THE INFLUENCE OF FARMER-TO-FARMER COMMUNICATION ON ACCESS TO AGRICULTURAL EXTENSION SERVICES IN THE GARU-TEMPANE DISTRICT

BY

JAMAL-DEEN IBRAHIM

(10444241)

THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF M.A. AGRICULTURAL EXTENSION DEGREE

AUGUST, 2014

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Declaration

I Jamal-deen Ibrahim do hereby declare that with exception of various forms of assistance and references to literature which have been duly cited and acknowledged, the work presented in this dissertation entitled "Potential of farmer-to-farmer communication to enhance access to agricultural extension services in the Garu-Tempane district" was undertaken by me in the Department of Agricultural Extension, College of Agriculture and Consumer Sciences, University of Ghana, Legon, and that no part has been presented for another degree in the university or elsewhere.

…… ……

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(SUPERVISOR)

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Dedication

I dedicate this work to my sister Hajia Shemima Ibrahim, my wife Issahaku Sahadatu and my son Ezdeen Bachuo Donkor whose inspiration spurred me on in every step to accomplish this study.

Abstract

Information is a key resource for agricultural and rural development. Farmers require agricultural extension services to improve their agricultural productivity. However, this does not appear to happen as agricultural extension is constraint with limited number of agricultural extension agents, inadequate logistics for extension agents and late release of funds for extension activities. To contribute to improving agricultural extension services, this study seeks to determine the influence of farmer-to-farmer communication on access to agricultural information in the Garu-Tempane district of the Upper East Region of Ghana. It employed survey method and primary data was obtained by administering questionnaires to farmers through multi-stage sampling technique of 120 respondents in 10 communities. Using Statistical Package for the Social Sciences (SPSS) (version 20) software for the analysis, Chi-Square test, percentages, frequencies and charts were tools used to generate the results. The study showed that farmers share agricultural information and technologies in their homes, on-farm and group meetings. The study also observed that farmers belong to indigenous community communication networks such as religious groups, farmer groups, kinship groups and cultural groups. Farmers employ one-to-one, group meetings and radio as the main communication channels. The study show 51.7% of respondents visit colleague farmers once in a week and 2.5% of respondents seldom visit colleague farmers for agricultural information. There is general timeliness in technology delivery among farmers; 82.5% of respondents receive crop management technologies timely and 60.0% of respondents received animal health care technologies timely. The study reveals that more women would potentially be reached with extension messages in FtF communication. It is recommended that extension delivery to farmers should adopt strategies of engaging community indigenous communication networks and forming radio listening groups to enhance access to extension services.

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List of Acronyms

ACDEP : Association of Church Development Projects
ADP : Agricultural Development Programmes
ADRA : Adventist Relief Agency
AEAs : Agricultural Extension Agents
AGRA : Alliance for Green Revolution in Africa
AKS : Agricultural Knowledge System
BESSFA : Bawku East Small-scale Farmers Association
CBEAs : Community Based Extension Agents
CBR : Community Based Rehabilitation
CLW : Community Livestock Worker
DAES : Directorate of Agricultural Extension Services
EWV : Extension Women Volunteers
FARA : Forum for Agricultural Research in Africa
FAO : Food and Agricultural Organization
FFS : Farmer Field School
FtF : Farmer-to-Farmer
GLSS : Ghana Living Standard Survey
GSS : Ghana Statistical Service
GTDADU : Garu-Tempane District Agricultural Development Unit
ICT : Information Communication Technology
IFDC : International Fertilizer Development Centre
IFPRI : International Food Policy Research Institute
IPM : Integrated Pest Management
IRY : International Rice Year
MFIs : Micro-Financial Institutions
MOFA : Ministry of Food and Agriculture
NGOs : Non-Governmental Organizations
PAS : Presbyterian Agricultural Station
PBC : Produce Buying Company
PPP : Public Private Partnership
R&D : Research and Development
SARI : Savannah Agricultural Research Institute

SPSS : Statistical Package for Social Sciences

SSA : Sub-Saharan Africa

T & V : Training and Visit

TV : Television

USAID : United State Agency for International Development

VGA : Village Group Animators

WCC : Wienco Cotton Company

ZOVFA : Zuri Organic Vegetable Farmers Association

CHAPTER ONE

INTRODUCTION

1.0. Introduction

This chapter presents background of the study, the problem statement, research questions, research hypothesis and research objectives. The chapter finally concludes by presenting the justification for the study and the study area.

1.1. Background

In Ghana, majority (60%) of the population live in rural areas and depend either directly or indirectly on agriculture for their livelihood and survival. Agriculture plays an important role in economic growth, food security, poverty reduction, livelihoods and rural development (Ghana Statistical Service, 2008). Smallholder agriculture is the main contributor to agricultural production in Africa and vital in increasing food and nutrition security and improving livelihoods.

According to Breisinger, Diao, Thurlow and Al-Hassan (2010), the crop subsector contributed to 75 – 85 percent of agricultural growth between 1991 and 2006. Many smallholder farmers are involved in the production of staple crops and livestock for their livelihood. Many of the smallholder farmers live in rural areas and are often seen as efficient users of resources and their system of farming is classified as subsistent. The purpose of production for these large numbers of smallholder producers is to address their immediate needs of providing food for the household before other interests are considered. Rapid urbanization and rising per-capita income in Ghana are driving increases in demand for and consumption of staple crops. This increase is expected to be filled through increased agricultural production to meet the food needs of the population. Despite the variations in arable land, weather conditions, water and erratic rainfall, Ghana has the

potential to increase agricultural production. Current crop yields are far below potential crop yields. Sustainable change in agricultural productivity requires change in attitude away from the traditional method of production which requires education. Thus the development of human resource through education and training provide an opportunity for economic development and is also necessary for the application of technologies to increase productivity which could be achieved through farmer-to-farmer communication.

Agricultural extension is a very important form of education. Extension has been defined as systems that facilitate the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agribusiness, and other relevant institutions; and assist them to develop their own technical, organizational and management skills and practices (Christoplos, 2010). Agricultural extension services are mainly provided by the state in many countries. Agricultural Extension Agents (AEAs) are usually engaged in delivering extension messages to farmers (Leeuwis and Ban, 2004). Improvement in agricultural production and productivity will depend on the ability and preparedness of farmers to access new technologies. Agricultural extension services provide the enabling environment in ensuring that farmers have access to improved and proven technologies that address their concerns and needs. Agricultural extension contributes to improving the welfare of farmers and other people living in rural areas as extension advisory services strengthen farmer's capacity to innovate by providing access to knowledge and information. According to USAID, 2002 as cited in Directorate of Agricultural Extension Services (2010), the role of extension today goes beyond technology transfer to facilitation; beyond training to learning, and includes assisting farmer groups, dealing with marketing issues, addressing public interest issues in rural areas such as resource

conservation, health, monitoring of food security and agricultural production, food safety, nutrition, family education, and youth development and partnering with a broad range of service providers and other agencies. A major function of extension is to get the farmer into a frame of mind and attitude conducive to acceptance of technological change.

Mahaliyanaarachchi (2003) defined agricultural extension as 'an ongoing, non-formal educational process which occurs over a period of time and it leads to improve the living conditions of farmers and their family members by increasing the profitability of their farming activities. In this activity, to achieve above goals, it expects the improvement of the farmer's knowledge, skills and change of their attitudes in agricultural technology, farming activities and agricultural marketing.' In Ghana, Agricultural Development Programmes (ADP) plays the role of extension and delivery services in the agricultural sector. The problems that emanate from agriculture at grass roots level are identified by Agricultural Extension Agents (AEAs) and then related to the scientists for solutions. Agricultural information is needed for overall development of agriculture for the improvement of living standard of farmers. Communication of information is a major function of extension aimed at the promotion of agricultural development. Farmer-to-Farmer (FtF) communication can enhance the flow of agricultural information which has the potential to increase agricultural productivity of the smallholder farmer. FtF communication in agriculture is utilization of informal communication between farmers to strengthen information flow and enhance agricultural production. Agricultural information creates awareness among farmers about agricultural technologies for adoption. According to Agbamu (2006) information is the first and indispensable step of an adoption process. FtF communication utilizes indigenous channels of communication as friends, relatives, group members and neighbours.

FtF communication plays an important role of reaching more farmers, reduce costs of extension, empower farmers, especially women and enhance technology adoption. FtF communication does not only provide information and advice on cultivation practices, but also in credit sources, source of input supply, post-harvest practices and management, marketing and alternative income generating sources and technologies.

Extension can play a critical role in organizing and developing capacities for farmer innovation, and linking farmers and other actors in the innovation process, including researchers, private companies, Non-Governmental Organizations (NGOs), product and credit markets (Poncet, Kuper and Chiche, 2010). According to the Nairobi Declaration on Agricultural Extension and Advisory Services (2011) as cited in Wellard, Rafanomezana , Nyirenda , Okotel and Subbey (2013) while national funding for agricultural extension and advisory services remains low and variable, renewed national, regional and global interest and commitments provide a momentous opportunity to deliver services that are farmer centred, participatory, well-funded, demand-driven and performance oriented.

Farmer-to-farmer extension places farmers at the centre of knowledge generation and dissemination processes. Farmers' abilities to spread innovation due to their comprehensive local knowledge and location make them potentially better able to communicate with fellow farmers, and at lower cost (Tripp, 2005). Targeting smallholder agricultural systems with new innovations is critical to increase agricultural productivity. It is important to support the needs of smallholder agricultural producers, and entrepreneurs to capture and add value to on-farm, post-harvest and off-farm enterprises. These are needed to assist the smallholder farmer to improve their income and livelihood.

Government agricultural organizations, N.G.Os and Community Based Extension Agents (CBEAs) would play a critical role in providing extension services to farmers.

1.2. Problem statement

The belief that farmers can use improved information to advance their productivity and profitability as well as contribute to higher rates of agricultural and economic growth and poverty reduction is widely held, and has been a key rationale for agricultural extension being an important element of agricultural development strategy for decades (Feder, Jock, Birner and Deininger, 2010).

Many farmers in the Garu-Tempane District are smallholders, who are unable to realize much improvement in their production and livelihood in general. The possible cause of this could be related to low agricultural production. Increased production would enable farmers have access to cash to provide for needs such as food, clothing, housing, education and health care which may influence the livelihood of the farmers. The information needs of smallholder farmers revolve around the resolution of problems such as pest and disease, weed control, moisture insufficiency, soil fertility, farm credit, labour shortage, soil erosion, post-harvest losses and livestock management.

Over the years, deliberate efforts have been made by donors and Ghana government to bring about agricultural development without much success. The minimum success can be attributed to the challenges in delivering agricultural advisory services. As often happens, agricultural information is not integrated with other development programmes to address the numerous related problems that face farmers. Information is an essential ingredient in agricultural development programmes but farmers in the Garu-Tempane District rarely

feel the impact of agricultural innovations probable because they have no access to such vital information or because it is poorly disseminated.

The non-provision of agricultural information is a key factor that has greatly limited agricultural development in developing countries (Ozowa, 1995). Notwithstanding the fact that farmers have the potential to achieve high yields, production levels are still low. The farm sizes are small. There is low use of technologies needed to enhance yields. There is also the problem of low access to extension services. Many farmers are not reached with the technical support required to improve their production. FAO (2004) acknowledged that, on a worldwide scale, the lack of farm-level information on improved rice technologies is a common and critical gap. There are still problems relating to low use of improved seeds, low fertilizer use, poor weed control and poor post-harvest management. The research community has developed technologies with proven ability to improve yields, but little of this potential has been captured by farmers (Giller et al., 2011). In view of this farmers are unable to increase income levels. This intends does not help the farmers to realize any meaningful livelihood outcomes through the agricultural production.

Agricultural extension services should reach farmers on time, in the form and manner that will enable them to use the service to address their farming needs. This seems to be a gap in agricultural extension service delivery in the Garu-Tempane District. It appears the needs and concerns of farmers are not been fully met by extension organizations. The study area is endowed with a number of extension systems. These include Ministry of Food and Agriculture (MOFA), Presbyterian Agricultural Station (PAS), Community Based Rehabilitation (CBR). Other organizations that provide agricultural extension

services in the area include Zuri Organic Vegetable Farmers Association (ZOVFA) and Wienco Cotton Company.

Farmer -to-farmer communication is one of the extension approaches extension organizations adopt in the Garu-Tempane District. These include Community Based Extension Agents (CBEAs), Community Livestock Workers (CLW), Extension Women Volunteers (EWV) and Village Group Animators (VGAs). This agricultural extension approach seeks to complement other extension approaches to satisfy the information needs of the smallholder farmer. Farmer-to-farmer extension is where farmers get information and advice from one another (Kantungi, Edmeades, and Smale, 2006).

In spite of the numerous agricultural extension systems in the study area, access to extension services is still a major challenge. The Directorate of Agricultural Extension of the Ministry of Food and Agriculture (MOFA) is constrained in delivering its agricultural extension mandate. There are some limiting factors and apparent constraints in agricultural extension information dissemination in the Garu-Tempane District, including insufficient number of extension staff, inadequate knowledge of agricultural extension agents, inadequate operational logistics and lack of inter-agency cooperation both in program planning and implementation. The agriculture extension agent-farmer ratio in Ghana stands at 1:3000 (Savannah News, 2012). Ackah-Nyamike and Ajoe (2007) as cited in Saravanan (2008), asserts that limited number of public extension personnel and dwindling budgetary allocation to agricultural and public extension system are among the factors that contribute to poor access to public extension services.

An examination of the factors influencing the practices of community extension will shows that information dissemination is a very important factor in agricultural productivity. Current practices of agricultural extension services seem not coordinated among Ministry of Food and Agriculture (MOFA) and Non-Governmental Organizations providing extension services.

Farmer-to-farmer communication can play a critical role in providing extension services to the smallholder farmer. This approach may be accepted as credible source of information since it comes from among the farmers. Farmer's preference of information sources are based on their perceived credibility and level of control over the source (Boateng, Boateng and Anaglo, 2014). Farmer-to-farmer communication has the potential to bridge information asymmetry gap. According to Bello and Obinne (2012), communication is a process of information flow by which ideas are transferred from a source to a receiver with the intent to change his/her skill. Farmer-to-farmer communication involves agricultural information dissemination among farmers for improved productivity.

The problem of paucity of women extension agents especially in a society where cultural and religious taboos make it impossible for male extension workers to reach women farmers can be curtailed through FtF communication. According to the Forum for Agricultural Research in Africa (FARA, 2012), agricultural research, extension, and education are key drivers of agricultural productivity growth. Inadequate access to agricultural advisory service will mean that farmers do not get relevant and timely information. This will mean that many farmers will continue to produce at the subsistence level. The above problems have necessitated the need to assess the potential of farmer-to-

farmer communication approach to enhance access to agricultural extension services in the Garu-Tempane District.

1.3. Research questions

1. How does farmer-to-farmer communication influence agricultural information flow?
2. How do channels of communication affect farmer-to-farmer communication in the study area?
3. To what extent does farmer-to-farmer communication affect technology transfer?

1.4. Research hypothesis

H_{01} - When farmers communicate among themselves, information flow is effective**.**

H_{02} - There is no difference in the effectiveness of channels of communication in farmer-to-farmer communication.

H_{03} - There is no relationship between farmer-to-farmer communication and technology transfer.

