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FEED THE FUTURE GHANA AGRICULTURE POLICY SUPPORT PROJECT (APSP)

Gender Responsive Agricultural Extension Delivery for Improved Agricultural Productivity in Northern Ghana



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**Gender responsive agricultural extension delivery for improved agricultural
productivity in Northern Ghana**

Contract No. 641-C-14-00001

February 2017

PREPARED BY:

Wilhemina Quaye, Masahudu Fuseini and Paul Buadu

This publication was produced for review by the United States Agency for International Development. It was prepared by Chemonics International Inc. The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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List of Acronyms

AES	Agricultural Extension Services
ADVANCE	Agricultural Development and Value Chain Enhancement
AEAs	Agricultural Extension Agents
ADEs	African Forum for Agricultural Advisory Services
AgREN	Agricultural Research and Extension Network
AOTR	Agreement Officer's Technical Research
BOPP	Benso Oil Palm Plantation
CIDA	Canadian International Development Agency
CSIR	Council for Scientific and Industrial Research
CSOs	Civil Society Organisations
DFID	Department for International Development
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
FASDEP	Food and Agriculture Sector Development Policy
FFS	Farmer Field Schools
GADS	Gender and Agricultural Development Strategy
GDP	Gross Domestic Product
GREL	Ghana Rubber Estate Limited
ICRW	International Center for Research on Women
ICT	Information communication Technology
IDS	Institute of Development Studies
IEHA	Initiative to End Hunger in Africa
IFPRI	International Food Policy Research Institute
ISSER	Institute of Statistical, social and Economic Research
MEAS	Modernizing Extension and Advisory Services
METASIP	Medium Term Agriculture Investment Programme
MOAAS	Market-oriented agricultural advisory services
MOFA	Ministry of Food and Agriculture
NGOs	Non-Governmental Organizations
OLS	Ordinary Least Squares
PHD	Degree of Doctor of Philosophy
PRA	Participatory Rural Appraisal
RAS	Rural Advisory Services
RTIP	Race Track Industry Program
SARI	Savanna Agricultural Research Institute
SPFS	Special Programme for Food Security
STEPRI	Science and Technology Policy Research Institute
TOT	Terms of Trade
USAID	United State Agency for International Development

VSLs	Village Saving and Loan Scheme
VSO	Voluntary Service Overseas
WEV	Women Extension Volunteer
WIAD	Women in Agricultural Development Directorate

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EXECUTIVE SUMMARY

This study was conducted with the overall goal of understanding gender responsive agricultural extension delivery for improved Agricultural Productivity in Northern Ghana. The specific objectives were to:

- investigate how gender dynamics interact with the agricultural extension practices in the three Northern regions in Ghana;
- gain an in-depth understanding of gender issues surrounding the adoption and adaptation of selected technologies;
- investigate intra-household decision-making on access to production resources such as land, water and other inputs needed for the adoption and adaptation of the selected technologies; and
- inform discussions and decisions on gender responsive strategies and practices for policy making.

Research Methodology

The study approach and methodology involved three clear phases: Phase I involved thorough literature review focusing on contextual gender analyses of agricultural communities in Northern Ghana including Northern, Upper East and Upper West Regions. The literature review was guided by the evaluation questions in order to capture the relevant literature in the specific themes and area of study. Phase II involved Case Studies of the Agricultural Development and Value Chain Enhancement (ADVANCE) and the Women Extension Volunteer (WEV) programs which ended in 2012. Phase III involved qualitative and quantitative content analysis. A total sample of persons interviewed was 592 in selected communities in East Mamprusi, Garu Tempane and Wa East districts in Northern Ghana. In addition to one-on-one interviews, 18 focus group discussions were conducted in the surveyed districts.

Key Findings

- ▶ Culturally, the study identified gendered associations with some crop types across all the study districts; Males generally cultivated the maize crop and adopted related technologies while females farmed Soyabean and adopted soyabean related technologies. Two main reasons are provided for this situation. The first important reason is that culturally, the man in male-headed households is responsible for the food security needs of the entire family which is provided via the cultivation of maize crop (main staple crop). The second reason is that because the men are comparatively more economically endowed than the females, they are able to afford the relatively high cost of the technologies and inputs

required in maize cultivation. Soyabean cultivation on the other hand is associated with females because its cultivation requires less expensive technologies and inputs.

- ▶ Cultural discrimination against women in terms of access to land is observed by the small plots of land apportioned to them and in most cases in far infertile areas. The validation workshop confirmed this gender gap with respect to access to land.
- ▶ Some value chain projects and NGOs reinforced the gender differentiated crop enterprises as stated in the preceding point without any serious efforts at implementing approaches and innovations aimed at significantly boosting productivity and reducing cost of technologies/ inputs which will break down the cultural and economic barriers hindering especially females in cultivating 'male' crops. The overall benefit from such development will be the empowerment of females socially and economically leading to improvement in family welfare.
- ▶ As evidence of the inadequacy in technological innovations, the stakeholders at the workshop decried the continued recommendation and application of NPK fertilizer on soils in the different districts where value chain projects are taking place. No soil analyses are conducted to determine the appropriate fertilizer blends to be applied. Another example is the continued drudgery and use of high labour inputs (from both male and females) involved in farming operations leading to low labour productivity.
- ▶ The study findings indicate that general extension delivery services are biased against women evidenced by:
 - Men are given consideration first in extension and rural advisory services because of the scale of their resource endowment – men had more access to land and had relatively bigger farms sizes than women;
 - Ability of men to access extension officers outside community in situations where there is no extension officer in the community because men have a considerable latitude in mobility than women due to cultural inhibitions on women's movement;
 - Females access extension through men house heads because of socio cultural inhibition on women engaging frequently with men who are not their spouses or family people.
- ▶ The study found that agricultural programmes that deliberately targeted gender in extension activities benefited females more than males. The new socio cultural and financial dynamics resulting from the gendered extension delivery by the value chain projects have led to some improvement in women empowerment.
 - Financially empowered men were able to overcome some of the carriers to access production resources such as land, seed and extension services.
 - Some resource-endowed women have more land than men. The average percentage increase in access to land is 6.4% for those women beneficiaries.
 - Female beneficiaries had a 13.2% higher maize income than male beneficiaries; however, female beneficiaries had only a 1% higher maize income than female non-beneficiaries.

Policy Recommendations

From the above conclusions, the study recommendations for MoFA and its Development partners are:

- (1) More conscious effort is needed to reach out to women than men considering that traditional gender roles and socio-cultural barriers play against women;
- (2) Break gendered support of crop types through women empowerment programmes. This can be achieved through the use of gender advocacy groups at the local level
- (3) MoFA extension delivery system could use male champions to increase women access to extension services;
- (4) MOFA should use appropriate extension methodologies/tools to reach out to females and the youth. For example the use of social network platform to reach the youth; and
- (5) MOFA and initiators of value chain projects should collaborate with advocacy groups to tackle strict traditional gender roles and socio-cultural barriers limiting women access to productive resources.

1.0 INTRODUCTION

1.1 Background

Gender inequality has become a major concern, an issue of importance and central to efforts in improving agricultural productivity. This is because agriculture contributes significantly to the nation's GDP; about 22.7%, 22% and 21.7% in 2012, 2013 and 2014 respectively (ISSSER 2015). Growth in the agricultural sector remains fundamental for employment creation, poverty reduction and food and nutrition security. However, productivity is far below its potential and the need to improve productivity in the agriculture sector is critical to the socio-economic development of the country. With women forming the majority of the agricultural labour force in Ghana and in Africa (50% agricultural labour force, (FAO 2011), they become the compelling target for support in terms of improving agricultural productivity. The case for enhancing women's productivity is made stronger against the background that several researchers including (Quaye *et al* 2014) have observed that there is wide gender gap crop productivity between man and women.

The gender productivity gap is attributed to various factors including limited access to production assets and services such as land, technology and extension services. The agricultural extension system has been found to be less sensitive to women's interests, needs and challenges and does not seem to create adequate opportunities for women (MOFA/WAAPP, 2014).

A study conducted in Ghana by Quaye *et al* 2014 found that culturally, males are empowered and better positioned to assume stronger rights over productive resources including improved technologies than their female counterparts who equally play significant roles in the agricultural value chain. Women also face other challenges such as inadequate capital, low use of fertilizer and other agro-chemicals, inadequate access to mechanization services (tractors), harvesters, processing technologies and insufficient access to output markets.

To address the long-standing issue of gender imbalances in terms of access to agricultural production resources and services as elaborated in the foregoing section, it is imperative that policy makers and agricultural extension practitioners understand gender perspectives concerning differentiated needs, interests, responsibilities and access to production assets and provision of services. This is because these issues affect the adoption and use of improved technologies and consequently, agricultural productivity. There is a great deal of academic discourse on the cultural and/or religious aspects of gender inequity among agricultural and rural communities which can be used to generate evidence for policy formulation to enhance female agricultural productivity and food security. However, not much work has been done on the extension-gender link in Ghana which is most novel element of the current study (Doss

2013, Jeyaruba et al 2013, Less 2012, Razavi 2003, Whitehead and Tsikata 2003, Fafchamps and Quisumbing 2002).

To this end, this study attempts to examine the gender dimensions of some selected agricultural interventions in the three Northern Regions of Ghana. This study addresses productivity improvement under the Food Security and Emergency Preparedness in FASDEP II/METASIP II with the view to obtain evidence for policymaking.

Two main case studies have been conducted including (i) Women Extension Volunteer (WEV) Approach and (ii) Agricultural Development and Value Chain Enhancement (ADVANCE) Program which mainstream gender in the implementation activities to reach more female farmers with extension delivery and other rural advisory services.

1.2 Study Objectives

Primarily, this research seeks to address issues relating to gender differences and understand how gender intersects with other socio-economic factors in agricultural extension delivery. In order to inform discussions and decisions on gender responsive strategies and practices to enhance technology adoption among women, the study aims are to:

- investigate how gender dynamics (socio-cultural issues) interact with the agricultural extension practices in the three Northern regions in Ghana;
- investigate intra-household decision-making on access to extension services and other production resources needed for the adoption and adaptation of the selected technologies;
- gain an in-depth understanding of gender issues surrounding the adoption and adaptation of selected technologies; and
- To inform discussions and decisions on gender responsive strategies and practices for policy making.

1.3 Methodology

The gender study employed both qualitative and quantitative approaches in data collection and analysis. Four clear phases including (1) literature Review, (2) Data Collection, (3) Reporting, and (4) Validation Workshop were followed.

1.3.1 Planning & Preparation for Field Work

Composition of project team and responsibilities

The Research Team Composition was made up of three research scientists from STEPRI and one university graduate national service person who assisted with the field work. Other

enumerators (university graduates) were contracted from the affected districts, to assist in the data collection exercise. The team leader was responsible for supervising and randomly cross-checking completed questionnaires on the field as well as organizing and conducting focus group discussions. The team composition and task assigned to individual team members is attached in Appendix I I.

1.3.2 Survey instruments, Sampling and Data Collection

A structured questionnaire was developed for use in collecting information from the target groups (see Appendix I). A representative sample of the ADVANCE project beneficiaries was interviewed one-on-one to generate the quantitative data. The first section of the structured questionnaire covered demographic information of the farmers. The subsequent sections of the questionnaire solicited data and information on access to productive resources including land, seed, extension services, credit, irrigation and tractor services and productivity. The last section of the questionnaire dealt with intra-household decision making on access to production resources.



Case studies of the Women Extension Volunteer (WEV) Approach and ADVANCE beneficiaries were conducted to illustrate how these projects addressed specific issues of gender gaps in access to extension delivery, improved seed varieties and market access, and to generate and document the important lessons from the projects for broad dissemination. An important aspect of this study is the focus on clear evidence of change and impact, using both project beneficiaries and non-project beneficiaries for the analysis. Focus Group Discussion was used to elicit the issues. A total of 18 focus group discussions were held in the three districts

Researcher interviewing ADVANCE Aggregator in Garu Tampane

Key informants (Agriculture Extension Agents (AEAs), chemical and input dealers, marketers) were also interviewed on one-on-one bases to gain deeper understanding of the subject matter in the various districts.



Males Group interviews at Funsu and Tambaalug in Wa East and Garu Tampane Districts respectively



Group interview at Dagbiriboare and meeting with the MOFA District Director in East Mamprusi

Two communities were purposively selected per region based on locations of demonstration sites/trials and level of commitment by farmers and operational areas of ADVANCE and WEV (See Table 1.1).

Table 1.1 Surveyed Areas

Region	Community	No. Focus Group Discussions	Sample Interviewed (one-on-one)	Common Language
Northern/ East Mamprusi District	Boayini Dagbiriboare	6	195	Mampruli

Upper West/Wa East	Funsi Yaala I	6	179	Wala/Dagaare
Upper East/ Garu Tampani District	Biamboog Tambaalug	6	218	Kusaal

Sample size for one-on-one interviews

Following Israel (2009) formula for determining sample size of the target population, given as:

$$n = N / [1 + N(e)^2]$$

Where, n = the sample size, N = population e = alpha level.

With an alpha (significance) level of 0.05, it was expected that approximately 100 farmers covered as a representative sample size per community in the selected areas for this study. Total sample interviewed was 592.

A stakeholder list was developed with email and telephone contacts generated for calls to book field appointments. The actual fieldwork was conducted in August 2016. With the help of the District Agricultural Directors and the Responsible Project Officers of the cases to be studied, respondents were identified for administration of the questionnaires.

1.3.3. Data Analysis

Qualitative content analysis approach was used for qualitative data analysis. From the textual material/transcription and translation, categories were generated, and inferences drawn to reflect the interpretation of the content of the data collected from the field. The analysis procedure started with the field notes from the focus group discussions, key informant interviews and observations. The themes discussed were basically the evaluation or research questions drawn from the research objectives. As presented in the study findings, themes were generated from the analysis and the write-ups give the research evidence that address the study objectives.

For the quantitative analysis, the *meta* production function approach was employed as detailed in section 4.3 to examine the effect of ADVANCE project on farm incomes of the beneficiaries.

1.3.4 Overview of surveyed areas

The East Mamprusi District

The East Mamprusi District is located in the north-eastern part of the Northern Region. It covers a land mass of 1,706.8 square kilometers, representing about 2.2 percent of the total land mass of the region. The population of East Mamprusi District is approximately 121,009

representing 4.9 percent of the region's total population. Males constitute 49 percent and females represent 51 percent of the population. The district has a rural population of 81,850, representing 67.6 percent. The district is primarily agrarian with 90.6% of the households engaged in agriculture. Most households in the district (97.3%) are involved in crop farming. Goat is the dominant animal reared in the district. About 14 percent of the population have mobile phones. Among the men, those who own mobile phones constitute 18.3 percent as compared to 9.8 percent of females.

The Garu Tempene District

The Garu Tempene District of the Upper East Region, shares borders to the East with the Republic of Togo, to the North with Burkina Faso, to the West, with Bawku Municipal and to the South with East Mamprusi District. The soil types are a combination of red and brown sandy loam and clays, moderately deep pale brown coarse sandy loams with biotic granites and gray sandy loams and clays in rivers valleys. The White Volta passes through the district. The rainy session in the area starts from May /June to September/ October. The average amount of rainfall during the period is between 800- 860mm per annum. The lowest mean temperature is 180C occurring in December/January and highest mean monthly temperature is 400C occurring in March/ April.

The estimated total population of the district is 125,280 with a population density of 99 persons per square kilometers. The district has total land area of 1230sqkm. The population of the district is primarily rural and scattered in dispersed settlements, which is about 90 per cent rural and about 10 per cent urban. Farming is the predominant occupation of the people in the district with the total farm population ranging between 80 and 90%. Farmers in the district engage in cultivation of cereals, legumes vegetables as well as tree crops.

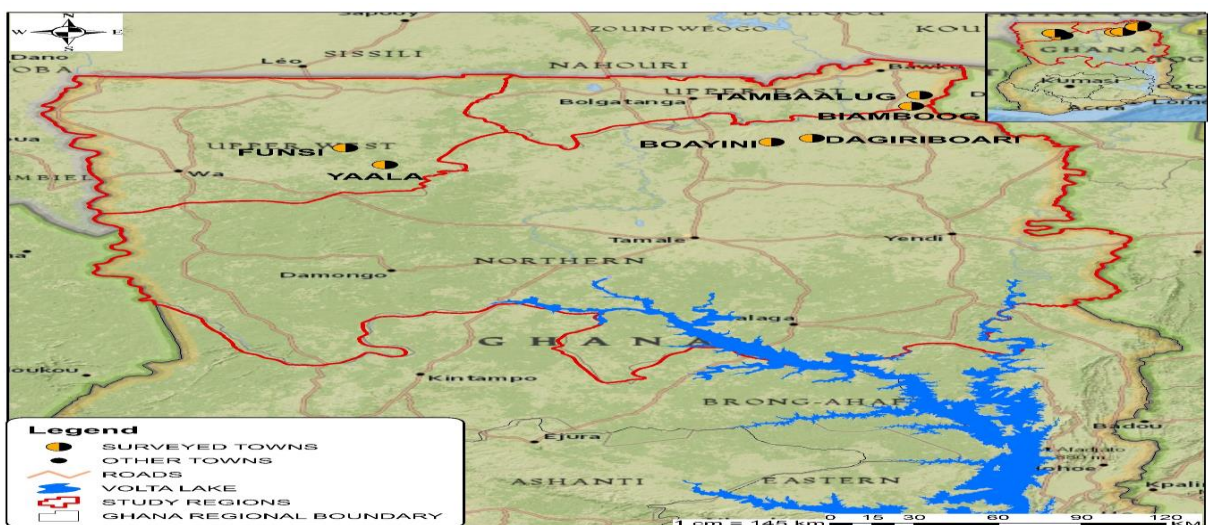
The Wa East District

The Wa East district is located in the South-Eastern part of the Upper West region. The capital is Funsu, about 115km away from Wa, the regional capital. The population of the municipality according to 2010 population and housing census stands at 72,074 with 36,396 males and 35,678 females. The land is generally undulating with height between 180-1300m above sea level. The vegetation is made up of scattered trees, shrubs and grasses of varying heights. The common trees in the district include Shea, Baobab, Kapok, Dawadawa, Acacia, Neem, Mangoes and Cashew. Annual bush burning, inappropriate farming practices, indiscriminate cutting of trees for wood, charcoal and poor animal husbandry practices have destroyed 30 percent of the natural vegetation. The district has a single rainfall regime, May-October.

