which requires demonstration to enhance clear understanding of issues. The choice of farm/nursery site according to respondents provides opportunity to see for themselves what extension can do to bring change to their life. It also came up that some farmers preferred services to be provided to them at the point of market square (grounds), this medium was the next after nursery sites, with 19%. Next were classrooms and others with 10.9%. The church rooms and other followed with 2.3% and 5.2% respectively. Meeting farmers in church rooms was the least response gathered from the survey conducted. Modern day extension is becoming more of demonstration based than information dissemination approach (Samari et al., 2012).

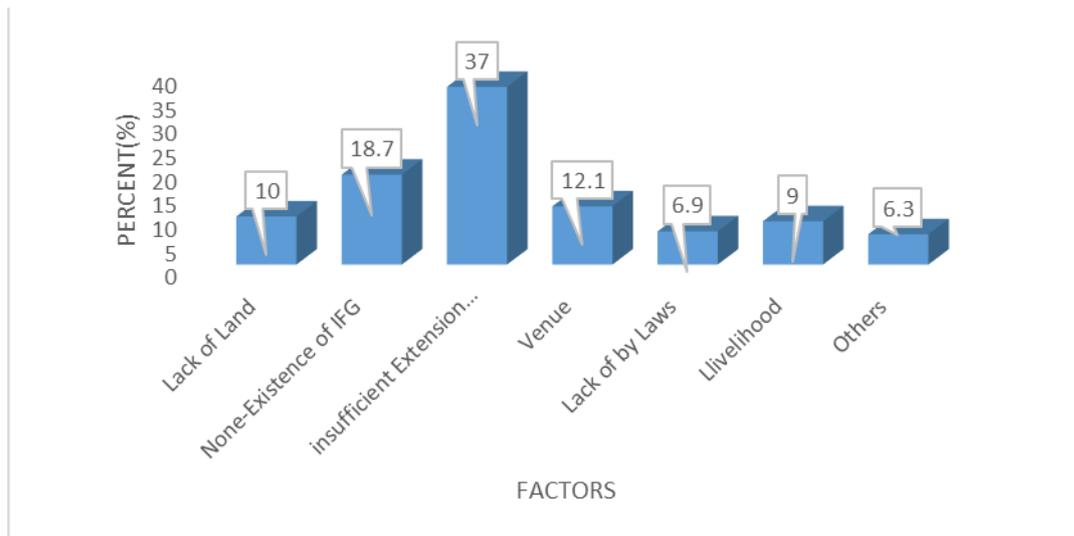


Figure 4.12: Factors Preventing Farmers Access to Extension Services

Source: Researcher's Survey Data (2015)

The figure 4.12 illustrates some of the factors that prevent farmers from accessing forestry extension services in the selected districts for the study. From the data gathered, insufficient extension services delivery as a result of fewer extension officers was a major hindrance for farmers in an attempt to access the services, this constituted 37% of the response gathered from farmers. Most farmers say that during the project implementation phase, some extension services were provided but stopped after the project exit. Since then, FSD has not implemented any formalized extension services unless it is requested on individual basis. The next factor on the list is the inability of the farmers to form identifiable farmer-groups (IFG) in the farming communities; this constituted about 18.7%. Venue for organising group meeting and lack of land followed with 12.1% and 10% respectively. The livelihood (9%) and lack of by-laws (6.9) and others (6.3). The result is interesting looking at the argument put forward by Swanson (2008). He said that public extension model type of extension often faces some challenges some of which includes; difficulty in bringing institutional change; current resources base within public extension agencies; the physical, operational and communications infrastructure and lastly incentives and sanction for rewarding either good or bad performance. Farmers are not able to access forestry extension because of resources available to the extension agencies, including the number of staff and their levels and type of training. The other difficulty in bringing institutional change and incentives and sanction for rewarding either good or bad performance are outside the reach of the farmers.

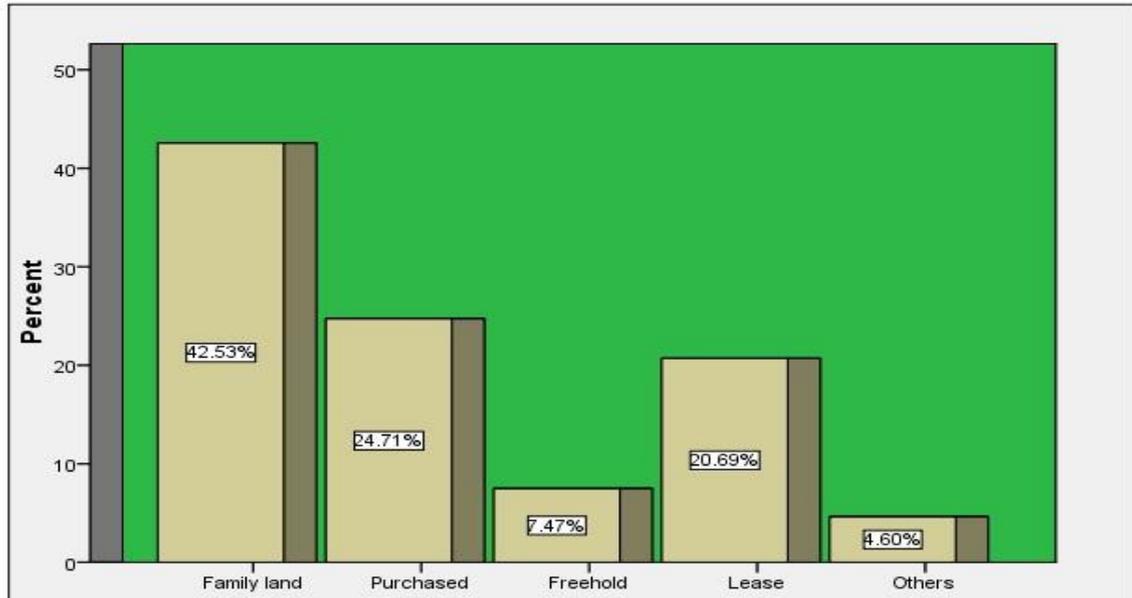


Figure 4.13: Land title type

Source: Researcher’s Survey Data (2015).

Figure 4.13 shows options of land title available to farmers. From the data gathered, it can be observed that most of the farmers used family land for their tree establishment. This category constituted 42.53%; followed by those who purchased the lands this also was made up of 24.71% and 20.69% for those on lease. Freehold constituted 7.47%. According to the information gathered from the various farming communities. Ehrlich *et al.*, (1987) as stated in Wireko 2011 stated that secure land rights is pivotal in determining whether the benefits of restoration schemes reach the intended beneficiaries. The most secured among the four options are outright purchased. Therefore, the result do not agrees fully with Ehrlich *et al.*, (1987) which said that more secure land always had positive impact on adoption. This is because family land, freehold and lease are often possess high risk. Tenure security as a result undocumented rights in traditional areas do not ensure clear sharing of benefits (Lawson 2013).