1.5. Research objectives

1. To determine the influence of farmer-to-farmer communication on agricultural information flow.
2. To determine the effectiveness of channels of communication in farmer-to-farmer communication in the study area.
3. To determine the effectiveness of technology transfer in farmer-to-farmer communication.

1.6. Justification for Study

High cost of extension and limited funding for extension activities is a major concern for agricultural development in Ghana. Although there is a large number of agricultural development programmes implemented, success can hardly be seen. Agricultural technologies and extension methodologies are available, the problem is how to reach farmers with these technologies. Given that FtF communication is a cost effective means to disseminate extension technologies to farmers, extension needs to take advantage of this to spread technologies to farmers in rural areas.

In the Garu-Tempane district, the Ministry of Food and Agriculture (MOFA) has only nine (9) Agricultural Extension Agents (AEAs) who are supposed to service twenty four (24) operational areas. MOFA has the technical expertise but has inadequate personnel to cover all farmers in the districts. This makes access to extension services limited. The release of funds for extension has not been the best. The funds released are inadequate to cover cost of extension services considering the vast nature of the district and the large number of people engaged in agriculture. The timing of release of funds is also a major problem. Most of the times the funds come late when the peak for extension activities have elapsed.

External communication channels have a limited range. Television and newspapers are confined largely to the richer, urban households. Even the most common external channels, radio and extension services, fail to contact many people. Indigenous channels have a much wider audience in rural communities, reaching those who cannot read or write. They are crucial for the exchange of information with those people who are out of the reach of external channels. Farmer-to-farmer communication at the community level

can be self-sustaining and stimulate public and private extension services to work more effectively.

FtF communication can play a crucial role in enhancing access to extension services to the smallholder farmer. Information dissemination has become easier due to the common language used in FtF communication. The use of indigenous knowledge to complement the modern technology is another advantage of FtF communication. Farmers in all corners of the district can be reached with agricultural information and technologies. The poorest farmer can be reached without the burden of recurring operational costs which has affected public extension organizations. Recognizing the role of FtF communication can empower farmers to be involved in agricultural information flow and enable farmers to take control of their information needs. In rural areas, the challenge is to increase the quantity and accessibility of information, this FtF communication can fulfil.

A lot of farmer solidarity groups and social networks exist among farmers in the Garu-Tempane district. This suggests a form of informal communication on agriculture going on among farmers. But, there are not enough studies conducted in the Garu-Tempane district context to analyse the effectiveness of FtF communication and its potential to enhance extension services. This study aims to contribute to a better understanding of FtF communication and its effectiveness for the formulation of Agricultural Extension Programmes that can enhance access to extension services by the smallholder farmer.

1.7. Study area

1.7.1. Location and size

The study was carried out in the Garu-Tempane District of the Upper East Region of Ghana. The District is located in the South Eastern corner of the Upper East Region. It

shares boundaries with, Bawku Municipal to the North, Binduri District to the North West, Pusiga District to North East, East Mamprusi District to the South West, Bunkpurugu-Yunyoo District to South East, Bawku West District to the West and the Republic of Togo to the East.

Garu-Tempane is the district capital. The district has an area of 1,230 sqkm and a population density of 99 persons per sqkm. It lays on approximately latitude 10^0 38^1N and 11^0N and longitude 0^0 06^1E and 0^0 23^1E. According to Ghana Statistical Service (GSS, 2012), the population of the district is 130,003 consisting 47.7 per cent male and 52.3 per cent female. The population of the district is primarily rural and scattered in dispersed settlement.

1.7.2 Relief and drainage

The district forms an extension of the Gambaga scarp and is underlain mainly by Birrimian and granite rock formations separated in parts by thinly to moderately bedded sandstones. The relief of the district easily marks the highest point of the Upper East Region. In areas bordering the White Volta and its tributaries the relief is generally low and slightly undulating with heights of 120-150 meters above sea level. The rest of the district consists of a series of plateau surfaces. The average height of the plateau is 400 meters above sea level, but isolated peaks rise beyond 430 meters.

The White Volta and River Oti have their tributaries in the district. The major rivers that are in the district are Tamne, Azimbaas, Baaring and Pawnaba-Kiyinchongo. These rivers have strong irregular seasonal flow patterns. They flow from June to December with peaks in August and September. The district usual experience flooding perhaps due to over flows of the Bagri dam in the Burkina Faso, but due to the good drainage system, the water

recedes within few hours or days in the case of major flooding. The topography of the district is flat with shallow soils.

1.7.3. Geology and soil.

The soils within the district are mainly developed from granite rocks which are shallow and low in soil organic matter content. The three (3) main soil types found in the district are red and brown sandy loam and clays, moderately deep pale brown coarse sandy loams with biotic granites and gray sandy loams and clays in valleys.

1.7.4. Climate and vegetation

Garu-Tempane district is part of the interior continental climatic zone of the country characterized by pronounced dry and wet seasons. There is a uni-modal rainy season from May /June to September/October. The average annual rainfall in the district is between 800-860mm. The lowest mean temperature is 18^0C occurring in December/January and highest mean monthly temperature is 40^0C occurring in March/April.

The vegetation is mainly the Sahel savannah type consisting of scattered drought resistant trees and grasses which often gets burnt during the long dry season. The most common economic trees found within the district are the dawadawa, baobab and the sheatree.

1.7.5. Agriculture

The geological and climatic features of the district support agricultural production. Agriculture is the predominant occupation of the people in the area, 82.5 per cent of the district's population is engaged in agriculture (Garu-Tempane District Assembly, 2013). The major outputs of farmers are maize, early and late millet, sorghum, rice, soybean,

cowpea, groundnuts, sweet potato, frafra potato, watermelon, and livestock such as pigs, cattle, sheep and goats. Poultry especially fowl and guinea fowl production is quite significant. In the dry season crops such as onion, tomatoes, pepper, okro, cabbage and leafy vegetables are produced. The rivers in the district are the major source of water for dry season vegetable production. According to Garu-Tempane District Agricultural Development Unit (GTDADU, 2010), the district has eight (8) dams and four-teen (14) dugouts which serve as source of water for dry season vegetable production and drinking water for animals.

The farming system in the district is characterized by rain-fed agriculture, mixed farming and smallholder based. There average household size in the district is seven (7) persons per household. Farmlands are incorporated into the settlement structures, houses are built far apart from one another creating a dispersed scene for compound farming. Donkeys which are kept by many farmers play an important role in the farming system as they are used as means of transport. With the shallow soil profile in the district, bullock plough is the main equipment used for land preparation. Other agricultural economic activities in the district include livestock trading, rice and soybean processing, pottery, sheabutter extraction, groundnut extraction, dawadawa processing and metal forging and fabrication. The sale of agricultural inputs such as seed, fertilizer, agro-chemicals, agricultural equipment and protective cloths are other agricultural economic activities in the district.

Several extension organizations are operating in the study area. These include the Ministry of Food and Agriculture (MOFA), Presbyterian Agricultural Station (PAS), Community Base Rehabilitation (CBR). Other extension organizations area Bawku East Small Scale Farmers Association (BESSFA) Rural Bank, Zuri Organic Vegetable Farmers Association

(ZOVFA), Savannah Agricultural Research Institute (SARI)-Manga and Wienco Cotton Company (WCC). The main aim of these organizations is to provide extension services to farmers to enhance production and productivity in other to increase incomes and improve the livelihood of the people. Non-governmental organizations through collaboration with extension organizations in the district provide services to farmers. Such non-governmental organizations include Care International, Technoserve, USAID ADANVCE, International Fertilizer Development Centre (IFDC), Alliance for Green Revolution in Africa (AGRA), Association of Church Development Projects (ACDEP) and World Vision International.

1.8. Summary of introduction

The study was carried out in the Garu-Tempane District of the Upper East Region of Ghana. This chapter concludes by presenting background of the study, the problem statement and justification for the study.

Smallholder agriculture is the main contributor to agricultural production in Africa and vital in increasing food and nutrition security and improving livelihoods. Many smallholder farmers are involved in the production of staple crops and livestock for their livelihood. Current crop yields are far below potential crop yields. Sustainable change in agricultural productivity requires change in attitude away from the traditional method of production which requires education.

Many farmers in the Garu-Tempane District are smallholders, who are unable to realize much improvement in their production and livelihood in general. The low agricultural production can be attributed to the challenges in delivering agricultural advisory services. The farm sizes are small. There is low use of technologies needed to enhance yields. There

are still problems relating to low use of improved seeds, low fertilizer use, poor weed control and poor post-harvest management. There are some constraints in agricultural extension information dissemination in the Garu-Tempane District, including insufficient number of extension staff, inadequate knowledge of agricultural extension agents, inadequate operational logistics and lack of inter-agency cooperation and the problem of paucity of women extension agents.

Agricultural technologies and extension methodologies are available, the problem is how to reach farmers with these technologies. Farmer-to-Farmer (FtF) communication which places farmers at the centre of information dissemination can enhance the flow of agricultural information which has the potential to increase agricultural productivity of the smallholder farmer.

The geological and climatic features of the district support agricultural production. Agriculture is the predominant occupation of the people in the area. The major outputs of farmers are maize, early and late millet, sorghum, rice, soybean, cowpea, groundnuts, sweet potato, frafra potato, watermelon, onion, tomatoes, pepper, okro, livestock such as pigs, cattle, sheep and goats and poultry especially fowl and guinea fowl.

The succeeding chapter deals with review of pertinent literature of farmer-to-farmer communication.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.0. Introduction

This chapter reviews existing literature on farmer-to-farmer agricultural extension communication approach. It discusses the conceptual framework and theory of the study, meaning and importance of agricultural extension to the smallholder farmer, role of agricultural extension, agricultural extension approaches, gender and access to extension services, farmer-to-farmer communication, cost of agricultural extension and private sector and product buying companies in service delivery.

2.1. Theoretical perspective

The study is backed by an information theory of homophily. Farmers have the tendency to homophily, the desire to communicate with people who are similar to them. There are several factors that account for this behaviour. This includes kinship, economic status, type of crop and livestock, membership of community network and socio-demographic characteristics such as age, sex and educational background. This is based on the notion that if farmers share certain background, information flow is easier among them. According to Rogers and Shoemaker (1971) as cited in Mccroskey, Richmond and Daly (2006) one of the most basic principles of interpersonal communication is that source-receiver similarity increases the likelihood of communication attempts and promotes communication effectiveness.

2.2. Conceptual framework

The conceptual framework described here focuses specifically on the potential of Farmer-to-Farmer extension approach in engaging and facilitating farmers' access to agricultural extension services. Conceptual framework explains, either graphically or in narrative, the

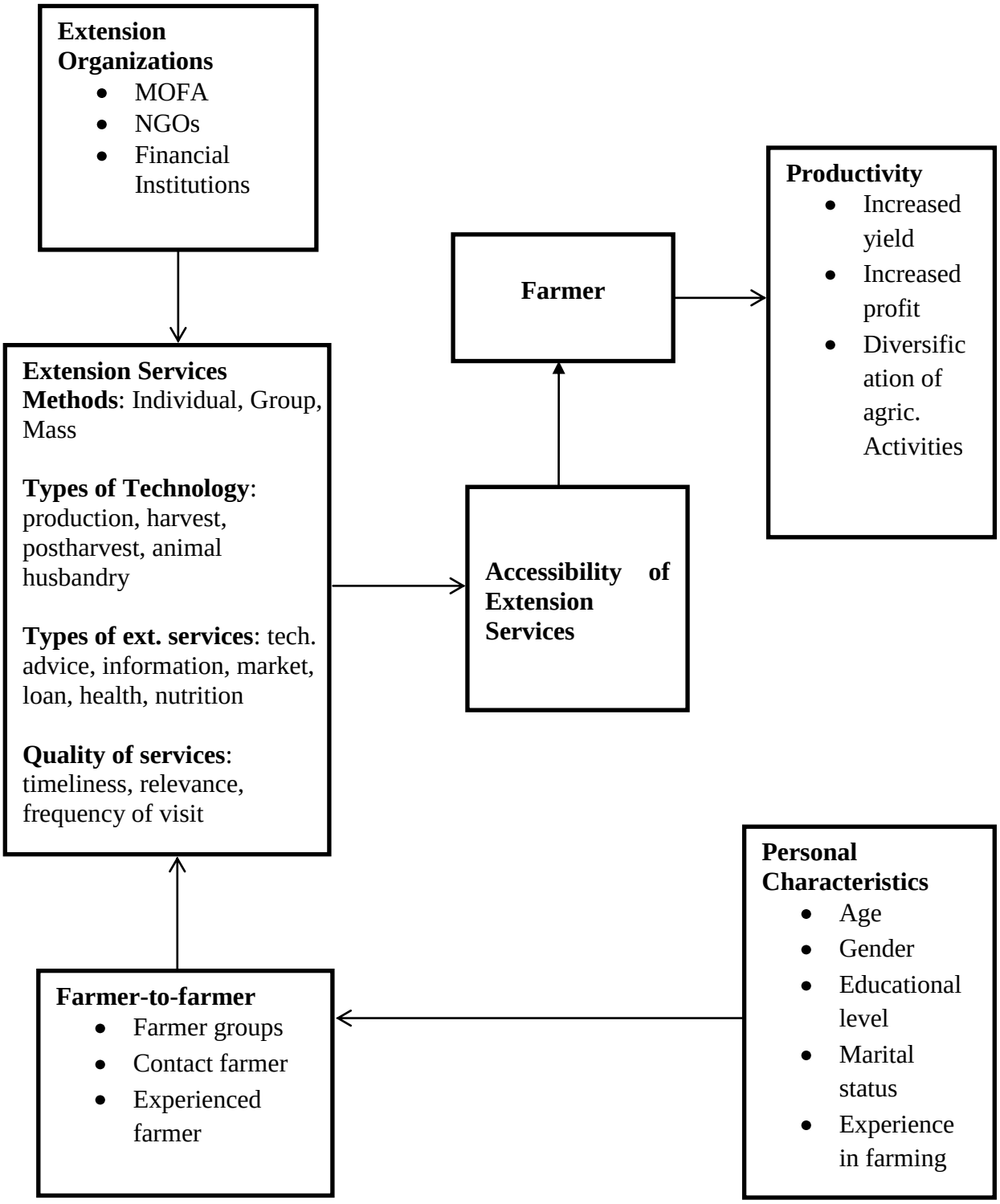
main things to be studied; the key factors, constructs or variables and presumed relationship among them (Miles and Huberman, 1994). The conceptual framework is used to analyse access to extension services and identify possible solutions that can help improve smallholder access to agricultural extension services.

The conceptual framework displays some of the variables that influence access to agricultural extension services by smallholder farmers through farmer-to-farmer communication. The framework also describes the relationships among the variables. Farmer-to-farmer communication is carried out through farmer groups, contact farmers and experience farmers. The personal characteristics of farmers such as age, gender, educational level, marital status and experience in farming influence delivery and reception of extension messages among farmers. Farmers and extension organizations disseminate extension messages through extension communication channels. Crop and animal production technologies as well as information are disseminated. The quality of the extension message is influenced by its timeliness and relevance. A combination of these factors leads to accessibility of extension services by the smallholder farmer. Accessed to extension messages by the smallholder farmer would lead to increased yield, increased profit and diversification of agricultural activities.