Food Crops grown include cereals (maize, rice, sorghum and millet), legumes (groundnuts, cowpea, soyabean), roots and tubers (yam and cassava). There is a high potential for livestock

and poultry production in the district. It is the second most important agricultural activity undertaken by farmers for income generation and home consumption. The major livestock and poultry kept by farmers include cattle, sheep goats, swine, rural poultry, guinea fowls, turkeys, ducks and pigeons. Potential investment opportunities exist in agriculture in the district. These include the following;

- Lowland /valley bottoms for expanded irrigation and rice production.
- Suitable land for tree crops cultivation (mango and cashew).
- Vast land for cash crops cultivation (cotton, soya beans, industrial maize).
- Water bodies for culture fish production (aquaculture).
- Large wild Sheanut picking and processing (women).



Map of Ghana Showing the surveyed communities

1.3.5 Validation Workshop

A validation workshop was held at the Tamale Catholic Guesthouse on the 1st December, 2016 to offer stakeholders particularly farmers, extension practitioners and other agricultural value chain actors interviewed during the survey, the opportunity to make inputs to enhance the content of the report. The objectives of the workshop were to receive inputs from key stakeholders to validate research findings (See appendix VII for participants List).



Participants at the validation workshop and a section of participants during discussions

2.0 LITERATURE REVIEW

Thorough literature review focusing on gender analyses of agricultural communities in Ghana was done. The literature review process was guided by the evaluation questions in order to capture the relevant literature in the specific themes and area of study.

2.1 Overview of Agricultural Extension System in Ghana

In Ghana, the Agricultural Extension System has been decentralized and embedded in the Local Government System (LGS). This is to promote local level participation in agricultural governance and policy-making processes as well as to enhance sustainable agricultural development. The Extension Directorate of Agricultural Extension Services (DAES) aims to achieve greater improvement in farm production and income, farmer household livelihoods as well as the nutrition of the rural population. With decentralization, MOFA has transferred power and extension staff to the District Assemblies while the regional and national level administration focuses on policy, planning, coordination, technical support, monitoring and evaluation (Okorley 2007). Decentralization of the agricultural sector is also to ensure that the District Agricultural Departments can access the District Assembly Common Fund and Member of Parliament's Common Fund.

Table 1.2 gives a summary of agricultural extension approaches in Ghana. Extension delivery in Ghana has evolved from the traditional methods of Farmer Field Schools (FFSs) and on-farm demonstrations, which are associated with high cost and limited scale of outreach to extension and the use of community-based extension services delivery systems. The community-based rural agricultural extension model is based on the idea of providing specialised and intensive technical training to 1 or 2 people in a community who then promote a variety of appropriate technologies and provide technical services with occasional support and review from a supporting organisation (FAO, 1997).

Currently, limited extension service delivery has become a major concern in Ghana's Agriculture sector. Extension officer to farmer ratio stands at 1:3000 which is woefully inadequate (instead of 1:500). Agricultural sector analysis study conducted in 2014 showed that only less than 20% of the representative sample of 372 value chain actors interviewed in 12 districts in Ghana accessed extension services (MOFA/WAAPP 2014). Male farmers have more access to extension services than their female counterpart (28.2% men against 12.3% women accessing extension services in agricultural production).

Table 1.2. Summary of the Extension Approaches in Ghana

TYPE	HOW IT IS USED (CHARACTERISTICS)	WHO USES IT	LOCATIO N	STRENGTHS	WEAKNESS	INSTITUTIONA L ARRANGMENT	HOW TO IMPROVE
Farmer field school/IPM	<ol style="list-style-type: none"> 1. Technology is transferred through experiential learning 2. It covers the entire season of the commodity 3. Farmer centered extension 4. Facilitator must be knowledgeable and confident 5. Use of TOT 6. Use of farmer groups 7. Aspects of FSR&E incorporated 	MOFA Projects (RTIP & SPFS), NGOs, FAO, COCOBOD	Cocoa growing areas, RTIP Districts	<ol style="list-style-type: none"> 1. Participatory and hands - on 2. Result oriented 3. enhances technology adoption 4. joint decision making 5. creation and sharing of knowledge 6. builds confidence of participants 	<ol style="list-style-type: none"> 1. Farmer Field School is expensive 2. Difficulty in assembling participants at all times 3. Implementation of approach is limited due to inter-personal differences 4. Not suitable for commodities with long gestation periods 	<ol style="list-style-type: none"> 1. Adequate logistics should be provided 2. Demonstration sites in place 	<ol style="list-style-type: none"> 1. Sensitize participants to fully participate 2. Cost reduction 3. Government should provide funding
T&V (Training and Visit)	<ol style="list-style-type: none"> 1. It requires a large number of staff 2. Regular staff training 3. Interaction between farmers – research-extension must exist 4. Focuses on training technical staff for training farmers 	MOFA under various projects	Countrywide	<ol style="list-style-type: none"> 1. Capacity building of staff and farmers 2. Increased extension coverage 3. Adequate logistics for 	<ol style="list-style-type: none"> 1. Rigid in terms of framework 2. High cost dependent 3. highly dependent on research knowledge 	<ol style="list-style-type: none"> 1. Single line of command 2. Monthly training 3. Fortnightly staff meeting 	<ol style="list-style-type: none"> 1. T&V should be modified for adoption (provision of adequate transport, fuel and other logistics to enhance supervision)

	<ul style="list-style-type: none"> 5. It relied on Transfer of Technologies 6. Emphasis on single line command 7. Activities are time bound with fixed visiting schedules 8. Use of farmer groups 			<ul style="list-style-type: none"> extension delivery 4. Adequate monitoring and supervision 5. Reporting was automated and regular for decision making 		<ul style="list-style-type: none"> 4. Bi-monthly technical review meeting 5. RELC planning and review sessions 6. Subject matter specialist 	<ul style="list-style-type: none"> 2. RELC should be strengthened 3. SMS centers should be revived 4. Improve staff strength 5. Redesign demos for use
Participatory Approaches (PRA, PTD&E, PID, FTD, PLA & SLA)	<ul style="list-style-type: none"> 1. Emphasize on client ownership 2. Client centered 3. Knowledge base is indigenous 4. It requires very good moderation or facilitation 5. Use of farmer groups 6. Relies on TOT for facilitation 	<ul style="list-style-type: none"> 1. NGOs, 2. Projects 	<ul style="list-style-type: none"> 1. Beneficiary project district 	<ul style="list-style-type: none"> 1. Client empowerment 2. Enhances sustainability 3. Enhances adoption of technologies 4. More judicious use of resources 5. Mutually supportive relationship 6. Improve farmer to farmer technology transfer 	<ul style="list-style-type: none"> 1. It is time consuming 2. It can conflict with clients time for other activities 	<ul style="list-style-type: none"> 1. Linking up with local leadership for mobilization of clients 2. Stakeholder fora/networking 	<ul style="list-style-type: none"> 1. Adequate sensitization 2. There should be well laid down monitoring and reporting systems

				7. Enhances communication among members			
Commodity based	<ol style="list-style-type: none"> 1. Target specific commodities (Cocoa, Oil Palm, Rubber & Cotton) 2. Covers relatively small beneficiaries 3. Provides embedded services (land preparation ,inputs, credit, farmer training and marketing) 4. Highly technology dependent 5. Deals with the entire value chain 	COCOBOD, TOPP, BOPP, GREL	Three Northern regions and the forest zones	<ol style="list-style-type: none"> 1. High use of technologies 2. Ready market for produce 3. Availability of other services (credit, inputs etc) 	<ol style="list-style-type: none"> 1. inputs may not be used for the purposes intended 2. Service provider can dictate all the contractual agreement 3. It ignores non target commodities 	<ol style="list-style-type: none"> 1. Contract farming for the companies 2.Intensive monitoring system and supervision 3. Nucleus farmer /Organization provides funding 	<ol style="list-style-type: none"> 1. There must be a strong FBO to negotiate

Source: Agricultural Extension Approaches Being Implemented in Ghana, Directorate of Agriculture Extension in Ghana (2010)

2.2 Women in Agricultural Development (WIAD)

The Women in Agricultural Development Directorate (WIAD), is one of the seven Technical Directorates of the Ministry of Food and Agriculture (MoFA) in Ghana. One of the functions of WIAD is to liaise with research and extension to analyze and find solutions to women specific challenges in the Agricultural sector.

The objective of WIAD is to develop effective policies and programs that promote delivery of improved technologies and information on agricultural production and post-production in an environmentally sustainable manner. Key functions are to promote:

- Improved nutrition interventions: bio-fortification, food fortification, food enrichment, nutrition education in relation to food production, post-production and food consumption;
- Value addition to agricultural produce: food processing and preservation;
- Food safety along the agricultural value chain (eg safe production and handling of exotic vegetables, cottage level processing, etc);
- Resource management (farm, home, processing site); and
- Gender mainstreaming of all agricultural policies, programs and projects.

WIAD is supposed to ensure provision of technical backstopping to regional and district staff of MoFA for effective transfer of appropriate technologies to farm families in crop, livestock and fish production, processing, utilization and marketing through regional officers and other stakeholders. In addition, WIAD collaborates with various institutions in research, development projects and MOFA Directorates to support dissemination and capacity building efforts in gender to the regions and districts. Monitoring and evaluation of implemented programs at the regions and districts are central to WIAD's responsibility.

Currently, WIAD through the support obtained from USAID developed a Gender and Agricultural Development Strategy (GADS) II. This is a gender focused strategy to promote sustainable agricultural development through the promotion of gender responsive MoFA programs and activities. The GADS II advocates for the recognition of gender division of labour as influenced by socio-economic and cultural factors and acknowledges the differential access to and control of resources by gender.

2.3 Gender Analysis of Agricultural Sector in Ghana

Gender Analysis of the Agricultural Sector (MOFA/WAAPP 2014) revealed that women have less access to extension services, credit facilities, land and tractor services among others than men. Consequently, women farmers' rate of adoption of many technologies and their productivity are less than those of men farmers. This is probably due to the fact that agricultural policies and

extension system in Ghana are not sensitive to the needs and circumstances of women – both staff and farmers. Women advisory service providers face challenges attributed to traditional, male-dominated organisational dynamics, and other cultural barriers on one hand (supply side). According to GADS II, there is bias towards men in extension service delivery and male-headed households are likely to have more access to extension services than female-headed households. Extension services are generally low in Ghana as a result of inadequate extension agents particularly females to offer services to female farmers. Extension agent to farmer ratio on average is 1 to 3000 farmers. On the demand side, participation of male farmers in technical training is higher than their female counterparts and this is partly attributed to women's lack of time, cultural inhibitions and heavy loads. Women however tend to participate more in training when held on the farms that are closer to their homes (Kabutha, 2010). There are factors constraining women access to agricultural advisory services such as poor infrastructure facilities, socio-cultural roles and responsibilities of women, high illiteracy rate and inadequate business management skills, lack of appropriate technology and low involvement of women in decision making among others.

The gender analysis of the agricultural sector in Ghana (MoFA/WAAPP, 2014) indicates that to integrate gender into MoFA, there is the need for a gender policy framework to support the GADS II. Gender should be at the core of all actions and activities of departments, institutions, agencies and directorates in MoFA. Other recommendations coming out of the gender analysis of the agricultural sector (ibid) in Ghana are:

- Stakeholders and leadership of MoFA to be concerned with the monitoring and evaluation of the GADS;
- Invigorate staff to become gender aware, thus building an organizational gender culture in the agricultural sector;
- Periodically (semi-annually), MoFA should organize specialized workshops on gender for its staff and invite experts to facilitate the process;
- Use affirmative action in mixed projects, to support and promote the cause of women and youth;
- Researchers should be more gender sensitive when developing agricultural technologies.
- Women's interest in projects should be assessed before implementation of such project. The women themselves should be involved in the planning and organization.
- The physically challenged are properly identified and involved in the projects they can benefit from; and
- Collection and analysis of gender-disaggregated data for policy formulation.

3.0 CASE STUDIES

The study focused on two main case studies (i) Women Extension Volunteer (WEV) Approach, which was jointly implemented by MoFA and Voluntary Service Overseas (VSO) in 2009 - 2012 and (ii) Agricultural Development and Value Chain Enhancement (ADVANCE) Program that mainstreamed gender in the implementation activities to reach more female farmers with extension delivery and other rural advisory services. The two case studies were purposely selected to illustrate how the interventions are addressing gender gaps in extension delivery and to document the important lessons from the projects for broad dissemination to policy makers and other stakeholders.

3.1 CASE I - Agricultural Development and Value Chain Enhancement (ADVANCE) Program

According to the ACIDI-VOCA-Ghana-ADVANCE Gender Impact Assessment Report 2013, the Agricultural Development and Value Chain Enhancement (ADVANCE) Program sponsored by USAID aims at facilitating a transformation of Ghana's agricultural sector in selected agricultural staples including maize, rice and soybean. The overall goal is to achieve a greater degree of food security among the rural population in northern Ghana while increasing competitiveness in the domestic markets.

The program adopts a value chain approach where smallholder farmers are linked to markets, finance, inputs and equipment services and information through relatively larger nucleus farmers and aggregators who have the capacity to invest in these chains. The program builds the capacity of smallholder farmers to increase the efficiency of their farm business with improved production and post-harvest handling practices that include access to improved seed varieties with particular attention to ameliorating gender constraints.

Experts in various fields of agriculture train these nucleus farmers on regular basis so that they can also train farmers in their groups. Through this approach agricultural extension services are extended to large number of farmers. This is important considering the limited number of public agricultural extension personnel in Ghana, especially in the northern part of the country. Through the ADVANCE program, farmers are trained on farm management and good agricultural practices as well as to the introduction of improved varieties of crops such as maize, soybeans, rice, sorghum, cowpea and groundnut to farmers. Smallholder farmers are organised as out-growers and linked to a nucleus (hub) farmer who provides tractor service, fertilizer, and other inputs. These services are paid back to the nucleus farmer/ aggregators by the farmer after harvesting in kind or in cash after sales.

ADVANCE also links farmers to financial institutions to enable them access credit to support their farming activities. Farmers who benefit from such inputs are to pay back with an agreed quantity of produce after harvesting through the aggregators. Concerning the delivery of extension services, the ADVANCE Project uses women volunteer extension agents with the aim to increase women access to extension services in project operational areas.

Strategic Interventions:

Specific activities implemented to increase project impact on women smallholder farmers included the following:

- increasing the number of women farmers benefitting from the ADVANCE project by targeting women farmer groups;
- expanding the number of women aggregators benefitting from the project by exploring the possibility of targeting “market queens”, female small-scale intermediary traders interested in upgrading to becoming aggregators themselves;
- building on the work done by the ADVANCE finance team by expanding banks’ capacity to evaluate potential clients, including looking at repayment rates disaggregated by gender;
- building agribusiness & entrepreneurial skills of women through training of trainers;
- Supporting radio stations to produce weekly radio programs on good agronomic practices, formed listenership clubs in farming communities and developed comprehensive agricultural programs to suit the different interests of both male and female farmers in their areas of operation;
- Creating agribusiness and market linkages for women through innovative approaches such as twice-yearly value chain networking forums where producers, buyers and sellers, and input dealers, equipment suppliers and financial institutions develop relationships at the multi-project pre-season and pre-harvest marketing events; and
- Esoko inter-marketing service whereby farmers receive pricing information on their cell phones and can reach out to the call center to find a buyer when they have something to sell.

For example, ADVANCE Project in the Garu Tempene district started in 2012. The Project was implemented through on-farm demonstrations and trainings from agricultural extension agents (AEAs) of MoFA and sometimes from consultants from Savanna Agricultural Research Institute (SARI). Trainings were organized for farmers and other value chain actors on value chain development in Rice, Soyabean, and Maize. The targeted training included good agronomic practices. The ADVANCE model ensures that small farmers are organised as out-growers and linked to a nucleus (hub) farmer who provides tractor service, fertilizer, and other inputs which are paid back to the nucleus farmer/ aggregators as indicated earlier. The effect of the ADVANCE extension support on farm incomes are presented under section 4.4.

Good practices by ADVANCE Program

- Conduct gender analysis before designing gender sensitive programs and engage male gender champions
- More conscious effort is put into reaching out to women against the background of traditional gender roles and socio-cultural issues
- ADVANCE puts in additional effort to ensure that women are engaged and their voices heard considering that women are less likely to take on leadership roles in mixed groups of both sexes – due to limited time available to women (productive and reproductive roles).
- Use experienced gender experts to provide regular staff training on gender mainstreaming

Lessons Learnt from ADVANCE Program

- Using gender approaches to understand social norms about men and women assists in identifying problems and solutions that affect both sexes
- Addressing gender inequalities that create market inefficiencies and distortions, such as in labour markets, can improve value chain competitiveness, thereby improving business efficiency and increasing economic opportunities for women
- Using staff who are familiar with the local environment and sensitive to gender issues enhances tailored interventions aimed at dealing with complex gender related issues that vary across communities in the same district.
- Increased economic security for women enables them to improve family welfare such as the education and nutrition of their children and families, and also lessens conflicts between spouses

3.2 Case 2 - The Women Extension Volunteer (WEV) Approach

The Women Extension Volunteer (WEV) Approach was an innovative extension approach aimed at providing affordable extension delivery systems that reach out to female farmers in targeted areas in Ghana. Although the WEV model was a collaborative effort by the Ministry of Food and Agriculture (MOFA) and the Voluntary Service Overseas¹ (VSO) Ghana, currently the WEV model has been institutionalized in the decentralized MOFA system in all the three Northern Regions.

The model is based on the key leadership role of the community-based female volunteers in supporting the community farmer groups through facilitation and basic training on topics

¹ VSO is a non-governmental organization with funding from Canadian International Development Agency (CIDA) through Cuso International, and by the United Kingdom's Department for International Development (DFID).

discussed during WEVs regular meetings (Hird-Younger and Simpson 2013). WEVs act as community-level liaisons to increase access to extension information and services among female farmers. WEVs are selected based on characteristics such as literacy, marital status, skill in farming, time availability, volunteer experience (previous involvement in farmer groups and past volunteer positions) and innovativeness.

During the pilot, volunteers were given a bicycle, boots and some writing materials by VSO to support their efforts. They were also provided with a "talking book", a portable audio recorder containing messages provided by MoFA that WEVs could play for groups in communities to facilitate communication in extension and rural advisory services delivery.

Good Practices by WEV

- *The WEV Model is more responsive to local interest* - WEV volunteers are based in the communities and are trusted by the community members and are able to act as effective liaisons between local interests and Extension delivery external resources
- *The WEV Model is supplementary to regular extension service delivery* – The WEVs act as community-level liaisons and help in reaching out to women in underserved communities with extension delivery.
- *The WEV Model strengthens local capacities in group formation* – The WEVs undergo training in leadership, organizational skills and building relationship with formal extension agents. WEVs bring their experiences to bear in strengthening the farmer groups at the community level.