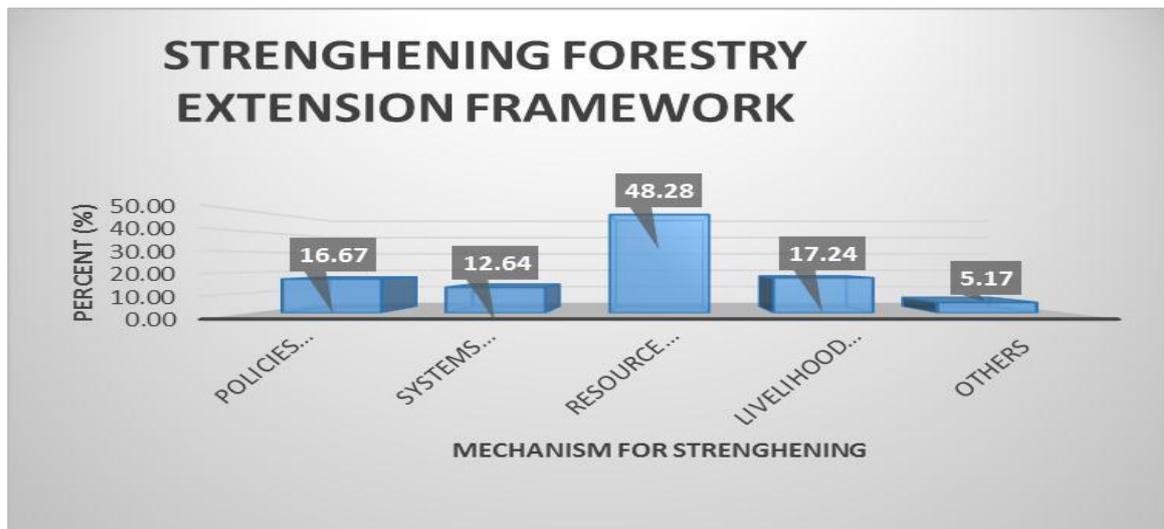


Figure 4.14: Strengthening the Framework for Extension Services.

Source: Researcher's Survey Data (2015).

Because of the long-term consequences on economic growth and short term consequences of improving rural economy; poverty reduction, strengthening forestry extension services through the development extension reform strategies requires attention (Rivera, Qamar & Crowder, 2001). The figure 4.14 shows farmers' response as to how the extension services framework can be strengthened in the various communities for farmers to make the most from the programme. It can be observed that even allocation of resources for farmers was seen as the main procedure to strengthen the services in the communities; this constituted 48.28%. The result goes to confirm that irrespective of Policy formulation, system development, livelihood improvement and other factors, project resource allocation must be central to extension services delivery. There are two schools of thought; either farmer were satisfied with allocation mechanism used during the ITTO project or not happy as a number of the famers also cited the ADRA's method of providing livelihoods including food to sustain the farmers while waiting for the cashew to mature at year three (3). This was followed by livelihood improvement (17.24%) and policy formulation 16.67% systems development had 12.64% from respondents/farmers point of view. The other also accounted for 5.17%. Swanson (2008) had suggested providing enabling legislation and/or regulatory rules that describe the role and define the task to be performed at each level and specify coordination mechanism among different levels as well as system development are important not priority to farmers. The result means that policy issues are not priority of the farmers. Again, the result could also mean that the livelihood provision used was good and may needs few changes to strengthen extension framework.

Table 4.4: Farmers View on Funding Forestry Extension Services.

Response	No. of Respondent	Percentage of respondent
No	31	17.8
Yes	143	82.2
Total	174	100.0

Source: Researcher's Survey Data (2015).

The table 4.4 shows farmers' view on how forestry services should be funded. It came clearly that farmers were not ready to fund the extension services received from service officers/organizations. Here, 82.2% of the respondents were of the view that farmer must not be made to fund extension services received. However, 17.8% were with the view farmers could be made to fund for the forestry extension services they receive. This agrees with Swanson 2008 which among other structures and organizational management suggested that small-scale, subsistence farmers are unable to pay the full cost of these advisory services. However, the result do not support the cost recovery scheme where both government and private organizations are offered the opportunities to charge for provision of extension services to farmers on a fee-based contract.

Moreover, Hanson and Just (2001) also had an interesting view on farmers funding forestry extension. They stated three mechanism; private extension system providing Fee-for-service extension; public extension funding private firms to deliver extension services; Policy-supported private extension schemes. However, the result do not agree with fee-for-service extension provided which runs through the proposed schemes.

Rivera, Qamar & Crowder (2001) had earlier proposed viability in the cost recovery scheme saying that payment need not be based on financial resources alone, but by payment in kind, such as; a portion of the crop produced, thus selling farm-related materials but the overwhelming result of 82.2% indicates farmers' disapproval of the cost recovery scheme.

The coefficient of (0.518824) was expected to be positive and this expectation was met, however, the coefficient was not statistically significant at 0.05 significance level, given the P-value of 0.283, which is greater than 0.05. This implies that there is not enough evidence to support the argument that farmers fund forestry extension services will increase the option for the services provided.

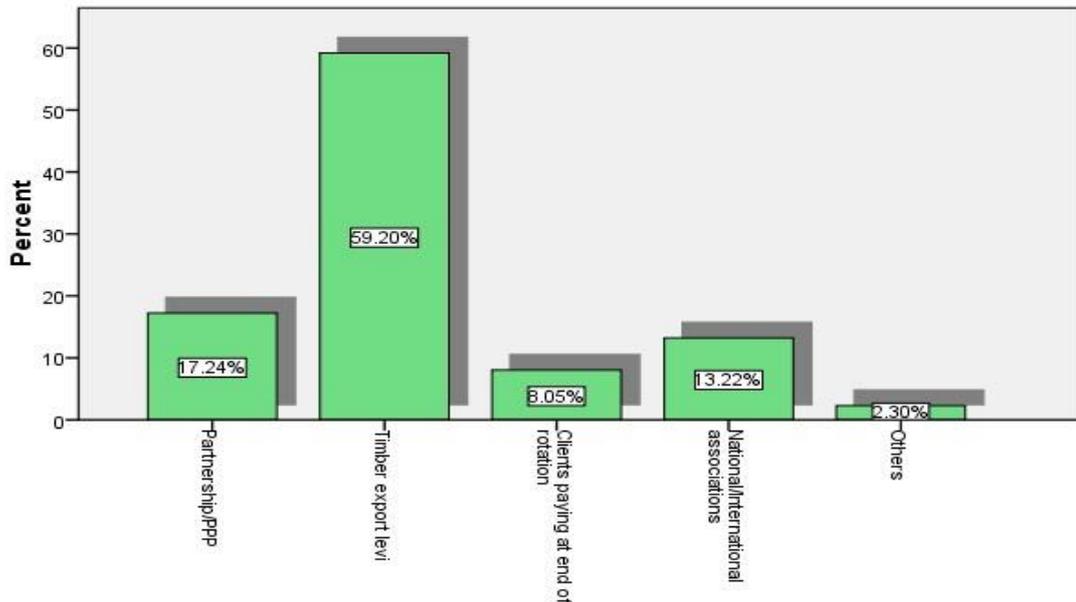


Figure 4.15: Mechanisms for Funding Forestry Extension Services.

Source: Researcher's Survey Data (2015).