The provision of information and farmers' use of it are influenced by a number of key factors, which include the following human capacity, content process of sharing information and technology (Glendenning, Babu and Asenso-Okyere, 2010). Human capacity refers to both the quality and quantity of extension personnel. Their ability to acquire and develop new information and knowledge and influence how farmers use the information and knowledge to improve their productivity and income. Content is the

reliability, relevance, usability, and timeliness of the information. The process through which the information is shared can determine the effectiveness of the information and its use. Increasing use of technology can improve the nature and speed of information sharing. Effective and sustainable use of technology depends on the appropriateness of the technology for the user.

Figure 2. 1:. Relationship between farmer-to-farmer communication and access to agricultural services by smallholder farmers



Source: Field Survey, 2014

2.3. Meaning and importance of agricultural extension

Agricultural extension was originally conceived as a process of disseminating research-based knowledge to the rural sector in order to improve the lives of farmers. Agricultural extension has included technology transfer, capacity building and non-formal education. Swanson and Clear (1984, pp1) as cited in Swanson, Bentz and Sofranko (1998*)* defined extension as "an on-going process of getting useful information to people and then assisting those people to acquire the necessary knowledge, skills and attitude to utilize effectively this information and technology".

Agricultural extension is a human-centred endeavour aimed at changing or improving knowledge, attitude, practices and skills through education and provision of other support services. Extension attempts to empower people with the requisite knowledge, attitude and practices for enhancing productivity and welfare, phrased in one of its philosophy as helping people to help themselves (Ackah-Nyamike, 2007). The traditional view of extension in developing countries was very much focused on increasing production, improving yields, training farmers, and transferring technology (Davis, 2009). The traditional approaches to research and development are linear. It was assumed that innovations originate from agricultural researchers, transferred by extension agents and other intermediaries and are applied by farmers.

According to Christoplos (2010, pp.8) "Extension is part of agricultural knowledge and information systems, which are in turn part of the agrifood and rural development innovation systems that frame the prospects for rural poverty alleviation and food security".

As the problems and challenges faced by agricultural sectors change over time, we will have to adapt our ideas about the role and meaning of agricultural extension (Leeuwis, 2004). Current understanding of agricultural extension transcend technology transfer to facilitation, learning, and includes helping farmers form groups, deal with marketing issues, environmental sustainability and partner with a broad range of service providers and other agencies. Extension has a crucial role to make to these broader systems. New meanings of agricultural extension involve the concept of Agricultural Knowledge System (AKS). Agricultural Knowledge System (AKS) combines agricultural research, extension and education in one system and focuses on how the three activities generate new knowledge and information for farmers (Anandajayasekeram, Puskur, Workneh, and Hoekstra, 2008). The emphasis is on the agricultural research, extension and education components with the purpose of working together to support decision-making, problem solving and innovation in agriculture.

2.4. Role of agricultural extension

A key element in supporting agricultural development is information. Agricultural development efforts will require information, education, and technology transfer on crop and livestock management. Agricultural extension and advisory services, both public and private extension organizations play a major role in providing farmers with information, technologies, and education on how to increase agricultural productivity to enhance food security and income levels of smallholder farmers.

Extension also plays a role in organizing people together to take a group or common action. Agricultural Extension Agents (AEAs) pay regular visit to farmers and provide them with appropriate advice and technologies to improve their agricultural productivity.

Agricultural extension facilitates problem solving; creates links to markets and other players in the agricultural value chain and provides access to information, skills, and technologies.

2.5. Agricultural extension approaches

The choice of extension methods and approaches can make an enormous difference in terms of who can access extension services. In order to impact on the livelihoods of the smallholder farmer, extension organizations have to recognize that the poor require a range of services. An extension system has an organizational structure, its leadership, its resources of personnel, equipment and facilities; it has a programme with goals and objectives as well as methods and techniques for implementation, it has linkages with other organizations and various publics and particular clientele (Axinn, 1988:3).

An extension approach is the style of action within an extension system. Leeuwis (2004) defined extension approach as the basic planning philosophy that is being adopted by an agricultural extension organization. This helps extension workers to understand the fundamentals, concepts and functional methods of extension adopted to fulfil its aims, especially in the planning phase. According to Directorate of Agricultural Extension Services (DAES, 2010) extension approach influences the choice of the target audience, the resource requirements and allocation, the methodologies employed, and the results and impacts of the extension efforts.

Many agricultural extension approaches have been tested, and adopted by countries in Sub-Saharan Africa (SSA) to improve the agricultural technology dissemination and the

capabilities of rural people. Agricultural extension approaches have been categorized into different types.

Table 2. 1: Categorizations of agricultural extension approaches

Axinn (1988,pp 51-52)	Gêmo et al. (2005)
1. The General agricultural extension approach	1. Public
2. The Commodity specialized approach	2. Commodity
3. The training and visit approach (T&V)	3. Training and Visit (T&V)
4. The Agricultural extension participatory approach	4. Non-Governmental Organization (NGO)
5. The Project approach	5. Private Sector
6. The Farming systems development extension	6. Farmer Field School (FFS)
7. Cost sharing	
8. The Education institution approach	

Source: DAES, (2010)

All the agricultural extension organizations have different approaches to the same field of agriculture. In practice all extension systems at a particular time will emphasize one approach or another. Common characteristics which all extension approaches share are that they all function through non-formal education, have content related to agriculture, use communication techniques and aids and they all seek to improve the capabilities of rural people.

Each approach can be characterized by at least seven dimensions. The seven dimensions are dominant identified problem to which the approach is to be applied as a strategic solution (the basic assumptions made by those who established the approach), the purpose

the extension approach is designed to achieve, way in which the control of programme planning is carried on, nature of the field personnel, resources required to implement the programme, the implementation technique used in executing the programme and the variables or outputs by which the system measures its success. These criteria are used to determine whether or not the system is achieving what it was designed to do.

2.6. The Farmer Field School (FFS) Approach and Access to Extension Service.

The FFS approach is to deliver information and educational services designed originally as a means to introduce knowledge of Integrated Pest Management (IPM) to irrigated rice farmers in Asia, but it has since been expanded to numerous countries, covering various agricultural themes (Van den Berg and Jiggins 2007). The FFS approach relies on participatory training methods to convey knowledge to farmer field school participants, with the extension agent-trainer expected to act not just as a transmitter of information but mainly as a facilitator encouraging farmers' own discovery and discussion of their experiences and observations.

Some common features of the FFS approach are an emphasis on field-based observation and experimentation, shared learning, and systematic member appraisal of results. The FFS is farmer-centred educational programme in rural areas. A farmer field school consists of a group of farmers (20-30) from the same or nearby villages. In regular sessions, from planting till harvest in a complete cropping cycle, groups of neighbouring farmers observe and analyse their agro-ecosystem. There is room for speculation and group discussion leading to a decision on agricultural interventions to be made. The experimental actions are evaluated and analysed weekly. Farmers develop the confidence

and expertise through these learning cycles that enable them to make evidence-based crop management decisions with the aim to grow a healthy crop.

FFS gives farmers the opportunity to acquire knowledge in biological processes and agro-ecological systems as the strategic solution to farmers' lack of knowledge in biological processes and analysis of the agro ecological system. The main purpose of this approach is to build the capacity of farmers to make well-informed crop management decisions through increased knowledge and understanding of the agro-ecosystem.

The control of programme planning tends to be controlled primarily by the farmers, while the extension staff through the government, and NGO's are secondary stakeholders. FFS is a participatory, community based approach and depends on the total involvement of individual farmers and communities. There is sharing of information among farmers. FFS participants extend the knowledge and skills gained to non-participants.

FFS enables farmers to access extension services as they work and share knowledge with other farmers and extension workers. FFS used for participatory research reinforce group work and social linkages, and strengthened institutional capacities. This enhances access to extension services to the smallholder farmer.

2.7. Gender and access to agricultural extension services

Gender describes the socially determined attributes of men and women, including male and female roles. Gender has proven to be an essential variable for analysing the roles, responsibilities, constraints, opportunities, incentives, costs, and benefits in agriculture. Improvement of women's access to agricultural research and extension services should

begin with an analysis of men's and women's participation in the agricultural production process and their role both in agriculture and in the household.

Moser (1993) posit that women play triple role in the household and community. The reproductive role of women includes childbearing, childrearing and maintenance and reproduction of future labour force. Women's roles also include productive work, often as secondary income earners in the form of agricultural production. Women also undertake community managing role comprising activities undertaken at the community level to ensure provision and maintenance of scarce resources. Men play two (2) roles in the household and community. The roles men play are the productive and community managing role.

In many parts of Africa women access to agricultural education and information is considerably less than men. Women are less likely to be exposed to education and information due to their low daily mobility probable as a result of their triple role. Over the years, considerable effort has been made throughout the world to provide women farmers and women on the farm with efficient, effective, and appropriate technology, training, and information Jiggins, Samanta and Olawoye, (1997) cited in (Swanson et al., 1998). Agricultural extension services still do not attach much importance to reaching women farmers or women on the farm. Extension services do not reach many farmers because of inadequate communication strategies and other factors. Extension services often miss women farmers who are responsible for the great majority of agricultural output in most African countries (Manyire and Apekey, 2013).

Review of gender issues in agricultural extension identified several constraints and opportunities for access to agricultural extension services. Among the constraints is the gendered African society. Gender therefore determines the economic and social role played by men, women, boys and girls. Another constraint is the lack of recognition of the triple role of women in agricultural extension programme planning. Gender disparities also affect access to extension services. Women limited access to resources and support services, inability to use heavy agricultural tools, low level of information technology and production techniques (Sakyi-Dawson, Freeman, Tambi and Odularu, 2012).

2.8. Farmer-to-farmer communication and Access to Extension Service.

Smallholder agriculture is the main contributor to agricultural production in Africa and vital in increasing food and nutrition security and improving livelihoods (Wellard et al., 2013). Farmers require a wide range of information to support their farm enterprises. Information is needed not only on best practices and technologies for crop and animal production, but also information about postharvest aspects including processing, marketing, storage, and handling.

Farmer-to-farmer communication contributes to farmers' access to extension services through the delivery of information to farmers that relate to appropriate technological options, optimal use of inputs, market demands for products, time to buy inputs and sell produce. Farmers also share information on off-farm income-generation options, credit and loans source, time of vaccinating animals and source of animal drugs. The contacts are mostly informal where people from the same or nearby communities approach individuals for information. The form of communication may involve individual farmers delivering extension messages to other farmers. These individual farmers are given basic trainings in

some cases in some subjects to extend the information to other farmers. These individual farmers may be contact farmers, experienced farmers or Village Group Animators (VGA) who are utilized by extension agents to spread agricultural information or technologies. These farmers may deliver information upon been contacted or unsolicited. Farmers' knowledge and skills in soil erosion and control measures, compost making, usage and selection of proper planting material improved following participating in trainings and meetings organized by fellow farmers.

Some forms of FtF communication are Community Based Extension Agents (CBAs) and Extension Women Volunteers (EWV). Under these schemes training is provided to some community members in a group to provide extension services to community members. Communities do not pay user fee for such services but in some cases group members derive some benefits in-kind from community members. The Extension Women Volunteers (EWV) provides extension services to women to address specific needs of women. The problem for these schemes is mobility as they have to reach farmers in their communities. FtF communication plays an important role in bridging information asymmetry gap between farmers and agricultural service providers. Micro-Financial Institutions (MFIs) use Community Based Extension Agents (CBAs) and Extension Women Volunteers (EWV) to know more about their clients in terms of their ability and willingness to pay their loans. These farmer communication groups can also serve as links between farmers and agricultural service providers.

2.9. Indigenous communication

African Governments and their development partners often tend to extrapolate communication models and apply them wholesale in local environments in Africa that are

quite unique (Mushengyezi, 2003). Many of the rural population are poor and have no formal education, they have no or little access to mass media such as radio, television (TV), newspapers, publications, internet and email.

According to Akpabio (2003) indigenous communication is the process and system which utilize symbols, values and institutions which directly appeal and readily connect with the people and thus enhance the variety and effectiveness of messages that circulate in the community The way we behave, speak, stay silent, or greet people, our way of dressing, the people we choose to befriend and the style of our work send out a multiplicity of messages to those around us. Communication involves transmission of a variety of messages to a variety of audiences and receiving of feedback. Communication is an iterative process between people who want both to share their knowledge with others, and to listen to what others have to say. Information is presented in a way which suits the needs, levels of understanding, and expectations of the audience.

In Ghana the media landscape continue to grow with the infiltration of many media houses, radio stations continue to spread across the country. The increasing mobile telecommunication networks have enabled people to increase access to internet services. Modern media occupy the centre stage of planning by government. Government agencies and NGOs disseminate messages such as immunization, maternal health care, civic education and extension messages through radio, television, newspaper and internet. A lot of time and money has been spent promoting messages through modern media in attempts to reach large audiences.

Given the limited coverage and cost of modern media in many rural areas, development organizations should not overlook the significance of indigenous communication. Indigenous forms of communication such as drumming, village criers, storytelling, folk media, songs, proverbs continue to play an important role in communication among rural communities. Indigenous communication is utilized to disseminate messages among farmers in rural communities as it is embedded in the cultural ideology of the people. The information is packaged in a way relating to their own experience, background and culture.

Indigenous communication is the horizontal exchange of information among people. This form of communication does not take place through radio, television (TV), newspapers, publications, internet and email. Such communication occurs within families, at home, on farm, meetings of community organizations and market place. This communication is informal, unorganized, oral, interpersonal, controlled by the local people and involves low level of technology use. Indigenous communication includes the transmission of technologies, news, announcements, entertainment and social exchanges of every type.

Indigenous communication is "any form of endogenous communication system, which by virtue of its origin, form, and integration into a specific culture, serves as a channel for messages in a way and manner that requires the utilization of the values, symbolism, institution and ethos of the host culture through its unique qualities and attributes" (Ansu-Kyeremeh, 1998). Indigenous communication has value in its own right. It is the means by which the culture and indigenous knowledge is preserved, handed down and shared. The men of Garu-Tempane district have innovated, tried and tested ways of designing simple farm equipment for their agricultural activities. They have designed simple hand hoe

locally referred to as “kuur” for weeding. The people have practised and used animal traction technologies for so many years. Animal traction technologies are used for land preparation and carting of farm produce within the farm and to the market. They do not only know the techniques, but they also hand them down through the generations.

Indigenous channels enjoy high credibility because they are familiar and controlled by the local people. Development programmes can use indigenous channels, both to collect and disseminate information. Development organizations tap the advantages of indigenous channels to help project officials discover the local situation. Folk media such as songs, storytelling, proverbs and group meetings are used by development organization to disseminate information. Indigenous channels allow local people to communicate among themselves and with development professionals, using forms that are familiar to them. This enables local people to participate in decision making in development programmes.

Indigenous communication can take many different forms such as folk media, indigenous organizations, deliberate instructions and informal channels. Folk media are used primarily for entertainment, but may also promote education, social values, and cultural practices. Each culture has its own song, dance, festivals, plays, storytelling and proverbs. Extension messages are developed into songs which are used to transmit information which has the capacity to amuse and educate as well as retain much indigenous knowledge in the communities. These songs carry messages such as family planning, new crop varieties and environmental protection. There are a multitude of indigenous organizations in rural communities. Some indigenous organizations in the Garu-Tempane district are male household and clan heads meetings, mutual-help work groups, farmer groups, religious groups, revolving-loan associations and cultural groups (Lungmwedib). These

networks of informal groups serve as effective means of communication among the local people and outsiders. Much of the information and technologies are learned through deliberate instruction.

