# Mekelle University

# College of Business and Economics

# Department of Economics

***COMPARATIVE STUDY OF LOCAL SEED BUSINEESS AND PUBLIC SEED SUPPLY SYSTEM'S***

***(THE CASE OF ATSEBI-WENBERTA TIGRAY, ETHIOPIA)***

***A Thesis Submitted to the Department of Economics, School of Graduate Studies Mekelle University***

***In Partial Fulfillment of the Requirements for the Degree of MASTER OF SCIENCE IN ECONOMICS (DEVELOPMENT POLICY ANALYSIS)***

***By***

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***MAY 2013***

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## CERTIFICATION

As Thesis Research advisor, I hereby certify that I have read and evaluated this thesis prepared, under my guidance, by Michaele G/selassie, entitled *Comparative Study of Local Seed Business and Public Seed Supply Systems': The case of Atsbiwemberta Woreda*, I recommend that it be submitted as fulfilling the Thesis requirement.

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# DECLARATION

I,Michaele G/selassie , hearby declare that this thesis entitled as "*Comparative Study of Local Seed Business and Public Seed Supply Systems': The case of Atsbiwemberta Woreda*'' submitted by me in partial fulfillment of the requirements for the award of Masters of Science in Economics (Development Policy Analysis) of Mekelle University, Tigray. It is my own work and that all sources of materials used for this thesis have been duly acknowledge and I have undertaken the research work independently with the guidance and support of my research advisor. I solemnly declare that this thesis, has not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

Name: Michaele G/selassie Signature: ……

Place: Mekelle University, Mekelle

Date of Submission: ……

# ACKNOWLEDGMENTS

First and foremost, I want to give my thanks to Almighty God. Then I am really happy to thank my major advisor, Weldegebriael Abreham (PHD) and co adviser Tefera Kebede (Msc.) without them encouragement and guidance, the completion of this work may not have been possible. Thus, I am very much indebted to them for all his support and willingness to advise me on my all efforts to successfully finalize the thesis.

I am deeply beholden to ISSD MU for funding my Msc. research work in this connection, ERCS Tigray Regional Branchfor giving me the scholarship and covering full tuition fee and for its provision of the necessary support to let me join postgraduate studies at Mekelle University.

The generous assistance of Atsbiwemberta WARDO and office staff members allowed me to conduct data collection smoothly both in the field and in the office.

My special thanks are given to my father, G/selassie Haftu, my mother, Negesti Kahsay for their invaluable encouragement throughout the study period. I also appreciate the assistance of key informants of seed providers and others for providing me valuable information during data collection.

My great gratitude goes to my friends, Tarik, Kiflom, Selam, Abreha and Genet for their heartly advice and material support.

My special gratitude goes to enumerators, the members of the sample farm respondents, and members of focus group discussions for their valuable cooperation during data collection.

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ADLI | Agricultural Development Lead Industrialization |
| BoARD | Bureau of Agriculture and Rural Development |
| BoFED | Bureau of Finance and Economic Development |
| DA | Development Agent |
| CDF | Cumulative Distribution Function |
| CSA | Central Statistics Authority |
| ESE | Ethiopian Seed Enterprise |
| EZARDD | Eastern Zone Agriculture and Rural Development Department |
| FAO | Food and Agricultural Organization |
| GDP | Gross Domestic Product |
| FBSPMS | Farmers Based Seed Production and Marketing Scheme |
| FGD | Focus Group Desiccation |
| FREG | Farmers Research Extension Group |
| FSE | Farmers Seed Enterprise |
| GDP | Gross Domestic Product |
| GO | Government Organization |
| GTZ | Deutsche Gesellschaft für Technische Zusammenarbeit |
| HH | Household |
| ICARDA | International Center for Agricultural Research in the Dry Areas |
| IFAD | International Fund for Agricultural Development |
| ISSD | Integrated Seed Sector Development |
| LPM | Liner Probability Model |

## ABBREVIATIONS AND ACRONYMS (Continued)

| | |
|---|---|
| LSB | Local Seed Business |
| Masl | meter above sea level |
| MoA | Ministry of Agriculture |
| MoARD | Ministry of Agriculture and Rural Development |
| MU | Mekelle University |
| NFIA | National Fertilizer Industry Agency |
| NGO | Non Governmental Organization |
| NSC | National Seed Council |
| NSIA | National Seed Industry Agency |
| NSIC | National Seed Industry Council |
| NSIP | National Seed Industry policy |
| PA | Peasant Association |
| PASDEP | A Plan For Accelerated and Sustained Development to End Poverty |
| PMGs | Produced Market Groups |
| PVS | Participatory Varietal Selection |
| REFLAC | Research Extension Farmers Linkage Advisory Council |
| SMSs | Subject Matter Specialists |
| SNNPR | Southern Nations Nationalities and Peoples' Regional State |
| SSA | Sub Saharan Africa |
| TARI | Tigray Agricultural Research institute |
| TGE | Transitional Government of Ethiopia |
| WARDO | Woreda Agriculture and Rural Development Office |
| WBG | World Bank Group |

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***ABSTRACT***

*Seed is generally considered to be the most affordable external input for farmers, and many of its benefits are assumed to be scale-neutral. So investments in crop improvement potentially can reach a wide range of farmers. While many other areas are also important for agricultural development such as markets, credit supply, support institutions, and policies access to appropriate seed is clearly the first step.*

*This study is intended for comparative study of LSB and Public seed supply systems' of the study area; to map the actor's linkages to identify influential factors for the smooth functioning of the system and to explore the influence of policy in providing an enabling environment in relation to the seed supply system in Atsbiwemberta Woreda. Two stages sampling were used in which both nonrandom sampling and systematic random sampling procedures were followed to select two tabia and 134 respondents. Structured interview schedule and questionnaires were used for collecting the essential quantitative and qualitative data from the sampled respondents and seed suppliers respectively. To generate qualitative data, field observations; informal interview with key informants; and discussions with separate focus groups were conducted. The quantitative data were analyzed using descriptive statistical tools chi-square test, t-test and Logistic Regressions from inferential statistics. The major output of the study indicates that the system is highly characterized by relatively good linkage between actors and farmers in the study area. Moreover, participation in seed supply system was significantly influenced by household family size, radio owner ship, access to market, extension service and credit access. In addition to this, from the supply sector factors like skilled man power, delay of temporary loan settlement by users, policy environment, storage facilities at grass root level, efficient marketing system, timely demand claims from users, clearly defined role and responsibilities of each partner, availability of improved seeds in terms of their germination, viability and adaptability, farmers willingness to take risks and demand for improved crop varieties were some of mentioned factors that influence the system positively and/or negatively. As to the enabling policy environment, pitfalls identified were; inflexibility of rules and regulations, lack of strong quarantine measures on imported seeds and prolonged time given for variety release and registration were amongst all. Therefore, it is recommended that, the existing extension service should be strengthened in a way that working in harmony with relevant actors to bring about change for efficient and effective delivery of improved seed. Likewise, policy should account the flexibility of rules on credit provision and organization of small farmers groups in addressing resource poor farmers to ensure food self sufficiency of rural community in particular and the nation at large.*

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1. Background of the Study

One of the most important inputs in agriculture is seed. Seeds form the foundation of all agriculture. Without seeds there is no next season's crop. The genetic traits embodied within seeds reflect and determine the nature of farming systems dependent on them. The genetic and physical characteristics of seed determine the productivity in line with the use of other agricultural inputs and improved cultural practices within the farming system. Improving the genetic and physical properties of seed can trigger yield increase and lead to improvement in the agricultural production and food security. In order for seed to act as a catalyst in agricultural transformation, however improved seed has to be made available to a broad base of farmers on continuing base. Most farmers still do not have access to commercially processed seed at a nearby retail outlet. Many released varieties have never been widely disseminated (Rohrbach *et al.*, 2009).

A core goal of the Government of Ethiopia, Agricultural Development Lead to Industrialization (ADLI) strategy was to raise cereal yields through a centralized and aggressive extension-based push focusing on technological packages that combined credit, fertilizers, improved seeds and better management practices ( Byerlee *et al.*,2009).

This government strategy resulted tremendous input demand especially for improved seed and fertilizer. However the supply side did not show significant improvement. Even though , the Ethiopian Seed Enterprise which has remarkable place to innovate, produce and distribute improved seed with different variety being the sole owner of the market before liberalization.

In recent years' research, extension and development programs have adopted community-based participatory approaches that unify the efforts of various stakeholders concerned with agricultural development with the aim of overcoming formal research-extension linkage weaknesses and improve localized seed availability on a sustainable basis. One of these approaches has been community-based secondary seed multiplication schemes whereby farmers, roles are shifted from passive recipients to that of active seed producers

and eventually serve as secondary seed sources and disseminators. Reportedly such efforts are found to increase access of many farmers within the shortest time and at low cost for they are essentially grafted on to the local social networks and farmers-to-farmers extension approaches (Abera *et al.*, 2010).

Tigray Region has also designed and implementing program that is expected to increase improved seed supply. The major component is the farmers' seed multiplication and distribution scheme. This scheme was started by the then Ethiopian Seed Industry Agency, which targeted transforming the informal seed sector to modern seed source. Currently based on the experience gained during the project life (Farmers Seed Multiplication and Distribution Scheme), and the intervention of different NGO s' farmers are producing seed of cereal crops and different fruits seedling for market.