The graph represents farmers' responses on the appropriate mechanisms through which the extension services can be funded. From the responses gathered; timber export levy, topped the chart as the most appropriate mechanism to fund the programme. This was made up of 59.20% of the responses, followed by public private partnership with 17.24%. Funding from national and international associations followed with 13.22% and 2.30% for others. The result indicates that government should through levies from Timber export fund Forestry Extension services. This does not agree with FAO (2000) which says that for sustaining the services governments are increasingly transferring their responsibilities and functions to privately led extension services delivery. Rivera, Qamar & Crowder (2001) stated that a country adopting particular strategy should not be seen as exclusive but rather as indicative of the reform being undertaken in that country. Thus a country is not tied to one particular strategy but several different reform directions may be pursued by any one country at a time. This is notably the case in Germany where three distinct extension systems exist side by side. Thus a country is not tied to one particular strategy but several different reforms. This means that the option of forestry extension model is dependent on a particular locality and their experiences in the model.

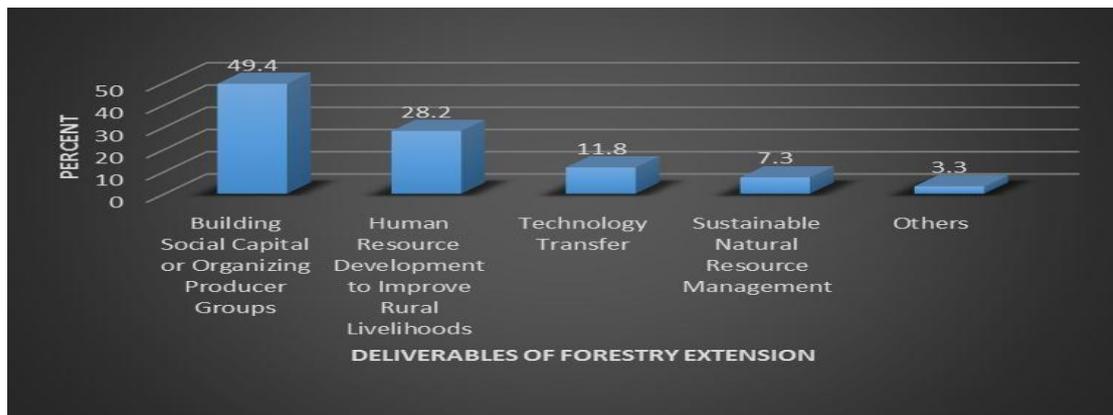


Figure 4.16: Some Expected Benefits From Forestry Extension Services *Source: Researcher's Survey Data (2015).*

The figure above illustrates some benefits that participants of the forestry extension services programme wants to gain. FAO (2003) had said every extension must function to deliver the following deliverables; Technology Transfer; Human Resource Development to improve Rural Livelihoods; Building Social Capital or Organizing Producer Groups and sustainable natural resource management. But the farmers believed that among the four benefits building social capital or organising producer groups“ tops all with 49.4% of the responses gathered. Followed by human resource development to improve rural livelihoods, this category had 28.2%. While technology transfer followed with 11.8%. Sustainable natural resource management and others constituted 7.3% and 3.3 respectively.

This study agrees with this position but thinks that expected deliverables should be in order of preference. The respondents think that building social capital or organising producer groups is the most preferred among the five. The percentage of the result for the sustainable natural resources could mean the forestry extension is seen as rural development driven rather than purely sustainable natural resource management. The low preference for sustainable natural resource management means that forestry extension services if well manage could solve many other processes apart from the intended purposes of sustainable forest management. This trend agrees with Rivera

The coefficient of (1.281079**) was expected to be positive and this expectation was met and was statistically significant at 0.05 significance level, given the P-value of 0.002, which is less than 0.05. The positive coefficient implies that the probability of farmers to opt for organizing producer group or building social capital increases as for forestry extension services also improves. Thus he/she is aware of the expected benefits from the Services

provided, compared to when there is no expectations with respect to the forestry services received, all things being equal.

Table 4.5: Options of Models for forestry extension services delivery

Forestry Extension Model	Diaso/Dunkwa District (n=22)		Offinso Municipal(n=37)		Nkoranza Municipal (n=115)		Average (%)
	Resource Rich		Resource Medium		Resource Poor		
	Freq.	%.	Freq.	%.	Freq.	%.	
Public	10	45.45	11	29.73	23	20.00	31.73
Partnership	5	22.73	11	29.73	28	24.35	25.60
Private	1	4.55	2	5.41	11	9.57	6.51
NGO's	4	18.18	9	24.32	30	26.09	22.86
Cooperatives	1	4.55	2	5.41	12	10.43	6.80
Others	1	4.55	2	5.41	11	9.57	6.51
TOTAL	22	100.0	37	100.00	115	100.00	100.00

Source: Researcher's Survey Data (2015).

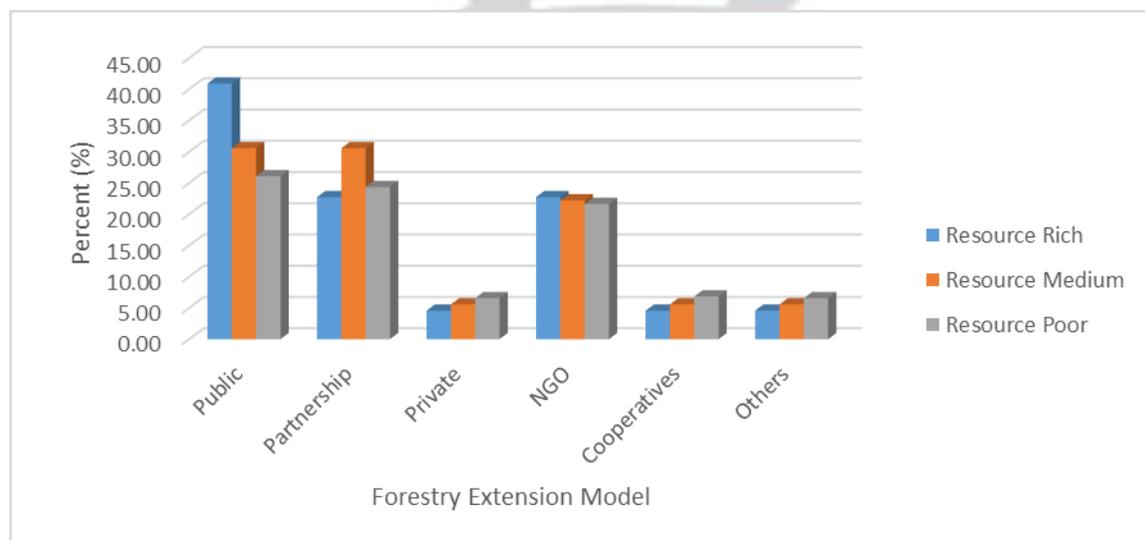


Figure 4.17: Models with respect to resource type Source:

Researcher's Survey Data (2015).

Public extension model

The percentage for overall average preferences for public model extension was 31.73% out of which resource rich areas preferred 45.45%, Resource medium 29.73% and resource poor 20.0%. The result shows that resource poor least prefer public extension. This may be attributed to the fact that most forestry extension programmes are publicly led. Resource rich areas have most extension project from MOFA and COCOBOD and are constantly have better relationship with these public institutions.