2.10. Private sector extension and produce buying

The success of extension programmes is tied to their responsiveness to the specific needs of the clients and market opportunities. This will empower farmers to select, test, compare and adopt appropriate technological service that best address their needs. Private sector participation in extension will help extension systems evolve in the direction of demand-driven extension.

Private sector extension providers may include private companies, NGOs, farmer associations and universities and agricultural colleges. Pluralism of agricultural extension will take advantage of expertise and infrastructure already in the field. Plurality of extension will contribute more investment in rural economies by the private sector. Non-Governmental organizations involved in extension activities in Ghana are generally known to operate in areas where public extension services are unavailable Ackah-Nyamike and Ajoe (2007) cited by Saravanan (2008). A form of private provision of extension services is the Community Livestock Worker (CLW) scheme. Under this scheme training is provided to some community members who in tend provide basic veterinary services to community members. Communities pay user fee for such services. The problem for this scheme is the failure of some community members to pay for the services. Other private extension service providers are the NGOs. NGOs provide extension services to address specific needs to their target clientele. In Ghana many of the NGOs are concerned with improving the livelihood of the smallholder farmer. Generally NGOs do not charge for

their services rendered to farmers. Farmers associations can educate farmers and serve as a link between farmers and service providers. Farmers associations can control expenditure on agricultural extension and demand technologies and service that respond to their problems. Community Based Extension Agents (CBEAs) concept is another form of pluralistic extension approach where farmers are trained to disseminate extension messages to colleague farmers.

Produce Buying Companies (PBCs) play critical role in extension service delivery. They provide marketing and transport services to farmers, and to a large extent they provide credit services to farmers to meet their input and labour cost. As a consequence PBCs provide farmers with advice and knowledge to produce to meet certain standards. To some extent contractual farming is gradually taking roots. This tries to eliminate the problem of market insecurity that is associated with smallholder agriculture. Savannah marketing company is one company that provide such services to farmers in northern Ghana.

Agriculture in Ghana has experienced a lot of Public Private Partnership (PPP), especially in the area of extension service delivery. Majority of the partnership is where NGOs depend on field staff of public extension organization for their field work. This is usually in the form of provision of resources to staff of Ministry of Food and Agriculture (MOFA) to interact with farmers effectively. Some of the partnerships are formally approved by the top hierarchy of MOFA and some are local arrangements between the NGOs and Agricultural Extension Agents (AEAs).

Some agricultural extension NGOs operating in Ghana include Care international, World Vision International, Technoserve and Adventist Relief Agency (ADRA).

2.11. Summary of literature review

This chapter concludes by giving a snap-short to the pertinent literature related to farmer-to-farmer communication in enhancing access to agricultural extension service. Theoretically farmers have the desire to communicate with people who are similar to them. The concepts explored in the conceptual framework include extension methods, extension services, agricultural productivity, personal characteristics of farmers and information flow in social networks.

Farmer-to-farmer communication is carried out through farmer groups, contact farmers and experience farmers. Agricultural extension is a human-centred endeavour aimed at changing or improving knowledge, attitude, practices and skills through education and provision of other support services. Agricultural extension and advisory services play a major role in providing farmers with information, technologies, and education on how to increase agricultural productivity to enhance food security and income levels of smallholder farmers.

An extension approach is the style of action within an extension system. Farmer Field School is farmer-centred educational programme in rural areas which emphasis on field-based observation and experimentation, shared learning, and systematic member appraisal of results. Gender disparities affect women access to agricultural extension service. In many parts of Africa women access to agricultural education and information is considerably less than men.

Farmers require a wide range of information to support their farm enterprises. Information is needed not only on best practices and technologies for crop and animal production, but

also information about postharvest aspects including processing, marketing, storage, and handling.

Farmer-to-farmer communication can lead to the delivery of information relating to appropriate technological options, optimal use of inputs, market demands for products, time to buy inputs and sell produce. Indigenous communication is utilized to disseminate messages among farmers in rural communities as it is embedded in the cultural ideology of the people.

The success of extension programmes is tied to their responsiveness to the specific needs of the clients and market opportunities. This will empower farmers to select, test, compare and adopt appropriate technological service that best address their needs. Private sector participation in extension will help extension systems evolve in the direction of demand-driven extension.

Private organizations involved in extension activities in Ghana are generally known to operate in areas where public extension services are unavailable.

CHAPTER THREE

METHODOLOGY

3.0. Introduction

The research was conducted in the Garu-Tempane District in the Upper East Region of Ghana. The research on the potential of farmer-to-farmer communication to enhance access to agricultural extension services was conducted with particular reference to three major aspects: the influence of farmer-to-farmer communication on agricultural information flow, effectiveness of communication channels in farmer-to-farmer communication and the effectiveness of technology transfer in farmer-to-farmer communication. The influence of farmer-to-farmer communication was analysed in terms of sharing of information among farmers. The effectiveness of communication channels was analysed in terms of farmers ability to understand and practise the information delivered through the communication channels. The effectiveness of technology transfer was analysed in terms of knowledge sharing among farmers and practicability of technologies.

This chapter focuses on the research design, methods and instruments used to collect data and method of data analysis. It also presents sampling procedure and limitations and scope of the research.

3.1. Research design

The research design provides guidance about all facets of the research, from assessing the general theoretical rational of the research to the data collection and analysis procedures. This will guide the researcher to establish connections of a specific problem such as access

to extension services by smallholder farmers. According to Myers (2009), the main purpose of research design is to provide a road map of the whole research.

The research design for this study is a descriptive and interpretive research that is analyzed through qualitative methods. Qualitative research involves an interpretive, naturalistic approach to its subject matter; it attempts to make sense of, or to interpret, phenomena in terms of the meaning people bring to them (Denzin and Lincoln, 2003). The research design helps to explore and to discover issues about farmer-to-farmer communication in the Garu-Tempane District.

3.2. Sources of data

The data sources represent the origins of data for the study. The data sources represent the opinion and experience of the target population. The main data sources were primary and secondary sources of data. The primary data sources included farmers in the district. Secondary data was obtained through literature review and reports of extension organizations.

3.3. Methods and instruments used to collect data

In this research, one interview schedule was used to gather information on farmer-to-farmer communication. Structured questionnaires were prepared to gather the required information from farmers. It included mostly closed ended questions which can be analysed quantitatively. Pre-planned questions to gather the information about; demographic profile of the respondents, farmer networks, sources of agricultural information, types of agricultural information, communication channels, knowledge and skill of farmers, transfer of technologies and trainings provided by agricultural extension

agents etc. Another data collection technique used in the research was literature review. Qualitative data sources include observation and participant observation, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions (Myers, 2009). Participant observation and face-to-face interviews were used as data collection methods.

3.4. Population of the study

A population consists of all the subjects you want to study (Rick, 2006). The population for the study consists of farmers in the Garu-Tempane District. This comprises all the possible cases (persons, objects, and events) that constitute a known whole.

3.5. Sampling procedure

According to Rick (2006), sampling is the process of selecting a group of subjects for a study in such a way that the individuals represent the larger group from which they were selected. According to the GTDADU (2010), the district is divided into three (3) zones for agricultural development. Each zone has eight (8) operational areas making a total of twenty-four (24) operational areas. Two (2) operational areas were purposively selected from each of the three (3) zones based on lack of agricultural extension agents in these operational areas. This will give an indication of how farmers communicate and share information where there is insufficient access to agricultural extension agents. The study also considered the geographical balance in the district. Zone one (1) is in the Eastern corridor, zone two (2) Central corridor and zone three (3) in the Western corridor.

Simple random sampling technique was used to select two (2) communities from each of the six (6) operational areas making a total of twelve (12) communities for the study. This was done mechanically by picking a community out of a hat which contains all the

communities in an operational area. A sample size of ten (10) farmers from each of the communities was selected, making a total of one hundred and twenty (120). Snowball method was used to select contact or experienced farmers and leaders of farmer groups. In the snowball method, a farmer is contacted and then he or she mentions another farmer till the total sample size of ten (10) is reached for each community.

3.6. Multi-stage sampling

The study began with a sample of the three (3) zones in the district. Six (6) operational areas were purposively selected and twelve communities (12) were selected using simple random sampling. Snowball sampling method was used to select ten (10) farmers from each community.

Table 3. 1: Multi-stage sampling process

Zone	Sampled operational areas	Sampled communities	Number of farmers sampled
1	Akara	Akara	10
		Karateshie	10
	Kpalsako	Kpalsako	10
		Wanwaago	10
2	Bimpella	Bimpella No. 1	10
		Bimpella No. 2	10
	Kpatia	Zari	10
		Damantega	10
3	Songo	Songo	10
		Aloko	10
	Farfar	Farfar	10
		Bantafarigu	10
Total	6	12	120

Source: Field Survey, 2014

3.7. Method of data analysis

A descriptive statistical method was used to analyze the data collected on FtF communication. In qualitative research, different knowledge claims, enquiry strategies, and data collection methods and analysis are employed (Creswell, 2003). The data obtained is analyzed to search for meaning to make direct interpretation of what is

observed as well as what is experienced and reported by the sampled population. Bogdan and Biklen (2003) define qualitative data analysis as "working with the data, organizing them, breaking them into manageable units, coding them, synthesizing them, and searching for patterns". Data analysis helps to discover patterns, concepts, themes and meanings.

The data was coded and entered into the Statistical Package for Social Sciences (SPSS) (version 20) software and the appropriate tests were employed for analysis. Chi-Square was employed for data analysis. Interpreting the Chi-Square, I compare the percentage of each independent category. The relationship of the variables is determined using the p-value chi-square statistics at 0.05 significance level to reject or accept the null hypothesis. When my p-value is greater than 0.05 then there is no significant difference. No significant difference implies no relationship. The results of both qualitative and quantitative analysis of the data have been presented using charts to determine relationships. Descriptive statistics such as frequencies and percentages were used for the analysis.

3.8. Limitations and scope of the study

In doing this study some limitations were encountered surrounding the execution, assessing published materials and interpretation and generalization of results. During data collection there were challenges in meeting respondents on-site for interview although schedules were made. Respondents were busy with their farming activities and not ready to meet for the interview. Assessing and using current published materials was also a challenge. Many hours were spent reading journals on-line and books to obtain relevant materials to the topic. The study was limited to FtF communication in the Garu-Tempane

district in the Upper East Region. It focuses on key areas of FtF communication that can enhance access to extension services to smallholder farmers in the Garu-Tempane district. Generalization and interpretation of the research results would therefore not exceed the scope of the study.

3.9. Sources of information and methods of data collection

The variable to be investigated in this research, the kinds of information, the sources of such information and methods used to solicit information is presented in table 3.2.

Table 3. 2: Summary of source of information and methods of data collection

Concepts	Objectives	Information required	Source of information	Data collection method
Personal Characteristics Indigenous communication networks	To determine the influence of farmer-to-farmer communication on agricultural information flow.	Age Gender Educational level Marital status Farming experience Community network groups Indigenous forms of communication	Farmers Contact farmers Farmers Contact farmers	Questionnaires Interview schedules Key informants
Effective extension delivery	To determine the effectiveness of channels of communication in farmer-to-farmer communication in the study area.	Extension Methods Channels of Communication Type of extension information	Farmers Contact farmers	Questionnaires Interview schedules
Accessibility of Extension Services	To determine the effectiveness of technology transfer in farmer-to-farmer communication.	Type of extension technologies	Farmers Contact farmers	Questionnaires Interview schedules

Source: Field Survey, 2014

3.10. Conclusion

The research design for this study was a descriptive and interpretive that was analyzed largely through qualitative methods mainly using descriptive and inferential statistics. Field data was collected from farmers to capture information from selected communities on FtF communication in three (3) agricultural zones in the Garu-Tempane District of the Upper East Region.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0. Introduction

This chapter presents the results of the study which investigated potential of farmer-to-farmer communication to enhance access to agricultural extension services. This is achieved by investigating the influence of FtF communication on agricultural information flow, indigenous communication networks and the effectiveness of channels of communication in FtF communication. The chapter also outlines the types of information that flow among farmers and the effectiveness of technology transfer in FtF communication.

The study was guided by the conceptual view that access to agricultural extension service is the extent to which a farmer obtains extension service at the time it is needed. This will help understand the potential of FtF communication in enhancing access to agricultural extension services in the Garu-Tempane district.

4.1. Demographic Characteristics of Respondents and Access to Extension Service.

The demographic information that was collected from respondents includes age, sex, level of education, marital status and religion. The study considered these demographic characteristics important in enhancing access to agricultural extension services through farmer-to-farmer communication.

4.1.1. Age of respondents and access to extension service.

The age of an individual is an important factor in determining the ability of him or her to work. According to Johnson and Neumark (1997) productive age is normally considered

to be between the age 15 and 49. It is in this light that the study considered age of respondents as a relevant demographic characteristic.

Distribution of by age of respondents is presented in table 4.1. The age of the respondents were categorized into three (3). As indicated in table 4.1 majority of the respondents (89.2%) fall within the age group of 18-57 years which is fairly comparable to the productive age group of 15-49 years as observed by Johnson and Neumark (1997). Moreover, only 10.8% of the respondents are within the age group of 58-77 years.

Table 4. 1: Age of farmer respondents

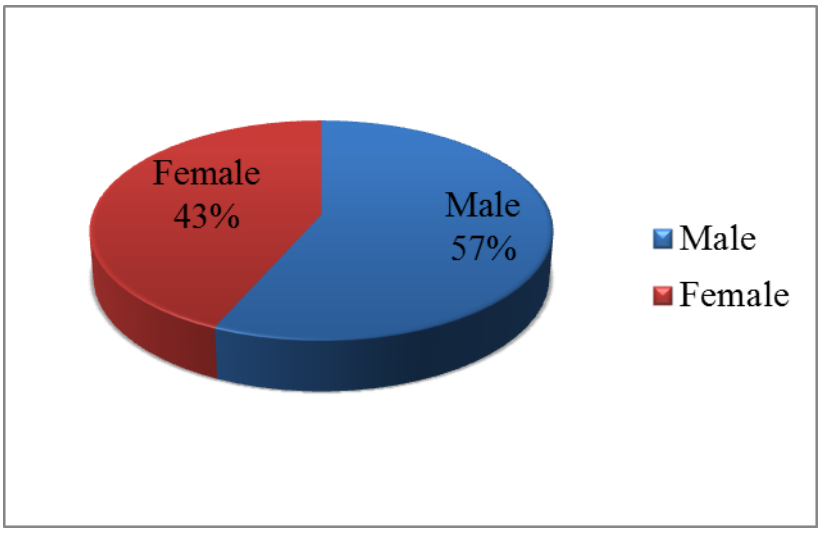
Age of respondents (years)	N	%
18-37	34	28.4
38-57	73	60.8
58-77	13	10.8
Total	120	100

Source: Field Survey, 2014

4.1.2. Gender of respondents and access to extension service.

The distribution of gender of respondents is presented in figure 4.1. The figure shows that out of the total respondents of 120 farmers, 68 (57%) are male while 52 (43%) are female. This shows a picture of the representation of male and female in agricultural activities in the study area. This indicates that many female are engaged in agricultural production.