For the success of these farmers based seed multiplication different actors have been involved in the regional seed system including Tigray Agriculture and Rural Development Bureau (BoARD), Tigray Agriculture Research Institute (TARI), Integrated Seed Sector Development collaboration with Mekelle University (ISSD MU), Cooperatives and NGOs'. Those organization support seed producer farmers in availing basic seeds and complimentary inputs, training, help seed producer farmers to get market for produced seed and on other related activities.

The Local Seed Business (LSB) project in Tigray builds upon the specific semi-arid agricultural characteristics of the region. The LSB sites are located where BoARD and ESE are working with the farmer based seed scheme in order to advance seed multiplication of locally preferred improved varieties. In another location Mekelle University and Tigray Agricultural Research Institute (TARI) are working with farmers in Participatory varietal selection (PVS), thus identifying those varieties adapted to the specific production environment. The LSB builds upon the basis of farmer based seed production and PVS, and enforces the farmer organizations, strengthens their commercial orientation and autonomy, promoting economic development within the limitations provided by the production environment. (Local Seed Business Newsletter Issue 4; 2010)

## 1.2. Statement of the problem

Majority of Ethiopian farmers have been using traditional way of agricultural practices.

This has contributed for low productivity of the agricultural sector. To solve these problems, governmental and non-governmental organizations have made efforts to bring about change in agricultural production system of peasant farmers. They have introduced improved agricultural technologies like fertilizers, high yielding varieties of seeds, pesticides, farm tools, etc. As a result, farmers who participated in the extension package program showed relative change in the style of their production process.

To increase production and productivity, the collective interaction of actors in the sector is a must. Agricultural input suppliers are one of the actors that are responsible to deliver according to the demand of the farmers.

However, due to the growing demands of the farmers in the study area, for high yielding varieties of seeds, the supply sector could not satisfy the needs of the farmers. This indicates that there are different factors directly or indirectly influencing the seed supply system that believed to boost up production and productivity of the smallholder farmers.

But the reasons why seed supplying system failed to satisfy the needs of the farmers is not analyzed so far in the study area. Therefore, this study focused on identification of factors that determine to participate in seed supply system and to map their linkage among actors in enhancing crop production and productivity, influential factors of the system and the enabling policy environment of seed supply system. Hence it attempts to fill the existing gap of knowledge regarding the seed supply system.

## 1.3. Objectives of the Study

The overall objective of this study is to compare between LSB and Public seed supply system and to map linkages among actors in seed supply system in Atbiwemberta and

hence to identify the major factors and to explore enabling policy environment of seed supply system. Thus the specific objectives of the study are:

1. To identify determinants of household's participant in seed supply system in the study area
2. To map the actors linkages in the Seed supply system of the study area
3. To explore the influence of policy in providing an enabling environment in relation to the seed supply system

## 1.4. Research questions

With the aims of addressing general and specific objectives of the study, the research work will be guided by the following specific questions:

1. What are the determinants of household's to participant in seed supply system in the study area?
2. Who are the actors, the status of linkage within the seed supply system in the study area?
3. What is the influence of policy in providing an enabling environment to the seed supply system in the study area?

## 1.5. Significance of the study

To enhance production and productivity of small scale farmers, efficient and effective in seed supply system should be on practice. To ensure this goal, relevant actors within the system should play role for effective linkage and policy implementation as to bring about change on peasant sector.

The result of this study will help to identify actors involved in seed supply, their role and linkage within the system and influential factors that hamper the smooth functioning. More over it will also help to identify policy issues that influence the system and make some corrective measures to benefit end users. The findings of this study can also be used in guiding policy makers and development planners who are concerned about seed provision in the region and elsewhere in the country.

## 1.6. Scope and limitation of the study

This study was undertaken in one woreda, namely Atsebiwemberta which is in the Tigray national Regional state. Since the study was limited by time, finance and human resources, there could have been some bias in the information obtained about the seed supply system.

Given the diversity of the Ethiopian population in terms of religion, agro ecological climate, the communities selected are not representative of all the people in Ethiopia. As such, the research does not claim to provide conclusive findings on seed supply system. However, the research findings could be used to raise awareness among different stakeholders and also serve as background information for others who seek to do further related researches and would help serve in formulating and revising the system towards benefiting the farmers in the study area in particular and the region in general.

## 1.7. Organization of the thesis

The rest of the thesis is organized into four chapters. Chapter two reviews the literature, chapter three explains the methodology of the study used, chapter four result and discussion and last chapter (five) to give concluding remark about the overall study.

# CHAPTER TWO

## 2. LITERATURE REVIEW

### 2.1. Definition of concepts and the theoretical framework

#### 2.1.1. Seed

The importance of seed as the carrier of most important characteristics for crop production has been recognized since the early days of agriculture. Starting from 10000 years ago, harvesting seed from preferred plants has been the basis of crop domestication and consequently of present day agriculture (Louwaars *and Gam*, 2009).

Seed is the most important agricultural input; it is the basic unit for distribution and maintenance of plant population. It carries the genetic potential of the crop plant. It thus dictate the ultimate productivity of other input such as fertilizer, pesticide irrigation water etc., which build the environments that enable the plant to perform (Mugonozza, 2009).

Seed and other planting materials are the farmers' most precious resources, especially for smallholders in Sub Saharan Africa, where agriculture is characterized by much risk and uncertainty (WBG, 2008). Seed is generally considered to be the most affordable external input for farmers, and many of its benefits are assumed to be 'scale-neutral'. So investments in crop improvement potentially can reach a wide range of farmers. While many other areas are also important for agricultural development such as markets, credit supply, support institutions, and policies access to appropriate seed is clearly the first step (McGuire, 2010).

The use of good quality seed of adopted and improved varieties is widely recognized as fundamental to ensure increased crop production and productivity. This is even more important in SSA in the view of increasingly available land, declining soil fertility and ever growing population; those facts increase the importance of promotion and use of good quality seed as a means to intensify food production (FAO, 2010).

The potential benefits from the distribution of good quality seed of improved varieties are enormous, and the availability of quality seed of wide range of varieties and crops to the

farmers is the key to achieve food security in SSA. Enhanced productivity, higher harvest index, reduced risks from pest and disease pressure, and higher incomes are some of the direct benefits potentially accrued to the farmers (FAO, 2010).

### 2.1.2. Seed system

Seed systems are composed of set of dynamic interaction between seed supply and demand, resulting in farm level utilization of seed and thus plant genetic resource. The seed system is essentially the economic and social mechanism by which farmers' demand for seed and various traits they provide met by various possible sources of supply (FAO, 2010).

The term seed system represents the entire complex organization, individual and institution associated with the development, multiplication, processing, storage, distribution and marketing of seed in any country. The seed system includes traditional (informal or local) system and the nontraditional (formal or commercial) systems. Legal institutions such as variety release procedures, intellectual property rights, certification programs, seed standards, contract laws, and law enforcement are also an important component of the seed system of any country. They help determine the quantity, quality, and cost of seeds passing through the seed system (Maredia, *et al.,* 2009).

Seed system participants may be relatively few or many, predominantly public or private depending upon the farmers that the system serves. In local systems of seed exchange, farmers often undertake most of the activities that define a seed system. As systems expand to national, regional, and international scales, participants will include the following: farmers, international agricultural research centers, private and public domestic seed enterprises, retailers and distributors, multinational seed companies, private research institutions, farmers associations and cooperatives, banks and credit institutions, trade associations, local governing bodies, donor agencies, national agencies and ministries, community groups (social, religious, etc.), agricultural universities, national agricultural research institutes and NGOs. These participants may assume multiple roles in the process of seed provision, performing one or several activities (WBG, 2009).

Seed systems, formal or informal, fulfill a series of functions that are basic prerequisites for expecting the best possible productivity from a crop in a specific situation. Healthy, viable seed of the preferred variety needs to be available at the right time, under reasonable conditions, so that farmers can use their land and labor resources with the best yield expectations. The wrong variety, sown at the wrong time with infected seed of poor germination potential, will seriously limit a farmer's expectation of production and productivity. Thus, any seed system has multiple functions to fulfill for a range of farmers, farming conditions, and crops in a village, region, or country. A seed system can be assessed at any time according to how well it fulfills these functions. Conditions, situations, groups of farmers, or crops can be identified under which the specific system works well (Welfzien *et al.,* 2010).

Activities undertaken to supply seeds to farmers include research and development, multiplication, processing, distribution, and uptake. Other activities that may occur in conjunction with these include transport and storage, as well as quality control (such as seed certification). Seed provision to farmers also includes activities undertaken to influence the process, such as: pricing, financial and technical support, provision of inputs, communication and coordination, as well as market research and promotion. Finally, policy formulation underpins seed systems, defining the boundaries and opportunities for the conduct of all seed system activities (WBG, 2009).

#### 2.1.2.1. Public seed system

According to FAO (2009), formal seed system as a sector comprises all seed program components, namely; plant breeding, seed production, processing, marketing, extension, quality control and certification that interact among themselves and usually regulated by law. The formal seed sector was set up and organized with the principal goal of diffusing quality seed of improved varieties developed by formal breeding programs. The principal sources of materials for formal breeding programs are the *ex situ* collections of gene banks. Gene banks contain materials that were originally collected from farmers' systems, that is in the case of cultivated plants materials that were developed and maintained by farmers.

The formal system has been relatively successful for well-endowed, high-potential areas, but much less successful in more variable, marginal areas. This is partly explained by the fact that improved varieties tend to be poorly adapted to farmers' preferences and production environments. In general, plant breeders have lacked understanding about what farmers in these areas need, developing only few, genetically uniform products for on farm testing. Evaluation and selection of new materials was on station, where conditions are different from those in the target environment (Almekinders, 2009).