Partnership extension model

On partnership/hybrid extension model 25.6% of the total respondent preferred. Resource rich 22.73%, resources medium 29.73%, resource poor 24.35%. An indication that resource medium prefer partnership model compared to others. The least preference at the resource rich may be a result of visible public led extension programmes been implemented. This also goes to show that government often focuses attention or direct on resources dominant areas to the detriment of resource poor areas. Swanson 2008 has advocated for collaboration between public and private in the delivery of extension services he was of the view that many private service providers do not have technically competent staff to deliver technical advice to farmers and so public extension personnel must view private sector as partners and not competitors.

Private extension model

Private sector lead extension model was among the least preferred (6.51%) resource rich (4.55%), resource medium (5.41%) and resource poor (9.57%). This is because the delivery of extension services is based on *Fee-for-service*. Under the model extension could be provided for by either the private or another sector and paid for by the farmers (Anderson & Feder, 2005). Most expert believe that key issue of consideration under this scheme is ensuring that services provided is focus and meets the aspirations of the beneficiaries. It is employed by the commercial plantation developers where group Small groups of commercial farmers usually contract the services. This arrangement allows clientele to “vote” on programs and program scale by paying for them (Hanson& Just, 2001). This model is common in developed countries, such as New Zealand, where forestry extension is completely privatized. Harrison et al (2004) has also suggested that private sector led model appears more viable with commodities that can easily be convert in cash. Though fee-for-service may provide additional sources of revenue to efficient extension, practising the model in the context of small holder farmers is not possible. Hanson and Just (2001) argued that universal paid extension model is not in the public interest and so the optimal is the mixture of public, private, and not the paid extension. Jacobson (1012) suggested that the inclusion for private sector entities to provide education and resources to enhance farmers“ ways of business in tree planting has far reaching effect but the respondent in the area studied thinks otherwise. His view on private inclusion was purely based on securing sustainable funding.

NGO extension Model

Under this model, it is obvious that most respondent in resource poor areas mostly preferred NGO's to all other type of models. Out of the average of preference of 22.86%. 26.09% in the resource poor area preferred NGO type followed by the resource medium (24.41%) and 18.18% for resource rich. The result shows a relationship between resource type and NGO model preference. Thus the poorer the resource dominance the more preferred NGO model of extension. This could also be to the fact NGO's are predominant in resource poor areas and major tool used is extension methods

Cooperative extension model

The average preference for cooperative model is 6.8% which was made up of resource rich (4.55%), resource medium (5.41%) and resource poor (10.43%). The result shows that the cooperatives extension model type is not commonly used in areas where the study was undertaken. However, Nepal on other hand works perfectly with this model type. This may be attributed to the fact that cooperatives resource management is well grounded in the forest act of 1993 which gives power and authority to communities to manage their forest resources on a daily basis even though government owns most of the country forest land. The fewer the respondents believing that cooperatives model type is not ideal may suggest that even though cooperative may looks more sustainable when providing extension services to the small holder farmer.

Models with Specific institutions

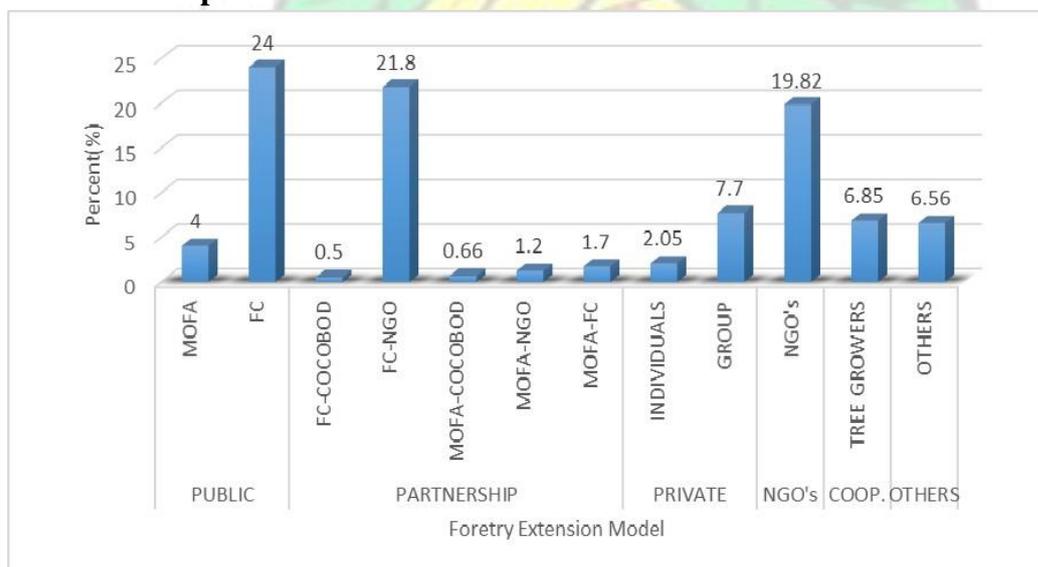


Figure 4.18 Specific institutions for forestry extension Service delivery *Source: Researcher's Survey Data (2015).*

From the above figure, it can be observed that the Forestry Commission (FC) under the public model type was the preferred option by farmers to provide the needed extension services (24%). This means that the farmers were of the view that forestry extension services can best be provided in the country by the public sector organizations through FC. This was followed by partnership model thus combination of FC-NGO with 21.8% and public through NGO with 19.82%. The partnership through FC- COCOBOD and FCMOFA had the least representing 0.5% and 0.66% respectively from the responses gathered. FC topping the preference chart is not surprising and confirms their statutory mandate to manage, regulate the utilization of the country's forest resources. The most interesting observation is the closely related result between the FC, FC – NGO partnership and Purely NGO indicating recognition growing dominance in the delivery of extension services delivery. This trend contradicts proposal by Jacobson (2012) who said in contemporary forestry extension, there is a distinct swing to private sector and approaches that are more user demand-driven and interactive. The 9.75% preference for show farmers dislike for this model. However, Swanson (2008) recommendation seem to support the growing preference for NGO by saying that Private Voluntary Organizations (PVOs) and NGOs should be increasingly involved in all types of rural development programmes because NGOs stay focus and have ability to hire staff with defined task to efficient resources manage.

The expected coefficient sign of (0.307683) was expected to be positive and this expectation was met, however, it was not statistically significant at 0.05 significance level, given the P-value of 0.545, which is greater than 0.05. This implies that there is not enough evidence to support the argument that forestry extension models do not influence forestry extension option for small holder farmers according to the data gathered for this study. Thus there was almost evenly spread preference between FC, FC-NGO and only NGO. This confirms Rivera, Qamar & Crowder (2001) which states that a country association with a one type of strategy should not be seen as static but rather as reform being undertaken by the country. This means a country can implement more than one extension model type model depending on its locality demand driven problems confronted. Germany for instance implement more three distinct type of forestry model.

Overall tests of significance of the models showed that the model estimated was statistically significant. The Model has LR of 0.7661 with p -value of 0.0000. The implication is that the

degree to which the variations in the dependent variable „options of forestry extension services“(γ_i) has been explained by the independent variables . Here, it can be observed that about 77% of the variations in the dependent variable was explained by the independent/explanatory variables. Most of the expected signs of the regression coefficients were met.