Lessons Learnt from WEV

- *The WEV Model Requires Effective Management* - The roles played by WIAD officers and DoAs within the WEV model in providing encouragement, incentives and support to volunteers were critical to the model's effectiveness and sustainability.
- The extent to which WEVs were actively integrated into the overall extension strategy and extension programming largely determined the contributions that they made in improving quality of services that reached women farmers.

Challenges

Although the WEV model had worked well in Ghana as a pilot, there were a number of challenges that emanated from relying on local female volunteers as primary intermediaries between the farmers and Extension/ Rural Advisory Services (RAS) providers. The key challenges included:

- Over-dependency on local volunteers to the detriment of regular extension services. Although the volunteers performed some extension duties, they had limited abilities in providing technical agricultural information or introducing farmers to new technologies. WEVs were not expected to replace agricultural extension agents.
- Setting the boundaries regarding roles and responsibilities between the WEVs and AEAs was a huge challenge.

4.0 SURVEY FINDINGS

4.1 Profile of Respondents

This section covers the findings in respect of the socio-economic background of the respondents consisting of five hundred and ninety-two (592) farmers surveyed in the Northern, Upper East and West Regions of Ghana. The socio-economic characteristics profiled in Appendix III include age, gender, educational level, residential status, form of occupation (major or minor), household heads, marital status and membership of farmer association or groups.

The age of respondents' ranges from below twenty to sixty years and above. As indicated in figure 4.1, the middle age ranging from age twenty to fifty years (20-50 years) dominates, forming about 78% of the total number of 592 respondents. Considering gender, the number of female farmers interviewed outnumbered the male farmers constituting 52% across regions surveyed.

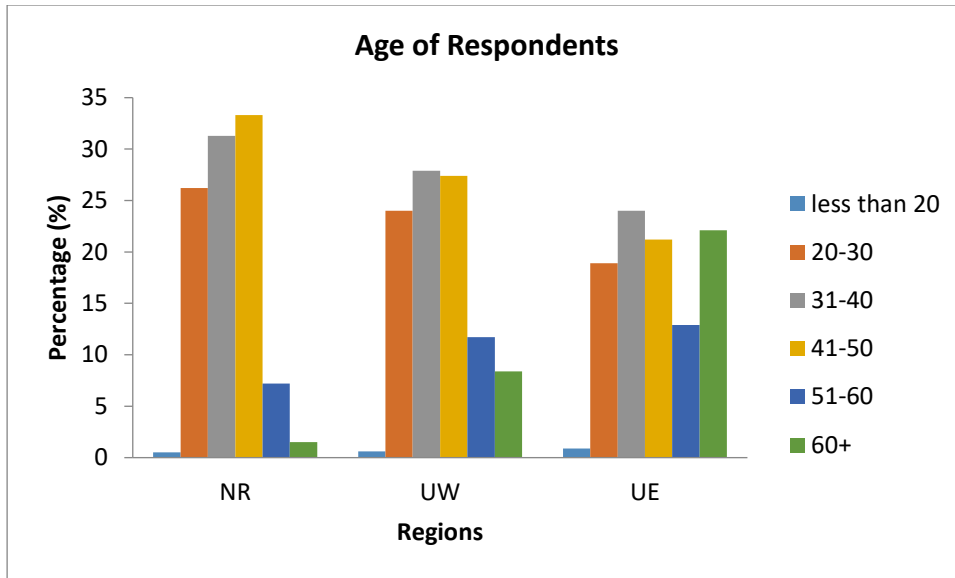


Figure 4.1 Age of respondents by surveyed regions

Educational level of the respondents were categorised into: None (83.3%), basic (11.3%), secondary (4.1%), tertiary (1.2%) and other (0.2%). Figure 4.2 shows the educational level of respondents across regions surveyed. There was a significant difference between gender of respondents and educational levels. About 80.3% of the male respondents had no formal education as opposed to 86.0% of female respondents with no formal education.

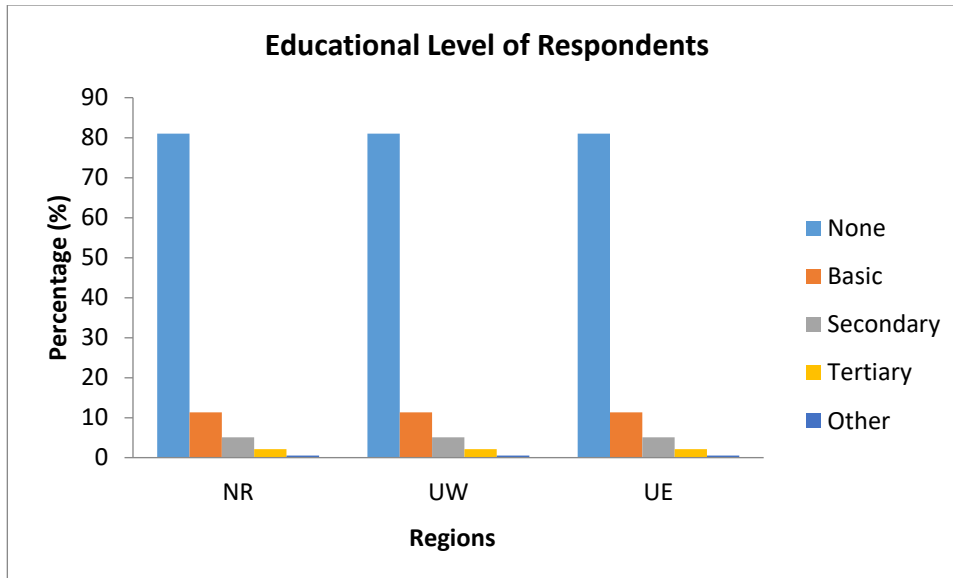


Figure 4.2 Educational Level of respondents by surveyed regions

Regarding whether respondents were natives or settlers, about 97% of the respondents indicated that they were natives whilst the other 3% said they were settlers from outside the districts. With respect of the forms of occupation undertaken by the respondents, about 97.6% of the respondents are engaged in farming as their major income generating activity, 0.2% into agro-processing, 0.5% engaging in trading, 1.2% in other service enterprise and the remaining 0.5% engaged in formal employment.

From the findings, 39.2% of the respondents were household heads whilst the remaining 60.8% were not. With marital status of respondents, 90.4% were married, 5.4% single, 0.3% divorced and the remaining 3.9% were widowed. With membership of farming association, out of the five hundred and ninety-two 592 respondents, 335 individuals representing 56.6% were members of a farming association whilst, the remaining 257 representing 43.3% were not members of any farming associations.

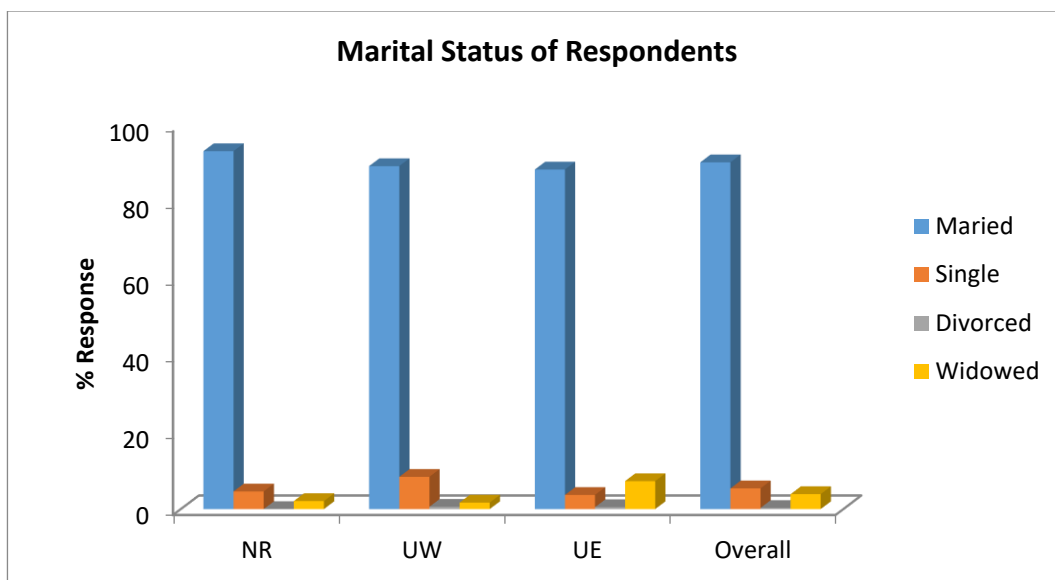


Figure 4.3 Marital status of respondents by regions surveyed

4.2. Access to Extension Services by Respondents

The most important sources of information on agricultural practices indicated by participants were extension agents, radio and NGOs. Females in the study locations obtain agricultural information from extension agents. Females prefer only females group. They mentioned that this enables them to share and learn better than in a mix of male - female group. They added that females have similar issues different from that of males as such only female group grants them the platform to lean and share better.

Table 4.1 Sources of Extension Services in all the surveyed districts

Criteria/ Districts	Mamprusi East		Garu Tempene	Wa East
Crops cultivated	males	Maize, Millet Groundnuts	Maize, Millet, Rice Groundnut	Maize, Yam, Millet Rice, Groundnut
	females	Soybean, Cowpea vegetables	Soybean, Vegetables	Soybean, Cowpea, Vegetables Sorghum, Bambara vean
Sources of extension				

Agricultural extension agents,	<ul style="list-style-type: none"> • MoFA AEAs actively deliver extension services based on farmers' demand. • Volunteer extension officers compliment that of the Ministry of Agriculture 	<ul style="list-style-type: none"> • MoFA AEAs play roles in extension services to farmers. • Sometimes engaged by the NGOs provide services in the communities. 	<ul style="list-style-type: none"> • Presence of MoFA AEAs in the district. • They work in tandem with the few NGO working in the district
Radio	<ul style="list-style-type: none"> • Walewale FM station in the district provide radio farming information to farmers. • Men benefit greatly since majority own radio sets. 	<ul style="list-style-type: none"> • Quality FM, a local radio station dedicates Tuesday evenings for extension information broadcast in the local language. • Illiterate listeners benefit but radio ownership is skewed to the disadvantage of women. • ADVANCE Project provided the women of Tambaalug a radio set, around which they converge Tuesday evenings to listen and learn. 	Local FM stations provide information on GAPS
NGOs	<ul style="list-style-type: none"> • Some agricultural NGOs operate in the district, • Key ones Partners in Rural Empowerment and Development (PARED in Nalerigu and the Presbyterian Agricultural Station – Langbinsi 	<ul style="list-style-type: none"> • Presence of a number of NGOs in the district. • Key NOG is the Presbyterian Agriculture's Centre (NGO) which has collaborated with MoFA on agriculture projects 	<ul style="list-style-type: none"> • Agricultural NGOs operate in the district and offer extension services to farmers. • An example is the TURIDEP
Female groups	Presence of Women Groups in the district. Some of them are in agriculture.	<ul style="list-style-type: none"> • Active women self-help groups or Village Savings and Loan Scheme (VSLs) in the district. • AEAs use these groups for extension delivery services 	Active women groups in VSLs
Mix of male - female groups	There are mixed farmers groups the composition of females and males differs	<ul style="list-style-type: none"> • Mixed farmers groups within the district with different composition ratios • Women dominate in the VSLs • Men mostly dominate in FBOs/ groups 	There are mixed farmers groups the composition of females and males differs

Access to extension services by the members of the ADVANCE Farmer group was higher than the control group. This suggests that the ADVANCE Project was effective in reaching out to farmers with extension services. As indicated under section 3.1, ADVANCE was basically an extension program. The program built the capacity of smallholder farmers to increase the efficiency of their farm business with improved production technologies such as improved seed varieties and post-harvest handling practices. ADVANCE incentivized extension staff from NGOs and MoFA to encourage effective extension delivery to smallholder farmers.

As shown in figure 4.4, sources of extension services accessed by farmers included MoFA (84.7%), NGOs (14.4%) and others (0.9%). It was realized that the NGOs either used the services of the MoFA extension staff or collaborated with MoFA in reaching out to the farmers with extension services. Figure 4.5 shows access to extension services by the respondents.

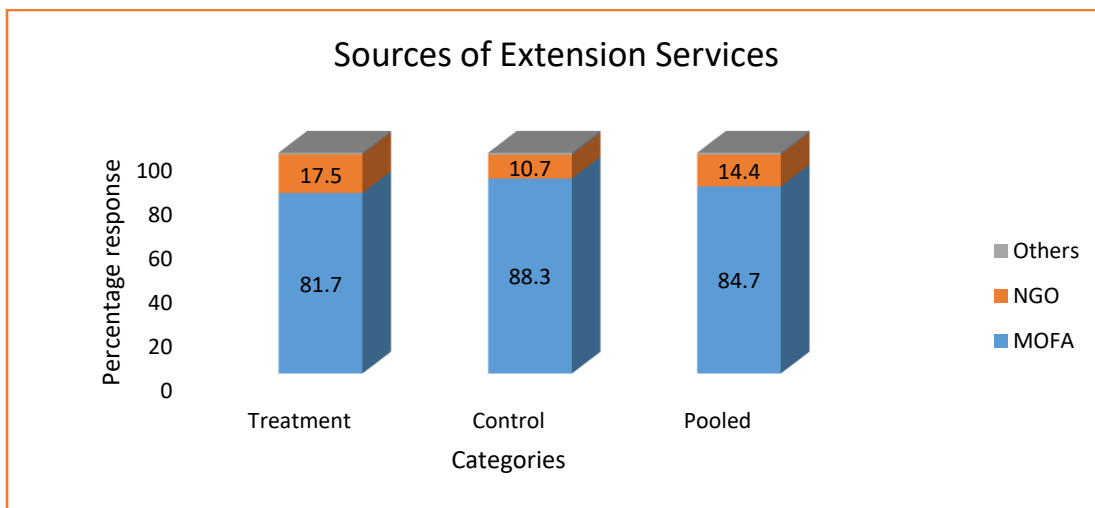


Figure 4.4 Sources of Extension Services among ADVANCE group (Treatment) against the control group

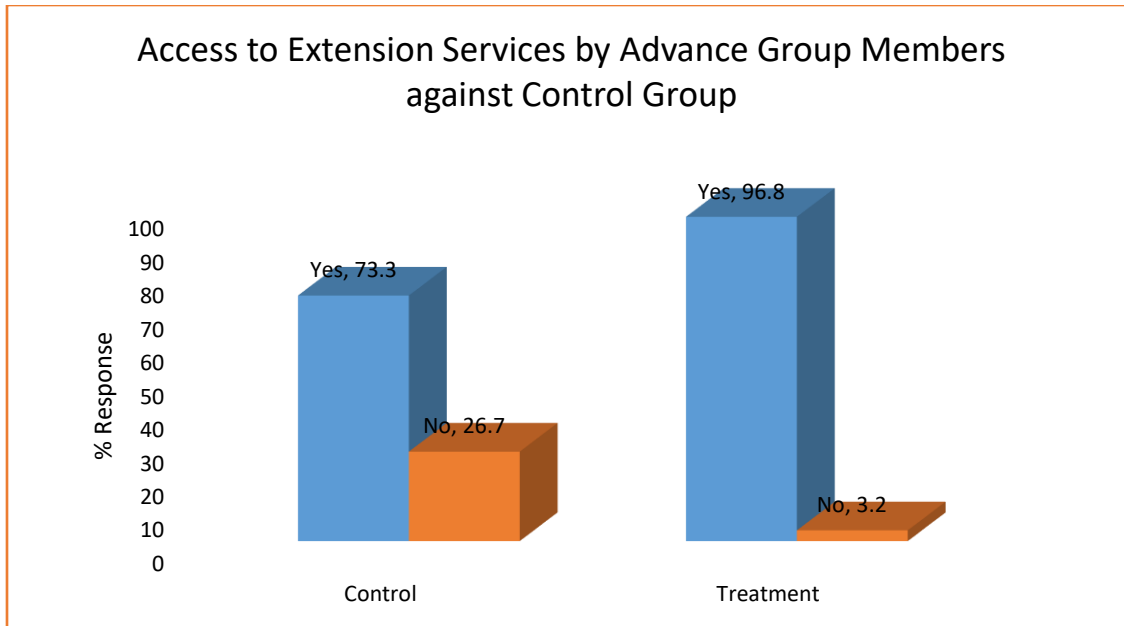


Figure 4.5 Access to Extension Services by ADVANCE group against the control group

Frequency of extension contact by the control group was not very encouraging. However, the male farmers had more regular contact than their female counterparts. Close to half of the sample interviewed had monthly contact with extension staff. Those who reported bimonthly frequency of contact with the AEAs constituted 14.9%, once in three weeks' frequency of contact with AEAs constituted 8.4% and once in two weeks' frequency of contact with AEAs constituted 13%. Only 7.6% of the respondents had once a week frequency of contact with AEAs.

Generally, the farmers interviewed did not pay for the extension services. Only 1.2% of the entire sample farmers interviewed indicated paying for extension services. When farmers were asked about their willingness to pay for agricultural extension services in cash there was a significant response of 42.2% of the sample interviewed indicating willingness to pay for extension services. Those indicating willingness to pay for extension explained that if such services would help them to increase productivity and income levels then it makes economic sense to pay for extension services.

Farmers who were unwilling to pay for extension services constituted 57.8% of the sample interviewed. This group of farmers explained that extension services were considered public services and therefore should not attract any fees. From the literature, extension agents tend to approach male farmers more often than females' farmers because of cultural restrictions and also

because of the general misconception that extension advice will eventually “trickle down” from male heads to other household members (Meinzen-Dick et al., 2010).

Respondents were asked to explain the socio-cultural factors influencing gender difference with regards to access to extension services. Frequencies (in terms of percentages) of responses on the sociocultural factors limiting access to extension are summarized in Table 4.2. This is qualitative analysis and does not give any results on causation.

Table 4.2 Socio-Cultural factors influencing gender difference in access to extension services

Socio-Cultural Factor	Valid Percent
Females are not involved in community development	18.4
Men are always considered because of land ownership	14.4
Men can access extension officers outside community	13.8
It is a government intervention and must cover everybody	13.8
Financial problems but men are relatively better resourced than women	13.2
Women have time for extension services whilst men don't.	7.5
Women access extension through men because men are usually family heads	4.6
Cultural practices restrict women and hinder them to access AEAS	8.6
Women are organized and services are rendered groups than to individuals	2.9
Project focus and its benefit in this dispensation	2.3
Women devote their time to learn new technologies and have more knowledge as compared to men	0.6
Total	100.0

4.3. Criteria used in evaluating new agricultural technologies/practices by Gender

In Mamprusi East, generally, resourceful farmers adopted improved varieties of maize better because such varieties require high level of inputs. Improved maize is adopted by males more than females because the men have the financial resources to purchase and apply fertilizer as they are necessary to attain the appropriate yield. Women normally do not have the financial wherewithal to buy such inputs. In addition, funding and time are required for weeding – which has to be done 3 times before harvesting. Limited choices face the farmers; either the farmer uses his/her labour to weed and/or employ family labour to weed – all of which require time or have the financial resources to pay for hired labour. Time available to women is generally limited and this imposes limitations on their ability to farm. Any technology available for use by women that requires additional time women will be a challenge adopting. Culturally, men inherit land but women can only hold land in trust for their male sons when are still young. The women cannot pass on land to another person by their culture. All these cultural restrictions place limitations on the ability of women to expand their farm sizes.