The Public seed system can be characterized by a clear chain of activities. It usually starts with plant breeding and promotes materials for formal variety release and maintenance. Regulations exist in this system to maintain variety identity and purity as well as to guarantee physical, physiological and sanitary quality. Seed marketing takes place through officially recognized seed outlets, and by way of national agricultural research systems. In formal seed production, seed multiplication occurs through several generations rather than continually recycling the seed of one generation, to avoid building up physical or genetic contamination over time in the same lot of seed (Louwaars *et al*., 2009).

A major challenge for Public seed supply is to produce sufficient seed of all varieties needed, and deliver it to farmers in a timely manner. This requires considerable organization, time, and space, and incurs risks due to costs and production. To start with, significant area and effort is involved in seed production, though this varies by crop according to its multiplication rate (i.e. how much usable seed is produced per seed sown (McGuire, 2009).The study made by Baniya *et al* (2009) signify that, the formal system focuses more on the interests of the seed company, and has more access to biotechnology and plant breeding techniques, so this seed system generally neglects the indigenous knowledge. The market is dominated by a few suppliers with potentially serious implications for technology choice and price fixing.

#### 2.1.2.2. Local seed system

A typical farmer managed seed production process consists of the following steps. Farmers rogue their growing crops by hand to remove diseased and off type plants. Selection is usually carried out based on characteristics including high yield, low input

(Including labor) requirement, resistance to pests and diseases, particular processing, cooking and taste qualities, storability, and good yield of non grain biomass (leaves and stalks). It is important to note that subsistence farmers select for yield stability, which is associated with diversity within and between crops and cultivars (Almekinders et al. 2008).

The crops are harvested by hand, which avoids mechanical damage to the seed and contamination with weed seeds and other inert material. After harvest, crops are often threshed and cleaned by hand to minimize damage and contamination, and then they are usually dried in the sun to reduce moisture content. Seed is often stored separately from grain. It is commonly hung overhead in a smoky place, such as the kitchen, to minimize insect damage and reduce moisture content. Also, seed can be conditioned by adding local insecticides and/or fungicides (eucalyptus leaves, sand, ash, neem) before being placed in special containers and stored above the fireplace (Cromwell 2006).

Various organizations have been involved in strengthening local commercial seed production, by building on the existing farmer-to-farmer seed exchange. As one would expect, an important component of this activity is plant breeding and variety selection. Farmers' participation in variety testing can be linked to seed provision. In Colombia, farmer groups were formed to collaborate with research and extension in participatory technology development for identifying new varieties (Tripp 2007). Several of these groups received considerable training and assistance for small scale seed production and were able to sell seed of these varieties in local shops and markets. Similar efforts were carried out in Zambia (Tripp 2007).

The public sector (the national agricultural research system) will continue to play an important role in producing source seed of modern varieties for small scale seed producers, who in turn have to be able to pay for the full cost of developing the source seed. One of the dilemmas of contract seed multiplication is that only farmers with sufficient resources at their disposal can participate.

Another important issue is that an official agency needs to be involved with seed quality and control, and small scale seed producers need to pay the full cost of seed certification. One element of quality control is seed conditioning and storage, which implies that small

scale producers need access to specialized equipment and facilities. In some cases, small scale seed producers have rented state owned processing facilities. There is a need for the construction of storage structures.

Finally, a marketing and distribution strategy needs to be developed to assist farmers in selling their products (Rohrbach et al. 2007). One of the major weaknesses of the organizations that have set up small scale seed provision is that not all of them had the time and resources to develop the necessary technical capabilities for organizing seed production and distribution. Also, they did not always test the adaptability of the varieties to the local environment. They often worked with the better off farmers and created new structures instead of building on existing structures (Tripp 2007).

## 2.2. Actors Mapping and their Linkage in Seed Supply System

### 2.2.1. Actors mapping

The purpose of this subsection is to provide information on how actors are functioning within the system main actors and organizations in the sector with the specific roles they play; extent of linkage between actors and organizations and the nature of these linkages for supporting interaction; level of coordination, and role in seed supply system.

#### 2.2.1.1. Linkage

Generation of technology is not an end by itself. It must be utilized by end users. This can be realized through the presence of effective linkage among the major stakeholders in the agriculture, agricultural knowledge and information system. Linkages between major institutional actors in agricultural knowledge and information system are widely recognized as essential for an effective flow of technology and information between research, extension and farmers. The types and nature of linkage between actors within the agricultural knowledge and information system directly influence the production and productivity of small holder farmers. It is commonly recognized by agricultural knowledge and information system stakeholders that poor performance of the system is often related to linkage problems (Akalu and Enyew, 2006).

According to Hagmann *et al*., (2002), linkages between service providers in to service delivery system are critical to 'make the system work as a system'. The different roles and mandates of service providers need to be clarified and even more important; they need to 'learn to play the roles' and work together in synergistic way towards making a difference.

Hence, to map the interactions thereby learning among the actors in the service delivery system, tools for diagnosis and institutional change in agricultural innovation systems are adopted (Hall *et al.,* 2007).

## 2.3. The Ethiopian Government Agricultural Policy

Agriculture is the foundation of the national economy and plays a major role in the socioeconomic development of the country. In 1991, the government launched the agricultural development- led industrialization strategy where emphasis is put on linking research with development through well focused and targeted transfer of appropriate technology to farmers. The agricultural development strategy is aimed at promoting growth, reducing poverty and attaining food self sufficiency while protecting the environment through safe use of improved technologies. The agricultural package program is spearheaded through demonstration and provision of improved varieties and required inputs such as improved seeds, fertilizers, and pesticides as well as better access to credit facilities (ICARDA *et al*, 1999).

Moreover, Agricultural Development Led Industrialization (ADLI) sets out agriculture as a primary stimulus to generate increased output, employment and income for the people, and as the springboard for the development of the other sectors of the economy. A 'green revolution' like intensification of smallholder agriculture was seen as central by the government in implementing the strategy (Keeley and Scoones, 2000).

Policy makers assumed that significant productivity growth could be easily achieved by improving farmers' access to technologies which would narrow the gap between farmers' yield and what agronomists called 'exploitable yield potential'. Researchers also reported the existence of technologies that can make a huge difference and shift upwards farmers'

yield frontier in grain production. Based on 6 years average data, researchers indicated that maize yield, for instance, can be increased from current farmers' yield level of 1.6 ton/ha to 4.7 ton/ha, and wheat from 1.1 ton/ha to 2.8 ton/ha and teff from 0.7 ton/ha to 1.5 ton/ha, if peasants use the right type and amount of improved seed varieties, fertilizers and other recommended practices (Berhane *et al*., 2004).

### 2.3.1. Input sector reform and emerging market structure

#### 2.3.1.1. The seed sub sector

In 1992, the Transitional Government of Ethiopia (TGE) announced the National Seed Industry Policy (NSIP) with the aim of strengthening the supply of adequate and high quality seed. The policy envisaged the participation of both public and private enterprises in the production and marketing of improved seeds. The National Seed Industry Agency (NSIA) was also established in 1993 with the following objectives:

- To oversee and ensure that the seed industry develops and operates efficiently,
- To ensure that producers and the farming community, industries using agricultural raw materials and organizations which export agricultural products benefit from the seed industry,
- To create an enabling environment for capacity building in research development and training in the fields of genetic resources, conservation, crop improvement and seed technology.

In spite of the reform measures, the seed industry is still dominated by the ESE. Over 93% of the total seed supply came from the enterprise in 1996/97(Afri-Tech Consult, 1998, as cited by Techane and Mulat, 1999). The enterprise owns three basic seed farms (Iteya/Gonde,Arssi,262 ha),Shallo, the former East Shewa, currently West Arssi zone 1870ha- 46.5% of which is currently under use and Kunzia, West Gojam, 500 ha).

The Iteya basic seed farm represents the high lands for the production of mainly basic seeds of wheat, barley, tef, maize, faba bean , field pea, chick pea, lentil, rape seed, mustard, linseed and sunflower. Shallo and Kunzia are situated in mid altitude and are used for the production of maize, sorghum, haricot bean, sunflower and tef. The ESE has also

has five seed processing plants located at Asela, Kofele, Awassa, Nekemt, Mekelle and Bahir Dar (NSIA, 1999 as cited by Techane and Mulat, 1999).

According to NSIA (1999), the Ethiopian seed industry is characterized by the following deficiencies.

- Shortage of improved varieties and inadequate supply of high quality breeder and basic seeds which serve as the foundation for certified seed production;
- Inadequate specialized seed farms for different agro ecological zones;
- Inadequate coverage of economically important crops and production regions;
- Absence of an organized system of using local cultivars;
- Inadequate provision for national seed data base and lack of provisions for reserve seed stock;
- Shortage of trained workforce in seed production, processing and marketing;
- Insufficient availability and supply of agricultural inputs mainly seeds and pesticides;
- No internal quarantine regulation to curtail the movement of seeds from contaminated area to another area;
- Inadequate follow up of imported materials by the quarantine unit of the ministry of agriculture.