4.3 Key findings

- i. All the farmers interviewed has received some level of forestry extension services.
- ii. There was interesting relationship between resource type and the forestry extension model. Public extension and NGO models have inversely relationships towards resource type. The richer the resource type the higher the farmer preference for public extension model but lower preference for NGO type and vice versa.
- iii. Small holder farmers in the study area preferred Public forestry extension model led by FC.
- iv. Farmer has no capacity to fund extension operations.
- v. Farmers preferred levy on timber export to fund extension services- vi. Farmer field school (FFS) is preferred to information dissemination type.
- vii. Silvicultural related challenges were encountered by famers.
- viii. Resources allocation including livelihood provision will forestry extension based ADRA cashew out grower.
- ix. Famer expect building social capital be on top of extension output

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The more information on options of forestry extension services available the better the chances of having effective forest extension services delivery

This study has presented relevant issues on options for forestry extension services delivery for small holder farmers in off-reserve areas. The study reviewed past and existing forestry extension practise as well as determining the alternative for forestry extension practise in

Ghana. Forestry extension as development base strategy is to improve rural economy by investment in education and skill training to enhance wealth oriented behaviour and values in individual.

5.1.1 Past and Existing Forestry Extension Practise

The study has confirmed the project as Piloting Innovative Forest Management Schemes for Off-Reserve Areas in Southern Ghana implemented by Forest Services Division and supported by ITTO project - PD41/95 *Piloting Innovative Forest Management Schemes for Off Reserve Areas in 'Southern Ghana'* which started in November 1996 and ended in June 2000 after a six-month extension period. It was found that 84.5% of 174 respondents received knowledge in plantation establishment through forestry extension. The remaining 15.5% received it not through the project. Institutions that provided the extension services included; Forest Services Division (56.32%), MOFA (17.82%), COCOBOD (11.46%), NGO (9.20%) and others (5.17%). The result shows that MOFA, COCOBOD, and NGO's collaborated with FSD in implementing the project. The extension type provided was mostly technical extension with 52.87% of majority of the farmers establishing farm size of between 5acres to 9.9 acres. Few of them also established between with 10-14.9 and 15-29.9 acres. Between 1-2 hours duration was deemed appropriate for providing extension services.

5.1.2 Expected Benefits from Forestry Extension Services

The farmers sampled sees Capacity building (49.4%) as the critical section that further extension must seek to address. Other section prefer livelihood improvement (28.7%), technological transfer (11.8%), sustainable natural resources management (7.3%) others (3.3%). The respondent believe that their capacity must be built in all the issues concerning tree planting most of which include marketing of final product generate the desired income.

5.1.3 Institutional Requirement and Framework for Forestry Extension Services Delivery

According to the respondents 59.77% of the farmers believe that the duration for receiving extension service should be between 1-2 hours. Though few of them thinks 1030 minutes (4.02%) and 30minute and above 2 hours (12.07%). Some had also wanted 30minute to 1 hour (24.14%).

On Place for meeting, majority 62.6% out of 174 think the good place for receiving services in farm/nursery site to offer opportunity for demonstration. Places outside field should not

use though some section believes places like; market (19%); classroom (10.9%); church grounds (2.3%) and others (5.2%)

37% of the respondent identified unavailable extension services delivery as a result of insufficient extension officers as the factor preventing farmers assessing extension services. This factor was selected in the mix of non-existence of identifiable farmer group (18.2%), inappropriate venues for meeting (12.1%), lack of land (10%), livelihood(9%) non-existence of group bye-laws (6.6.9%) and others (6.3)

The finding indicates that 42.53% of the respondent says the Land title type used for tree planting exercise are family land; purchase land (24.71%); freehold (7.47%); lease (20.69%) and others (4.60%). The preferred family land system has potential to generate risk but it is common system used by farmer.

Most of the farmers believe that extension must come with resource allocation especially providing livelihood for farmers. Farmers are of the view that strengthening extension services calls for a well-structured resource allocation scheme (48.28%) together with livelihood (17.24%), policy formulation (16.67%) systems development (12.64%) and other (5.17)% including; mobilization at local level.

On funding, 82.2% thinks the farmers must not be made to pay for extension services received. Various funding mechanism was considered but 59.20% of the respondents are of the view that forestry extension services must be funded through timber export levy.

17.24% thinks that finding must through partnership/PPP. Whiles 13.22% and 8.05% believes that international bodies and client paying at the end of rotation respectively.

Views with other were 2.30%.

5.1.4 Forestry extension Approaches

On the approaches, the farmer information dissemination with 43.4% was the commonest approach type used by the project. However, 60% of the respondent preferred farmer field school approach to employ for any future extension practise.

5.1.5 Forestry extension methods

For the method to be used for the delivery of extension services, farmers see the group contact method (61.46%) as the commonly desired method in the mix of individual and mass contact methods. This method type was used during the ITTO project and still has relevance.

5.1.6 Options of Forestry Extension Model

Models with resource type

The result show a spread of preference for public, partnership and NGO models even though the overall preferred of forestry extension model was public with 31.73% followed by Partnership (25.60%) and NGO (22.86%). Respondent on other hand had relatively lower preference for cooperatives (6.8%), private (6.51%) and other (5.15%) literature also support a shift towards partnership (Swanson 2008)

Models with specific institutions

On the preferred institutions for delivery forestry extension FC (24%) came on top followed by FC-NGO (21.8%) and only NGO (19.82%) follows in that order. Other institutions like private groups (7.7%), Tree grower (6.85%) and MOFA (4%) lower preference. The result contradicts recommendations by Johnson (2012) which states that partnership between publicly funded but privately delivered forestry extension model.

5.2 Recommendations

- i. Partnership/hybrid model type provided by FC-NGO is recommended. This is because literature says that contemporary forestry extension model is shifting toward partnership model. Additionally NGO,,s employing forestry extension practice in the study area have observable success compared with any other model type.
- ii. FC should organise refresher courses for its field officers especially TO"s and FG"s on forestry extension practice.
- iii. FC led the enact National Forestry Extension Policy (NFEP) to ensure full operationalization of the service.
- iv. Future extension practise should emphasis on marketing extension type to equip farmers on how to trade in timber market.
- v. Because of long rotation of trees, future extension practice should focus on build capacity in sustainable livelihood development.
- vi. FC should collate and update database on small holder farmers.
- vii. FC should consider reviewing timber export levy to support funding forestry extension practice.

- viii. Forest Plantation Development Fund should be review to enable small holder farmers assess the fund. This is because currently only farmers with more than five (2) Ha are eligible to assess the fund.