The **Garu-Tempene district** is a patriarchal society, where men traditionally have absolute control of many resources. Although women form the majority in the district, they are often marginalized in accessing many agricultural services including provision of extension services, borne out of traditional or cultural practices ingrained in the populace. Some of the challenges of providing extension services to particularly women are; most women do not own farm lands, cultural inhibition of men interfacing with women and extension officers, women utilization of among any others.

Out of the nine (9) AEAs working in the district, only two (2) are women. The nine (9) officers are expected to cover the 24 operational areas into which the district is divided. In effect, each extension officer handles two or three operational areas which are generally extensive. The extension staff is usually complemented by National Service Personnel posted annually to the district.

In Wa East, farmers in the study location consider several factors in evaluating new agricultural technologies. These factors include affordability, cost implications in terms of complementary inputs and time, user friendliness, user acceptability, additional income generated, among others. These factors have direct implications on gender perspectives in evaluating new technologies. Both male and female farmers in the study location are engaged in the production of crops such as maize, groundnut, sorghum, soybeans, etc. However, farmers with more financial resources tend to adopt improved varieties, such as maize, that require inputs such as fertilizer because they are able to afford improved technologies and associated complementary production inputs.

The difference between males and females in crop cultivation arises in connection with yam and rice cultivation as only the men are engaged in due to the drudgery involved in cultivation. The females provide supportive services in their cultivation.

Females usually cultivate crops that require less input such as groundnut, and cowpea. Females cultivate maize only when they are sure of supply of complementary inputs such as fertilizer. Females would be more likely to adopt improved technologies that are affordable and require little or no complementary inputs. Table 4.3 gives an overview of the criteria used in evaluating new agricultural technologies that came up during the focus group discussions.

Table 4.3 Criteria Used in evaluating new agricultural technologies/practices in all the districts

	East Mamprusi		Garu Tempane	Wa East	
Crops cultivated	males	Maize	Maize	Yam, Rice	
	females	Soyabean	Soyabean		Groundnuts, cowpea
Criteria for choice of technology	<ol style="list-style-type: none"> 1. Amount of input required 2. Time at one's disposal to weed 3. Amount of fertilizer input needed 		<ol style="list-style-type: none"> 1. Cultural norms determine gender roles and what is cultivated 2. Men serve as interface between women and extension officers 	<ol style="list-style-type: none"> 1. Affordability, 2. Additional cost implications in terms of complementary inputs and time, 3. User friendliness, 4. Consumer acceptability 5. Additional income 	
Technology Adaptation	Men tend to adopt technologies which require heavy financial input more than women		Culture of the area determines what technology is used by male or female	Men are financially resourced and adopt improved technologies than women.	
Labour resources available	Women help in their husbands' farms before turning to their own. Only few men help their wives on their farms		<ul style="list-style-type: none"> • The use of tractor is described as a man duty and women often task their husbands or brothers to play that role. • Harvesting is considered the 	Groups help members to farm in turns.	

		responsibility of women	
Extension Approach	Extension service is given to groups by nucleus farmers formed by Development partners like the USAID such as the ADVANCE intervention. Normally extension services pass through the district AEs.	Non-Governmental Organizations like the Presbyterian Agricultural services, and other NGOs use AEs from the MoFA to provide extension services. • Usually information dissemination is carried out through existing groups (like Women's Association and Village Savings and Loan Schemes)	AEAs provide extension services to farmers but are most often inadequately resourced to reach out to every farmer. Sometimes NGOs support AEs to provide extension services Eg. ADVANCE and Turidep
• Community Approach			
• AEs			

4.4 In-depth understanding of gender issues surrounding the adoption and adaptation of selected technologies

In East Mamprusi, women may not get adequate land for farm expansion and so intensification of land use will favour women. Women adopt soyabean technologies as opposed to maize partly due to the input requirements. As already discussed women spend much time at the household level and so will consider labour requirement associated with a technology particularly the number of times one needs to weed the farm. For soyabean only one time weeding and less fertilizer application is required. Other factors considered are yield and marketability.

In Guru Tampane, adoption and adaption of technologies by both genders vary, partly as a result of the skewed approach of disseminating information through women groups. Interestingly, the transmission of new technologies in the district usually is done by AEs of MoFA or of NGOs (who most often rely on MoFA AEs) Information on technologies is often disseminated through existing groups in communities or ad hoc gathering of members of the communities purposefully for the activity. Most of the existing groups in the study area are predominantly women-based. The men often engaged in their farm activities.

Though existing groups have different objectives, the majority are into the Village Saving and Loan Scheme (VLS). Purveyors of new technologies make use of these existing groups to popularize the new technologies. Consequently, women turn to benefit more than men, especially at the incipient stage of the introduction of new technologies because of their involvement in the groups. The VLS has become the vehicle for the mobilization of funds by women due to the many

responsibilities they have in connection with the payments of school fees, footing medical bills, buying ingredients for soup, etc.

Tractor service in the area is not patronized by the farmers because they claim their lands are not fertile and they risk destroying the soil structure if ploughed with tractor. Thus, they rely on bullocks, which are generally operated by adult men and youth (male). It is considered as high energy demanding and inappropriate for women. Women most often get their small plots of land ploughed by bullocks after the men have finished ploughing their relatively large farms. Since women spend most of their time on family plots and on family chores, they are left with little time to spend on their own farms. This affects the productivity and production levels on their farms.

In Wa East, both male and female farmers have adopted improved practices such as planting rows, application of appropriate fertilizers and use of improved crop varieties such as maize, soybeans, cowpea and rice. The proportion of females that adopt cowpea is higher than males in all the study communities because yield is guaranteed even without the application of fertilizer which only the men can afford. The proportion of males who have adopted improved maize variety is higher than females because they control family financial resources and can afford such complementary inputs. Securing the maize commodity as staple food is a top priority for family food security and everything is devoted to achieving that.

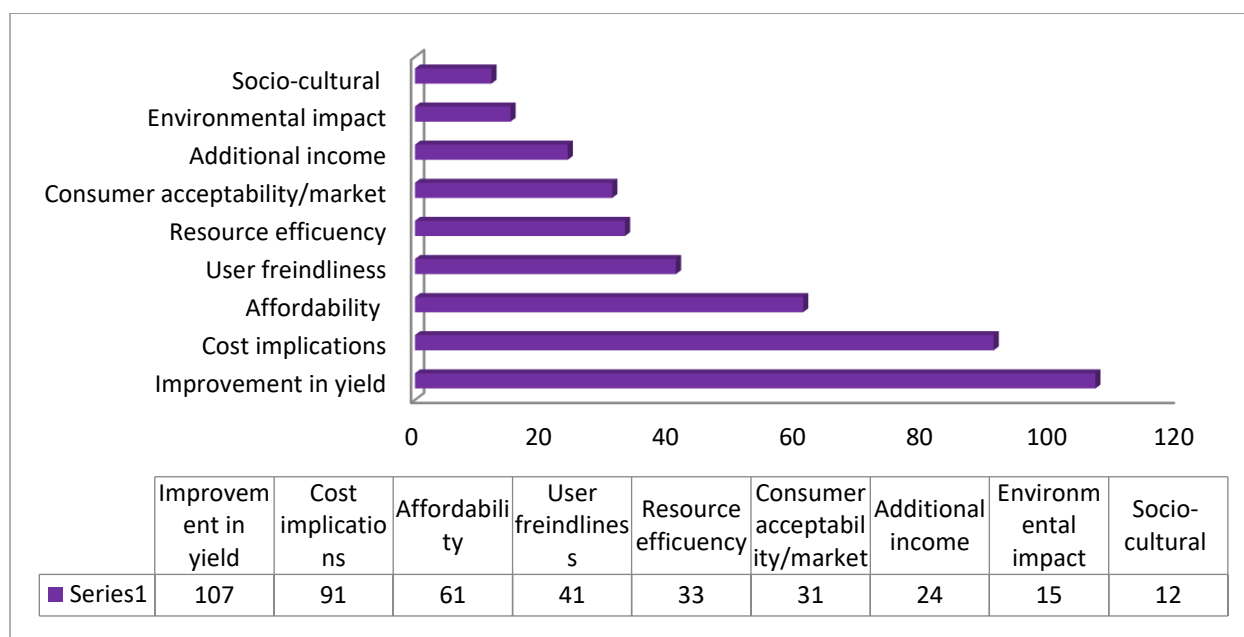


Figure 4.6: Ranking of factors considered by males as very important in adopting improved technology

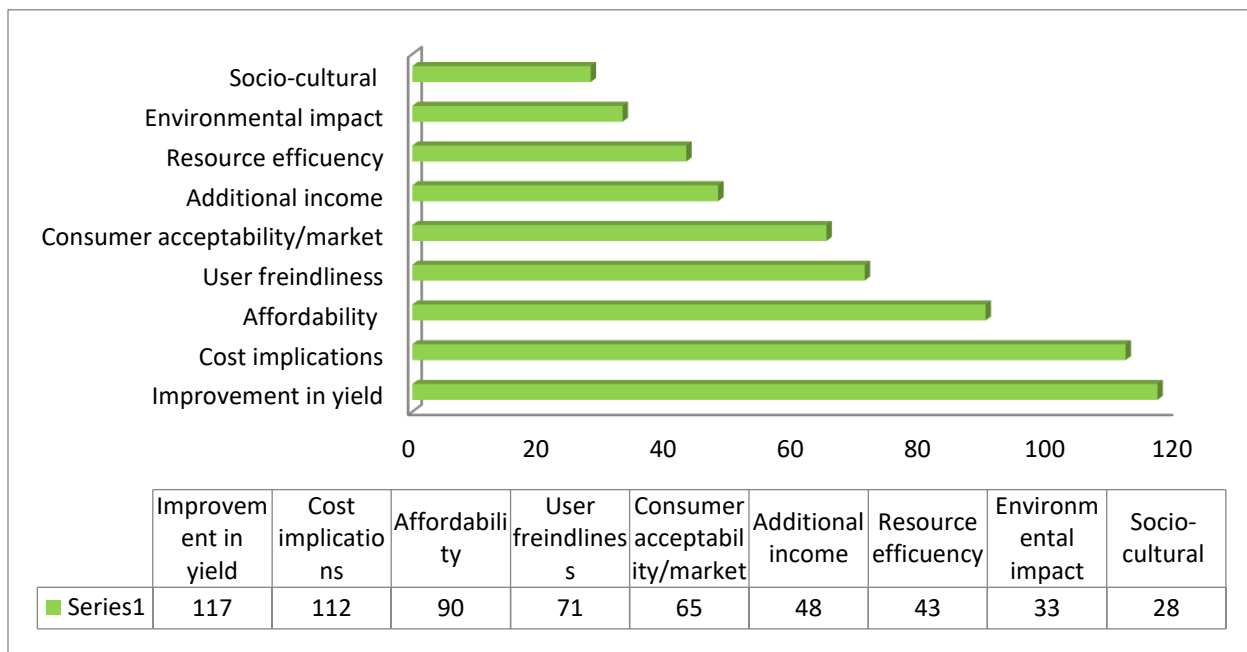


Figure 4.7: Ranking of factors considered by females as very important in adopting improved technology

As shown in figures 4.6 and 4.7, the study found that the four most important factors influencing improved technology adoption include improvement in yields, cost implications, affordability and user friendliness.

Decisions on gender responsive strategies and practices for policy making

Implementing effective gender responsive strategies and practices in their programs, it is clear that Madam Mary Agotiba Anabiiga's liberation from the shackles of traditional practices of depriving her of land was the result of a deliberate intervention strategy. Her economic independence has been the primary factor in defying the practice of tying the umbilical cord of women to men in order to access land for income generation. Affirmative action should be encouraged through the existing women's groups to provide financial muscle to women to gain economic independence. That will afford them the opportunity to effectively buy lands or hire bigger portions of land for their agricultural purposes.

The existing women groups could be strengthened by introducing elements of clustering in to it, where the local Assembly, and research institutions are brought closer to the women farmers, to leverage on the strengths of these institutions. For instance, the research institutions would understand the peculiar needs of these women farmers groups and conduct demand driven solutions to increase productivity. The women farmers would get to know and benefit from government interventions.

Local women extension officers could be re-introduced, where women are selected in communities, trained and equipped with the necessary tools to deliver extension services to women. This concept was premised on the realization that women understood their fellow women better. The concept existed in the district, courtesy of the VSO/WIAD initiative called Women Extension Volunteers (WEV). Garu-Tempene had five (5) WEVs under the project and it later fizzled out. Three of the selected women have made gains in their farming activities. For instance, *Abopaga Atambugri* from Nafteeg was the District Best Woman Farmer in 2014; *Monica Abugri* from Kpatiya was the district's Best Farmer – Soybeans (2011/12); and *Patience Nyuliba* was the district's Best Women Farmer in 2008/09. These laurels chalked by the selected women attest to the benefit of such an arrangement and it could have had a trickle-down effect on the entire women in the Garu-Tempene District.

Credit can be arranged for women groups. The credit can be passed through groups instead of individual women farmers, to reduce default rate. Women most of the time sell the produce of their farms to buy ingredients for food, pay children school fees and medical bills. These responsibilities live them with nothing during the raining season where they need much to invest in their farms. So if support could be given to the deprived women, would go a long way to improving of productivity and standard of living.

ADVANCE initiative of providing community radios for groups is really catching on well with the beneficial communities, example Tambaalug. Radio is a powerful tool and a means by which the rural folks get informed on best farming practices, especially if the message is carried in a local language. More radios could be given to communities that have not been covered yet to widen coverage and improve on the productivity of farmers.

4.5 Intra-household decision-making and access to production resources (Qualitative)

In East Mamprusi, men have more access to more labour because the women will have to help their husbands before attending to their own farms. Men have more access due to e-extension services due to high ownership of mobile phones in the case of e-extension. They are also more capable to organize for extension visits in terms of paying for transport of extension officers. On the other hand, female farmers access extension services through their husbands. Methods of extension dissemination that appeal to women are different from men. For example, e-extension is enjoyed by more men than women because 70% of men have mobile phones as opposed to 10% women.

In Garu Tempane, certain crops are known culturally to be cultivated by only men while others are cultivated by either gender or by women only. Crops that require some bit of drudgery are reserved for men with women cultivating crops that are deemed less laborious. In the Garu Tempane district, although soybean is cultivated by men, it is largely considered to be for women in the communities. Non-farm activities such as the use of bullocks, tractors, demarcation of farm boundaries, sale and buying of animals are considered men jobs and women who require such services rely on their husbands, male children, brothers or other male family members. In the same vein, men who have grains to sell on the local or Garu markets will have to sell it through their wives, as the society traditionally abhors men from selling grains in the market.

Control of productive resources (land, water, seeds, and other inputs) and intra-household decision-making are essential to the timely cultivation and application of inputs. Ownership and inheritance of land in the Garu-Tempane district is generally through men. Females do not inherit land from deceased parents but have to farm through the benevolence of the husband if married or through the father or male family head. This particular practice is dominant in the rural communities. In the urban areas like Garu where there are women farmers and marketers, women can acquire land through buying due to modernity. For instance, an aggregator who also farms, *Madam Mary Agotiba Anabiiga* bought and owns some lands that she farms on. She complements her purchased land with others she obtains through renting of land holdings.

Men have limited involvement in the processing of major crops produced in the area. Processing is traditionally assigned to women. Rice that is produced in the area is sold outright in paddy form to market queens or processed by women before sale or consumption. It is traditionally unacceptable for men to be engaged in processing of agricultural produce. Sometimes women process on behalf of their husbands. In areas where women dominate, it is relatively easy to gather them for extension delivery. The only challenge is that the women have to converge with the consent of their husbands.

In this district, decision-making in households is a shared responsibility between women and men but the final decision rests with the man. Certain roles are culturally defined as feminine while others are masculine. For instance, what is cooked in a household is a decision of the woman whose responsibility is to provide ingredients for the soup to complement the grains provided by the man. However, in the case of what type of crop is cultivated, harvested and when to sell, etc the decision rests with the man. In typical rural settings, the woman needs to consult with man when decisions regarding these activities are being taken. Generally, decision making at the household level is more influenced by men than women.

The youth are responsible to the adults (parents) but the father's view reigns supreme. It is the responsibility of the youth – female children (if any) to provide water for household use and even

on the farms. This and other roles invariably affect the period of hours devoted by women on farms.

On the issue of seed, both women and men are at liberty to keep and use any seed. While some women use improved seeds bought from the Ministry of Food and Agriculture, others save seeds acquired from produce harvested from the previous farming season. Women can also request for seeds from the men, if his stock is not exhausted.

In the Wa East district, land preparation for farming is done by males and the youth because of the drudgery involved. Where financial resources are available, tractor is used to plough the land before planting. Males and the youth operate tractors used for ploughing. Both males and females are involved in planting, weeding and harvesting activities including the youth. Men have more access to labour than women because the latter provide help on their husband's farm before attending to their own farms (see table 4.4).

The male household heads control household income. There is communal ownership of land in the study communities where land belongs to all community members under the supervision of the chief. However, males have more access to land than women. Farmers cultivate on lands farmed by their predecessors. Males inherit land from their family but not females; women can only hold land in trust for their male children who are still young. This sets limits to women access to land for farming purposes. In most cases, men allocate lands that they have cultivated for some time to females.

Except for the cultivation of yam which entails drudgery in mound preparation and harvesting and therefore reserved for males, both genders participate in the production of all other crops (e.g. maize, groundnut, sorghum, soybeans, etc) in these communities. Farmers with more resources normally adopt improved varieties such as maize that require inputs such as fertilizer. Females usually cultivate crops such as groundnut and cowpea that require less input.

Table 4.4 gives an overview of gender roles, while table 4.5 presents the intra-household decision-making and access to production resources across all surveyed areas.