#### 2.3.1.2. Agricultural input credit

Credit administration and channeling system varies from region to region. In Amhara, SNNP and Tigray, the regional governments actually assess loan requirement, screen eligible beneficiaries, process the loan applications and issue purchase order to the input supplies using the relevant administrative machinery. In such cases, the task of the bank is to distribute payments to the designated suppliers. Cooperative promotion bureau, Omo micro Financing Institute and ICU at different level are responsible for input credit administration. In Tigray, while the cooperative promotion bureau is responsible for administering input credit obtained from CBE, Dedebit Credit and Saving Institute deliver and administer input credit from its own fund. In Oromya region, the credit required for the extension program is administered by the Agricultural Bureau at different levels. The

agricultural bureaus assess loan requirement, process loan applications and issue purchase order to the suppliers. With regard to credit required for the regular program, the beneficiaries deal directly with the bank through their groups or service cooperative backed by the technical assistance from the cooperative promotion bureaus at different level.

The regional governments use their administrative machinery at all level and apply administrative measures to enforce repayment. Although strenuous efforts are made by the regional governments to enforce repayments, loan recovery is still facing problems. Some of the factors constraining loan recovery are:

- Crop damage due to bad weather conditions
- Lack of integrated efforts among all concerned to collect overdue loans according to the time table
- Strategic default decision by some farmers not to repay loans even they have the capacity to do so
- Some farmers are taking inputs and sell it in cash at a cheaper price to solve their immediate financial problems.

## 2.4. The Potential and Limitations of Farmers Based Seed Multiplication

In the mid 1970, different governments and donors recognized the critical role of seed in agricultural transformation and began to provide substantial support for seed system development across the developing countries. Most of those resources were used to establish large scale parasitical seed corporation, technical laboratories, processing plant and certification department. In Africa, these efforts achieved only limited success in a few crops such as hybrid maize and sorghum, leaving the majority of smallholders un-served. Parasitical seed system supplied only about 10% of the total seed planted each year, about 60-70% of seed used by African smallholder is saved on-farm, and the remaining 20-30 % is borrowed or purchased locally (Maredia *et al*., 2009).

Global agriculture has experienced considerable technological development during the last four decades that has been responsible for the expansion of the world food production. The innovation comes from fields of knowledge and well incorporated in to the agricultural activities. However, commercial agriculture have benefited more from this process than the

small scale farmers involved in traditional agriculture due to the latter marginal access to the knowledge and technique. The breeding program of major crops and the diffusion of the high yield varieties that they release follow the same pattern (Gusti, 2008).

In addition, the national agricultural research institute plant breeding strategies often don't address the need and the demand of small farmers, more subsistence oriented farmers. Because the demand of subsistence oriented smallholder farmers are more interested in the characteristics such as storage quality, test, and resistance to pest (Maredia *et al*., 2009). Due to this small scale farmers in developing countries rely largely on seed from their own farm or from other sources in the community. In some countries, commercial enterprises play a significant role in supplying seed for cross pollinating crops and vegetables. The role of the public sector in supplying seed is of little significance for most small scale farmers and crops. While the farmers' seed supply is far from ideal, the public seed sector faces financial and institutional constraints that limit its performance (Almekinders, 2010).

Due to the prevailing condition in the most SSA countries, farmers based seed multiplication systems appear to be the most appropriate strategy for developing effective seed supply system in the region (FAO, 2008). Decentralized farmers based seed enterprises have several advantages over more formal centralized operation. Some of the advantages are seed production costs are low, seed is available to farmers at the right time, users can purchase the quality of seed desired and seed producers are well informed about the seed and variety characteristics valued by farmers (Maredia *et al.*, 2009).

In addition, the benefit of small scale farmers from commercial seed activities include, increasing production through increment in productivity, increasing the income of the small farmers and improving agricultural seed and other input market, in addition it is possible to create changes that will improve the standard of living of the rural population, reducing poverty and improving food security and promoting the transformation toward a sustainable commercial agricultural sector (Gusti, 2009).

The implementation of such scheme towards improving the traditional agriculture by certain changes in the local seed system, it promotes an innovative process or technological change aimed at better insertion of seed system in to the market through improving the

current local seed system. Such improvement entails transforming the small scale farmers group in to market oriented seed enterprise dedicated to the production of seed of improved varieties. Links between the informal and formal seed system are then established to develop a favorable environment for small scale farmers to get in to the seed business. The replacement of local seed with better quality seed produced by local farmers will make the benefit of improved seed varieties available to them (Gusti, 2009).

There are some specific limitations to the development of local seed system. There may be some economic limitation with horticultural crops, for instance, since the cost of producing those seeds in small scale is usually not cost effective. Hybrid seed production require isolating seed production fields and there for unsuitable for small scale farmers communities. Another limitation relates to the need for investment in infrastructure such as seed conditioning machinery, tractors and implements. There are however, seed market niches that can be occupied by organized groups of small scale farmers. Those opportunities are usually neglected by the formal system because the market is not large enough to attract large scale farmers or because they require hand labor. These market niches need to be identified and suitable condition developed in order that groups of small scale farmers may explore those (Camargo *et al*., 2009).

Tripp (2001) stated that, local level seed project are subject to a number of problems, there is often confusion about goal and target participants and lack of clarity about whether the principal objective is to increase the incomes of the participant or to develop sustainable source of high quality seed. One of the major failing of most local seed projects has been to ignore the importance of transaction cost in process. The projects are often confused with the multiplication, seed provision, overlooking the fact that seed multiplication is only one aspect of the process.

The other concern is the potential risk posed to small scale entrepreneur if seed stocks go unsold. Mechanisms for assessing the potential demand for seed and protecting the seed seller against the liability for unsold stocks need to be explored. The second issue involves the regulatory role of the government in an increasingly decentralized seed system. Key

equations include; how will farmers be assured of the seed quality? How can seed enterprise and farmers be assured that their contract will be honored (Maredia *et al.*, 2009).

## 2.5. Seed Development, Production and Distribution in Ethiopia

The Ethiopian seed industry is composed of formal and informal sectors as well as public and private organization. The formal sectors include federal and regional agricultural research establishments, universities, the regulatory organ in the MoARD, and private companies. The informal sectors encompass millions of farmers, who continue to practice seed selection and preservation, just as their ancestors did (Abdisa *et al*., 2009).

The formal system is concerned with the development and distribution of seeds of modern or improved varieties, while local cultivars or landrace varieties are handled by the informal system. The line between the formal and informal seed sectors can become somewhat blurred, as seeds of modern varieties can be saved by farmers and eventually become considered a "local variety" after some years. In addition, in Ethiopia there have been attempts made by the government and NGOs to promote quality seed production and distribution through market channels for landrace varieties, although until now the volume they represent is quite small (Lipper *et al*.,2009).

The bulk of seed supply in Ethiopia is provided through the informal system. According to data obtained from the NSIA in 2003, the total demand for food grain seeds in the country is approximately 1.4 million quintals per year. In 2005 the formal sector provides around 200,000 quintals or between 10-15 % of the total. The remainder is made up by supplies from the informal sector.

Formal breeding and seed multiplication activities were conducted on an ad-hoc basis until the 1970s. In 1976, the National Seed Council (NSC) was set up to formulate recommendations for seed production in the formal sector and the release of varieties from the national research programs (Byerlee *et al.*, 2009). From their recommendations the Ethiopian Seed Corporation was founded in 1979 as a state enterprise, run through the Ministry of State Farms, Coffee, and Tea Development (Dabi *et al.*, 1998). It was renamed the Ethiopian Seed Enterprise in 1993, and restructured to answer directly to the Prime Minister's Office, according to a Regulation of the Council of Ministers (No. 154/1993).

For simplicity, this account uses ESE to refer to both Corporation and Enterprise (McGuire, 2008).

To create the right condition for the establishment of strong seed system for production and supply of good quality seed to the farming community, the government formulated the national seed industry policy, which was issued in October 1992. The policies is instrumental to developing a healthy national seed industry conserving and sustain genetic resource, reinforcing crop breeding research and supplying of high quality seed to the farmers to participate in germplasm conservation as well as in the seed production and supply system. It also has an objective of creating a functional and efficient institutional linkage among seed industry participants (Tsgedingil, 2009).

A Ministerial Regulation No. 16/1997, which was enacted to cover registration of varieties, seed producers, processors, distributors, quality control, seed trade (import-export), etc. has been replaced by Seed Proclamation No.206/2000. The latest Proclamation is more comprehensive and creates stronger legal framework for the protection and control of the interests of all players in the seed industry. Moreover, field and seed standards prepared for 74 crops are officially issued for implementation. NSIA has built the necessary capacity to implement and enforce the standards (Getnet *et al*., 2009).

Despite the crucial importance of improved seed in bettering the livelihoods of small scale farmers, in Ethiopia access to this invaluable technology is still constrained by many factors. One important factor is the underdeveloped seed industry. Independent studies have estimated a large annual demand for seed, which is never met or (in the case of hybrid maize and sunflower) is met only through imports (Alemu *et al*., 2007).

Study made by Abera *et al*., (2008) signifies that the supply of seed is constrained by the inefficiency of public seed enterprises, poor seed promotion, poor transportation, and inappropriate agricultural and pricing policies. Moreover, because high-yielding varieties perform well with fertilizers, the limited availability of fertilizers constrains demand for improved seed. As a result, in the peasant sector most seed is still produced by farmers themselves.

An important impetus for reform of the seed system was provided through the Seed System Development Project (Cr. 2741 ET), which was implemented from 1997-2001 through financial support from the World Bank and IFAD. This project had two main components: seed enterprise development and capacity building. The former component was intended to improve the supply of quality seed of landrace and modern varieties by providing support to the ESE. In addition, support for the promotion of seed multiplication among farmers through the Farmers Based Seed Production and Marketing Scheme (FBSPMS) came under this component (Lipper *et al*., 2009).