REFERENCES

- Adarkwa K. K. (2014). Research Methods, Unit 12; Secondary Data Sources and Referencing, Kumasi, Department of Planning, KNUST, Kumasi.
- Anderson, J. & Crowder, L. Van. (2005). The Present and Future of Public Sector Extension in Africa: Contracting out or contracting in? *Public Administration and Development Journal*, 20(5): 573-384.
- Anim-Kwapong, G. (2004). Agroforestry Practice in Ghana: retrieved on July 3rd 2015 from <http://worldagroforestry.org/>
- Asante S. Michael (1998) Deforestation in Ghana: Explaining the Chronic Failure of Forest Preservation in a Developing Country (3rd ed.), University Press of America Inc. Lanhan, Mary land, USA.
- Asare, R. (2004). Agroforestry initiatives in G a look at research and development, A presentation made at the World Cocoa Foundation conference in Brussels April 21 –22, 2004: retrieved on August 25th, 2015 <http://worldagroforestry.org/>
- Axinn, H. G. (1988), Guide on Alternative Extension Approaches, Agriculture Education and Extension Services (ESHE), Human Resources Institutions and Agrarian Reform Division, FAO. Rome.
- Babbie E.R., (1992). Survey Research Methods. Belmont, CA publishers: Wadsworth Belmont, United States.
- Bernard H.R, (2002). Research Methods in Anthropology: Quantitative and qualitative methods. (3rd ed.). Altamira Press, Walnut Creek, California.
- Bhattarai and Dhungana, (2005) How Can Forests Better Serve the Poor? A Review of Documented Knowledge on Leasehold and Community Forestry in Nepal, Kathmandu, Centre for International Forestry Research (CIFOR), Bogor, Indonesia. Sourced on January 3rd, 2015 from <https://cgspace.cgiar.org/>.
- Boon E. and Ahenkan A., and Baduon, B. N. (2009). An Assessment of Forest Resources Policy and Management in Ghana; Conference Proceedings, Impact Assessment and Human Well-Being 29th Annual Conference of the International Association for Impact Assessment, Accra International Conference Center, Accra, Ghana.
- Boone, E. J. (1990) Developing programs in adult education. Prentice-Hall, Purdue University Press, Englewood Cliffs, NJ.

- Bruce A, and L Fortmann, (1988). *Whose Trees? Proprietary dimensions of forestry, Scientific Basic of Alternatives agriculture*, Westview Press, Boulder.
- Bryman A, (2001), *Social Research Methods*, Oxford University Press. NY.
- Christoplos, I. (2010), *Mobilizing the potential of rural and agricultural extension* Rome Office of Knowledge Exchange, Research and Extension; printed by the Global Forum for Rural Advisory Services, FAO, Rome, 4431(43); 58-61.
- Clark G.M and D Cooke, (1992). *A Basic Course in Statistics*, (3rd Ed.) Edward Arnold Publishing, London.
- Davis, K. E. (2008) *Extension in Sub-Saharan Africa: Overview and Assessment of Past and Current Models and Future Prospects*, *International Food Policy Research Institute* Addis Ababa, Ethiopia, 15(3):17-19.
- Diaso District Medium Term Development Plan (DMTDP) (2013). MLGLD, Accra, Ghana.
- Durst P.B. and Victor M. (eds.). 2000. *Decentralization and Devolution of Forest Management in Asia and the Pacific*. RECOFTC Report N.18 and RAP Publication 2000/1. Bangkok, Thailand.
- Eicher, C.K. (2001), *Africa's Unfinished Business: Building Sustainable Agricultural Research Systems*, Michigan, Staff paper 20001-10, Department of Agricultural Economics, Michigan State University, East Lansing.
- Etling, A.W. (1993). *What is Non-Formal Education?* *Journal of Agricultural Education* 34 (4): 72-76.
- FAO (2000) *Community Integrated Pest Management*. Rome: FAO, retrieved on January 20th, 2015 from www.fao.org/forestry/.
- FAO (2001) *Distance Learning: A Framework for the Food and Agriculture*, retrieved on April 10th, 2015 from www.fao.org/forestry/.
- FAO (2005, 2010), *Global Forest Resources Assessment and the State of the World's Forests*, retrieved on June 16th May 2015 from www.fao.org/forestry/fra/.
- FAO. (1987). *Marketing extension services for small farmers*. AGSM, Occasional Paper No.1. Rome: Agricultural Services Division, Marketing and Rural Finance Service. Retrieved on August 7th, 2015 from www.fao.org/forestry/fra/.
- FAO. (1995). *The group promoter's resource book: a practical guide to building rural self-help groups*. Rome: Cooperatives and Other Rural Organizations Group, FAO, retrieved on July 16th, 2015 from www.fao.org/forestry/.
- FAO. (1999) *The Farming Systems Development (FSD) Approach to Improved management of Farm Systems - An FSD handbook for the front-line extension*

worker. Rome: Agricultural Support Systems. Farm Management and Production Economics Service retrieved on May 17th, 2015 from www.fao.org/forestry/fra/.

Forest and Wildlife Policy (2012), Ministry of Land and Natural Resource, Accra.

Forestry Commission, National Forest Plantation Development Programme Annual Report (2012), F C Publications. Sourced on March 25th 2015 from <http://www.fcghana.com/publications>,

Ghana Investment Plan for the Forest Investment Program (FIP), (2012), Ministry of Lands and Natural Resources MLNR Accra.

Gillham B, (2008). Developing a questionnaire (2nd ed.). Continuum International Publishing Group Ltd. London, UK.

GNA (2008). The Success of FORUM Project in Ghana, V/R Regional News, Published on 14 August 2008.

Gregor S, (2002). Design theory in Information Systems. *Australian Journal of Information Systems*, Special Issue, 4(6); 14-22.

Hanson, J. C., & Just, R. E. (2001). The potential for transition to paid extension: Some guiding economic principles. *American Journal of Agricultural Economics* 83(3): 777-784.

Harrison, M., Ssabaganzi, R., Goldman I. and Carnegie J. (2004), Reform of Forestry Advisory Services: *learning from Practice in Uganda in Natural Resource Perspectives*, ODI publisher 93(1); 12

Index Mundus (2014), World's Demographics, sourced on June 16th 2015 from <http://www.indexmundi.com/ghana/area.html>.

Jacobson, M. (2012), Role of Extension in Forestry, (5 ed.), South African Forestry State, University Press, School of Forest Resources, Handbook, Pennsylvania.

Jeakins, P., Sheppard, S.R.J., Bunnell, F.L. & Wells, R. (2006). A framework for sustainable forest management. *BC Journal of Ecosystems and Management* Arrow IFPA Series, 7 (1): 37-49.

Jolliffe F.R, (1986). Survey Design and Analysis. Ellis Horwood Limited, Halsted Press Chichester, New York.

Keefer, P. 1998. An opportunity for public sector reform and private sector development in transition economies. Washington, DC: The World Bank, DECRG. Retrieved on May 16th 2015. from <http://www.worldbank.org/ecspf/final/html/papers/contract.html>

Kenyan Forest service division (2011), Forest Resource Management in Kenya retrieved on June 25 from <http://www.kenyaforests.service.org>.