Table 4.4 Gender Roles in all the surveyed districts

Criteria/ Districts	East Mamprusi		Garu Tempene	Wa East
Crops cultivated	males	Maize, Millet Groundnuts	Maize, Millet, Rice Groundnut	Maize, Yam, Millet Rice, Groundnut
	females	Soybean, Cowpea vegetables	Soybean, Vegetables	Soybean, Cowpea Vegetables Sorghum, Bambara vean

Activity by gender	males	Females	Males	Females	Males	Females
Land preparation	Adult males Male youth		X		Adult males Male youth	
Planting		X		X		X
Weeding	X	X	X	X	Male youth	Female youth
Acquisition of fertilizer	X		X		X	X
Application of fertilizer	X	X	X	X	X	X
Allocation of resources	X		X	X	X	
Marketing of farm produce (Crops)		X		X		X
Marketing of livestock	X		X		X	
Processing		X		X		X

Table 4.5 Intra-household decision-making and Access to Production resources in all the surveyed districts

Criteria/ Districts	East Mamprusi	Garu Tempene	Wa East
Intra-household Decision-making			
<ul style="list-style-type: none"> Type of farming Household chores 	<ul style="list-style-type: none"> Women are largely subsistence farmers as opposed to men who are commercial farmers Household chores are mainly the responsibility of women 	<ul style="list-style-type: none"> Women farm on small lands because they do not own lands, which sometimes lead women to practice mixed farming Household chores are the preserve of women, conferred on them by tradition. 	<ul style="list-style-type: none"> Women help their husbands on their farms before working on their own farms It is the preserve of women, defined by tradition

<ul style="list-style-type: none"> Income 	<ul style="list-style-type: none"> The income of men are comparatively higher since they farm on large tracks of land and may have high returns 	<ul style="list-style-type: none"> The income that women generate from the sale of their produces are meager which they use to buy ingredients for household use 	<ul style="list-style-type: none"> Men are relatively well off in terms of resources because the farm on bigger sizes of land
Ownership of resources			
Landed properties	Land is largely owned by men. Men are effectively the owners of all the assets of and for that matter practically control all the resources	Many resources, including productive resources are under the control of men. Women do not inherit lands and can have access to land through husbands and sometimes leasing	Land, capital etc are largely owned and controlled by men and they take advantage of it to farm on big lands
Labour	Men have more access to labour because the women must help their husbands before attending to their farms		Men have more access to labour than women do because women help on their husband's farm before attending to their farms
Seed	Seed access is dependent upon the resource availability of the individual farmer which tends to favour the male farmers more than female farmers.	Both women and men are at liberty to keep and use any seed.	Both women and men are at liberty to keep and use seed which is tied to types of crops cultivated.
Tractor services	Men have more access to tractor services. Most tractor operators do not want to deal with women	Bullocks are predominantly used because the use of bullocks help maintain the fertility of the soil	
Extension Delivery <ul style="list-style-type: none"> Through Husbands Mobile phones 	<ul style="list-style-type: none"> Extension services are acquired most often from their husbands. Men are the great beneficiaries of e-extension because they own and use the greatest number of mobile phones in the communities 	<ul style="list-style-type: none"> It is not uncommon to find women take extension services from AEAs through the instructions of the husband Men own a considerable proportion of the mobile phones in the communities 	<ul style="list-style-type: none"> Existing FBOs and women groups are the conduit of providing extension services Men own a considerable proportion of the mobile phones in the communities

Production activities	The predominant crop cultivated in the area is maize and it done by men	The majority of farmers in production activities are men since they own and control wide acreages of the fertile lands	Men are the majority in the production process
Processing activities	Women are the majority in this endeavor	Traditionally, it is the duty of women to process farm products, so they are the dominant in the section on the value chain	Women predominate in the processing, as it a taboo for men to process agricultural products
Marketing activities	It is the duty of the women to market farm produces	Men sell livestock and not grains	Depending on the product, either genders can sell. Livestock is generally sold by men and grains sold by women

Some Quotations

..... *“Women may not get adequate land for farm expansion and so intensification of land use will favour women. Women go into technologies for soyabean as opposed to maize partly due to the low input requirements while maize related technologies are usually adopted by male farmers since maize is food security crop and men are responsible for the provision of food security staples at the household. Women spend a lot of time on household chores and so reaching women with extension service requires more efforts, the right methodology and timing should be appropriate. It easier to reach women in groups”*
 **Zakari Hamidu Ali, District Extension Director East Mamprusi**

.....” *most women have access to land but lack control. Lands in the Garu-Tempne district are shallow in nature and use of tractor for tilling is not encouraged because the soil structure is destroyed in the process. Bullocks are preferred because the top fertile portion is not disturbed much. Out of the USAID interested crops (Rice, soyabean, and maize) in the district, women are inclined to soyabean as compared to maize”*
Dennis Asampambila District Director Ministry of Food and Agriculture, Garu-Tempne

.....” *Right to ownership of land within the Garu Tempne District vary and depends on one’s community. Women who stay in the district capital, and are financially capable, can purchase land and control as opposed to women in the hinterland, whose ownership and control of land are drawn from husbands”* **Mary Agotiba Anabiiga Aggregator, Garu- Tempne District**

.....” *Men go to the district capital, most at times the women give them money to them for the purchase of items for them. Men buy seeds for their women because the men control the earning from farming at the end of the season. Men reserve some seeds for upcoming farming season but the women do not as the local customs have it that the gods like the local varieties. For compost making, the women cannot transport large quantities of cow dung into the field”* **a farmer**

Table 4.6 Summary of Focus Group Discussions on gender difference regarding adoption of improved Technologies in the study areas

ISSUES/ DISTRICTS	EAST MAMPRUSI		GARU TEMPANE		WA EAST	
Crops cultivated	males	Maize, Millet, Groundnuts	males	Maize, Millet, Rice Groundnut	males	Maize, Yam, Millet, Rice Groundnut
	females	Soybean, Cowpea vegetables	females	Soybean, Vegetables	females	Soybean, Cowpea Vegetables, Sorghum Bambara bean
Which improved technologies/ practices have been/have not been adopted by male/female and why?	<p>Males – use tractor to limited extent partly because of limited availability in the community. Farmers therefore rely on bullocks. Secondly, cost of tractor services is very high. For the 2016 farming season, tractor service for an acre of land is GHS 70 while that of the bullock is GHS 50.</p> <p>Females – They largely use of bullocks. The female dominated groups serve as extension delivery points for the introduction of new technologies Women are more engaged in the widespread cultivation of Soybeans stemming from promotion by ADVANCE -USAID sponsored project.</p>		<p>Males - Predominant use of bullock due to soil conditions in the district compared to tractors.</p> <p>Females - Women engage their husbands or young men to supervise ploughing by bullocks</p>		<p>Males - Improved maize is adopted by males because they have money to purchase fertilizers compared to women.</p> <p>Females - Females adopt and cultivate improved maize only when they are sure of fertilizer supply. Women usually adopt improved crop varieties with less input requirement</p>	
What is the relationship with gender dynamics in terms of labour allocation, income distribution, and access to resources and to information?	<p>Males - Men cultivate family farms to produce maize for family food security with women contributing labour. Inheritance from their paternal lineage. Culturally men own the land and have more mobile phones than females.</p>		<p>Males - Men own land and therefore can cultivate large plots of farm compared to women. Men contribute labour. Women also provide labour including labour for sowing, fertilizer application.</p>		<p>Males - Men have more access to labour because women help on their husband's farm before attending to theirs. Men have more access to information because the majority own mobile phones compared to women.</p>	

	<p>Income from agriculture is controlled by the men. Men provide the food grains while the woman takes care of expenditures such food ingredients, health and school fees and the grinding / milling of grains. Income for such expenditures is obtained the sales of farm produce from her farms.</p> <p>Females - Women play supporting roles in the home with the man taking the final responsibility for decisions. For instance, if one needs to sell an animal which belongs to the woman, she has to get the clearance from the man because, animals are sold by men and not women.</p>	<p>Females - In terms of information, both men and women have equal access to information because extension delivery by MoFA, and some NGOs like Presbyterian Agriculture services is available to both genders.</p> <p>Women do not control family resources including income from agricultural activities. Women do not own land.</p>	<p>Men control financial resources and therefore have more access than women</p> <p>Although land is available for agricultural purposes because men inherit land, they have access to land compared to the women who rely on their husbands' land for farming.</p> <p>Females – Women have less access to productive resources such as land, labour and agro-chemicals. They also have less access to extension services</p>
<p>Have female/male farmers adapted certain technologies/practices to make them more suitable for their use and why?</p>	<p>Males - Men are engaged in the cultivation of rice using mostly tractors or manual labour.</p> <p>Females - Women are more likely to adopt earlier maturing crops than men because of the delay in ploughing their lands. The early harvest is tie the family over the hunger period.</p>	<p>Males – Males cultivate a type of millet (late millet) which is said is used to pacify gods of the area</p> <p>Rice farming is also done by men because it is labor intensive</p> <p>Females - Early maturing crop varieties are often adopted by women because of shorter rain fall</p>	<p>Males – Except for yam cultivation, both genders engage in all farming activities. The differences are in the type of crops cultivated and the ability to apply other complementary inputs</p>

4.6 Details of Access to production resources from one-on-one interviews (Quantitative)

In this subsection, descriptive statistics (quantitative measures) are used to demonstrate the gender differences in access to production resources particularly among ADVANCE beneficiaries and non-beneficiaries.

4.6.1 Access to Land

About 93% of the respondents used family lands for cultivation or agricultural purposes. About 3% of the respondents used leased land and those using hired land constituted 2.5%. The others used free land that they claimed did not belong to any family in the communities. Farmers interviewed were asked if they faced challenges when accessing land for agricultural purposes. About 29.2% of the female farmers interviewed faced challenges with acquisition of land as opposed to 20.8% of the male farmers. Figure 4.8 shows the type of land used by respondents for farming activities.

As indicated in the focused group discussion, ownership and inheritance of land is generally through men. Females do not inherit land from deceased parent but have to farm through the benevolence of the husband if married or through father or male family head. However, in current times some well-resourced women are able to acquire land through buying or hiring.

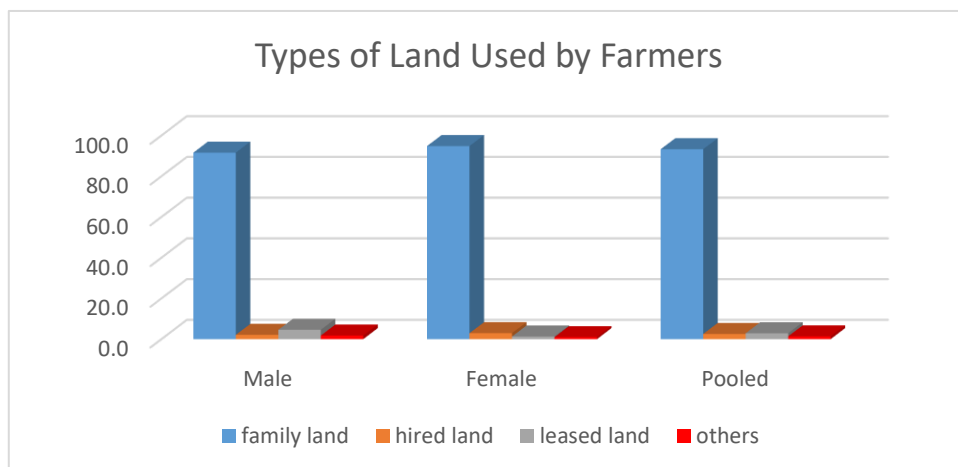


Figure 4.8 Types of Land used by farmers interviewed

Land belongs to families. Usually land accessed by males and could be leased to females to work on. There were issues with unavailability of lands for agricultural purposes. It was also pointed out that women could only access land for farming but could not own or control its use. Some mentioned that women are given infertile or marginal lands to cultivate certain types of crops only. Men decide on which land they want to cultivate before deciding on allocation to women. Men are the family heads with ownership of land and make decision on land.

In terms of land tenure system and inheritance of land women are disadvantaged. Moreover, women are like visitors, they leave their family house to join their husbands. Women have to access land through their husbands. Traditionally, the widely-held view is that men are responsible for taking care of women and consequently should have ownership of resources to be able to fulfill that responsibility. Therefore, the men should control family lands. Actually, in some of the communities it is considered a taboo for women to own land as this appears to go against customs. For women who used hired land, one's financial standing and interpersonal relationships determine acquisition of land.

Table 4.7 shows farm sizes of the respondents.

Table 4.7 Average land size cultivated by respondents (acres)

Land/Farm size	Male	Female	Total
Up to 2.5	20	113	133
Percentage	15.0	85.0	22.5
2.5-10	212	195	407
Percentage	52.1	47.9	68.8
More than 10	52	0	52
Percentage	100.0	0.0	8.8
Total	284	308	592
Percentage	48.0	52.0	100.0
Mean farm size	7.6	3.2	5.3

4.6.2 Access to Seed and Other Agro-inputs

Generally, women groups working under project interventions have easy access to improved seeds because these projects fund the provision of such inputs directly or indirectly through farmer linkages with agro input dealers. Small scale farmers generally often access their own saved seeds because they perceive improved seeds to be relatively expensive and try to avoid transport costs incurred in traveling from the community to the district capital where agro-dealers are

mostly found to purchase seeds. Due to the latter reason, they often rely on the men control family income earnings and have the freedom of movement to buy seeds for the farm household.

Compared to women, men tend to cultivate large farms to feed the relatively large families and therefore tend to depend on improved varieties to produce more to achieve that objective. Women who are culturally not expected to provide their family food requirements devote a large proportion of their time to supporting their husbands on the family farms. Thus, they farm relatively smaller plots of land - most often in infertile, faraway places. The tendency is for most women to cultivate mostly Soya beans farms and to a lesser extent Maize after tending to the family farms. The women cultivate local varieties due to their inability to purchase improved varieties. Figures 4.9 and 4.10 respectively show access to improved seeds and sources of seed used by farmers interviewed. Figure 4.11 depicts level of access to inorganic fertilizer by the farmers interviewed.

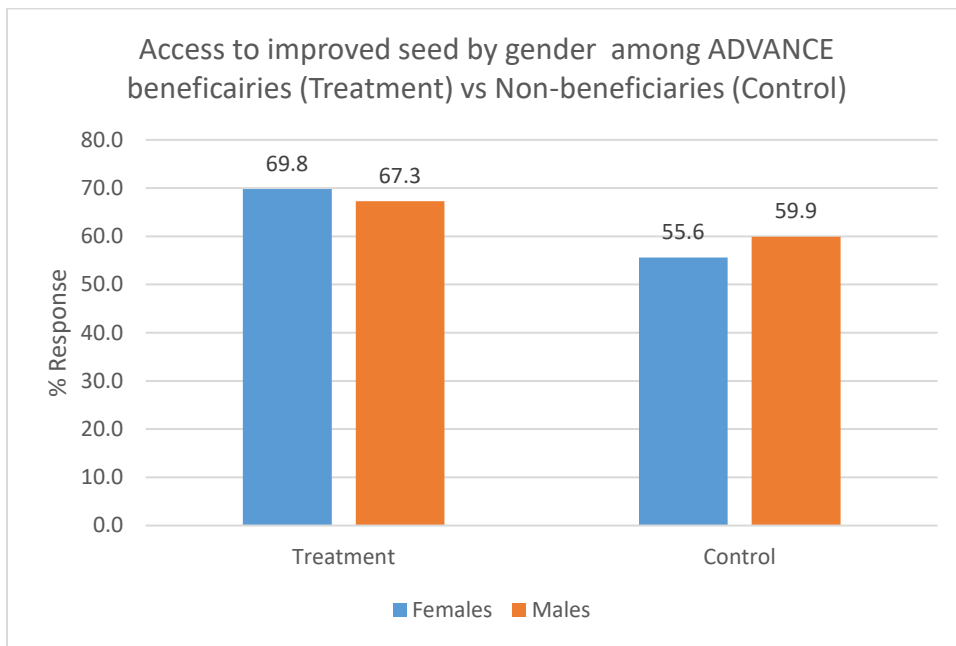


Figure 4.9 Access to Improved Seed by farmers interviewed

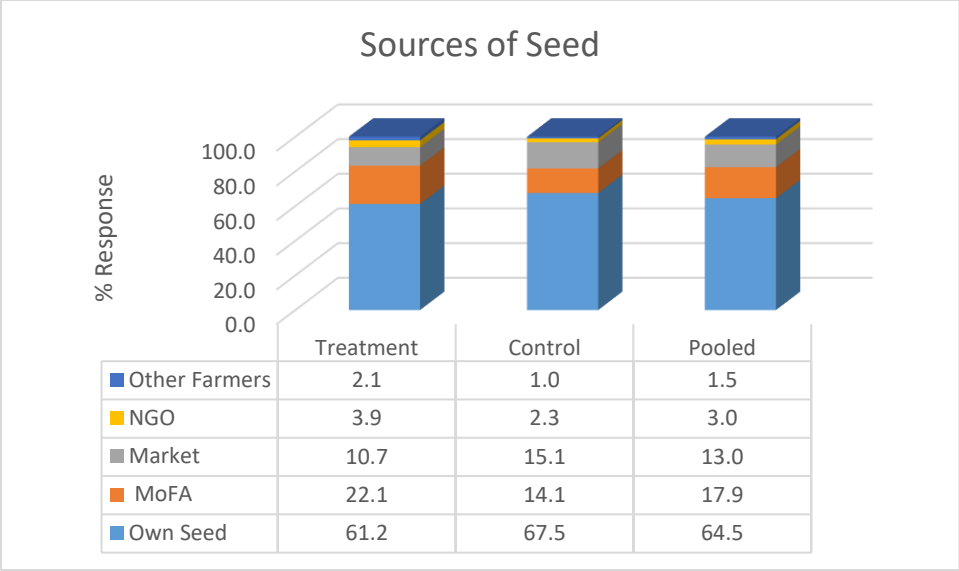


Figure 4.10 Sources of seed among farmers interviewed: ADVANCE beneficiaries (Treatment) against Non-beneficiaries (control)

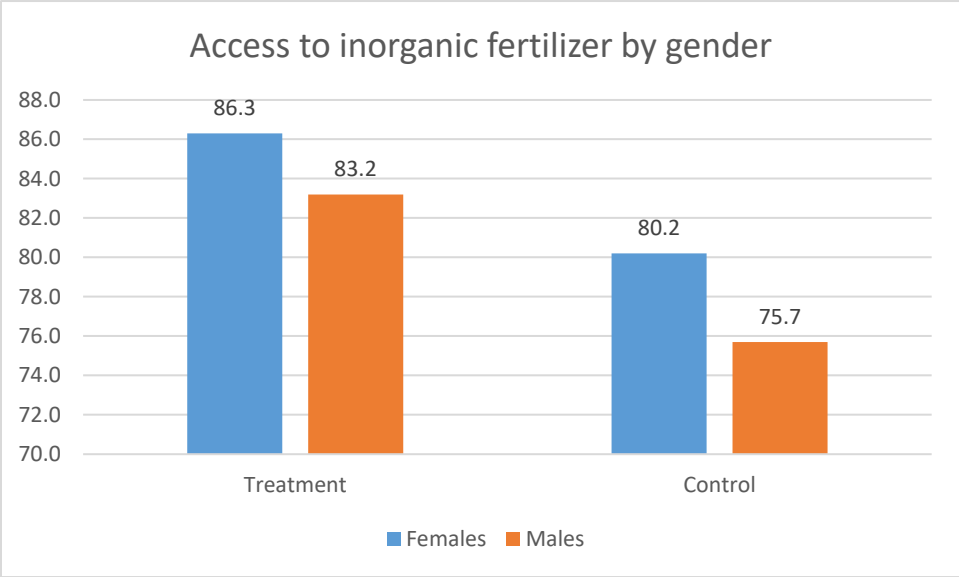


Figure 4.11 Level of Access to Inorganic Fertilizer among farmers interviewed: ADVANCE group against control

4.6.3 Access to Tractor Services

Smallholder farmer access to tractor services in the East Mamprusi and Wa East districts is very high, with 85% and 76% of the respondents from the two districts indicating have access to

tractors respectively. On the other hand, only about 10% of the respondents from the Garu-Tempene district use tractors which also confirms the findings that district is inundated with bullocks which is often used for ploughing under section 4. 5.