The intention was that this scheme would double the total national production of Certified Seed, while making this seed more available to farmers by virtue of the decentralized approach, as the seed could be sold directly to district MoA offices, or reach neighboring farmers through informal exchange. With this widely dispersed approach, the FBSPMS sought to be more effective in meeting local demand, and supply seed in a timely and affordable manner. A further goal of the scheme is to organize the most successful seed-producing farmers into producer groups, and support these groups in becoming small independent enterprises specializing in seed production (McGuire, 2005).

## 2.6. Partnership in Farmers Based Seed Multiplication

According to the study made on farmers based seed multiplication in Tanzania by Rohrbach *et al.* (2002), strong implementation partnership are essential to ensure both the success and sustainability of these seed projects. The role and responsibility of each implementing partners need to be clear both to the partner and to the other involved in the project. The full team should know who to call up on when problems or disputes arise. Clear responsibilities help to insure consistent implementation of the mandated program, and eventually the sustainability of those efforts.

Improved communications and collaboration between various participants in the seed sector is vital. Literally, hundreds of institutions, donors, and programs are currently active in African seed programs, all of which are to some extent directly or indirectly interrelated. Coordinated efforts are essential to facilitate system reforms and no initiative can achieve

this objective by working independently as a program of a single donor or organization (WBG, 1999).

Farmers' seed production can be quite efficient and some producers will have potential to expand as specialized, small or medium sized seed companies. Seed trade associations, government agribusiness promotion programs and especially NGOs have a potential role in promoting improvements in production, marketing, and distribution systems for traditional farmers' seed producers. This may involve training in seed production and handling, establishing linkages to sources of foundation seed, developing marketing skills and approaches, and promoting the transformation into commercial seed companies. For these interventions to be sustainable, they must be accompanied by appropriate legal changes, training and market development, and elimination of direct subsidies (WBG, 1999).

Recent years have witnessed a proliferation of NGO and research support to local level seed production and dissemination activities. These activities have a wide range of objectives including improved dissemination of modern varieties, preserving genetic diversity and quality, improving seed availability (time, place, quantity), and reducing the cost of seed and dependence on external sources (David, 2008). However, there are different NGO and relief agencies involved in the seed sector, the role played by them in the Ethiopian seed system is difficult to assess because their activities are dispersed and uncoordinated especially in the case of relief interventions. A few NGOs are now focusing on providing source seed, other inputs, and technical assistance aimed at strengthening local community driven multiplication of improved open pollinated varieties, and in a few cases, enhanced local varieties. With regard to the distribution of relief seed after emergencies such as war or drought, NGOs were initially responsible for acquiring and providing early maturing varieties seed to service cooperatives at cost, including transport. However, the distribution of free seed by NGOs and relief agencies has caused negative effects; creating dependency on free services, disrupting the informal farmers -to-farmers seed exchange system, and weakening sustainable development in the seed sub-sector (Abdisa *et al*.,2009).

Tripp (2003) also verify that, seed system development requires support and funding and many countries may be able to take advantage of donor projects in the seed sector. Unfortunately, much of donor activity to date has not been supportive of sustainable seed sector development. Indeed, if we need an analogy from crop production, a strategy towards donor projects might be compared to weed control.

Donors and NGOs as well as policymakers should think more carefully about what types of community level activities are most likely to stimulate seed system development. There is now good evidence that despite its attractive image, the strategy of village-level seed enterprises is untenable. Part of the problem is mistaking seed multiplication (which all farmers are capable of) for the more complex process of market development. Community seed projects may achieve a greater impact by strengthening the capacities of farmers to test new varieties and to make them well-informed consumers of agricultural inputs. Local-level interventions should also develop farmers' crop marketing capacities (Tripp, 2009*)*.

The study made by Bekele *et al. (*2008) pointed that, among the potential market-supporting institutions can that enhance market functions in rural areas are farmers' organizations such as Producer Marketing Groups (PMGs). Their potential in this process lies in enabling contractual links to input and output markets. They can facilitate collective marketing of agricultural outputs that will help reduce transaction costs related to the marketing of agricultural inputs and small marketable surplus emanating from a large number of widely dispersed small producer.

# CHAPTER THREE

## 3. METHODOLOGY

### 3.1. Description of the Study Area

#### 3.1.1. Atsbi wemberta woreda

Atbiwemberta is one of the 46 woreda of the Tigray regional states. It is located in the Eastern Tigray Zone parts of the region. It is divided in to 16 Administrative 'tabias' (PAs) and 2 Administrative towns.

#### 3.1.2. Physical feature

Atsbiwemberta is astronomically roughly lies between $13^0$ 52' 53"N and $13^0$ 53' 37" N latitude and between $39^0$ 42' 05" E and $39^0$ 43' 57" E longitude. It is bordered with Saesetaedaemba woreda to the North, Keleteawlaelo woreda in the West, and the Ethiopian regions of Afar and Enderta woreda to South and East respectively.

The climate is "Dega Dry" according to the recent agro-ecological classification. Moreover, the survey conducted by UNDP, 1998 for socio-economic study for the land use indicated that total area of the woreda is 885.3 $Km^2$, From the total area the woreda 60.96% is already under cultivation, 8.9 % are forest land and 28.6 % are uncultivated, grazing and non utilized land and other uses. (BoFED , 2004).

The mean annual temperature of the study area between $18^0$c and the climate of the woreda is classified into three agro-climatologic resources: High land representing 73.4 per cent, Midland 12.6 per cent and lowland 14 per cent. The altitude of the area ranges from 1800m-2300m.a.s.l. (BoARD, 2004). The average annual rainfall of the woreda ranges from 400-800mm (BoARD, 2004). The major soil types in the area include Leptosols (46%), Luvisols (26%) and Cambisols (26%) (Assefa, 2005)

#### 3.1.3. Population

The estimated total population of Atsbiwemberta Woreda was 124,036 or 2.58% of the total population of Tigray National Regional state, which comprises of 59,289 males and 64,747 females. Out of the total population of the Woreda, 12,279 persons are urban

dwellers and the remaining 111,757 persons reside in the rural areas of the Wereda (CSA, 2010).The total number of households in the Woreda were 24,807 and the estimated average family size stands at 5 persons per household with an average population density of 90 persons $km^2$. The age distribution of the population revealed that the young (1-15 age) and the old age (60 and above years) account for about 50.1% of the population.

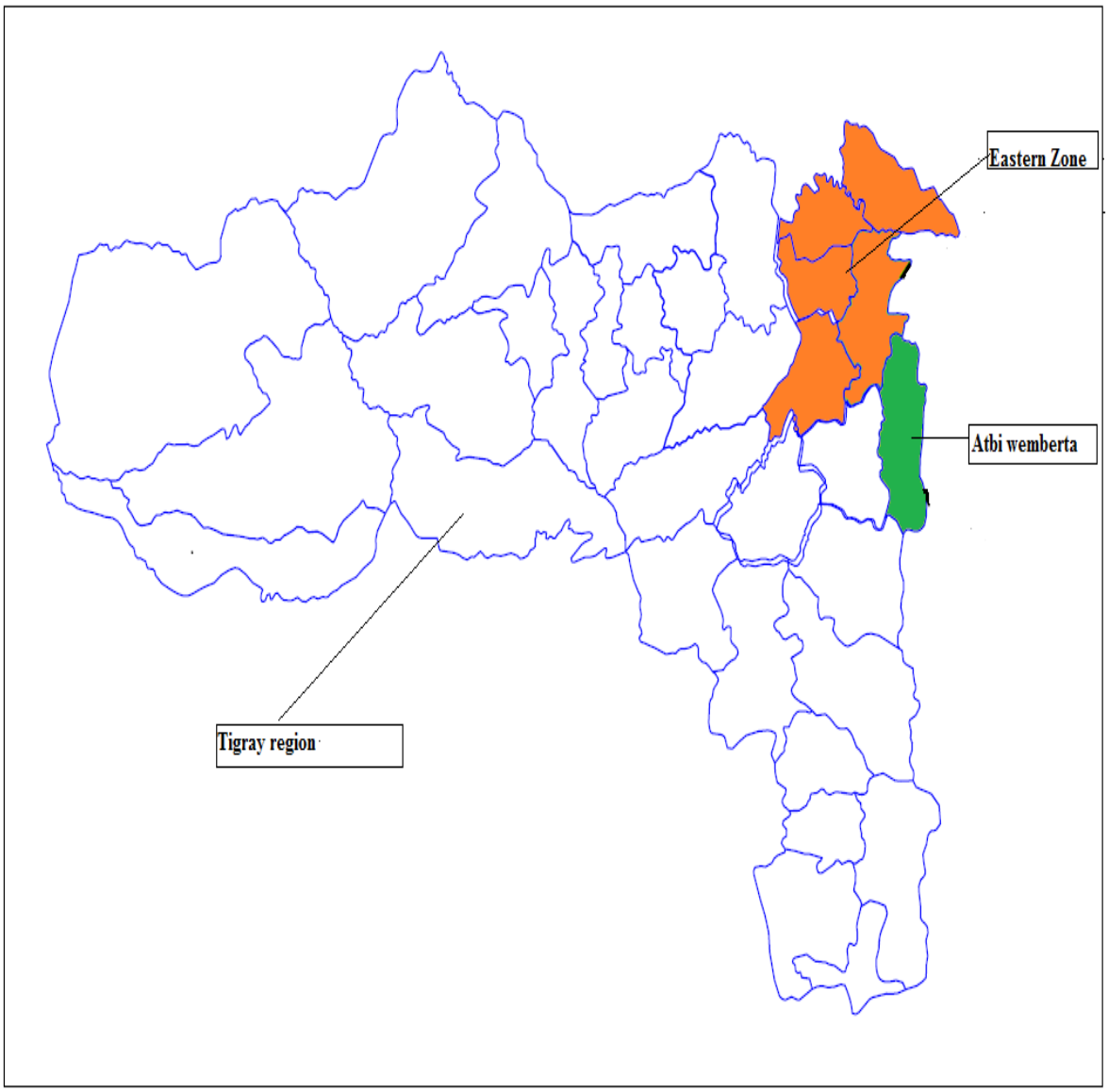

**Figure1. The Map of Tigray National Regional State and Atsbiwemberta woreda**

### 3.1.4. Farming system and crop types grown in the study area

Agriculture is the main stay of the population of the Woreda. Mixed farming, crop and livestock production including apiculture is the major practice of the Woreda including the study sites. The predominant agricultural practice is traditional and subsistence farming.