- Kenyan Forest service division, (2011) Forestry Extension programmes implemented in Kenya, retrieved on December 14th 2015 <http://www.jica.go.jp/kenya/english/office/index.html>.
- Kincaid H, (2001). *Philosophical Foundations of the Social Sciences: Analysing Controversies in Social Research*. Cambridge University Press, Cambridge.
- Krueger R.A, (1994). *Focus Groups: A Practical Guide for Applied Research* (2nd Ed.). California: Sage Publishing, Newbury Park, CA. USA.
- Kurtz W.B, (2000). Economics and policy of agroforestry; An Integrated Science and Practice, North American Agroforestry, *American Society of Agronomy*, Madison, 61(1): 321–360
- Lawson A. (2013) (ed.), Forest Inhabitants Should Have Ownership Rights to Encourage Conservation (2013) in in *Forest News*, CIFOR, sourced on June 19th 2015 www.centerforagroforestry.org/research/
- LeCompte, M. D., Millroy, W.L. and Preissle, J. (Eds.) (1992). *The Handbook of Qualitative Research in Education* CA: Academic Press, San Diego, USA.
- Leung W.C, (2001). How to conduct a survey. *Student British Medical Journal* 9(5): 143–145.
- Mapping of Forest Cover and Carbon Stock in Ghana (2013), Pasco Corporation, Japan in Collaboration with FC-RMSC, CSIR-FORIG and CSIR-SRI. Accra
- Mau P. N., Anh H. V, Khanh D. K. Bich, D. T. N. (2003), *Forestry Extension in Relation with the 5 million Hectare Reforestation Program (5mhrp)*, country case study of Vietnam development of national forest policies & strategies, CMK Publisher, Thailand. Bangkok.
- McDonald J.H. (2009). *Handbook of Biological Statistics* (2nd Ed.). Sparky House Publishing, Baltimore, Maryland.
- Muzari W. Gatsi W. & Muvhunzi S. (2012) the Impacts of Technology Adoption on Smallholder Agricultural Productivity in Sub-Saharan Africa: *A Review Journal of Sustainable Development*; Canadian Center of Science and Education Publishers, 5(8): 17-27
- Narayanan, A. (1991). Enhancing Farmers' Income through Extension Services for Agricultural Marketing; In: W.M. Rivera & D.J. Gustafson (eds.); *Agricultural Extension: Worldwide Institutional Evolution and Forces for Change*; Elsevier Science Publishers, Amsterdam.
- National Forest Plantation Development Programme (2011). *Annual Plantation Report*, FC. Accra.

- National Forest Plantation Strategy (Draft), (2013), Forestry Commission, Accra. Sourced on May 16th 2015 from www.fcghana.com/publications.
- Nketia, K. S. (2014) Functional Forestry Extension: The Missing Link in Promoting Plantation Development. Proceeding paper, First National Forest Conference dated 16th-18th September, 2014. FORIG, Kumasi.
- Nkoranza Municipal Medium Term Development Plan (NMMTDP) (2013) MLGLD, Accra, Ghana.
- Offinso Municipal Medium Term Development (OMTDP), 2013. MLGLD, Accra, Ghana.
- Operations Evaluation Department (OED), (2001). World Bank, Community Forestry in Nepal, Precis 217 Press, Washington DC.
- Osanjo, T. (ed.) (2011). The Role of Economic Cities, Nairobi, United Nation Human Settlement Programme, the Global Urban Economic Dialogue Series, UNHABITAT retrieved on July 20th, 2015 from mirror.unhabitat.org/pmss/.
- Porter, G. 2001. Accountability, Subsidiarity and Diversity. Retrieved on March 5nd 2015 from <http://www.converge.org.nz/pirm/subsidia.htm>.
- Qamar, M.K. 2001. Global Trends in Reforming Extension Services: Implications for Rural Development Education and Training. Paper presented at International Workshop on Technical Training for Rural Development: Looking to the 21st Century, held at Baoding, China.
- Quarterly Reports on Forest Plantation Permits (2014), Resource Management Support Centre, FC, Kumasi- Ghana.
- Quizon J. B., Feder G. & Murgai R. (2004), the Acquisition and Diffusion of Knowledge; *A journal for Training Cases of Pest Management in Farmer Schools*, Indonesia. Vol, 55 (2); 221-243.
- Rasamoelina M. S. (2008); adoption of sustainable forestry practices by non-industrial Private Forest Owners in Virginia, Phd Dissertation Submitted to the Faculty of the Virginia Polytechnic Institute and State, Blacksburg, Virginia retrieved May on 20th 2015 from scholar.lib.vt.edu/theses/available/etd-05232008-135626.
- Rivera W. and Alex G. (ed.) (2003), extension reform for rural development in Operationalizing Reforms in Agricultural Extension in South Asia, discussion paper held from 5 to 8 May 2003 in New Delhi, retrieved on July 17th, 2015 from www.fao.org/forestry.
- Rivera W. M. & Qamar, M. K. & Van Crowder, L. (2001) Agricultural and Rural Extension Worldwide: Options for Institutional Reform in the Developing Countries, Education and Communication Service, *Journal for Research, Extension and Training* Division Sustainable Development Department FAO-UN 4(2); 17-18.

- Rivera W. M. and Qamar M. K. (2003), A New Extension Vision for Food Security; Challenge to Change, Education and Communication Service Sustainable Development Department, Food and Agriculture Organization of the United Nations, FAO Publications, Rome.
- Salmon, O., M. Brunson, and M. Kuhns. (2006) Benefit-based audience segmentation: A tool for identifying Nonindustrial Private Forest (NIPF) owner education needs. *Journal of Forestry* 104 (8): 419-425.
- Samari D. et al (2012) Determining appropriate forestry extension model: Application of AHP in the Zagros area, Iran, *Forest Policy and Economics publication*, 15(4); 91-97.
- Sim, D. & Hilmi, H.A. (1987), Forestry Extension Methods, FAO Forestry Paper 80; 77114, Rome, retrieved on July May 3rd 2015 from www.fao.org/forestry
- Singh, H. H. (2003), Farmer Field School; Users' Perspectives with Agriculture Research and Development, Emerging Issues and Challenges, International Potato Center Publication, Los Banos, Laguna.
- Swanson B. E. & Rajalahti, R. (2010), Agriculture and Rural Development, Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming, and Evaluating Extension Systems, Washington, DC, The International Bank for Reconstruction and Development/The World Bank, Discussion Paper 45, sourced on May 1st from <http://www.fao.org/extension>.
- Swanson B. E. (2008) Global Review of Good Agricultural Extension and Advisory Service Practices, Research and Extension Division Natural Resources Management and Environment Department and Policy Assistance and Resources Mobilization Division Technical Cooperation Department, FAO Rome, retrieved on August May 3rd 2015 from www.fao.org/forestry
- TBI (2012). Unpublished Programme Document between 2012-2016, Tropenbos-Ghana, Kumasi, Ghana.
- U.N. FAO (2013) Forest Statistic and Measurement, retrieved on June 16th 2015 from <http://faostat3.fao.org/>
- Van Crowder, L. (1996), Environmental and sustainable development themes in agricultural extension programmes: a review of FAO case-studies in Training for agriculture and rural development, Rome FAO Economic and Social Development Series (FAO), Extension and Training Div., 54(10) 134-149.
- Weisberg H.F, Krosnick J.A, and Bowen B.D, (1989). An introduction to survey research and data analysis. Glenview, IL: Scott Foresman, retrieved on May 21st 2015 from <https://books.google.com.gh/books>.

Wireko F. (2011) Farmers' Perception of Agroforestry Adoption in the Asunafo South District in the Brong Ahafo Region of Ghana. Msc. Unpublished M.sc. thesis Submitted to Department of Agorforestry, CANR, KNUST, Kumasi.