Another significant reason for the difference in access to tractor services in the 3 districts could be attributed to the fact that farmers on the ADVANCE Project in Wa East and East Mamprusi have been linked to tractor operators, making access easy for nucleus farmers and the farmers they support. In these arrangements, farmers in Wa East district use the ADVANCE tractor facility in Funsu while farmers in the East Mamprusi district hire the tractors belonging to a private tractor owner (Sulemana Ibrahim- Leader of the Nandanbaaya Group) which is paid for in cash or in kind.

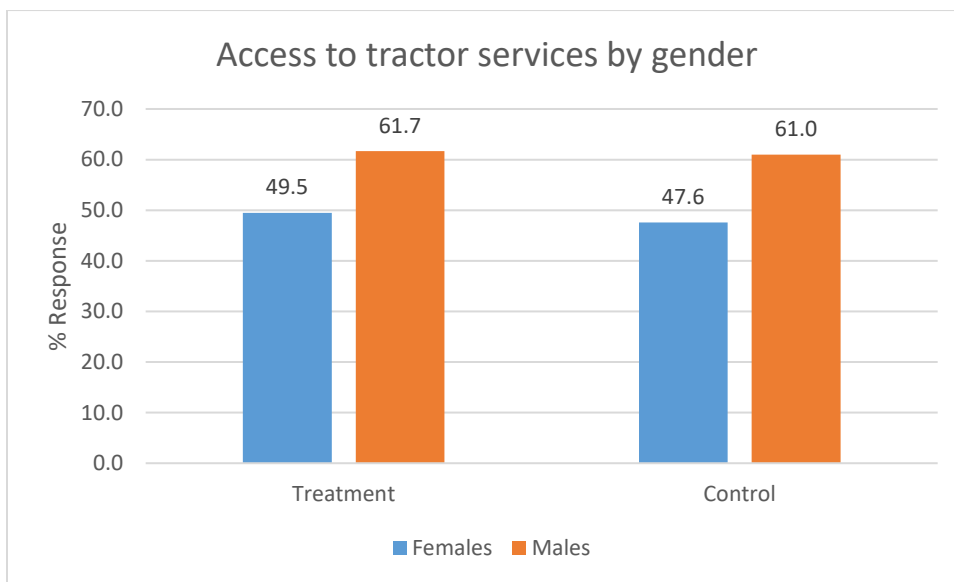


Figure 4.12 Access to Tractor Services by gender in the surveyed areas

In two districts (Mamprusi and Wa East) farmers complained of late tilling of land due to the great pressure on the few available tractors. This situation creates additional difficulty for women in securing tractor services. This is against the backdrop of financial difficulties already facing women in agricultural services.

Socio-cultural factors limiting access to tractor services by women

Socio- culturally, it is the men who use machinery to undertake activities, which involves a lot of drudgery, and are energy sapping. Women are considered weak and therefore are not expected to be in the forefront using or looking for tractors. Based on this socio-cultural situation, most tractor operators who are men do not want to deal with women in relation to securing tractor

services. These socio-cultural inhibitions including women’s lack of ownership or control over land therefore limit women to cultivate smaller acreages of farm. Following from this, it does not make financial sense for the women to use tractors to plough small acreages of land especially when these women generally do not have the financial resources to do so.

In the Garu Temppane District, the nature of the soils does not encourage the use of tractors but rather bullocks for tilling. The few tractor operators in the area charge high fees for ploughing that to break even because of low patronage of their services. This situation disadvantages women, since bullock usage requires is strength and energy sapping. Other factors that are limiting the use of tractors by women are:

- Many stumps on the farms do not encourage tractor usage;
- Priority given to men due to their large farms and financial power compared to women;
- Tractors operate at night at the peak of the season making it difficult for women to be in the field at that time;
- Delay arising from the use of men and women groups as fronts to access tractors.

Coping strategies used by women to access tractor are:

- Male children help to provide tractors, as women are not allowed to search for tractors
- Building relationships with tractor owners makes access to the service very easy.
- Using husbands to front for them
- Financial planning to get tractor services

4.6.4 Access to Irrigation facilities

Irrigation facilities that could support all-year-around farming in the study areas are generally unavailable. As shown in figure 4.13 almost 90% of the respondents in all the three districts do not have irrigation services available to them although the White Volta River passes through some of the districts like the Garu-Temppane district.

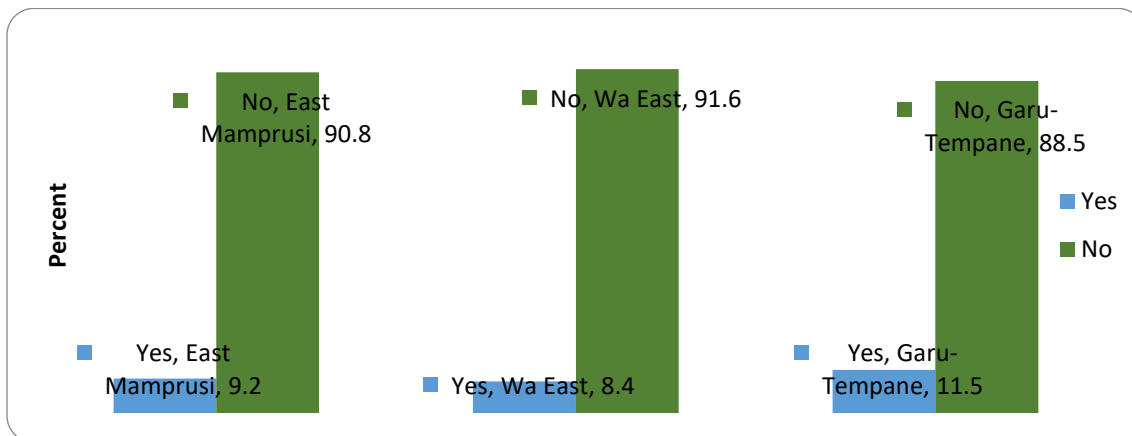


Figure 4.13 Access to Irrigation Facilities in the surveyed areas

Respondents who reported having access to irrigation services constituted only about 10% of the entire sample interviewed. The sources of water for irrigating crops in the communities are dug out wells from which small-scale farmers obtain water by using water cans to fetch water for watering their crops particularly in the dry season. Women find it difficult to manually water crops in situations where the dugout well or river sources are far out in the fields.

Factors that influence access to irrigation

1. Availability of rivers, streams and dams are pre-requisites to accessing irrigation
2. Lack of land ownership creates difficulties in building dams to for irrigation on individual plots of land
3. There are no big streams in some communities and such communities would have to rely on dams and manual watering, an approach which is not conducive for women because it is tedious process

4.6.5 Financing for Farm Activities

The study gathered that personal savings, family support, and 'susu' (informal saving schemes) are the means by which farmers' finance their farming activities. Surprisingly trade credit, local money lending, and bank loans were not the popular mode of financing farming activities. The situation does not encourage higher productivity since the farmers are not able to obtain inputs for agricultural activities using external funding sources. Smallholder farmers are generally unable to meet credit acquisition requirements of the financial institutions.

Figure 4.14 Sources of Finance for Farming Activities among farmers interviewed

4.6.6 Marketing

Farmers interviewed sold their agricultural produce mostly to people or agencies within the districts. The percentage of respondents who sell solely within the district is 91.6%, those who sell outside the district constitute 4.2% while those who sell both within and outside the district make up the remaining 4.2%. About 85.5% of the sample interviewed indicated that they can sell all their produce regularly.

Those who were unable to sell all their produce (mostly from the control group), irrespective of the sales outlet, explained that prices offered by customers were generally low due to excess

supply over market demand during harvest season. Farmers made sales only when there was urgent need for cash. The agricultural marketing situation was not encouraging because the districts are agricultural producing areas with a large percentage of the populations producing and supplying the same agricultural commodities while effective demand was low. Value addition to produced food products was nearly absent limiting the range of food products that consumers will demand. Consequently, this situation results in low commercial activity in the districts.

On the other hand, most of the farmers in the ADVANCE group (treatment) sold their produce to aggregators in their communities which is reflected in the higher percentage (74.4%) of sales to traders and individuals in the community as compared to 61.4% for those not in the ADVANCE group (the control) .

4.7 EFFECT OF ADVANCE EXTENSION PROJECT ON FARM INCOME IN SELECTED DISTRICTS IN NORTHERN GHANA

4.7.1 Background to the analysis

Strengthening the national agricultural extension support system is increasingly being advocated as a means to increase agricultural productivity. Augmenting government (traditional) extension system is an important intervention in this regard as government funding of such system is limited. As indicated under section 3.1, the USAID-funded Agricultural Development and Value Chain Enhancement (ADVANCE) project is one of such intervention in the northern regions of Ghana to augment government efforts. The ADVANCE extension strategy operates through the nucleus farmer concept where in every community, successful and influential farmers (nucleus farmer) are identified to serve as a contact extension person between programme implementers, experts and group of farmers in their community. This section presents an evaluation of the effect of the ADVANCE extension services on farm income

The increasing recognition of the important role agriculture extension plays in the sector over the world has motivated many studies that link various aspect of agricultural extension to farm productivity and income. These studies employ different models and data is used to examine the causal relationship between agricultural extension and farm income depending on the aspect of extension under consideration (Haq et al., 2016; Haq, 2011a, b; Jan et al., 2008; Owens and Hoddinott, 2001). Haq (2016) employed an input-output model to assess the impact of agricultural extension contact on farm income in Bangladesh. The results showed a positive and significant impact. Hassan et al, (2013) examined the effect of different type of extension on farm productivity. Using a treatment effect model, which controlled for sample selectivity bias, they found that participation in agricultural extension programme significantly raises crop income and productivity and increases household expenditure per capita in most cases in Uganda. Evenson and Mwabu (1999) used a quantile regression technique to investigate productivity effects of agriculture extension and other farm inputs on farm yield in Kenya. Their results show a higher productivity effect of agricultural extension at the extreme ends of distribution of farm yield residuals. They concluded that unobserved factors such as farm managerial ability affect crop yield differently. Other factors found to affect yield included level of education, farmer's experience, agro-ecological characteristics, fallow acreage and type of crop grown.

Methodologies used for such investigations include analyses of the effects of extension services based on the meta production function and total productivity index framework. The meta production function incorporates fixed variables such as technology options, and farmer information sets in an estimation model. This contrasts with the conventional agricultural production function that assumes that such variables are given and thus excludes them from

model estimation. The total factor productivity index approach, on the other hand, is based on an aggregate input index whose value depends on quantities of variables and fixed inputs. The observed agricultural output is then divided by this aggregate index to obtain total factor productivity, which can then be conditioned on extension service and background variables. The choice of evaluation approach according to literature is dependent on the nature of available data. A meta production function approach is adopted in this study. The meta production function model for the study is given as:

$$Y_i = f(FS, F, T, E, C, B, I) + U_i \dots \dots \dots (1)$$

Where

- F(.) is the deterministic component of crop income;
- Y_i is the logarithm of crop income (log of crop income for maize and soybeans in Ghana cedis) for individual respondents.
- Fs is the log of acres of cropped area/ farm size.
- F is use of inorganic fertilizer (1 if farmers uses inorganic fertilizer and zero (0) otherwise).
- T is access to tractor services (1 if farmer has access to tractor services and zero (0) otherwise)
- E is access to extension services (1 if farmer has access to extension services and zero (0) otherwise)
- C is personal characteristics of respondents (age, educational level, marital status (used as proxy for labour, and sex of respondents)
- B is a dummy variable (equal to 1 if farmer is a beneficiary of ADVANCE project, and zero (0) otherwise)
- I is interactive term (beneficiary and gender)
- U_i is the stochastic components or the error term

A quantile regression is used to estimate the production function assuming Cobb-Douglas functional form. Quantile regression is employed in the study to enable an assessment of how farmers in extreme distribution of farm income residuals are affected by ADVANCE programme. That is given the crop income distribution of farmer, this model as able to characterize farmers

into those who crop income is 25th percent and below in the distribution, those farmers whose crop income is in the middle (50th) percent of the income distribution and those whose crop income is at 75th percent and above of the income distribution, and estimate the model accordingly. More importantly, it would be of interest to know the effect of the programme on farmers with similar crop incomes at extreme distribution (25th and below and 75th) and above. This would help in policy making as farmers may be affected differently by extension services due to their unobserved personal endowments. Also, the majority of females in the survey area cultivate smaller farm sizes than their male counterparts, and are expected to obtain income that vary from male farmers. Such analytical results cannot be obtained through Ordinary Least Square (OLS) approaches, which are based on mean estimates.

Therefore, the quantile regression is used to estimate the effect of the ADVANCE project at three points of distribution of crop income residuals. These are the first quartile (25th percentile), the second quartile (50th percentile) and the third quartile (75th percentile). Regression estimates at the first quartile show the extension effects for the sample farmers at the lowest 25 per cent of crop income residuals, whereas estimates at the second quartile depict effects for farmers at the median residual. Also, estimates are obtained at the third quartile are for farmers at the 75th percentile of the distribution of crop income residuals. Thus, the quantile regression technique permits a comparison of how crop income of the median farmer responds to changes in its determinants relative to the crop income of any other farmer below or above the median residual. For purpose of comparison, mean effects of productivity determinants (the average effect of these determinants at levels of crop income) are also estimated using OLS.

Following the work of Buchinsky (1994, 1998) and Evenson and Mwabu (1998), a quantile regression model of crop income function for equation (1) is expressed as:

$$y_i = z_i\beta_\theta + \mu_{\theta i} \dots\dots\dots(2a)$$

$$\text{Quant}_\theta (y_i|z) = z_i\beta_\theta \text{ and } \text{Quant}_\theta (\mu_\theta|z) = 0 \dots\dots\dots(2b)$$

Where

β_θ and z_i are $K \times 1$ vectors, and $z_{i1} = 1$;

z is a vector of the right-hand side covariates in Equation (1);

$\text{Quant}_\theta (y|z)$ is the θ th conditional quantile of y given z , and

y vector of crop income with the constraint that $0 < \theta < 1$.

The parameter vector, β_{θ} is obtained by minimizing the sum of absolute chosen quantile of crop income across farmers.

In the case of Equation (2) the sum is expressed as:

$$\text{Minimize } \sum_i |\gamma_{\theta i} - \sum_j \beta_{\theta j} z_{ij}| \dots \dots \dots (3)$$

Where

$\gamma_{\theta i}$ is crop income (maize or soybeans) for farmer i at quantile θ , $i = 1, \dots, n$;

z_{ij} is covariate j (e.g., education) for farmer i , $j = 1 \dots K$;

$\beta_{\theta j}$ = Effect of covariate j on crop income at quantile θ

The solution to Equation (3) is found by rewriting the expression as a linear programming problem of the entire sample. The linear representation to the estimated model is given as:

$$Y_i = \beta_0 + \beta_1 Land_{size} + \beta_2 Age + \beta_3 Education + \beta_4 Fertilizer + \beta_5 Tractor + \beta_6 Married + \beta_7 Female + \beta_8 Beneficiary + \beta_9 Extension + \beta_{10} Beneficiary.Female + \mu \dots \dots \dots (4)$$

The estimation was done using STATA statistical software. The next section presents correlation matrix and estimated regression results.

4.7.2 Results and Discussions

Degree of association between crop income of maize and soybean, and selected variables

Table 4.8 and 4.9 show the degree of association between crop income of maize and soybean, and selected variables. The results in Table 4.8 show that farm size, basic education, access to extension services, tractor usage, marital status and beneficiary dummy and interactive term between gender and project beneficiary dummy have positive effect on soybean yield and therefore income obtained by farmers. Variables such as age, lack of formal education level, inorganic fertilizer usage and sex (female) of respondent have negative effect crop income of soybean in 2015.

In the case of maize, all the variables except for basic education level, beneficiary dummy and gender, are positively associated with yield and crop income obtained by respondents in 2015. Except for a few cases, the correlation coefficients shown in Table 4.9 are largely consistent with results from the OLS regression results reported in the ensuing Table 4.10, 4.11 and 4.12.

Effect of project intervention on crop income of maize and soybean in East Mamprusi District

Table 4.10 shows regression results at the first quartile (25th percentile), the median (50th percentile) and the third quartile (75th percentile) of the crop income residuals of respondents in the East Mamprusi District. Considering the magnitude and pattern of regression coefficient across the crop income quantiles, the effect of farm size on income reduces with an increase in quantile range. The results show that a ten-percentage increase in maize farm size increases income by 1.5 percent for farmers at the 25th percentiles of the distribution of crop income residuals; the correspondent increase is 1.1 % and 0.8% for farmers at the 50th and 75th percentiles of the distribution of crop income residuals. This is statistically significant. The OLS result under estimate the effect of farm size on yield expressed in terms of income. The result shows that a ten-percentage increase in maize farm size increase crop income by 0.6%. This is statistically significant at 10 percent level. This shows that farmers whose crop income is 25th percentile who are mostly females stand a higher chance (about 0.7% more) of increasing their productivity and crop income than farmers who are within the 50th and 75th percentiles, all things equal. This result demonstrates the law of diminishing returns to scale. But the fact that farmers in all the three distributions experienced an increase in crop income with an increase in farm size show that there is room for production/productivity increase and hence income increases for farmers.