Despite the fact that agriculture is the main economy of the woreda, the production does not cover the food demand of the population. The productivity of the study area has been significantly reduced not only because of the climate change and land degradation, but also the significant reduction of landholding due to population growth.

Livestock production is very important in the area, which enables them to buy the grains and other necessities they need. The area is known for high valued sheep and/or goat farming. It is also an important honey producing area where the highest price is paid too. There is an intervention to increase the honey production and provide as option for landless farmers. In general, they practice a mixed farming system, which combines rain fed crop production with small-scale livestock breeding. Most of the households can only feed themselves with their own crop production during a limited number of months of the year. In addition due to land pressure we see that fallow does rarely exist but crop rotation with legumes is more commonly practiced.

The cropping system in the Atsibiwemberta area is dominated by diversified field crop production with limited horticultural crops production under irrigation, in which has recently tended to expand and having significant economic contribution. The major crops grown are barely, wheat, fababean, field pea, teff, lentil, linseed, finger millet, and new introductions of irrigated crops like potato, onion, garlic, cabbage, lettuce, swiss chard, beet root and highland fruits such like apple. Among the major crops grown in the woreda, barely covers the largest area (49.96%) followed by wheat (33.83%), faba bean (8%), field pea (4.27%) and teff (3.87%). The average productivity of the major crops is 5-6 quintal per hectare. On the average a household produces support for about five to six months. Most members of the community should look for off-farm activities to feed their families all year round (BoARD, 2010).

### 3.1.5. Input Distribution

Farmers in the woreda have been utilizing different agricultural inputs which increase the productivity and production of their small plot of land in order to assure their food security and increase household income. Even though there are different types of agricultural inputs that can increase the production and productivity of crops and livestock's, the dominant inputs utilized are seed and fertilizer. According to BoARD (2011), in the year 2010/11 2340 quintals of fertilizer and 2750 quintals of improved seed were distributed to the farmers.

The distribution of those inputs in this woreda carried out by different organizations and companies. Fertilizer and improved seed has been distributed mainly by primary cooperatives and Agricultural bureau of the woreda that is the dominant source of the region, ISSD MU distributing different variety of barely in the woreda.

### 3.1.6. Institutional service

Agricultural extension is of paramount importance to introduce better agricultural practices and improved technologies to smallholder farmers in a country like Ethiopia where the traditional practices are dominating. The agriculture and rural development bureau through its technical experts and development agents at community level has been providing agricultural extension services in the woreda.

In order to give effective extension service to the farmers the woreda assigned currently three extension workers/DAs are placed at each tabia to provide technical assistance in crop, livestock production and Natural Resource Management. Most of the DAs have diplomas and/or certificates i.e they are graduates from recently established agricultural colleges.

Currently there are 54 DAs in the woreda. According to the 2011's Tigray Cooperatives Promotion Office (TCPO) report, in the woreda there are 16 Multi-Purposes, 6 WUAs, 5 RuSACCOs and two dairy cooperatives in Atsiby Womberta. The total number of members of MPCSs increased from 13618 in 2010 to 14832 in 2011 and 322,354.19 birr

capital. The government of the region is providing promotional and regulatory services to the cooperatives at regional and district level. Particularly, the district level promotional department is responsible to organize the people on voluntarily basis, register and provide technical assistance and keep the momentum of cooperatives development in their course of service provision to the members. To do so the promotional department is organized at district level into the organization and promotion team, marketing and credit team and auditing and registrar team. Each team is consisted of three experts. Besides, one team leader for each team and one department head are appointed to coordinate the overall effort of the department (DCPD, 2010).

Today they diversify their activity to involve in output marketing and seed distribution and enhance their capacity from mere distributor to importer of fertilizer.

### 3.1.7. Infrastructure

The widely used means of movement of people as well as goods from one place to another in the woreda is road transport. The existing road network is inadequate and poor the woreda in road networks. The all weather road branched from Agula'e Town to the east crossing Haik Mesahil, Endasselassie and Dessia Towns. The other all weather road stretches from Wukro to Endasselassie. Small villages alongside the roads are benefited from the transportation services. Otherwise, the remaining rural roads in the two districts are dry whether roads which are rough, unfit for transportation of agricultural products for they lack regular maintenance. Donkeys and human portage are commonly used to transport produce to the local markets and to take supplies from such points to the farm.

## 3.2. Sampling Techniques

A multistage sampling technique was used to select sites and draw sample of Households for the study. First AtsbiwebertaWoreda were selected purposively from the region considering their intervention of ISSD project and experience in farmers' based seed multiplication, and the production potential for crops in the region demonstrated by the consideration of the Woreda as model demonstration area for farmers' based seed multiplication.

From the sample Woreda two tabias were selected purposively based on the intervention of ISSD project and their relative numbers of seed producing farmer and experience in farmers' based seed multiplication.

Sampling of households was carried out considering two sampling frames of households: participants in LSB seed supply system and Public seed supply systems. Farmers engaged in local seed multiplication in the tabia were considered as participants of LSB seed supply systems. The sampling frame for participants in LSB seed producers was farmers' list from the respective Woreda Agriculture and Rural Development Office registered as local seed producers. The researcher included all members of LSB seed supply system participants. In the same way, Public seed supply system participants sample was taken from name of total resident in the respective tabia which is not members of LSB seed producing farmers.

The sample household's Public seed supply system participants for the Woreda were selected using systematic random sampling. Accordingly, a total of 67 households i.e. 34 and 33 from Habese and Felegewayni tabias respectively were selected using systematic random sampling. 134 total sample of households from the woreda shared between the two samples tabia based on the participation in LSB seed supply system and Public seed supply system in each tabia *(Table 1*).

Table3.1. Number of samples from the Woreda.

| Name of the woreda | Tabia selected | Classified | Sample farmers From each tabia | Size sample Households |
|---|---|---|---|---|
| Atsebiwemberta | Felegewayni | Shewit mesno | | |
| | | Cooperative members | 33 | |
| | | Non members | 33 | 66 |
| | Habese | Hiwet habes | | |
| | | Cooperative members | 34 | |
| | | Non members | 34 | 68 |
| **Total** | | | | **134** |

### 3.3.Methods of Data Collection

The primary data necessary for the study were collected from sample respondents by using pre-tested and structured interview schedule.

For the purpose of data collection, 4 enumerators, who have acquaintance with socio economic concepts and knowledge of the culture of the society as well as local language proficiency were selected, oriented and employed.

The interview schedule was consisted different types of questions or items, related to the topic of the research and relevant variables to gather the needed information. Thus structured interview schedule was developed and used in order to allow the respondents to freely express their opinion on issues related to the research topic. After formulating the interview schedules, necessary editing was done for its observed consistency and logical sequence with frame of reference of the respondents. Then it was subjected to a pilot study on non-sample respondents with a minimum and adequate sample size. Based on the nature and extent of responses obtained, necessary modifications and further editing was done in the interview schedules to ensure its clarity and completeness for generating the needed information from the respondents. As to seed suppliers, data were collected through questionnaires distributed to relevant Actors related to the research topic.

To supplement the quantitative data, qualitative data was collected through focused group discussions, informal interview with key informants, discussions with woreda level and village level extension staff and related actors.

To collect data on Actors linkage in the study area, linkage matrix (Tool B4/a) were used. This tool helps to identify the status of linkage among actors (Salomon and Engle, 1997).

### 3.4. Method of Data Analysis

Different types of analytical methods can be used to evaluate different research results and make a sound conclusion for a given survey information. Literature reveals that each and every analytical method has their advantages and limitations; it is always advisable to

select the one that can better suit to answer the specific purpose (Hopkins *et al*., 1996; Pallant, 2001).

The role of statistics in research is to function as a tool in analyzing its data and drawing conclusions there from. Only after this, we can adopt the process of generalization from small groups (i.e., sample) to population.

In this study, data were analyzed using different quantitative and qualitative procedures and methods. Descriptive statistical tools were used to analyze the quantitative data. The important statistical measures that were used to summarize and categorize the research data were means, percentages and frequencies. Qualitative assessment was carried out using key informants and focused group discussion; seed suppliers' survey and government policy document content analysis.

### 3.5. Model specification

To test the sated research question, a probabilistic model was specified to identify determinants of household's participant in seed supply system in the study area as a function of series of socio economic, households, seed supply system, demographic and institutional issues variables. The dependent variable is dummy variable, which takes a value of 1 or 0 depending on the households' participation in seed supply system. Here, the main purpose is to determine the probability that an individual with a given set of attribute will fall in one choice rather than the alternative, i.e., either participation in LSB or Public seed supply system not both.