KNUST



APPENDIX I

Kwame Nkrumah University of Science and Technology College of Architecture and Planning Master of Science in Development Policy and Planning PROJECT TOPIC *Options for forestry extension service delivery in landscape*

Restoration

QUESTIONNAIRE FOR TREE GROWER (Farmer)

Section A; this section assess Past and Existing forestry Extension Practice over the years in the study area. Please indicate with YES or NO the degree of your agreement or disagreement with the following statements by ticking the appropriate number against each question using the scale between zero (0) and one (1) below .

1.1 Do you receive forestry extension services? YES [] =1 NO [] =2 If YES,

from where; i. MOFA [] ii. COCOBOD [] iii. FORESTRY []

iv. NGO [] others.....

1.2 Do you receive different forestry extension services type? YES [] =1 NO [] =2

1.3 What are they;

i. Non-farm rural microenterprise development extension services [] ii.

Marketing extension services [] iii. Farmers' associations services

[] iv. Technical extension services []

v. Emerging purposes services []

How long have you received forestry extension services?

.....

2.1 Do you plant in aches? YES [] =1 NO [] = 2

2.2 Specify aches have you established with a Tick.

Plantations	Size (aches)	Tick
i.	1 – 5	
ii.	5 – 10	
iii.	10 – 15	
iv.	15 – 30	
v.	30 <	

2.3 What type of trees species do you plant? A. Exotic; I. Teak [] ii. Cedrella [] ii.

Cassia []

B. indigenous i. Mahogany [] ii. Mansonia [] iii. Of ram [] IV. Wawa [] v. Bake []

]

2.3 Please give reasons for your choice of

species.....

2.4 What challenges did you encounter in tree planting?

i. Land acquisition ii.

planting materials iii.

silvicultural practises iv.

pest control

v. Others.....

Section B; this section tries to examine the Forestry Extension Models, Approaches and methods used by farmers and the type they would recommend. Please indicate the degree of your agreement or disagreement with the following statements by ticking YES or NO as well as the appropriate box for specification purposes.

3.1 Have you receive any forestry extension model type? YES [] =1 NO [] = 2

3.2 Which of the forestry extension model type have you worked under (tick)

i. Public [] ii. Private [] iii. Partnership/hybrid [] iv. Cooperatives []

v. NGO/Project []

3.3 Which of this forestry extension model would you recommend? (tick)

i. Public [] ii. Private

[] iii. Partnership/hybrid []

iv. Cooperatives []

v. NGO/Project []

3.4 Have you receive any forestry extension approach type? YES [] =1 NO [] = 2

3.5 Which of this extension approach did you received; (tick)

i. Farmer information dissemination system []

ii. Integrated rural development programs [] iii.

NGO [] iv. Private sector []

v. Farmer field schools (FFS) []

3.6 Which of this extension approach would you recommend; (tick)

i. Farmer information dissemination system []

ii. Integrated rural development programs [] iii.

NGO [] iv. Private sector []

v. Farmer field schools (FFS) []

3.7 Have you receive any forestry extension method type? YES []=1 NO [] = 2

3.8 Which of these methods provided in your case.

i. individual contact [] ii.

Group contact [] iii.

Mass contact []

3.9 Which of these methods would you

recommend? iv. individual contact [] v.

Group contact [] vi. Mass

contact []

vii. And why.....

Section C; this section looks at the Institutional Requirements and Framework for the Delivery of Forestry Extension Services and the framework and funding farmers would require. Please indicate the degree of your agreement or disagreement with the following statements by ticking YES or NO as well as the appropriate box for specification purposes.

4.1 At what period do you receive the services? i. Morning [] ii. Afternoon [] 4.2

How long does it take? I.10-30m [], ii. 30-1 hrs [], iii. 1-2hrs [] IV. 2hrs and above []

4.3 Where does it take place.....

4.4 What are the factors that prevent access of the service?

i. Existence of identified farmer groups []

ii. unavailable extension officers (FSD) []

iii. Venues for meeting [] iv. Existence of by-laws []

v. Others []

4.4 How did you acquire your farm land?

i. Family land [] ii.

Purchase/own [] iii.

Freehold [] iv.

Lease []

v. Others (specify) [].....

4.5 Did you encounter problems with your land acquisition? Yes [] = 1 No [] = 2

4.6 What were the problems and how were it solved?
.....

4.7 Can forestry extension services be strengthen Yes [] = 1 No [] = 2

4.8 Through what means?

- i. Policies formulation []
 - ii. Systems development []
 - iii. Resource allocation []
 - iv. Others
-

4.9 Should the tree growers be made to pay for the provision of forestry extension? YES [] =1 NO [] =2

4.10 If yes, Give reasons for your

4.11 If NO which of the under listed funding mechanism would be appropriate.

- i. Partnership (PPP) []
- ii. Timber Export Levy []
- iii. Client paying at the end of rotation []
- iv. National and International Assistance (CDM e.g. REDD+ ...) []
- v. Others [].....

4.12 Do you expect benefit from the services of forestry extension services?

4.13 YES [] = 1 NO [] =2

4.13 What type of forestry extension benefit do you want to receive?

- i. Technology Transfer
- ii. Human Resource Development to Improve Rural Livelihoods
- iii. Building Social Capital or Organizing Producer Groups
- iv. Sustainable Natural Resource Management
- v. Others.....

Section D; specific organisation/institution type under all the three models to determine suitable options applicable in the Ghanaian context

5.1 Can a single or group organisation provide effective forestry extension better? YES [] = 1 NO [] =2

5.2 In your opinion which of these organisations can provide forestry extension?

Public;

MOFA [] COCOBOD [] NGO"s [] FC []

Partnership;

FC- COCOBOD [] FC-NGO [] MOFA - COCOBOD [] MOFA -NGO's []
MOFA -FC []

Private;

NGO [] Tree Growers [] individual [] Group []

Cooperative

Tree Growers []

Others.....

Name of respondent

Contact no (if any).....Date.....

What is your main occupation? Farming

[] Public/Civil servant [] Trading [] Artisan []

Other (specify).....

What is your secondary occupation? Farming [] Public/Civil servant [] Trading []

Artisan [] other (specify).....

APPENDIX II

Table: The logit regression results from the estimated model

VARIABLES	COEFFICIENT	STANDARD ERROR	P-VALUE
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Extension Services Received	0.529766**	0.4237441	0.001
Challenges Encountered In Tree Planting	0.330865***	0.411854	0.000
Forest Extension Models available to farms	0.871485*	0.4450981	0.050
Forestry Extension Approaches	0.446049**	0.4552959	0.007
Forestry Extension Methods	0.385880*	0.4741554	0.016
Farmers funding extension services	0.518824	0.4835192	0.283
Benefits From forestry extension Services	1.281079**	0.40833	0.002
forestry extension models	0.307683	0.5085947	0.545
Pseudo R²	0.7661		

Legend: * p<0.01; **P<0.05; * p<0.001**

Source: Researcher's Survey Data (2015)

The dependent variable, forestry extension framework, is a function of all the explanatory variables (Extension Services type Received, Challenges Encountered in Tree Planting, Available Extension Models, Extension Service Approaches and Methods of Providing Services, Funding Mechanisms Adopted, Benefits from Services and options of forestry extension model).