The OLS estimate for “beneficiary” variable, which is used as proxy for effect of ADVANCE project participation, is -0.122 for maize, indicating that on the average farmers who participated in the project had about 0.122% maize income lower than non-participant. This is statistically significant at 10% level. This result shows the farmers who participated in the ADVANCE programme in general observed 0.12% lower maize income than non-participant in East Mamprusi during the 2015 crop season. A close look at the quantile regression shows that such negative impact was only felt by farmers at the 25th percentile of the distribution of maize crop income residuals. This result may imply that the ADVANCE programme did not benefit farmers who are within the 25th percentile of the crop income distribution. This could be attributed to the fact that either the benefit in the form of input support was too small to have an impact or rather came at the later part of the 2015 cropping season. Also, given the level of financial resources of

farmers in the 25th percentile, they may not be able to afford fertilizer and improved seeds on the market and therefore may tend to wait on project support.

The results from the quantile regression estimation show that family labour is an important maize production factor for farmers in the 25th percentile of the distribution of income residuals. A ten-percentage increase in family labour increases crop income from maize by 1.0%. This is statistically significant at 10% level. This means that farmers in this category of income bracket rely more on family labour as compared to farmers in the other income category. Furthermore, while the OLS estimates show that on the average crop income from maize obtained by females in 2015 cropping season is 0.119% lower than that obtained by males in the district at 10% significant level. This shows that on the average income obtained from maize by male farmers were higher than their female counterpart. This is not surprising because in all the study locations, maize production was mainly done by male farmers who had greater control of family recourses to purchase complementary inputs. The quantile regression results did not show any significant gender differences in crop income from maize. This shows that the quantile regression provides a more robust parameter and stricter significant values than the OLS estimates. The interactive term between beneficiary and gender (Beneficiary Female), which measure the effect of female participation in the ADVANCE programme, is positive. This shows positive effect of project on female participants. The OLS estimate shows an increase in crop income from maize by 0.13% for female participant in the project compared to non-participants. This shows that project that mainstream gender and target women in agricultural extension tend to have a positive impact on women. The quantile regression estimates also show positive results across the three-quantile points. The effect is statistically significant (5%) at the 25th percentiles where female farmers observed 0.10% increase in crop income from maize compared to male participants. Thus, all things equal, female participants in the ADVANCE programme were better off in terms of farm resources, made available by the programme, that resulted in an increase in income realized from maize production. The elasticity coefficients of the constant term across quantiles, and the OLS estimation are similar, about 1.7, and statistically significant at 1% level. This shows that other factors such as rainfall amount, which were excluded from the model, significantly contribute to maize production in the study location.

Table 4.8: Correlation matrix of crop income of soybean and explanatory variables

	lnS~2015	lnLansize	lnAge	None	Basic	Beneficiary	Extension	Fert	Tractor	Married	Female	Beneficiary
lnSoybean~2015	1											
lnLansize	0.1836	1										
lnAge	-0.0846	0.0574	1									
None	-0.1257	-0.2432	0.1577	1								
Basic	0.0907	0.1888	-0.1089	-0.8302	1							
Beneficiary	0.0523	-0.1136	0.0506	0.1082	-0.1129	1						
Extension	0.0796	0.0291	0.1052	-0.0498	0.1002	0.3106	1					
Fert	-0.026	0.1279	0.0544	-0.0891	0.0584	-0.0366	0.1077	1				
Tractor	0.2641	0.3127	-0.2395	-0.0703	0.0534	0.1859	0.0126	-0.1301	1			
Married	0.0449	0.1753	-0.1415	-0.093	0.1002	0.1656	0.158	-0.0287	0.1928	1		
Female	-0.0941	-0.5309	-0.005	0.2178	-0.1021	0.2186	0.0737	-0.1136	0.0122	-0.0733	1	
Beneficiary	0.0665	-0.4269	-0.003	0.2012	-0.1174	0.7083	0.2172	-0.1295	0.0932	0.0415	0.6755	1

Table 4.9: correlation matrix of crop income of maize and explanatory variables

	InM~2015	InLans~e	InAge	None	Basic	Benfiry	Extens~	Fert	Tracto r	Married	Femal e	Benefi ciar~e
InMaize~2015	1											
InLansize	0.4254	1										
InAge	0.0113	-0.0691	1									
None	0.024	-0.1411	0.2156	1								
Basic	-0.0685	0.0890	-0.1791	-0.7974	1							
Beneficiary	-0.1032	-0.0726	0.1041	0.1136	-0.0942	1						
Extension	0.0591	-0.028	0.1342	0.1199	-0.0207	0.3277	1					
Fert	0.1568	0.0931	0.0941	0.0583	-0.05	0.0817	0.1283	1				
Tractor	0.2314	0.3405	-0.1857	-0.0731	0.0153	0.0296	-0.1003	-0.0381	1			
Married	0.1139	0.0764	0.0900	0.1171	-0.1086	0.1428	0.0835	0.0523	0.0582	1		
Female	-0.3527	-0.5522	0.0718	0.0965	-0.0188	0.2406	0.0819	0.0634	-0.142	-0.0413	1	
Beneficiar~e	-0.2295	-0.3476	0.0743	0.133	-0.0677	0.6508	0.236	0.1168	-0.0719	0.0408	0.6767	1

Table 4.10: Quantile regression estimation results Maize and Soybean income –East Manprusi District (Northern Region)

	Maize				Soybean			
	Quantile Parameter Estimation			OLS	Quantile Parameter Estimation			OLS
	0.25	0.5	0.75		0.25	0.5	0.75	
Variable	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	
InLansize	0.15*** (5.60)	0.110** (2.25)	0.088** (2.53)	0.069* (1.73)	0.523*** (2.68)	0.496** (2.23)	0.527* (1.71)	0.143 (0.39)
InAge	-0.07* (-1.88)	-0.053 (-0.70)	-0.006 (-0.11)	-0.022 (-0.35)	-0.415 (-1.18)	-0.010 (-0.03)	-0.107 (-0.18)	-0.564 (-0.91)
None	0.05 (0.96)	0.016 (0.20)	-0.014 (-0.26)	0.027 (0.39)	-0.138 (-0.38)	-0.041 (-0.10)	-0.889 (-1.38)	-0.792 (-1.21)
Basic	-0.05 (-0.89)	-0.027 (-0.27)	-0.039 (-0.57)	-0.046 (-0.55)	-0.252 (-0.58)	-0.199 (-0.43)	-1.127 (-1.49)	-0.989 (-1.28)
Beneficiary	-0.11*** (-2.69)	-0.041 (-0.53)	-0.037 (-0.70)	-0.122* (-1.94)	-0.090 (-0.26)	-0.780** (-2.29)	-1.048* (-1.71)	-1.483** (-2.50)
Extension	0.01 (0.20)	0.067 (1.03)	0.039 (0.76)	0.072 (1.26)	0.096 (0.34)	-0.023 (-0.07)	0.315 (0.49)	0.578 (1.07)
Fert	0.03 (1.06)	0.011 (0.19)	-0.015 (-0.36)	0.049 (1.02)	-0.375 (-1.30)	-0.227 (-0.74)	-0.151 (-0.31)	-0.104 (-0.21)
Tractor	-0.03 (-1.00)	0.006 (0.09)	0.030 (0.81)	0.018 (0.36)	0.073 (0.25)	0.174 (0.55)	0.131 (0.24)	0.785 (1.54)
Married	0.08* (1.85)	0.091 (1.15)	0.101 (1.52)	0.034 (0.46)	0.382 (1.13)	0.267 (0.78)	-2.666*** (-4.50)	-0.793 (-1.40)
Female	-0.02 (-0.39)	-0.034 (-0.45)	-0.043 (-0.74)	-0.119* (-1.87)	-0.649 (-1.55)	-0.906** (-2.32)	-0.763 (-1.15)	-1.813*** (-2.69)
Beneficiar~e	0.10** (2.06)	0.046 (0.52)	0.055 (0.93)	0.132* (1.79)	0.539 (1.25)	1.049** (2.46)	1.408** (2.00)	2.254*** (3.13)
Constant	1.72*** (12.51)	1.745*** (6.08)	1.726*** (8.24)	1.768*** (7.16)	6.380*** (4.84)	5.746*** (4.12)	9.757*** (4.28)	9.585*** (3.97)
Pseudo R2	0.137	0.130	0.136	0.146	0.082	0.122	0.148	0.187
Dependent variable mean	1.768	1.856	1.970	5.594	5.298	5.799	6.477	6.160
Observations	136	136	136	136	111	111	111	111

In the case of soybean production and crop income, Table 4.10 shows that a ten-percentage increase in farm size increases crop income by about 5.2% among farmers at the 25th and 75th percentile of the distribution. The effect on farmers at the 50th percentile is 5.0%. This implies that soybean farmers in the extreme distribution of the crop income residuals have capacity to increase their productivity. Agricultural support programmes must target such farmers in order to achieve the needed increased soybean productivity.

Also participation in the project reduced soybean crop income by 0.78% and 1.04% for farmers at 50th and 57th percentile. These are statistically significant at 5% and 10% level, respectively. The

reasons being similar to those aforementioned in the case of maize production. The OLS estimate shows a 1.5% reduction in crop income from soybean at 5% percent significant level. Furthermore, the results show that female project participant observed 2.5% increase in crop income from soybean compared to their none-female participants. The effects were statistically significant for farmers at the 50th and 75th percentile of the distribution of crop income residuals, the increase in crop income of soybean were 1.05% and 1.4%, respectively. This buttresses the fact that mainstreaming gender in agricultural extension programmes tend to benefit female participants. The significant estimates of the constant terms across quantiles and OLS coefficient shows the importance of other factors excluded from the model to soybean production.

Effect of project intervention on crop income of maize and soybean in WA East District

Table 18 shows the regression results of crop income from maize and soybean in Wa East District. The results show that a ten percent increase in maize farm size increases crop income by 6.7% and 7.8% for farmers at 50th and 75th percentile of crop income residuals. This is statistically significant at 1% level. This shows that farmers in these income categories have capacity to increase their maize production. Support to such farmers would lead to an increase in maize production, all things equal. This also reflects the important role access to financial resources and ability to procure complementary inputs such as fertilizer play in maize production in the Was East district.

- The result shows that farmers at the 50th and 75th percentiles who participated in the project had 0.055% and 0.063% income lower than none-participants. This is statistically significant at 1% and 5% level, respectively. This result confirms farmers complains about delays in obtaining input supports such as fertilizer and inadequate supply of complementary inputs especially in the 2015 production season.
- Access to extension services shows positive effect on crop income for maize across quantiles and estimated regression models. The results show that a ten percent increase in access to extension increase crop income from maize by 1.15% and 1.13% for farmers at 50th and 75th percentiles of the distribution. This is statistically significant at 1% level. This shows the importance of extension visits to maize production in the Wa East district.
- Access to tractor services shows a positive effect on crop income except for farmers at the 25th percentile of the distribution on crop income from maize. This may be because it is not cost effective to use tractors due to the small size of land cultivated by such farmers.
- Family labour support was found to be important factor in maize production in the Wa East district. A ten percent increase in family labour increase crop income from maize by 1.1% and 0.5% for farmers at 50th and 75th percentile of the distribution of crop income, respectively.

This is statistically significant at 1% level. This shows that family labour is an important factor in maize production.

The results further show that crop income from maize for female farmers at the 50th and 75th percentile was 7% and 5.8% lower than male farmers. This is statistically significant at 5% and 1% respectively. This result is consistent with male dominance in maize production.

All the coefficients of the interactive term between beneficiary and female is positive. This indicates positive effect of project on female participant. Female project participants obtained 6.7% increase in crop income from maize compared to their male counterparts. This implies that female participation in the ADVANCE programme resulted in positive impact on their farm productivity and therefore income. This is statistically significant at 1% level. The significance of the constant terms show the importance of other factors excluded from the model in maize production function in the survey location.

In the case of soybean production, except for fertilizer usage that was statistically significant at the 10% level for farmers at 75th percentile of the distribution of crop income, all the variables included in the model were not statistically significant. This implies that fertilizer is an indispensable input in the production of soybean in the Wa East district. As such, interventions to increase soybean production in the district should prioritize making access to fertilizer a priority, all things equal.

Table 4.1 I: Quantile regression estimation results Maize and Soybean income –Wa East District

Variable	Maize				Soybean			
	Quantile Parameter Estimation				Quantile Parameter Estimation			
	0.25	0.5	0.75	OLS	0.25	0.5	0.75	OLS
Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	
InLansize	0.045 (1.01)	0.067*** (3.66)	0.078*** (7.67)	0.088*** (3.35)	0.716 (1.29)	0.199 (0.24)	0.365 (0.83)	0.399 (1.61)
InAge	-0.054 (-0.99)	0.000 (0.02)	0.015 (0.99)	0.001 (0.04)	-0.037 (-0.06)	-0.018 (-0.02)	0.007 (0.01)	-0.038 (-0.12)
None	-0.051 (-0.36)	-0.088 (-1.59)	-0.031 (-1.07)	-0.064 (-0.40)	-0.831 (-1.11)	-0.783 (-0.55)	-0.732 (-1.08)	-0.690 (-1.26)
Basic	-0.076 (-0.47)	-0.114* (-1.87)	-0.031 (-0.98)	-0.070 (-0.43)	-0.500 (-0.56)	-0.616 (-0.41)	-0.404 (-0.55)	-0.204 (-0.35)
Beneficiary	-0.054 (-0.83)	-0.055** (-2.03)	-0.063*** (-3.97)	-0.060 (-1.59)	0.855 (1.24)	-0.212 (-0.19)	-0.214 (-0.36)	-0.136 (-0.40)
Extension	0.091 (1.65)	0.115*** (3.95)	0.113*** (7.19)	0.084** (1.98)	-0.205 (-0.41)	0.503 (0.50)	0.109 (0.14)	0.346 (0.93)
Fert	0.227*** (2.66)	0.108** (2.16)	0.087*** (4.23)	0.136 (1.57)	-0.615 (-1.45)	0.096 (0.15)	0.653* (1.97)	-0.043 (-0.05)
Tractor	-0.066 (-0.85)	0.024 (0.77)	0.035** (2.02)	0.002 (0.04)	-0.250 (-0.29)	0.903 (0.74)	0.733 (1.19)	0.339 (0.94)
Married	0.098	0.111***	0.055***	0.063	0.083	0.188	0.396	0.363

	(1.36)	(3.70)	(2.98)	(1.43)	(0.11)	(0.22)	(0.78)	(1.20)
Female	-0.068 (-1.00)	-0.070** (-2.54)	-0.058*** (-3.75)	-0.069* (-1.83)	0.356 (0.62)	-0.157 (-0.17)	-0.073 (-0.13)	-0.056 (-0.19)
Beneficiari~ e	0.004 (0.04)	0.021 (0.57)	0.076*** (3.63)	0.021 (0.42)	-0.762 (-0.85)	0.169 (0.12)	0.580 (0.75)	0.197 (0.46)
Constant	1.675*** (8.86)	1.632*** (17.35)	1.610*** (30.89)	1.601*** (8.05)	5.563*** (2.70)	5.843* (1.75)	5.211*** (2.81)	5.386*** (3.78)
Pseudo R2	0.176	0.243	0.244	0.312	0.129	0.118	0.289	0.303
Dependent variable mean	1.773	1.880	1.968	3.686	5.298	5.768	6.174	6.160
Observatio ns	144	144	144	144	66	66	66	66

Effect of project intervention on crop income of maize and soybean in Garu Tampani District

Table 4.12 shows the estimated results of maize crop income for respondents in Garu Tampani District. There was no regression estimate on soybean because the number of respondents involved in soybean cultivation was not enough for estimation. The results highlight the importance of farm size, educational level, and fertilizer usage in maize production in the district. The results show that a ten percent increase in maize farm size will increase crop income by 1.2%, for farmers at 25th and 75th percentile of the distribution of income residuals and 1.0% for farmers at 50th percentile. These are significant at 1% and 5% level, respectively. The results show there is capacity to improve maize production among farmers in those income category in the district.

Table 4.12: Quantile regression estimation results Maize income –Garu Tampani District

Variable	Maize			
	Quantile Parameter Estimation			OLS
	0.25	0.5	0.75	
Coef.	Coef.	Coef.	Coef.	
InLansize	0.121*** (3.01)	0.101** (2.04)	0.120*** (4.25)	0.094** (3.26)
InAge	0.060 (0.66)	0.065 (0.65)	0.066 (1.18)	0.030 (0.54)
None	-0.101 (-1.24)	-0.078 (-0.79)	-0.045 (-0.84)	-0.048 (-0.82)
Basic	-0.211* (-1.90)	-0.114 (-0.85)	-0.037 (-0.57)	-0.091 (-1.17)
Beneficiary	-0.030 (-0.51)	-0.016 (-0.23)	-0.014 (-0.39)	0.009 (0.23)

Extension	0.038 (0.63)	0.047 (0.67)	0.074* (1.85)	0.052 (1.27)
Fertilizer	0.103* (1.74)	0.123* (1.77)	0.127*** (3.58)	0.124*** (3.18)
Tractor	0.016 (0.27)	0.066 (0.90)	0.131*** (3.00)	0.075* (1.72)
Married	0.033 (0.41)	0.044 (0.45)	0.043 (0.80)	0.061 (1.07)
Female	-0.059 (-0.72)	0.006 (0.06)	0.079 (1.43)	0.039*** (0.68)
Beneficiary Female	-0.014 (-0.11)	-0.066 (-0.46)	-0.139* (-1.83)	-0.136* (-1.70)
Constant	1.462*** (4.24)	1.461*** (3.96)	1.391*** (6.67)	1.534*** (7.36)
Pseudo R2	0.247	0.284	0.277	0.305
Dependent variable mean	1.856	1.959	2.136	6.036
Observations	132	132	132	132

Farmers who use inorganic fertilizer recorded higher crop income from maize than those who did not use inorganic fertilizer. A ten percent increase in fertilizer usage increase crop income by 1.2% on the average this is statistically significant at 1% level.

4.8 Results of Validation Workshop

Participants at the validation workshop agreed to the findings from the research on gender responsiveness to agricultural extension study. Additionally, the under-listed comments were made by some participants:

- ✚ Family farms attract more efforts than the individual women farms. This explains why women have to help their husbands on their farms;
- ✚ Women will receive fertilizer under an intervention package that is meant for women farms but will rather give to their husbands for the family farms;
- ✚ Maize farm requires more inputs but currently there is low access to loan/credit for agriculture. This explains why better resourced farmers are able to adopt improved maize related technologies (improved maize seeds, fertilizer application and agronomic practices);
- ✚ Resource rich farmers are the early adopters of improved technologies. In extension, farm is considered as household – gender mainstreaming in extension is key this will ensure that female farmers get access to extension delivery;
- ✚ There is a challenge with poor soil fertility. Some farmers are virtually farming on gravels but coping with the use of water conservation measures;
- ✚ Some NGOs are promoting cultivation and utilization of soybean among women as a means to improve nutrition security at the household level. Here it is perceived that

consumption of soyabean products will improve the nutrition conditions of women and children who are more likely to suffer from protein deficiencies;

- + There is a gender gap with respect to access to land. However, the current dynamics show some improvement with women empowerment. Some resource endowed women have more land than men;
- + In the past when women get more yields than their husbands they get scared but currently this is changing;
- + Subsidies on improved seeds helped a lot of women farmers to access improved seeds in Wa East; and
- + We have been educated that farming is a business. Hence quality information on crop budgeting is critical for decision making.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

1. Gender dynamics (socio-cultural issues) and Farming

The study identified gender differences in the cultivation of crop types across all the surveyed districts. Maize related technologies were adopted by males more than females because Culturally it's the male household responsibility to feed the household. The staple of the study areas is maize. Soyabean related technologies were adopted by women because it was easy to cultivate and easy to sell on the local market. Traditionally, women have to provide ingredients for the preparation of food, so they occasionally sell the soyabean to buy ingredients

2. Women access to agricultural extension

Women access to agricultural extension was very low as interaction between extension agents and women were highly influenced by cultural factors limits interaction between females and males who are not couple. Women access to extension is normally through men who are normally their husband or male children.