There are approaches developed for a probability model whose response variable is dummy one. These are: the Linear Probability Model (LPM), Logit Model, and Probit Model. The choice of these models depends on the suitability to fit the data. LPM has inherent draw backs. To mention some of these downside of: it lacks to show the uniformity of error terms, hetroscedasticity (the variance of the error term is not constant) of the error term, possibility of getting the probability function result out of 0 and 1, and the general lower $R^2$ value. Owing to these fundamental problems, LPM is not logically attractive model for dummy responsive variables (Gujarati, 1995).

Thus, one can use Cumulative Distribution Function (CDF) namely Logit or Probit models (Gujarati, 2003). The question is that which CDF model to use. However, both can be used for dummy responsive variable most researchers choose Logit than Probit regression model (Gujarati, 1995). Therefore, Logit model guarantee the estimated probabilities increases and never steps outside 0 to 1 interval and the relationship between probability ($p_i$) and explanatory variable ($X_i$ ) is non linear (Gujarati, 2003). Thus, a logistic model was used to identify the determinants of participation in seed supply system and to assess their relative importance in determining the probability of being participation in LSB or not.

The functional form of Logit model is specified as follow, Gujarati (2003)

$$Pi = E(Y = {}^{1}/_{Xi}) = {}^{1}/_{1 + e^{-(\beta 0 + \beta i x i)}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad 1$$

For simplicity (1) can be expressed

$$Pi = {}^{1}/_{1 + e^{-zi}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad 2$$

The probability that given household participation in seed supply system is expressed by (2) while, the probability for participation in LSB as: -

$$1 - Pi = {}^{1}/_{1 + e^{zi}}$$

After some steps

$$\ln [Pi/1- Pi] = Li = Zi = \beta o + \beta 1 x1 + \dots + \beta n\, xn$$

If the disturbance term (Ui) is introduced, the Logit model becomes

$$Zi = \beta o + \beta 1 x1 + \dots + \beta n\, xn + Ui$$

Where βo = intercept

β1, β2. . . ,βn slopes of the equation in the model

Li = is log of the odd ratio, which is not only linear in Xi but also linear in the parameters.

Xi = is vector of relevant socio economic, demographic and institutional issues explanatory variables

Zi = the function of n explanatory variables (x); in this case Zi = Household participation in seed supply system status

Prior to the estimation of the logistic regression model that the explanatory variables was checked for the existence of multicolinearity. In this study among the other methods, robest standard error was used to measure the degree of linear relationships among the continuous explanatory variables.

### 3.6. Description of Variables and Working Hypothesis

**Dependent variables:**

**Participants in Seed Supply System (PSSS):** is a dummy dependent variable in the model assigned value of 1 for households participate in LSB seed supply system and 0 participate in Public seed supply system.

**Independent variables:** It is hypothesized that households participating in seed supply system at any time are influenced by the combined effect of a number of factors. This includes both discreet and continuous variables such as: household characteristics, socioeconomic characteristics and institutional characteristics in which farmers operate. Even though most factors are common to all improved seeds, like on time availability, quality and price of improved seed are specific for all crops due to their nature. Based on the review of seed supply system literature, past research findings and the researcher's knowledge of the farming system of the study area, among the large number of factors which were expected to relate to farmers' participate in seed supply system behavior 13 potential explanatory variables were considered in this study and examined for their effect in farmers' decision to participate in seed supply system.

**1. Age of Households (AGE):** Most of the time rural households spent much of their time on agriculture and they base their livelihood on agriculture. Thus, the more aged the HH, the more experience he/she has to be participate in seed supply system by avoiding risk and diversifying their production.

**2. Sex of households (SEX):** A dummy variable for the household head's sex 1 if male and 0 if female. Because of the allocation of resources in the community is biased towards males, they are expected to be better participating in seed supply system (Legesse, 1998).

**3. Family size of households (FAMSIZE):** It is a continuous variable which indicate the number of person living in the house of the farmers. It is expected that as the size of the house hold increase the participation in seed supply system increase .This indicates the family with large number more involved in seed production since seed multiplication need more labor and continuous follow up.

**4. Education level of the household (EDUCLEVEL):** In almost all of studies on agriculture, education was taken as an important explanatory factor that positively affects the decision of households to participate in seed supply system (Abay and Assefa, 2002). Farmers with more education should be aware of more sources of information, and be more efficient in evaluating and interpreting information about innovations than those with less education. Thus it is hypothesized that participants with more education are more likely to be participants in LSB seed supply system than farmers with less education (Teklewold *et al*., 2006). It is measured as a categorical variable in grades or number of years in school.

**5. Fertility characteristics of households farm Land (FCHXFL):** It represents the fertility characteristics of total owned and cultivated land by household. It is expected to be positively associated with the decision to participate in seed Supply system. This means that farmers who have relatively good fertile farm land will be more initiated to involve in seed production, and the reverse is true for farm land. It is categorical variable. The good fertile farm land indicates its positive influence on seed supply system.

**6. Off-farm income (OFFINCOME)**: Off-farm income represents the amount of income that farmers earn in the year as additional income out of on farm activity. It is the amount of income (in Birr) generated from activities other than crop and livestock production. These include petty trading, charcoal selling, firewood selling and others. The households engaged in off farm activities are better endowed with additional income to purchase initial seeds or other essential agricultural inputs for seed or seedling production.

Therefore, it is expected that the availability of off-farm income is positively related with participation in seed supply system.

**7. Availability of Improved Seed on time (AISOT):** According to study made in Uganda on FSE (Farmers Seed Multiplication) by (David, 2003), establishing a sustainable system for supplying source seed are key elements needed to ensure the successful development of FSEs . Availability seed on time is the main input for farmers participate in seed multiplication. In this study this variable was treated as a dummy variable that is 1 yes if the farmers responded that there is get of improved seed on time and 0, otherwise. Because if the farmers perceived as there is foundation seed on time to produce seed for market s/he will be interested to participate in seed supply system.

**8. Price of distributed improved seed (PRICE):** the price of agricultural inputs may encourage/discourage farmers in order to use production enhancing inputs. Wolday (1999) indicated that price of inputs is significantly related to use of improved seeds. If the pricing regulation of seed does not invite farmers, it will have negative effect on improved seed use. Therefore, this variable was expected to have negative association with the dependent variable. It was dummy variable with value of 1 for price of seed expensive and 0 other wise.

**9. Providing Quality improved seed (PQSEED):** the distributions of good quality seed of improved varieties are enormous, and the availability of quality seed of wide range of varieties and crops is the key to achieve the farmers to participate in seed supply system. Enhanced productivity, higher harvest index, reduced risks from pest and disease pressure, and higher incomes are some of the direct benefits potentially accrued to the farmers (FAO, 2010).as the perception of the farmers the variable for Providing Quality improved seed is dummy that is 1 yes if the farmers received quality seed 0 otherwise.

**10. Credit Access of Improved Seed (ACREDIT):** It is a dummy variable, which takes a value of 1 if the household had access to credit and 0 otherwise. Participants on seed supply system with complementary inputs require considerable amount of capital for purchase of inputs. Farmers who have access to seed on credit are more probable to participate in seed supply system than those who have no access of seed on credit (Yishak, 2005). On the other hand the availability of seed credit especially from formal sources is vital components of the modernization of agriculture and to increase productivity. Those Households who have access to seed credit are believed to adopt technology more than those who have no access to credit. This indicates smallholder households cannot finance these inputs for seed production unless they get alternative means.

**11. Extension service (EXSERVICE):** Extension visits will help to reinforce the message and enhance the accuracy of implementation of the technology packages (Oladele, 2005). More frequent DA visits, using different extension teaching methods like attending demonstrations and field day can help the farmers to participate in seed supply systems. If the Households get better extension services, they are expected to participate in seed supply system than others. In this study this variable was treated as a dummy variable. That is if the farmers gets extension service it is coded as 1 and 0, otherwise.

**12. Radio ownership (RADIO):** Information's are important to make a decision on alternative enterprise that helps Households to achieve his goals .At present, radio is the popular means of mass communication. Therefore, radio ownership is assumed to increase the probability of participating in seed supply system. In this study, this variable takes the value 1 yes if the respondent has a radio and 0, otherwise.

**13. Access to market**- Market access is one of the variables that affect seed output marketing in rural areas. Presence of input/output marketing at farmers' disposal would increase the participation in seed supply system. Hence the variable was expected to have positive influence on the dependent variable. It was dummy variable with value of 1 for yes and 0 other wise.

# CHAPTER FOUR

## 4. RESULT AND DESCUSSION

### 4.1. Household Characteristics

#### 4.1.1. Distributions of household by sex and marital status

More than 67.27% of the sample farmers' households are headed by males in all two sites of the Survey and 80% were married (Table 4.1). Habes participants in LSB seed supply systems have better number of female participants as compared to Felegewayni. Participation of single household in LSB seed supply system was 21.28% and 5.26% in Habes and Felegewayni respectively. The percent of male-headed households of LSB seed supply systems participants were higher than that of female-headed households. This is attributed to various reasons including the problem of economic position of female-headed households like shortage of labor, limited access to information and required inputs.