Figure 4. 1: Gender distribution of respondents



Source: Field Survey, 2014

4.1.3. Educational level of respondents and access to extension service.

According to Kabeer (2003) education is a major component of human empowerment and a means of enhancing human capital of rural farmers for effective production and productivity. Table 4.2 shows the distribution of educational level of respondents. The study reveals that 1.7% of respondents had tertiary education, overwhelming majority (74.2%) have no formal education, 20.0% have basic education and 4.2% have secondary education.

Table 4. 2: Educational level of respondents

Educational level	N	%
No formal education	89	74.2
Basic (Primary/JHS/Middle)	24	20
Secondary (SHS/Vocational/Technical)	5	4.2
Tertiary (College/Poly/University)	2	1.7
Total	120	100

Source: Field Survey, 2014

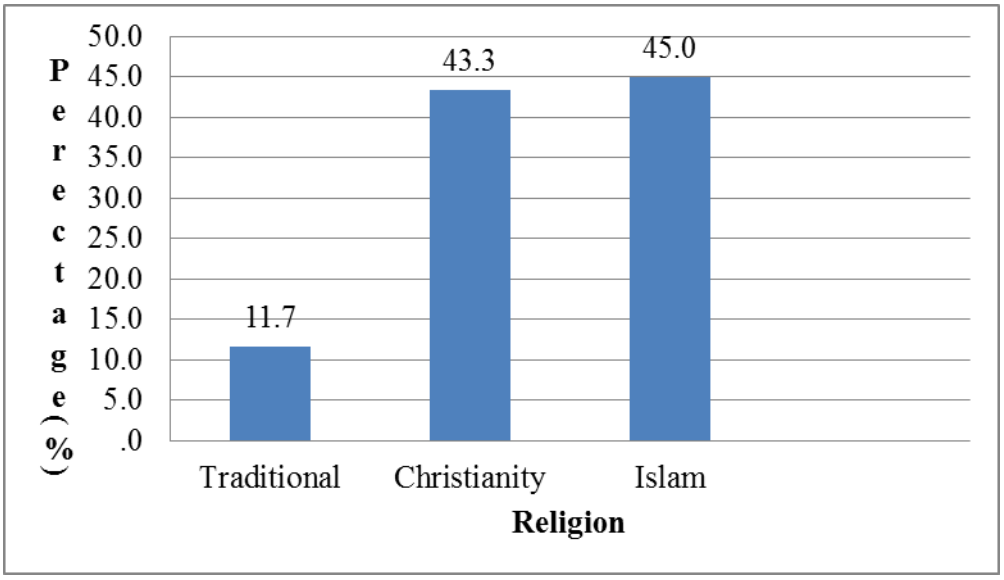
4.1.4. Marital status of respondents and access to extension service.

The institution of marriage is highly valued in the District like any other Ghanaian society. It is an indicator of social responsibility, trust and achievement. All adults who are in good physical and mental status are expected to marry. The study explored the marital status of respondents. The data analysis shows that, overwhelming majority (99.2%) of respondents are married while very few (0.8%) are single.

4.1.5. Religion of respondents and access to extension service.

Figure 4.2 presents the distribution of the religious affiliation of respondents. The results show that Islam is dominant (45.0%), slightly higher than Christianity (43.3%) with traditional (11.7%) having the least.

Figure 4. 2: Religion of respondents



Source: Field Survey, 2014

4.1.6. Respondents experience in farming and access to extension service.

Respondents experience in farming was examined as presented in table 4.3. The analysis shows 34.2% of respondents have been into agriculture (crop or livestock or both) for the

past 11-20 years. The mean number of years of farming experience of the respondents was 25 years. The minimum and maximum are 4 and 50 years respectively. The minimum and maximum values indicate that the respondents have some experience in farming and are not entirely new to agriculture.

Table 4. 3: Respondents years of farming

Years	N	%
1-10	7	5.8
11-20	41	34.2
21-30	40	33.3
31-40	21	17.5
41-50	11	9.2
Total	120	100

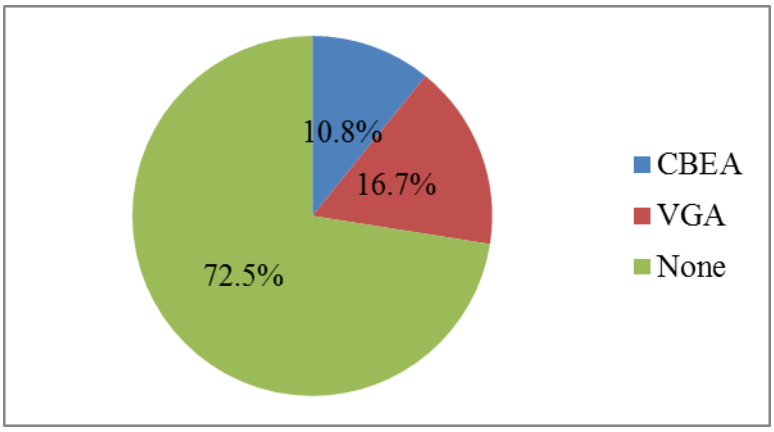
Source: Field Survey, 2014

4.1.7. Respondents membership of farmer networks and access to extension service.

Farmer networks serve as means of disseminating agricultural information and technologies to farmers. They also serve as link between farmers and extension organizations in the study area. Community Based Extension Agents (CBEAs) are group of farmers whose main objective is to disseminate agricultural information and technologies to colleague farmers. Village Group Animators (VGAs) are experienced farmers who serve as contact farmers to Agricultural Extension Agents (AEAs). They assist AEAs in passing agricultural information to colleague farmers.

As presented in figure 4.3, the results revealed that 16.7% and 10.8% of respondents are CBEAs and VGAs respectively. The study show 72.5% of respondents do not belong to any farmer extension network, however, they receive agricultural information from colleague farmers who are CBEAs or VGAs or both.

Figure 4. 3: Respondents membership of farmer networks



Source: Field Survey, 2014

4.2. Farming Characterizations

The farm characteristics of respondents includes types of crops cultivated, types of livestock reared and types of poultry reared. The study considered these farm characteristics important to ascertain the type of agricultural information and technologies farmers require.

4.2.1. Types of crops grown by respondents and access to agricultural extension service.

The study examined the various crops respondents cultivate for their livelihood as presented in table 4.4. These crops can be categorized into cereals, legumes and vegetables. The crops that respondents grow were maize, rice, early and late millet, sorghum, groundnut, soybean and cowpea. The other crops are onion, watermelon, tomatoes, pepper, okra, bra (leafy vegetables), garden eggs and sweet potato. The overwhelming majority (98.3%) of respondents cultivate maize and 80.8% cultivate rice. 89.2% cultivate soybean and a moderate 40.8 % cultivate groundnut. The results also show majority (85.8%) of respondents cultivate onion, 42.5% and 41.7% cultivate tomatoes and pepper respectively.

These crops were cultivated in rain and dry seasons with majority of crops cultivated in the rainy season. Majority (96.7%) of the cereal crops were cultivated in the raining season. Very few respondents (3.3%) cultivate cereals (only maize) in the dry season. Majority of respondents (96.7%) cultivate legumes in the raining season. Majority of respondents cultivate vegetables in the dry season, 85.8% and 42.5% of respondents cultivate onion and tomatoes respectively in the dry season.

Table 4. 4: Types of crops grown by respondents

Type of crop	Raining season		Dry season	
	Count	%	Count	%
Maize	118	98.3	4	3.3
Rice	97	80.8	0	0
Millet-early	95	79.2	0	0
Millet-late	84	70	0	0
Sorghum	91	75.8	0	0
Groundnut	49	40.8	0	0
Soybean	107	89.2	0	0
Onion	3	2.5	103	85.8
Water melon	2	1.7	28	23.3
Tomatoes	9	7.5	51	42.5
Pepper	22	18.3	50	41.7
Okra	21	17.5	49	40.8
Bra	42	35	21	17.5
Cowpea	4	3.3	4	3.3
Garden egg	1	0.8	0	0
Sweet potatoes	1	0.8	0	0

Source: Field Survey, 2014

4.2.2. Types of livestock reared by respondents and access to extension service.

The types of livestock reared by respondents include small ruminants such as sheep and goat and large ruminant like cattle. They also rear pigs, donkey and poultry such as fowls, guinea fowls, ducks and doves. These animals serve as income security, portray wealth and also used for animal traction. Results obtained from the study indicate that, 92.5% of

respondents rear goats, 87.5% of respondents rear sheep and 58.3% of respondents rear cattle. More than half (51.7%) of respondents keep donkey and 32.5% rear pigs. As shown in table 4.5, 78.1% of respondents keep a flock size of 1-10 sheep, 88.6% keep 1-10 cattle and 82.9% keep 1-10 goats. Very few (8.6%) of respondents keep between head size of 11-20 cattle. Majority (96.8%) of respondents keep 1-10 donkeys and very few (3.2%) of respondents keep 11-20 donkeys.

The study shows that 46.5% of respondents rear 1-10 fowls and 40.2% rear 1-10 guinea fowl. Very few, 16 and 12 respondents rear 1-10 doves and ducks respectively. Poultry serve as source of income and protein for the household. They are also given out as gifts to visitors.

Table 4. 5: Types of livestock reared by respondents

Livestock		Number						
		1-10	11-20	21-30	31-40	41-50	51-60	Total
Sheep	Count	82	17	5	1			105
	%	78.1	16.2	4.8	1.0			100.0
Goats	Count	92	17	2				111
	%	82.9	15.3	1.8				100.0
Pigs	Count	36	3					39
	%	92.3	7.7					100
Cattle	Count	62	6	1	1			70
	%	88.6	8.6	1.4	1.4			100.0
Donkey	Count	60	2					62
	%	96.8	3.2					100.0
Fowls	Count	53	35	11	8	5	2	114
	%	46.5	30.7	9.6	7.0	4.4	1.8	100.0
Guinea fowls	Count	39	35	9	5	9		97
	%	40.2	36.1	9.3	5.2	9.3		100.0
Ducks	Count	12	1	1				14
	%	85.7	7.1	7.1				100.0
Doves	Count	16	2	1	1			20
	%	80.0	10.0	5.0	5.0			100.0
Turkey	Count	1						1
	%	100.0						100.0

Source: Field Survey, 2014

4.3. Influence of Farmer-to-Farmer Communication on Agricultural Information Flow

Information is an important ingredient for agriculture and rural development. Sharing of agricultural information among farmers has been going on since time immemorial. Agricultural information interrelates and influences agricultural productivity in many ways. Information is shared by farmers to meet the needs of the users (Demiryurek, Erdem, Ceyhan, Atasever and Uysal, 2008). It is important to note that farmers with similar needs require similar information. Farmer-to-farmer communication therefore empowers farmers to share information for their mutual and individual benefits.

From this study, the influence of FtF communication on access to agricultural extension services was assessed by examining how effective communication among farmers influence agricultural information flow.

4.3.1. Types of groups in community

The study reveals that there were various types of groups in the study area. It was established that groups such as religious groups, farmer groups, kinship groups, cultural groups and Village Savings and Loans Associations (VSLA) were in all the study communities as shown in table 4.6. Religious groups are groups of people with similar religious affiliation such groups include women fellowship, men fellowship and young adults fellowship of the Christian faith. Farmer groups comprise two (2) or more farmers who come together for a common goal. Kinship groups include Kussasi Youth Association, Bisa Youth Association and Bimoba Youth Association. Cultural groups include dancing, singing and drumming groups. VSLA are group of people who meet and

make regular monetary contributions for the purposes of loaning the money to one another.

Respondents' memberships of these groups were examined. Members of these groups interact with each other, they see themselves as group and they have common objectives. This confirms Sanusi1, Petu-Ibikunle and Mshelia, (2009) that extension essentially is a communication process whereby various participants serve as linked exchange of information is a critical requirement for sustainable development. As shown in table 4.6, majority (90.8%) of respondents are members of farmer groups. The results also show that 69.2% and 27.5% of respondents are members of religious groups and VSLA respectively. Few respondents 19.2% and 16.7% are members of cultural and kinship groups respectively.

This study reveals that farmers deliver information to each other during group meeting. This shows that farmers have access to agricultural information from colleague farmers. As mentioned in the methodology, the sampled communities have no AEAs so interactions among farmers enhance agricultural information flow.

Table 4. 6: Types of groups in community and membership

Group	In community				Membership			
	Yes		No		Yes		No	
	Count	%	Count	%	Count	%	Count	%
Religious groups	118	98.3	2	1.7	83	69.2	37	30.8
Farmer groups	119	99.2	1	0.8	109	90.8	11	9.2
Kinship groups	93	77.5	27	22.5	20	16.7	100	83.3
Cultural group	103	85.8	17	14.2	23	19.2	97	80.8
Village savings and loans associations	43	35.8	77	64.2	33	27.5	87	72.5

Source: Field Survey, 2014

4.3.2. Information delivery to colleague farmers

One of the main sources of agricultural information to farmers is from colleague farmers. As shown in table 4.7 this study observed that all the one hundred and twenty (120) respondents indicate they deliver agricultural information to colleague farmers at different frequencies. Pearson Chi-Square analysis shows there is no significant difference between the frequency of delivery of information to colleague farmers at 0.05 significance level (χ^2 = 2.262; df= 3, p= 0.520). This implies that there is no particular period or frequency at which farmers deliver information to colleague farmers. Farmers continue to provide agricultural information to colleague farmers on regular bases. Specifically, 53.3% of the respondents deliver information to colleague farmers once in a week, 30% of the respondents deliver information to colleague farmers once in two weeks. Few farmers (16) deliver information to colleague farmers once in a month and 3 farmers seldom deliver information to colleague farmers. Dissemination of agricultural information among farmers is to help farmers make better decisions in order to improve their agricultural productivity. Access to information helps inform decision on land use, credit, labour, crop management and livestock management.

Table 4. 7: Frequency of delivery of agricultural information to colleague farmers

Frequency of delivery of information		Deliver information		Total
		Yes	No	
Once a week	Count	64	0	64
	Row %	100.00%	0.00%	100.00%
Once in two weeks	Count	36	1	37
	Row %	97.30%	2.70%	100.00%
Once in a month	Count	16	0	16
	Row %	100.00%	0.00%	100.00%
Seldom	Count	3	0	3
	Row %	100.00%	0.00%	100.00%
Total	Count	119	1	120
	Row %	99.20%	0.80%	100.00%

Source: Field Survey, 2014. χ^2 = 2.262; df= 3, p= 0.052 at 0.05 Significance level. Not Significant

4.3.3. Places of receiving agricultural information from colleague farmers

Farmer-to-farmer communication promotes dissemination of agricultural information amid improving agricultural development. Respondents covered for this study receive information from colleague farmers at different places. Respondents receive information from colleague farmers at home, on-farm and at group meetings. To assess whether the different places respondent receive agricultural information have influence on access to agricultural information, Chi-Square test was conducted. As shown in table 4.8, Pearson Chi-Square value at 0.005 significance level (χ^2= 0.293; df= 2, p= 0.864) shows there is no significant difference in the places farmers receive information from colleague farmers. This implies that farmers receive agricultural information from colleague farmers irrespective of their location either at home, on-farm or at group meetings. Since farmers live with each other in the same community it suffices to state that information delivery to colleague farmers is always going on among farmers. The proximity of farmers to one another promotes information sharing. This confirms Akanda and Roknuzzaman, (2012) that majority of farmers use community information centre, NGO information centre and home of colleague farmers often as places for access to information.