3. Other factors influencing choice of agricultural technologies

The study found out that the four other most important factors influencing improved technology adoption include improvement in yield, cost implications, affordability and user friendliness.

4. Impact of ADVANCE 's gender strategy on women's incomes

ADVANCE's gendered extension services impacted females more than their male counterparts with females at the 25th percentile of distribution of crop yield and crop income earning more income than those at the 50th and 75th percentile of the distribution. Results show "an increase in crop income from maize by 1% for female participant in the project compared to non-participants." That is, the 0.132 interaction coefficient shows that, female beneficiaries had a 13.2% higher maize income than male beneficiaries; however, female beneficiaries had only a 1% higher maize income than female non-beneficiaries.

5. Decisions on gender responsive strategies and practices for policy making

ADVANCE's initiatives in mainstreaming gender in their programs resulted in ADVANCE's female farmer group accessing more extension than the non-ADVANCE female farmer groups (control group).

5.2 Recommendations

Recommendations from the study include the following:

Institutional/ Organisational mainstreaming and use of women extension agents – MOFA and value chain projects should mainstream and use women extension agents in the delivery extension services as evidence show that they are effective in delivering extension services to women. These agents should be regularly trained and well equipped with the necessary tools for effective agricultural extension and rural advisory services delivery.

Value chain projects should break gendered stereotyping in crop cultivation: Socio-culturally, men and women cultivate different crop types reinforcing the barriers between the genders. Value chain projects increasing women access to extension advice and production inputs including credit support packages will empower women to cultivate crops which have become the preserve of males.

Value chain projects should use Civil Society Organisations (CSOs) and male champions with gender competencies to effectively empower women farmers: Dealing with long held cultural traditions requires competencies which extension agents normally do not have, as they are comfortable with transfer of agricultural technologies. CSOs with competencies in social change issues are best suited to engage with custodians of traditional to dialogue for change. Other change agents are male champions who will be in position to convince their male counterparts to modify/ change customs in line with modernity.

Value chain projects should improve women access to production resources: Women are greatly disadvantaged regarding access to production resources such as land, credit etc and this perpetuates their current subordinate situation. Women do not inherit land. By facilitating women's access to production resources, value chain projects will assist women to be better positioned to support their families and thereby get their social positions enhanced. This is a crucial component of women economic empowerment interventions.

Deployment of appropriate extension methodologies/tools to reach out to females and the youth: Considering the challenges the government is facing in attempt to improve the farmer extension ratio in the country, the extension policy should be reviewed to encourage the use of modern IT tools and radio for mass outreach especially to women farmers. The IT tools developed and radio networks should take into consideration low literacy levels among women and low IT knowledge. Ensure that training content, time and materials as well as trainers used are appropriate for the target group.

Some gender based policies could address human capital formation and access to school for girls: Education levels of the samples farmers were extremely low. Education is key to exit subsistence farming and precarious living conditions successfully.

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Appendix I Team Composition and Responsibilities

Name of Expert	Task Assigned	Area of Expertise
<p>Wilhemina Quaye-CSIR-STEPRI</p> <p>Principal Investigator</p>	<p>Development of inception report on the project, methodologies, work plan and timelines</p> <p>Literature Review</p> <p>Designing discussion and interview guides</p> <p>Selection of districts and communities in the 3 project Regions in Northern Ghana</p> <p>Lead Meetings with key informants to identify farmer groups</p> <p>Training of surveyors / enumerators</p> <p>Lead the Organisation of validation workshop</p> <p>Submit final report and other relevant documents and close project</p>	<p>PhD RURAL SOCIOLOGY 2012, Wageningen University, The Netherlands</p> <p>Socio-economic Research, Gender Mainstreaming and Analysis, Rural Sociology and Development and Monitoring &Evaluation</p>
<p>Masahudu Fuseini CSIR-STEPRI</p> <p>Team Member</p>	<p>Selection of districts and communities in the 3 project Regions in Northern Ghana</p> <p>Stakeholder list and Initial Field Contacts</p> <p>Meetings with key informants to identify farmer groups to be interviewed</p> <p>Conduct semi structured questionnaire/interview guide for group discussion and interview guide</p> <p>Data collection</p> <p>Report Writing</p> <p>Validation Workshop</p>	<p>MSc. Social Research Methods London South Bank University, London, United Kingdom</p> <p>Organisation of Data Collection</p> <p>Organisation of Dissemination Event</p> <p>Assessment of capacity gaps, identification of factors affecting research performance, and critical areas of support and training needs to improve on productivity.</p>

Name of Expert	Task Assigned	Area of Expertise
Paul Buadu - CSIR-SARI Team Member	Data Entry Template Design Data analysis and Interpretation Report Writing Dissemination Strategy Develop policy brief and newspaper article for publication Dissemination of policy brief to policy makers	PhD Candidate Economics

Appendix II Implementation Plan

No	Activity	Timelines						Deliverables
		July 2016	August 2016	Sept 2016	Oct 2016	Nov 2016	Dec 2016- Jan 25, 2017	
1	Planning stage, detailed timetable in an Inception Report							Inception Report
2	Semi Structured questionnaire /interview guide for Focus Group Discussion and Case Studies							Interview Guides/Questionnaire
3	Literature Review							Will form part of the Main Report
4	Field contacts and Appointments							List of Stakeholders and Scheduled Appointments
5	Field visits, key informant interviews and Focus Group discussions							Transcriptions and Translations Field Report/Quarterly Report
6	Qualitative Content Analysis							Submission of draft report

	and Writing of draft report							
7	Validation Workshop							Proceedings
8	Revision of draft Report and Submission of final report							Final Report
9	Policy Brief and Dissemination							Policy Brief Distribution List

Appendix III Socio-economic Characteristics of Respondents

Characteristics	Overall Response	
Age		
	Frequency	Percentage
<20	4	7
20-30	135	22.8
31-40	163	27.6
41-50	160	27.1
51-60	63	10.7
>60	66	11.2
Gender of respondent		
Male	284	48.0
Female	308	52.0
Educational Level		
None	493	83.3
Basic	67	11.3
Secondary	24	4.1
Tertiary	7	1.2
Other	1	0.2
Residential Status		
Native	572	96.6
Settler	20	3.4
Major Occupation		
Farming	578	97.6
Agro-processing	1	0.2
Trading	3	0.5
Other service enterprise	7	1.2
Formal employment	3	0.5

Minor Occupation		
Farming	11	1.9
Agro-processing	58	9.8
Trading	70	11.8
Other service enterprise	38	6.4
Formal employment	14	2.4
None	401	67.7
Household heads		
Yes	232	39.2
No	360	60.8
Marital Status		
Married	535	90.4
Single	32	5.4
Divorced	2	0.3
Widowed	23	3.9
Membership of Farming Association		
Yes	335	56.6
No	257	43.4

Appendix IV Questionnaire

Qualitative Evaluation of Gender Responsiveness to Agricultural Extension for improved Agricultural Productivity in Northern Ghana	
Questionnaire No:.....	Date:
Name of Enumerator:	District/Community:

A. Personal Data:

1. Name of Respondent
2. Gender of respondent 1= Male 2= Female
3. What is your residential status in this community? 1= Native 2= Settler 3=Others
4. What is your highest level of education? 1= None 2= Basic (Primary/JHS),
3=Secondary (SHS, Tech/Vocational) 4= Tertiary 5= Others (Specify)
5. What is your age (in years)? :.....
6. What is your major occupation? 1= Farming 2= Agro-processing 3= Trading 4= Other service
enterprises (hairdressing, tailoring) 5=Formal employment
7. What is your minor occupation? 1= Farming 2= Agro-processing 3= Trading 4= Other service
enterprises (hairdressing, tailoring) 5=Formal employment
8. Are you the household head? 1 = Yes 2= No
9. Marital status..... 1= Married 2= Single 3=Divorced 4=Widowed
10. Do you belong to any farmer association? 1=Yes 2= No
Name of farmer association
11. If Yes, what benefits do you derive from the association?
.....
.....
12. If yes to Q10, how frequently do you meet in a year (number)? :
13. Are you a beneficiary of the ADVANCE Program? 1=Yes 2= No
14. If no to question 13, do you benefit from other interventions? 1=Yes 2= No

B. Access to Land

1. Type of land used for cultivation 1=Family land 2= Hired Land 3= leased land 4=Others Specify
2. Size of land cultivated (in acres)?:,,,,,,,,,,,,,,,,,,,,,
3. Do you face challenges with acquisition of the land? 1= Yes 2=No
4. Describe any **five (5)** socio-cultural factors that influence gender differences with respect to access
to land in this community (in order of importance):
i.....

ii.....

- iii.....
- iv.....
- v.....

C. Access to Seed and Agro-Inputs

1. Where is your main source of seed ? 1= own seed 2= improved seeds from MOFA 3. Purchase seeds from the market 4. NGO 5. Purchased seed from other farmers 6.Others specify.....

2. Do you have access to improved seed? 1=Yes 2=No

3. If yes for which types of crops?
.....

4. Describe any three (3) socio-cultural factors that influence gender differences with respect to access to improved seeds in this community

i.....

ii.....

iii.....

5. Do you use inorganic fertilizer? 1=Yes 2=No

6. Is inorganic fertilizer available in the community? 1= Yes 2=No

7. Do you have access to inorganic fertilizer? 1=Yes 2=No

8. Do you use organic fertilizer? 1 =Yes 2=No

9. Is organic fertilizer available in the community? 1= Yes 2=No

10. Do you have access to organic fertilizer? 1 =Yes 2=No

11. Describe any three (3) socio-cultural factors that influence gender differences regarding access to organic fertilizer (in order of importance)

i.....

ii.....

iii.....

12. Describe any three (3) socio-cultural factors that influence gender differences regarding access to inorganic fertilizer

i.....

ii.....

iii.....

D. Access to Extension Services

- 1. Do you have access to extension service? 1=Yes 2=No
- 2. If yes specify the type of extension services received.....
.....
- 3. How often do you receive extension services? 1=once a week 2=once in every two weeks 3= once every three weeks 4= Monthly 5= Bi-monthly 6. Others specify.....
- 4. Source of Extension services 1=MOFA 2= NGO 3= Private provider 4=others specify.....
- 5. Do you pay for the extension services? Yes/No
If yes, how much per visit?
- 6. If no will you be willing to pay for extension services? 1=Yes 2=No
- 7. Describe any three (3) socio-cultural factors that influence gender differences with respect to access to extension services in this community (in order of importance)
 - i.....
 - ii.....
 - iii.....

E Access to Tractor and Irrigation Services

- 1. Are tractors available for farm work in your community? Yes /No
- 2. Do you have access to tractor services? 1=Yes 2=No
- 3. If yes is it difficult accessing tractor services 1=Yes 2=No
- 4. Please explain your answer to question 3 above.....
.....
- 5. Describe any three (3) socio-cultural factors that influence gender differences with respect to access to tractor services in this community (in order of importance)
 - i.....
 - ii.....
 - iii.....
- 6. Do you have irrigation services available in your community? 1=Yes 2=No
- 7. If yes is it difficult accessing irrigation services 1=Yes 2=No
- 8. Please explain your answer to question 6 above.....
.....
- 9. Describe any three (3) socio-cultural factors that influence gender differences with respect to access to irrigation services in this community(in order of importance)
 - i.....
 - ii.....
 - iii.....

E. Access to Credit / Financing

1. What are the sources of finance for your farming activities? (**tick all applicable**)
 1= Family support 2=Trade credit 3=Susu 4= Local money lenders 5= Personal savings 6=Bank loan
 7=Projects/programmes/NGO 8 Other.....

2. If there are more than one source of funding/financing state the main source of financing. (**N:B tick only one**) 1= Family support 2=Trade credit 3=Susu 4= Local money lenders 5= Personal savings 6=Bank loan 7=Projects/programmes/NGO 8Other.....

3. Do you save from income generated from your farming activities? 1=Yes 2 =No

4. If no, please provide reasons

5. Where do you save your money, if you do? 1=Relative 2=Home 3=Bank 4=Susu 5= Credit Union
 6=Other (specify)

6. If you do not in any bank or other financial institutions why?

7. How accessible are financial services to women and men?.....

8. What are some of the challenges.....

Productivity

1. Please indicate any improved agricultural technologies adopted over the last three years.....

2. Indicate any adaptation strategies regarding the improved agricultural technologies adopted over the last three year.....

3. Which criteria do you use when evaluating new agricultural technologies/practices for suitability

4. Please rank the following factor considerations when adopting an improved technology

Factor Considerations	Ranking (1= most important)	Remarks (Explain your Ranking)
Cost Implications		
Affordability		

Socio-cultural		
User Friendliness		
Resource Efficiency		
Improvement in yields		
Consumer Acceptability/Market		
Environmental Impact		
Additional Income		

5. Please indicate the level of productivity for the various crops cultivated in 2016 (Maize, rice, sorghum, soyabean, cowpea and groundnuts)

Crop Type	Farm Size (acres)	Improved Agronomic Practices Adopted	Yield (Output/Acre)	Total Output		Price per bag	Total Income (GHS)
				Qty	Unit		

6. Please indicate the level of productivity for the various crops cultivated in 2015 (Maize, rice, sorghum, soyabean, cowpea and groundnuts)

Crop Type	Farm Size (acres)	Improved Agronomic Practices Adopted	Yield (Output/ Acre)	Total Output		Price per bag	Total Income (GHS)
				Qty	Unit		

7. Please indicate the level of productivity for the various crops cultivated in 2014(Maize, rice, sorghum, soyabean, cowpea and groundnuts)

Crop Type	Farm Size (acres)	Improved Agronomic Practices Adopted	Yield (Output/ Acre)	Total Output		Price per bag	Total Income (GHS)
				Qty	Unit		

8. Describe any three (3) gender differences regarding adoption and adaptation of selected technologies (in order of importance)

- i.....
- ii.....
- iii.....

F. Processing

- 1. Do you process agricultural products 1=Yes 2= No
- 2. If no why are not processing?.....

Crop	Product	Improved processing technologies	Benefit from adopting improved processing technologies

G. Access to Market and Marketing Information

1. Where do you sell your products/services? 1= within this district 2= outside the district 3= both within and outside district 4= Export

2.What proportion of your products is sold outside this district/project area?

.....

3. Are you able to sell all that is produced regularly? 1=Yes 2= No

4. If No, please provide reasons for not being able to sell all your products?.....

.....

.....

5. Who are the main clients/customers of your products/services? 1= Individuals 2 = Traders in the community 3= Traders outsider the community 4= Institutions in the community 5= Institutions outside the community 6= Other.....

6. How do you make your products/service known to customer? (Tick all applicable).

1= Word of mouth Radio 2= Hand bills 3= Sign boards 4=Other specify).....

H. Intra-household decision-making on access to production resources

Please indicate the one who takes decisions on productive resources at the household level (Please tick as applicable)

Access/adoption	Men	Women	Youth	Remarks
Land				
Seed				
Extension Services				
Inorganic Fertilizer				
Organic Fertilizer				

Tractor Services				
Irrigation Services				
Improved Production Technologies				
Improved Processing Technologies				
Market and Marketing Information				
Access to Credit				

Thank you for your time and attention!

Appendix V List of Key Informants

Northern Region			
	Name	Position	Contact
1	[REDACTED]	District Extension Director	[REDACTED]
2	[REDACTED]	MIS Officer	[REDACTED]
3	[REDACTED]	ADVANCE Contact Person	[REDACTED]
4	[REDACTED]	Aggregator	[REDACTED]
5	[REDACTED]	Boayini	[REDACTED]
Upper East Region			
1	[REDACTED]	District Director, Ministry of Food and Agriculture	[REDACTED]
2	[REDACTED]	District Extension Officer	[REDACTED]
3	[REDACTED]	Owner, Azure Farm Enterprise, Agro-Chemical/ input Dealer	[REDACTED]
4	[REDACTED]	Market Aggregator	[REDACTED]
Upper West Region			
1	[REDACTED]	Director, District Agricultural Development Unit	[REDACTED]
2	[REDACTED]	District Agricultural Officer, MoFA	[REDACTED]
3	[REDACTED]	ADVANCE nucleus farmers- Finsi	[REDACTED]

4	[REDACTED]	Programme Coordinator, Tumu Deanery Rural Integrated Development Programme (TUDRUDEO)	[REDACTED]
5	[REDACTED]	ADVANCE regional Coordinator	[REDACTED]
6	[REDACTED]	ADVANCE nucleus farmer, Yaala I	[REDACTED]

Appendix VI List of people interviewed in Focus Group Discussion

No.	Name	Position	Contact
Biamboog Women on ADVANCE in the Garu-Tempene District of the Upper East Region			
	[REDACTED]	Farmer	[REDACTED]
	[REDACTED]	Farmer	[REDACTED]
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
Biamboog Men (Non -ADVANCE) in the Garu-Tempene District of the Upper East Region			
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
Tambaalug Women Non-ADVANCE - in the Garu-Tempene District of the Upper East Region			
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		

Tambaalug Men Non- ADVANCE -- in the Garu-Tempene District of the Upper East Region			
Tambaalug Men ADVANCE - in the Garu-Tempene District of the Upper East Region			
Tambaalug Women ADVANCE - in the Garu-Tempene District of the Upper East Region			
Female Group in Finsi – Wa West in Upper West Region			

	██████████		
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	██████████		

Male Group in Finsi – Wa West in Upper West Region

	██████████		
	██████████		
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Male Group in Yaala No.I in Upper West Region

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	██████████		
	██████████		
	██████████		

Female Group in Yaala No.I in Upper West Region

	██████████		
	██████████		
	██████████		
	██████████		

Young Group in Yaala No.I in Upper West Region			
Age Group in Yaala No.I in Upper West Region			