Table 4. 8: Places of receiving agricultural information from colleague farmers

Places of receiving agricultural information		Receive of information		Total
		Yes	No	
At home	Count	92	1	93
	Row %	98.90%	1.10%	100.00%
On farm	Count	25	0	25
	Row %	100.00%	0.00%	100.00%
At group meetings	Count	2	0	2
	Row %	100.00%	0.00%	100.00%
Total	Count	119	1	120
	Row %	99.20%	0.80%	100.00%

Source: Field Survey, 2014. χ^2 = 0.293; df= 2, p= 0.864 at 0.05 Significance level. Not Significant

4.3.4. Farmers relationships and agricultural information delivery

Farmers' relationship with one another is expected to enhance access to agricultural information. Relationship of respondents with colleague farmers that was assessed include family members, friends, farmer group members, religious group members and none community members. In line with expectation, Pearson Chi-Square value at 0.005 significance level (χ^2 = 0.504; df=4, P=0.973) shows there is no significant difference between farmers relationships and delivery of agricultural information to colleague farmers (Table 4.9). This implies that farmers' relationship with one another is not a barrier when it comes to delivery of agricultural information. However, more farmers tend to deliver information to family members as 65.8% of the respondents deliver information to family members as compared to 24.2% of respondents who deliver information to friends. If information flow among farmers is free regardless the relationship that exists among them, than FtF communication has a huge potential to enhance access to agricultural services among smallholder farmers. According to Adhiguru, Birthal, and Kumar (2009) the biggest information source was the fellow progressive farmers. This suggests that many farmers deliver agricultural information to colleague farmers.

Table 4. 9: Agricultural information delivery and farmers relationships

Relationship with colleague farmers		Deliver information to colleague farmers		Total
		Yes	No	
Friends	Count	29	0	29
	Row %	100.00%	0.00%	100.00%
Family members	Count	79	1	80
	Row %	98.80%	1.20%	100.00%
Farmer group members	Count	8	0	8
	Row %	100.00%	0.00%	100.00%
Members of religious group	Count	1	0	1
	Row %	100.00%	0.00%	100.00%
None community members	Count	2	0	2
	Row %	100.00%	0.00%	100.00%
Total	Count	119	1	120
	Row %	99.20%	0.80%	100.00%

Source: Field Survey, 2014. χ^2 = 0.504; df=4, P=0.973 at 0.05 Significance level. Not Significant

4.3.5. Gender and agricultural information delivery to colleague farmers

Studies have shown that gender of farmers have influence on their access to agricultural extension services. This makes gender status of respondent an important variable to explore so as to determine its influence on respondents access to agricultural information in FtF communication. From table 4.10 Pearson Chi-Square value at 0.005 significant level (χ^2 = 0.166; df=2, P=0.920) shows there is no significant difference between gender and delivery of agricultural information to colleague farmers. Overwhelming majority (85%) of respondent deliver information to both male and female farmers. Only 10% and 4% of respondents deliver information to only male and female respectively. This implies that in FtF communication, farmers deliver agricultural information to one another irrespective of the gender of the receiver. The study reveals that more women would potentially be reached with extension messages in FtF communication. This is contrary to

2010 World Bank and IFPRI surveys in three countries which reveal that men had access to extension services than women.

Table 4. 10: Gender and agricultural information delivery to colleague farmers

Gender of respondents		Deliver information to colleague farmers		Total
		Yes	No	
Male	Count	12	0	12
	Row %	100.00%	0.00%	100.00%
Female	Count	5	0	5
	Row %	100.00%	0.00%	100.00%
Male and Female	Count	102	1	103
	Row %	99.00%	1.00%	100.00%
Total	Count	119	1	120
	Row %	99.20%	0.80%	100.00%

Source: Field Survey, 2014. χ^2 = 0.166; df=2, P=0.920 at 0.05 Significance level. Not Significant

4.3.6. Respondents major sources of agricultural information

The primary source of agricultural information and technologies to smallholder farmers is Agricultural Extension Agents (AEAs). As shown in table 4.11, the major source of agricultural information to respondents is AEAs, followed by colleague farmers, radio and publications. Majority (65.8%) of respondents interviewed for this study said their major source of agricultural information is AEAs. Also 68.3% of respondents consider colleague farmers as their second major source of information while 27.5% of respondents consider AEAs as their second major source of information. 85.6% of respondents consider radio as their third major source of information.

Table 4. 11 Ranking of major sources agricultural information

Source of agricultural information	4th major		3rd major		2nd major		1st major	
	Count	%	Count	%	Count	%	Count	%
AEAs	0	0	8	6.7	33	27.5	79	65.8
Colleague farmers	0	0	0	0	82	68.3	38	31.7
Radio	5	4.2	101	85.6	9	7.6	3	2.5
Publications	20	95.2	1	4.8	0	0	0	0

Source: Field Survey, 2014

4.3.7. Crop production information farmers received from colleague farmers

It is relevant to assess the types of crop production information farmers receive from colleague farmers to examine whether farmers have access to relevant agricultural information from colleague farmers to ensure good crop production practices. The types of crop production information farmers receive from colleague farmers include information on farm credit, post-harvest management, marketing, crop production management and source of input supply. Crop production management information includes information on planting materials, weed control, fertilizer use and pest and disease control. Table 4.12 present type of crop production information respondents receive from colleague farmers. The results of the study show 97.5% of respondents, indicate they receive crop production information from colleague farmers. To improve yields, farmers need information on fertilizer use to enhance soil fertility. Akanda and Roknuzzaman (2012) affirmed that majority of farmers receive information from professional colleagues or other farmers, school teacher and community leader/village head. Farmers require information on seeds, diseases and pest, soil and water conservation, post-harvest techniques, manure and fertilizer management and weeding control.

Table 4. 12 Types of crops production information farmers share

Type of Information	Responses		Percentage of Cases
	N	%	
Farm credit	117	20.9	97.5
Post-harvest management	107	19.1	89.2
Market information	107	19.1	89.2
Crop production management	117	20.9	97.5
Source of input supply	111	19.9	92.5
Total	559	100	465.8

Source: Field Survey, 2014

4.3.8. Livestock production information farmers received from colleague farmers

It is relevant to assess the types of livestock production information farmers receive from colleague farmers to examine whether farmers have access to relevant information from colleague farmers to ensure good livestock production practices. Livestock production information farmers receive from colleague farmers include information on breed selection, housing, feeding, vaccination schedules, animal health care, marketing, source of drugs, farm credit and hatching of guinea keets. As show in table 4.13, 100% of the respondents indicate they receive all the livestock production information from colleague farmers. Farmers share a variety of information on livestock production and related subjects. Farmers consider livestock information important as livestock production serve as major source of family income security and livelihood.

Table 4. 13 Types of livestock production information farmers share

Type of Information	Responses		Percentage of Cases
	N	Percentage	
Breed selection	96	12.2	80
Housing	117	14.9	97.5
Feeding	119	15.1	99.2
Vaccination schedules	108	13.7	90
Health care	116	14.8	96.7
Marketing	85	10.8	70.8
Source of drugs	96	12.2	80
Farm credit	48	6.1	40
Early hatching of guinea keets	1	0.1	0.8
Total	786	100	655

Source: Field Survey, 2014

4.4. Effectiveness of Channels of Communication in Farmer-to-Farmer Communication

Channels of communication help extension organizations and individuals to disseminate information to the audiences. According to Israel and Wilson (2006), developing an understanding of extension sources and channels used by clients to obtain information is a pre-requisite for efficient educational programming because messages that go unheard or unseen cannot lead to change.

Respondents' understanding of technologies received from colleague farmers were elicited on the communication channels using mean scores on a five point Likert scale as 1 = very low, 2 = low, 3 = moderate, 4 = high, 5 = very high. Analysis of the results will provide the needed information on the effectiveness of channels of communication in FtF communication in disseminating agricultural information and technologies to farmers. The level of practice of technologies received from colleague farmers was measured on a five point Likert scale as not well practiced at all, not too well-practiced, somehow well

practiced, well-practiced and very well practiced. Ayanwuyi, Adeola and Oyetoro (2013) in a similar study on Analysis of Relevance of Agricultural Extension Services on Crop Production used Likert scale to elicit response from respondents.

4.4.1. Understanding of crop production technologies using communication channels

The types of crop production technologies farmers share include compost making, improved planting materials, storage, planting in lines at correct spacing, use of agro-chemicals, land preparation and fertilizer use. Table 4.14 shows mean scores of dissemination of crop production technologies among farmers.

Respondents have high understanding (4.60) when colleague farmers disseminate planting in lines at correct spacing technology to them through one-to-one. Farmers have high understanding of fertilizer use technologies with mean scores of 4.59 when received from colleague farmers through one-to-one channel of communication. The understanding of use of agro-chemicals is average (3.84) when farmers receive the technology from colleague farmers through one-to-one. Using group meetings, respondents have high understanding of fertilizer use (4.32) and improved planting materials (4.30). Using group meetings respondents have average understanding (3.72) when received fertilizer use technology from colleague farmers. Using mass method, respondents indicate they have low understanding of all the technologies with the exception of fertilizer use which the results show they have average understanding (3.15). It is observed that, ordinary farmers can learn much from their more innovative neighbour (learning by seeing), and in the process, adopt a few promising technologies (Dhital, Sharma, Sapkota, Sharma, Karki and Thagunna, 2009).

There is high understanding of all the technologies when respondents receive them from colleague farmers through one-to-one and group meetings with the exception of fertilizer use which they have average understanding. This suggests that farmers are able to ask questions and seek clarifications in interpersonal communication channels. Technology dissemination through one-to-one and group meetings is effective in FtF communication in the Garu-Tempane district. This result reiterates earlier research findings in the same study area that indicates that a key factor identified by the farmers as contributing to the understanding of agricultural technologies is the face-to-face communication methods that is used by CBEAs living in the farmers' communities Atengdem, Adiita, Appiah-Kubi & Galyuon (2010). Low understanding of technologies using mass communication channels especially radio in FtF communication suggests that farmers do not have the opportunity to ask questions for further explanations.

Table 4. 14 Mean scores of understanding of crop production technologies using communication channels

Crop production technologies	One-to-one	Group meetings	Mass method
Compost making	4.5	4.26	2.54
Improved planting materials	4.41	4.3	2.88
Storage	4.34	4.12	2.72
Planting in lines at correct spacing	4.6	4.22	2.87
Use of agro-chemicals	3.84	3.72	2.36
Land preparation	4.41	4.14	2.63
Fertilizer use	4.59	4.32	3.15

Scores: 1 = Very low, 2 = Low, 3 = Average, 4 = High and 5 = Very high
Source: Field survey, 2014

4.4.2. Understanding of livestock production technologies using communication channels

In a communication process the farmer is the key factor as an active participant. The farmer is expected to learn voluntarily by listening, ask questions and practice what is been taught. The study reveal that the livestock production technologies farmers communicate are pen construction, breed selection, deworming, wound treatments, feed preparation, animal traction and disease control. Table 4.15 shows the mean score of level of understanding of farmers upon receiving these technologies from colleague farmers through the channels of communication.

The results show farmers understanding is high (4.63) when colleague farmers disseminate animal traction technology to them through one-to-one communication. Farmers understanding is average (3.81) when colleague farmers disseminate disease control technology to them through one-to-one communication. When farmers receive information through group meetings, their understanding is high for all the technologies except wounds treatment and disease control which they have average understanding. Farmers understanding is low for all the technologies upon receiving the technologies through mass method (radio). Farmers understanding of the technologies they receive from colleague farmers through radio is low perhaps because they do not have the opportunity to ask questions and that the technologies are quite technical and difficult for a farmer to explain on radio.

Table 4. 15 Mean score of understanding of livestock production technologies using communication channels

Technology	One-to-One	Group meetings	Mass method
Pen construction	4.56	4.32	2.5
Breed selection	3.89	4.01	2.39
Deworming	4.22	4.13	2.49
Wounds treatment	4.06	3.92	2.39
Feed preparation	4.19	4.27	2.72
Animal traction	4.63	4.23	2.48
Diseases control	3.81	3.98	2.36

Scores: 1 = Very low, 2 = Low, 3 = Average, 4 = High and 5 = Very high
Source: Field survey, 2014

4.4.3. Practicing of crop production technologies received from colleague farmers

The dissemination of agricultural technologies is very crucial to agricultural productivity of farmers because it is only through this farmers can practice the technologies they learn from each other which can improve their productivity. The study found it important to investigate how well farmers are able to practice the technologies they receive from colleague farmers. Table 4.16 show frequency distribution of how farmers practice crop production technologies they receive from colleague farmers. The results show 52.5% of respondents well-practiced compost making and 53% very well practiced land preparation technologies. Not too many respondents 35.8% and 7.5% well-practiced and very well practiced respectively agro-chemical use technology. A lot of farmers in general have low understanding of agro-chemical use technology so delivering such technology to colleague farmers may be difficult. Majority of respondents well-practiced and very well-practiced all the technologies. This confirms findings by Feder and Savastano (2006) that farmers learn best from peers.

Table 4. 16.Level of practice of crop production technologies received from colleague farmers

Crop production technology	Not well practices at all		Not too well-practiced		Somehow well practiced		Well-practiced		Very well practiced	
	Count	%	Count	%	Count	%	Count	%	Count	%
Compost making	2	1.7	1	0.8	10	8.3	63	52.5	44	36.7
Improved planting materials	0	0	1	0.8	10	8.3	74	61.7	35	29.2
Storage	0	0	1	0.8	11	9.2	81	67.5	27	22.5
Planting in lines at correct spacing	0	0	1	0.8	3	2.5	85	70.8	31	25.8
Use of agro-chemicals	8	6.7	17	14.2	43	35.8	43	35.8	9	7.5
Land preparation	0	0	2	1.7	14	11.7	51	42.5	53	44.2
Fertilizer use	0	0	1	0.8	4	3.3	53	44.2	62	51.7

Source: Field Survey, 2014

4.4.4. Practicing of livestock production technologies received from colleague farmers

Table 4.17 show a frequency distribution of how well farmers practiced the livestock production technologies they receive from colleague farmers. From the analysis of the results obtained from the study, it was found that 69.8% of respondents well-practiced pen construction and 50.0% well-practiced breed selection technologies. Over half (55.0%) and 40.8% well-practiced and very well-practiced respectively animal traction technology. Animal traction technology is one technology which has been passed on from one generation to another. Majority of respondents well-practiced and very well-practiced all the technologies. Key factors that help farmers to well-practiced these technologies are that they live in the same community, speak the same language and one can always go back and ask questions for clarification.

Table 4. 17 Level of practice of livestock production technologies received from colleague farmers

Livestock production technologies	Not well practices at all		Not too well-practiced		Somehow well practiced		Well-practiced		Very well practiced	
	Count	%	Count	%	Count	%	Count	%	Count	%
Pen construction	0	0	2	1.7	16	13.3	71	59.2	31	25.8
Breed selection	10	8.3	8	6.7	26	21.7	60	50	16	13.3
Deworming	2	1.7	0	0	28	23.3	63	52.5	27	22.5
Wounds treatment	5	4.2	5	4.2	23	19.2	67	55.8	20	16.7
Feed preparation	1	0.8	3	2.5	16	13.3	79	65.8	21	17.5
Animal traction	0	0	1	0.8	4	3.3	66	55	49	40.8
Diseases control	4	3.3	8	6.7	29	24.2	62	51.7	17	14.2

Source: Field Survey, 2014

4.4.5. Indigenous channels of communication

Apart from the conventional channels of communication, it is relevant to ascertain the types of indigenous channels of communication to determine their effectiveness in FtF communication. The study reveals that the indigenous forms of communication used in FtF communication include songs, proverbs and storytelling. Table 4.18 show the different forms of indigenous communication used in FtF communication. The result show majority of respondents (71%) deliver agricultural information to colleague farmers by verbal communication. Very few respondents deliver information to colleague farmers using songs (27%), proverbs (16%) and storytelling (5%). Pearson Chi-Square analysis (χ^2 = 0.672;, df=3, p=0.880) shows that there is no significant difference at 0.005 significant level between the forms of indigenous communication farmers use and delivery information to colleague farmers. This implies that farmers can access agricultural information using any of the indigenous forms of communication. There is no perfect medium for the exchange of views, the best medium is the one which is appropriate to the people taking part in the communication Mundy and Lloyd-Laney (1992).

Table 4. 18 Indigenous channels of communication

Indigenous communication channels		Deliver information to colleague farmers		Total
		Yes	No	
Songs	Count	27	0	27
	Row %	100.00%	0.00%	100.00%
Proverbs	Count	16	0	16
	Row %	100.00%	0.00%	100.00%
Story telling	Count	5	0	5
	Row %	100.00%	0.00%	100.00%
Verbal	Count	71	1	72
	Row %	98.60%	1.40%	100.00%
Total	Count	119	1	120
	Row %	99.20%	0.80%	100.00%

Source: Field Survey, 2014. χ^2 = 0.672; df=3, p=0.880, 0.05 Significance Level. Not Significant

4.5. Effectiveness of Technology Transfer in Farmer-to-Farmer Communication

Agricultural technologies are intended to help farmers increase production and enhance their livelihood. The relevance and timeliness of the technologies can enhance productivity. Relevance of technologies aids in adapting of these technologies for improved productivity. The relevance of the technologies farmers share was measured on a five point Likert scale as highly irrelevant, irrelevant, not sure, relevant and highly relevant. The timeliness of the technologies farmers receive from colleague farmers was measured on a five point Likert scale as highly untimely, not timely, not sure, timely and highly timely.

4.5.1. Relevance of crop production technologies

It is important that the technologies disseminated are relevant in meeting the needs of farmers. Farmers' technology and information needs differ based on their peculiar agricultural problems. Table 4.19 present a frequency distribution of the relevance of crop production technologies farmers receive from colleague farmers. Less than 2% of respondents consider the technologies irrelevant with no respondent considering the

technologies as highly irrelevant. The study show 8.5% of respondents are not sure of the relevance of agro-chemical use technologies they receive from colleague farmers. More than half (61.3%) and 26.9% of respondents consider land preparation techniques as relevant and highly relevant respectively. This is because many farmers relay on each other for land preparation especially women who do not have bullocks. These findings are confirmed by Oladele and Fawole (2007) who reported that farmers perceived the relevance of agricultural technologies as the potential to affect the eventual adoption of technologies.

Table 4. 19: Relevance of crop production technologies farmers receive from colleague farmers

Crop production technologies	Highly irrelevant		Irrelevant		Not sure		Relevant		Highly relevant	
	Count	%	Count	%	Count	%	Count	%	Count	%
Fertilizer use	0	0	1	0.8	8	6.7	60	50	51	42.5
Post-harvest management	0	0	1	0.9	7	6	93	80.2	15	12.9
Crop production management	0	0	1	0.8	1	0.8	78	65	40	33.3
Agro-chemical use	0	0	1	0.8	10	8.5	53	44.9	54	45.8
Land preparation	0	0	2	1.7	12	10.1	73	61.3	32	26.9

Source: Field Survey, 2014

4.5.2. Timeliness of crop production technologies received from colleague farmers

Agriculture is time bound and the timeliness of available technologies is crucial in increasing production. Table 4.20 present frequency distribution of timeliness of crop production technologies received from colleague farmers. Very few respondents (3.3%) and 12.5% consider fertilizer use technology as highly untimely and not timely respectively. Only 12.5% of respondents are not sure of timeliness of agro-chemical use technology they receive from colleague farmers. Almost 83.3% of respondents receive

post-harvest management technology timely and 82.5% of respondents receive crop management technologies timely. At the same time, 61.7% and 16.7% of respondents receive land preparation technology timely and highly time respectively. The large percentage of respondents receiving crop production technologies timely and highly time is an indication that respondents are able to reach each other quickly as they live in the same community. According to Mittal and Mehar (2013) majority of farmers cited other farmers as the most reliable, easily accessible source of information.

Table 4. 20: Timeliness of crop production technologies farmers received from colleague farmers

Crop production technologies	Highly untimely		Not timely		Not sure		Timely		Highly timely	
	Count	%	Count	%	Count	%	Count	%	Count	%
Fertilizer use	4	3.3	15	12.5	16	13.3	62	51.7	23	19.2
Post-harvest management	0	0	4	3.3	7	5.8	100	83.3	9	7.5
Crop production management	0	0	2	1.7	2	1.7	99	82.5	17	14.2
Agro-chemical use	0	0	12	10	15	12.5	62	51.7	31	25.8
Land preparation	4	3.3	10	8.3	12	10	74	61.7	20	16.7

Source: Field Survey, 2014

4.5.3. Relevance of livestock production technologies

According to Atengdem et al., (2010) the relevance of extension messages are operationally understood as those messages that fulfil the needs of the clients/beneficiary target as evidenced by their participation in the activities promoting those messages. The study examined those livestock production technologies that respondents consider relevant and seek advice on them from colleague farmers. Table 4.21 show a distribution of the relevance of technologies farmers receive from colleague farmers. The results show that 56.7% of respondents consider breed selection as relevant. The study reveals that 70.0%

and 17.5% consider animal traction as relevant and highly relevant respectively. Majority of the respondent consider all the technologies as relevant and highly relevant. This implies that farmers seek technologies that are relevant in addressing their production needs.

Table 4. 21: Relevance of livestock production technologies farmers received from colleague farmers

Livestock production	Highly irrelevant		Irrelevant		Not sure		Relevant		Highly relevant	
	Count	%	Count	%	Count	%	Count	%	Count	%
Breed selection	1	0.8	1	0.8	14	11.7	68	56.7	36	30
Pen construction	1	0.8	0	0	4	3.3	85	70.8	30	25
Feeding	0	0	1	0.8	5	4.2	75	62.5	39	32.5
Sanitation	1	0.8	1	0.8	11	9.2	70	58.3	37	30.8
Health care	0	0	0	0	3	2.5	54	45	63	52.5
Animal traction	1	0.8	0	0	14	11.7	84	70	21	17.5
Disease control	1	0.8	0	0	16	13.3	61	50.8	42	35

Source: Field Survey, 2014

4.5.4. Timeliness of livestock production technologies received from colleague farmers

Table 4.22 show frequency distribution of timeliness of technologies farmers receive from colleague farmers. The results show 60.0% of respondents received animal health care technologies timely and 70.0% receive animal traction technologies timely. The study show that 17.5% of respondent are not sure of the timeliness of breed selection technology they receive from colleague farmers. Few respondents (8.3%) indicate the health care technology they receive is not timely. Over 50% of respondents receive all the technologies timely.

Table 4. 22: Timeliness of livestock production technologies farmers received from colleague farmers

Livestock production	Highly untimely		Not timely		Not sure		Timely		Highly timely	
	Count	%	Count	%	Count	%	Count	%	Count	%
Breed selection	0	0	2	1.7	21	17.5	78	65	19	15.8
Pen construction	1	0.8	2	1.7	7	5.8	90	75	20	16.7
Feeding	1	0.8	1	0.8	7	5.8	85	70.8	26	21.7
Sanitation	1	0.8	2	1.7	12	10	80	66.7	25	20.8
Health care	1	0.8	10	8.3	4	3.3	72	60	33	27.5
Animal traction	2	1.7	3	2.5	16	13.3	84	70	15	12.5
Disease control	1	0.8	2	1.7	19	15.8	68	56.7	30	25.00%

Source: Field Survey, 2014

4.5.5. Effective practice of technologies received from colleague farmers

Effective practice of technologies received from colleague farmers is crucial in assessing the effective transfer of agricultural technologies in FtF communication. As presented in Table 4.23 Pearson Chi-Square statistical analysis at 0.005 significant level (χ^2 =0.771; df=2, p value=0.680) shows there is no significant difference between technology practice and technology reception from colleague farmers. Analysis of the data obtained from the study show 55.8% and 42.5% of respondents practice effective and very effective respectively the technologies they receive from colleague farmers. This implies farmers learn effectively from colleagues and they put what they learn into practice. This confirms earlier studies that rural people are less likely to resist adoption of an innovation when the new technique is based upon a concept or procedure they are already familiar with or are currently using Jiggins, Samanta, and Olawoye, (1997) cited in Swanson et al., (1998).

Table 4. 23: Effective practice of technologies received from colleague farmers

Effective practice of technologies		Receive technologies from colleague farmers		Total
		Yes	No	
Very ineffective	Count	1	0	1
	Row %	100.0%	0.00%	100.00%
Effective	Count	67	1	68
	Row %	98.50%	1.50%	100.00%
Very effective	Count	51	0	51
	Row %	100.00%	0.00%	100.00%
Total	Count	119	1	120
	Row %	99.20%	0.80%	100.00%

Source: Field Survey, 2014. χ^2 =0.771; df=2, p value=0.680, 0.005 Significant level. Not significant

4.5.6. Methods of extension delivery

The study examined the method of extension delivery that was employed by extension organizations in disseminating agricultural information and technologies to farmers. Table 4.24 presents methods of extension delivery to farmers. The extension teaching methods employed by extension organizations operating in the study area were found to be demonstration, training, group discussion and farm and home visits. Out of the 120 respondents for this study, majority (85%) of respondents receive agricultural information and technologies from AEAs through group discussions and 80.8% of respondents through farm and home visits.

Table 4. 24: Methods of extension delivery use by AEAs

Extension method	Responses		% of Cases
	N	%	
Demonstration	44	13.4	36.7
Training	86	26.1	71.7
Group discussion	102	31	85
Farm and home visit	97	29.5	80.8
Total	329	100	274.2

Source: Field Survey, 2014

4.5.7. Frequency of extension agent visit and access to extension services

The frequency of extension agent visit to farmers was explored to determine access to extension services. Table 4.25 present frequency of AEAs visit to farmers to provide extension services. The results show AEAs always visit 33.3% of the respondents and never visit 0.8% of respondents. Majority (65.8%) of respondents were seldom visited by AEAs. This suggests that despite the many extension organizations operating in the study area, extension service delivery by AEAs is still low in the Garu-Tempane district.

Table 4. 25: Frequency of agricultural extension agent visit to respondents

AEAs visit to farmers	N	%
Always	40	33.3
Seldom	79	65.8
Never	1	0.8
Total	120	100

Source: Field Survey, 2014

4.5.8. Changes that take place in farming practices of respondents after receiving technologies from colleague farmers

Adoption of good agricultural practices could result in improvement in farming practices. The study examined the changes that occur in farming practices of respondents after receiving agricultural technologies from colleague farmers. As shown in Table 4.26, 94.2% of respondents indicate their yields have increase as a result of the technologies they receive from colleague farmers. Important among the changes in farming practices of respondents is use of improved planting materials as overwhelming 82.5% of respondents indicate they receive improved planting materials from colleague farmers. Marketing of farm produce of respondents (26.7%) have also improved as a result of the technologies they receive from colleague farmers. Farmers realizing some benefits from the technologies they receive from colleague farmers would serve as motivation for farmers to

seek more technologies from colleague farmers. The findings confirm earlier study that asserts that access to information on fertilizer use is known to improve yields and incomes of farmers (Ali-Olubandwa, Odero-Wanga, Kathuri and Shivoga, 2010).

Table 4. 26: Changes that take place in farming practices of respondents as a result of technologies received from colleague farmers

Changes taken place	Responses		% of Cases
	N	%	
Increased yield	113	26.7	94.2
Increase farm size	92	21.7	76.7
Use of improve planting materials	99	23.4	82.5
Better Marketing	32	7.6	26.7
Food production improved	25	5.9	20.8
Increased income	62	14.7	51.7
Total	423	100.0	352.5

Source: Field Survey, 2014

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0. Introduction

This chapter presents conclusions based on the results of the study and recommendations which when implemented could enhance access to agricultural extension services to smallholder farmers in the Garu-Tempane district through FtF communication. This could therefore contribute to use of improved practices which could result in increased agricultural production thereby enhancing the livelihood of smallholder farmers.

5.1. Conclusion

From the analysis of results of this study in the Garu-Tempane district in the Upper East Region, it was established that farmers in the study area share agricultural information and technologies at home, on-farm, group meetings and other places that they normally meet. The study also discovered that farmers belong to indigenous community communication networks such as religious groups, farmer groups, kinship groups, cultural groups and Village Savings and Loans Associations (VSLA).

The results show the major source of agricultural information to respondents is AEAs, followed by colleague farmers, radio and publications. Majority (65.8%) of respondents interviewed for this study said their major source of agricultural information is AEAs. Pearson Chi-Square analysis of results shows there is no significant difference between gender and delivery of agricultural information to colleague farmers. Pearson Chi-Square value shows there is no significant difference between farmers' relationships and delivery of agricultural information to colleague farmers. The analysis of results shows the

indigenous forms of communication used by farmers include songs, proverbs, storytelling and verbal.

The types of crop production information farmers share with colleague farmers include information on farm credit, post-harvest management, marketing, crop production management and source of input supply. Overwhelming majority (89.2%) receive crop production information from colleague farmers. Livestock production information farmers share with colleague farmers include information on vaccination schedules, animal health care, marketing, and farm credit. Overwhelming majority (80%) receive livestock production information from colleague farmers.

The results show there is regular visits among farmers in search for agricultural information. It shows that 51.7% of respondents visit colleague farmers once in a week to seek agricultural information and very few (2.5%) respondents seldom visit colleague farmers for agricultural information. The study also reveals that the types of crop production technologies farmers share with colleague farmers are compost making, improved planting materials, planting in lines at correct spacing, use of agro-chemicals, land preparation and fertilizer use. The livestock production technologies farmers share are pen construction, breed selection, deworming, wound treatments, feed preparation, animal traction and disease control.

The study shows the major channels of communication used in FtF communication are one-to-one, group meetings and radio. There is high understanding of compost making, improved planting materials, land preparation and fertilizer use technologies when respondents receive them from colleague farmers through one-to-one and group meetings.

However, mean score (3.72) indicates that when farmers receive use of agro-chemicals technology from colleague farmers through group meetings, the understanding is average. The understanding is low when farmers receive all crop technologies from colleague farmers through radio. The results show farmers understanding is high with mean score of 4.63 when farmers receive animal traction technologies from colleague farmers through one-to-one communication. Mean score (3.81) indicates farmers understanding is average when farmers receive disease control technology from colleague farmers through one-to-one communication.

From the analysis, an encouraging situation of general timeliness of agricultural information and technology flow among farmers was established. Almost 83.3% of respondents receive post-harvest management technology timely and 82.5% of respondents receive crop management technologies timely. The results show 60.0% of respondents received animal health care technologies timely and 70.0% receive animal traction technologies timely. The results reveal that majority of the respondents consider all the livestock production technologies they receive from colleague farmers as relevant. 61.3of respondents consider land preparation techniques they receive from colleague farmers as relevant.

The study shows a worrying large number of farmers do not practice well agro-chemical technologies when received from colleague farmers. Based on respondents level of practice of technologies 35.8% somehow well practiced and 14.2% not too well-practiced agro-chemical technologies they receive from colleague farmers. Further analysis of results show that respondents' farming practices have changed as a result of the agricultural technologies they receive from colleague farmers. This accounts for 92.4% of respondents haven seen increased in yields, 82.5% of respondents now use improved

planting materials and 26.7% of respondents have improved marketing of their farm produce.

5.2. Recommendations

1. The study established that farmers communicate agricultural information through social interactions in community network groups. It is therefore recommended for AEAs to plan their extension activities in line with these groups so that more farmers could be reached.
2. The CBEAs concept which is existing in the district could be strengthened to serve as a link between MOFA and the community. This will complement efforts of the few AEAs in the district.
3. Promote the use of improved agricultural technologies and provide exposure and training in agricultural technologies to contact farmers. This would empower farmers especially women and enhance demand for improved agricultural information and technologies. The skills of contact or lead farmers however need to be sharpened in certain areas. Specific areas include:
    - Agro-chemical use
    - Disease and pest control in crops and livestock
    - Processing of agricultural produce
    - Livestock and poultry husbandry and health
4. The study observed that majority of farmers consider radio as their third major source of agricultural information. The presence of QUAILTY FM in the district has boosted radio listening among farmers. It is recommended that extension organizations form radio listening groups for extension messages to be broadcasted at specific times known to farmers.

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APPENDIX

Appendix 1: Questionnaire for farmers' survey in the study area

Topic: Potential of Farmer-to-Farmer Communication to Enhance Access to Agricultural Extension Services in the Garu-Tempane District.

Sir/Madam, I am a student of the University of Ghana conducting a survey on Potential of Farmer-to-Farmer Communication in the Garu-Tempane District. You have been selected to provide the needed information that will enable me complete the project. I will therefore like to solicit information from you regarding farmer-to-farmer communication. Your answers to the questions shall be used confidentially towards enhancing access to extension services in the district. Thank you.

TO BE ADMINISTERED TO FARMERS

SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. District…….
2. Village/Community…….
3. Age of respondent:…….(years)
4. Gender. **Tick only one**

   (1) Male [ ] (2) Female [ ]
5. Level of formal education. **Tick only one**

   (1) No formal education [ ] (2) Basic (Pri/JHS/Middle) [ ]

   (4) Secondary (SHS/Voc/Tech) [ ] (5) Tertiary (College/Poly/University [ ]
6. Marital status. **Tick only one**
   (1) Married [ ] (2) Single [ ]
7. Religion. **Tick only one**
   (1) Traditional [ ] (2) Christianity [ ]

   (3) Islam [ ] (4) Others specify…….
8. How many years have you been farming?.....
9. Which of these farmer networks do you belong to? **Tick all that apply**
   (1) CBEA [ ] (2) CLW [ ] (3) WEV [ ] (4) VGA [ ] (5) Non

10. What areas of agriculture are you involved in? **Tick all that apply**

Crops	**Rain**	**Dry**
Maize		
Rice		
Millet-early		
Millet-late		
Sorghum		
Groundnut		
Soybean		
Onion		
Water melon		
Tomatoes		
Pepper		
Okra		
Bra		
Cowpea		
Others specify …… ……		

Livestock	**Yes**	**No**	**Number**
Sheep			
Goat			
Pigs			
Cattle			
Donkey			
Others specify …….			
Poultry			
Fowls			
guinea fowls			
Ducks			
Doves			
Turkey			
Others specify ……..			

Influence of farmer-to-farmer communication on agricultural information flow.

11. Please indicate the presence of the following types of groups in your community and your membership? **Tick all that apply**

No.	**Group**	**In community**		**Member**	
		Yes	**No**	**Yes**	**No**
1	Religious groups				
2	Farmer groups				
3	Kinship				
4	Cultural group				
5	Village savings and loans associations				
6	Others specify……				

12. Please indicate by rank your source of agricultural information from the following? **Tick appropriately**

Source of information	**Ranked major source**			
	1st major	**2nd major**	**3rd major**	**4th major**
AEA				
Colleague farmers				
Radio				
Publications				
Others specify……				

13. How often do you visit other farmers for agricultural information? **Tick only one**

(1) Once a week [ ] (2) Once in two weeks [ ] (3) Once in a month [ ] (4) Seldom [ ]

14. Where do you seek agricultural information from other farmers? **Tick all that apply** (1) at home [ ] (2) on farm [ ] (3) at group meetings [ ]

CROP PRODUCTION

15. What type of information do you receive from colleague farmers on crops? **Tick all that apply**

(1) Farm credit [ ] (2) Post-harvest management [ ] (3) Market information
(4) Crop production management [ ] (5) Source of input supply [ ]

16. How well would you say you understand the message you receive from colleague farmers? **Tick only one**
(1) Not well at all [ ] (2) Somehow well [ ] (3) Well [ ] (4) Very well [ ]

17. How would you rate the relevance of these technologies you receive from colleague farmers in fulfilling your crop production needs? **Tick appropriately**

Crop production information	**1.Highly irrelevant**	**2.Irrelevant**	**3.Not sure**	**4.Relevant**	**5.Highly relevant**
Fertilizer use					
Post-harvest management					
Crop Production management					
Agro-chemical use					
Land preparation					

18. Indicate how timely you received each of these technologies from colleague farmers. **Tick appropriately**

Crop production information	**1.Highly untimely**	**1.Not timely**	**3.Not sure**	**4.Timely**	**5.Highly timely**
Fertilizer use					
Post-harvest management					
Crop Production management					
Agro-chemical use					
Land preparation					

19. What crop production technologies do other farmers transfer to you? **Tick all that apply**

(1) Compost making [ ] (2) Improved planting materials [ ] (3) Storage [ ]
(4) Planting in lines at correct spacing [ ] (5) Use of agro-chemicals [ ]
(6) Land preparation [ ] (7) Fertilizer use [ ]
(8) Pest and disease control [ ](9) Others specify……

20. How would you rate your understanding of these crop production technologies received from colleague farmers using the communication channel? **Tick appropriately**
1. Very low 2. Low 3. Average 4. High 5. Very high

Technology	**One-to-one**	**Group meetings**	**Mass method**
Compost making			
Improved planting materials			
Storage			
Planting in lines at correct spacing			
Use of agro-chemicals			
Land preparation			
Fertilizer use			
Others specify……			

21. How well would you say you are in practicing these crop production technologies received from colleague farmers? **Tick appropriately**

Technology	**1.Not well practices at all**	**2.Not too well-practiced**	**3.Somehow well practiced**	**4.Well-practiced**	**5.Very well practiced**
Compost making					
Improved planting materials					
Storage					
Planting in lines at correct spacing					
Use of agro-chemicals					
Land preparation					
Fertilizer use					
Others specify……					

LIVESTOCK PRODUCTION

22. What type of information do you receive from colleague farmers on livestock production? **Tick all that apply**

(1) Breed selection [ ] (2) Housing [ ] (3) Feeding [ ]
(4) Vaccination schedules [ ](5) Health care [ ] (6) Marketing [ ]
(7) Source of drugs [ ] (8) farm credit [ ]

23. How would you rate the relevance of these technologies you receive from colleague farmers in fulfilling your livestock production needs? **Tick appropriately**

Livestock production	**1.Highly irrelevant**	**2.Irrelevant**	**3.Not sure**	**4.Relevant**	**5.Highly relevant**
Breed selection					
Pen construction					
Feeding					
Sanitation					
Health care					
Animal traction					
Disease control					

24. Indicate how timely you received each of these technologies from colleague farmers. **Tick appropriately**

Livestock management information	**1.Highly untimely**	**2.Not timely**	**3.Not sure**	**4.Timely**	**5.Highly timely**
Breed selection					
Pen construction					
Feeding					
Sanitation					
Health care					
Animal traction					
Disease control					

25. What animal production technologies do your colleague farmers transfer to you? **Tick all that apply.**

    (1) Pen Construction [ ] (2) Breed selection [ ] (3) Deworming [ ]
    (4) Treatment of wounds [ ] (5) Feed preparation [ ] (6) Animal traction [ ]
    (7) Disease control [ ] (8) Others specify……

26. How would you rate your understanding of these animal production technologies received from colleague farmers using the channel of communication? **Tick appropriately**

1. Very low 2. Low 3. Average 4. High 5. Very high

Technology	**One-to-one**	**Group meetings**	**Mass method**
Pen construction			
Breed selection			
Deworming			
Wounds treatment			
Feed preparation			
Animal traction			
Diseases control			
Others specify……			

27. How well would you say you are in practicing these livestock production technologies received from colleague farmers? **Tick appropriately**

Technology	1.Not well practiced at all	2.Not too well-practiced	3.Somehow well practiced	4.Well-practiced	5.Very well practiced
Pen construction					
Breed selection					
Deworming					
Wounds treatment					
Feed preparation					
Animal traction					
Diseases control					
Others specify……					

Farmer-to-Farmer Communication

28. How often do you receive information from colleague farmers on crops, poultry and livestock? **Tick only one**.

(1) Once a week [ ] (2) Once in two weeks [ ] (3) Once in a month [ ] (4) Seldom [ ]

29. Do you deliver information to other farmers? **Tick only one**

(1) YES [ ] (2) NO

30. If No, why?.....……...

31. If Yes indicate the type of information do you deliver your colleague farmers? **Tick all that apply**

Type of information	**Crop**		**Livestock**	
	Yes	**No**	**Yes**	**No**
Farm credit				
Post-harvest management				
Crop production				
Livestock production				
Source of input supply				
Market information				

32. How often do you deliver information to your colleague farmers? **Tick only one**
(1) Once a week [ ] (2) Once in two weeks [ ] (3) Once in a month [ ]
(2) (4) Seldom [ ]

33. What is your relationship with the farmers you deliver agricultural information to? **Tick all that apply**

(1) Family members [ ] (2) Friends [ ] (3) Farmer group members [ ]

(4) Members of religious group [ ] (5) Non community members [ ]

34. What category of farmers do you deliver agricultural information to? **Tick all that apply**

(1) Male [ ] (2) Female [ ] (3) Male and female [ ]

Effectiveness of Communication Channels in Farmer-to-Farmer Communication

35. How do you receive agricultural information from colleague farmers? **Tick all that apply**

(1) Personal [ ] (2) Groups meetings [ ] (3) Mass methods [ ]

36. Which indigenous communication channels do you use to deliver information to colleague farmers? **Tick all that apply**
(1) Songs [ ] (2) Proverbs [ ] (3) Story telling [ ] (4) verbal [ ]
(5) Others specify……

Extension Services to Farmers

37. Do you know the AEA in-charge of your community? **Tick only one**
(1) YES [ ] (2) NO [ ]

38. Did you receive agricultural technology(s) from any extension organization in the past one year? **Tick only one** (1) YES [ ] (2) NO

39. If yes to 38. Indicate frequency of technology transfer? **Tick only one**

(1) Once a month [ ] (2) Once in two months [ ]
(3) Once in three months [ ] (4) Once in a year [ ]

40. Which extension organization transferred the technology(s) to you? **Tick all that apply**

(1) Ministry of Food and Agriculture (MOFA) [ ]
(2) Presbyterian Agricultural Station (PAS) [ ]
(3) Bawku East Small Scale Farmers Association Rural Bank [ ]
(4) Care International [ ] (5) ZOVFA [ ] (6) World Vision International [ ] (7) Wienco Cotton Copany [ ] (8) Others specify……

41. How is the technology transferred to you? **Tick all that apply**
(1) Demonstration [ ] (2) Training [ ] (3) Discussion [ ]

42. How often do AEAs visit you to give you technical guidance or monitor your work? **Tick only one**
(1) Always [ ] (2) Seldom [ ] (3) Never [ ]

CROPS PRODUCTION TECHNOLOGIES

43. What crop production technologies do extension organization(s) transfer to you? **Tick all that apply**
(1) Compost making [ ] (2) Improved planting materials [ ] (3) Storage [ ]
(4) Planting in lines at correct spacing [ ] (5) Use of agro-chemicals [ ]

(6) Land preparation [ ] (7) Fertilizer use [ ] (8) Pest and disease control [ ] (9) Others specify…….

44. How effective do you practice the technology(s) you receive? **Tick only one** (1) Very ineffective [ ] (2) Ineffective [ ] (3) Not sure [ ] (4) Effective [ ] (5) Very effective [ ]

45. What would you say is the contribution of the technology(s) received to your farming? **Tick all that apply**
(1) Increased yield [ ] (2) Increased status [ ] (3) Increased income [ ]

46. What changes have taken place in your farming practices as a result of the technology(s) you received? **Tick all that apply**
(1) Increased yield [ ] (2) Increase farm size [ ]
(2) Change to improve planting materials [ ] (4) Others specify……

47. What crop production technologies do you transfer to colleague farmers? **Tick all that apply**
(1) Compost making [ ] (2) Improved planting materials [ ]
(3) Storage [ ](4) Planting in lines at correct spacing [ ]
(5) Use of agro-chemicals [ ](6) Land preparation [ ] (7) Method of fertilizer application [ ] (8) Pest and disease control [ ] (9) Others specify……

LIVESTOCK PRODUCTION TECHNOLOGIES

48. What livestock production technologies do extension organization(s) transfer to you? **Tick all that apply**
(1) Pen Construction [ ] (2) Breed selection [ ] (3) Deworming [ ]
(4) Treatment of wounds [ ] (5) Feed preparation [ ] (6) Animal traction [ ] (7) Disease control (8) Others specify……

49. How effective do you practice the technology(s) you receive? **Tick only one** (1) Very ineffective [ ] (2) Ineffective [ ] (3) Not sure [ ] (4) Effective [ ] (5) Very effective [ ]

50. What would you say is the contribution of the technology(s) received to your farming? **Tick all that apply**
(1) Increased stock size [ ] (2) Increased status [ ] (3) Increased income

51. What changes have taken place in your farming practices as a result of the technology(s) you received? **Tick all that apply**
(1) Increased stock size [ ] (2) Increase health status of livestock [ ]
(3) Others specify……
52. What livestock production technologies do you transfer to colleague farmers? **Tick all that apply**

(1) Pen Construction [ ] (2) Breed selection [ ] (3) Deworming [ ]
(4) Treatment of wounds [ ] (5) Feed preparation [ ] (6) Animal traction [ ]
(7) Disease control [ ] (8) Others specify……