Table4.1. Sample household sex and marital status

| | | Percentage (%) | |
|---|---|---|---|
| **Sex** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Male** | LSB seed supply system participants | 66.67 | 79.17 |
| | Public seed supply system participants | 86.67 | 50 |
| **Female** | LSB seed supply system participants | 33.33 | 20.83 |
| | Public seed supply system participants | 13.33 | 50 |
| **Marital status** | | | |
| **Married** | LSB seed supply system participants | 78.72 | 94.74 |
| | Public seed supply system participants | 77.08 | 45 |
| **Single** | LSB seed supply system participants | 21.28 | 5.26 |
| | Public seed supply system participants | 22.92 | 55 |

Source: own computational result 2013

### 4.1.2. Distribution of household by age and family size

Average family size is about 4.9 and 3.88 people per household for LSB seed supply system participants and Public seed supply system participants respectively. LSB seed supply system participants in Habese comprise the biggest family size (9 per household) of the two tabias (Table 4.2). As statistical results of this survey show on the same table Habese and Felegewayni tabias have the larger family size of LSB seed supply system participants with average size of 5.42 and 4.37 persons, respectively. As the t-test results indicate there was significant difference in average family size between LSB seed supply system participants and Public seed supply system participants of Habese and Felegewayni tabia sample farmers.

Average age of household head for the sample farmers of Felegewayni was 44 and 43.10 years for LSB seed supply system participants and public seed supply system participants, respectively. At Habese, both groups had similar average age of 52 years. The t-test result indicates there is no significant difference between the average age of LSB seed supply system participants and public seed supply system participants for sample farmers in the sample tabias.

Table4.2. Age and family size composition of sample house hold

| | | Mean | |
|---|---|---|---|
| **HH characteristics'** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Family size** | LSB seed supply system participants | 5.42 | 4.37 |
| | Public seed supply system participants | 4 | 3.75 |
| **t test** | | -5.12 ** | -5.04** |
| **Age of HH** | LSB seed supply system participants | 52.79 | 44 |
| | Public seed supply system participants | 52.05 | 43.10 |
| **t ratio** | | -0.26 | -0.28 |

Source: own computational result

** Significant at 5%

### 4.1.3. Distributions of household by educational status

From the total public seed supply system participants 39.31% of are illiterate, where as only 34.52% of LSB seed supply system participants found in this category. Also 10.46 % LSB seed supply system participants farmers had formal schooling that help them not only to acquire and interpret information on agricultural technologies, but also to rationally allocate existing farm resource to achieve the objective and goals of farm household's. As shown in (Table 4.3) Participants in LSB seed supply system farmers taken from Habese and Felegewayni tabias 34.04% and 35% found to be illiterate, respectively and the rest attended formal schooling or at least can read and write. However there is no significance difference between LSB seed supply system participants and public seed supply system participant's farmers in their educational status.

Table4.3. Educational level of the household

| **Educational** | | **Percentage (%)** | |
|---|---|---|---|
| **Category** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Illiterate** | LSB seed supply system participants | 34.04 | 35 |
| | Public seed supply system participants | 47.37 | 31.25 |
| **Read and write** | LSB seed supply system participants | 55.32 | 55 |
| | Public seed supply system participants | 42.11 | 56.25 |
| **Primary school** | LSB seed supply system participants | 4.26 | 5 |
| **Completed** | Public seed supply system participants | 10.53 | 8.33 |
| **Secondary school** | LSB seed supply system participants | 4.26 | - |
| **Completed** | Public seed supply system participants | - | 4.17 |
| **Others** | LSB seed supply system participants | - | - |
| | Public seed supply system participants | 2.13 | 5 |
| **Chi-square** | | **3.1836** | **3.5120** |

Source: own computational result 2013

### 4.1.4. Radio ownership

With regard to radio ownership, it was assumed that respondents who owned radio got information regarding local seed produced in that area and agricultural market. The statistical result depict that 78.72% and 80% of LSB seed supply system participants in Habese and Felegewayni tabias responded that they have radio that helped them to get information local improved seed produced in that area and market information about their agricultural produce and inputs, respectively (Table 4.4). Whereas, only 36.84% and 72.92% of the same tabias' Public seed supply system participants farmers were responded as they have radio. To see whether there is difference between each group of LSB seed supply system participants and public seed supply system participants with respect to ownership of radio Chi-square test was employed. As shown from the result the difference was significant for all Habese and Felegewayni tabias farmers.

Table4.4. Response of sample farmers on ownership of radio

| **Radio** | | **Percentage (%)** | |
|---|---|---|---|
| **Ownership** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Yes** | LSB seed supply system participants | 78.72 | 80 |
| | Public seed supply system participants | 36.84 | 72.92 |
| **No** | LSB seed supply system participants | 21.28 | 20 |
| | Public seed supply system participants | 63.16 | 27.08 |
| **Chi-square** | | **10.67** | **0.3778** |

Source: own computational result 2013

## 4.2. Farm Resource Characteristics

### 4.2.1. Land Holding

From the total sample farmers in the two tabias 55.22 % of LSB seed supply system participants and 76.12% public seed supply system participants have less than 0.5 ha of land. On the other hand only 5.97% LSB seed supply system participants and 2.98% of public seed supply system participants own more than 2 ha of land .However the allocation of land for

seed multiplication were greater at Habese as compared to Felegewayni tabia which is 0.71 ha and 0.57 ha in average respectively. As (Table 4.5) the t-test reveals that, from sample farmers at two sites, there was insignificant difference between average landholding of LSB seed supply system participants and LSB seed supply system participants in Habese and Felegewayni Tabia.

Table4.5. Land allocation for seed multiplication

| | **Average Land Holding** | |
|---|---|---|
| **Farmer groups** | **Habes** | **Felegewayni** |
| LSB seed supply system participants | 0.9473684 | 0.609375 |
| Public seed supply system participants | 0.6170213 | 0.4875 |
| **t-ratio** | **1.6390** | **1.5976** |
| **Land allocated** | **0.7121212** | **0.5735294** |
| **SD** | **0.7509512** | **0.2899396** |

Source: own computational result 2013

### 4.3. Access to Service and Institutions

Farmers' institutional factors have important bearing on the observed status of the farmers with respect to willingness to participate in seed multiplication. The most important institutional factors identified were agricultural extension service and access to credit.

#### 4.3.1. Extension service

The study found that about 96.81% of the LSB seed supply system participants and 94.74% public seed supply system participants respondents in two tabias had made contact with extension agent during the previous season.

Table4.6. Distribution of household by extension service

| | | Percentage (%) | |
|---|---|---|---|
| **Extension Service** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Yes** | LSB seed supply system participants | 93.62 | 100 |
| | Public seed supply system participants | 89.47 | 100 |
| **No** | LSB seed supply system participants | 6.38 | - |
| | Public seed supply system participants | 10.53 | - |
| Chi square | | 0.3317 | |
| **Extension contact** | | | |
| **Once a week** | LSB seed supply system participants | 82.98 | 100 |
| | Public seed supply system participants | 68.42 | 20.83 |
| **Once a month** | LSB seed supply system participants | 17.02 | - |
| | Public seed supply system participants | 31.58 | 79.17 |
| Chi square | | 1.7157 | 4.8851 |

Source: own computational result

Significant at 5%

there is a not great difference among sample areas, as it can be seen from (Table 4.6) from the total sampled farmers involved in LSB seed supply system participants only 93.62% got extension service on specific area of the seed they are multiplying. Higher proportion of respondent to get extension service is reported in Felegewayni that is 100% of Sample LSB seed supply system participant's farmers have got extension service on seed multiplication technology respectively. This is mainly due to the nature of multiplication and the attention given by local government and ISSD MU involved in rural development program in these Woredas. From the total sample LSB seed supply system participants farmer 89.47% from Habese and 100% from Felegewayni responded that they get extension service on seed multiplication. The chi-squere result depict that, there was not a significance difference between LSB seed supply system participants and public seed supply system participants.

From LSB seed supply system participants sample farmers who got extension service responded that, 91.49 % any weekly and 8.51% two weeks. In the same way from public seed supply system participants sample farmers 44.63% and 55.37% received the service weekly once in a week and two weeks, respectively. The result of chi- square indicated that there is significant difference in obtaining extension service between LSB seed supply system participants and public seed supply system participants at 5% significance level.

### 4.3.2. Access of credit improved seed

Access to credit service helps the farmers to purchase improved seeds which in turn increase production and participating LSB seed supply system of the credit users.

Based on the survey result of this study total 79.36% of sample LSB seed supply system participants farmers obtained improved seed credit in the year 2011/12 (Table 4.7). The lowest proportion of farmers with access to credit is observed in Habese tabia. There is a significant difference between LSB seed supply system participants and public seed supply system participants group of farmers by access to credit at 5% significance level. The public seed supply system participants reveal the absence of institutions to provide the credit service was one of the reasons that hamper them in not using the credit and fear of high interest rate.

Table4.7. Input credit availability to farmers

| | | Percentage (%) | |
|---|---|---|---|
| **Credit service** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Yes** | LSB seed supply system participants | 78.72 | 80 |
| | Public seed supply system participants | 36.84 | 72.92 |
| **No** | LSB seed supply system participants | 21.28 | 20 |
| | Public seed supply system participants | 63.16 | 27.08 |
| **Chi-square** | | **10.67** | **0.3778** |

Source: own computational result 2013

### 4.4. Farmers Attitude and Perception about participation in Seed Supply System

#### 4.4.1. Farmers perception about the benefit of participate in seed supply system

As indicated in (Table 4.8) in Habese about 23.40% of LSB seed supply system participants farmers perceived seed production activities have increased income and the rest consider that seed production has no any difference from grain production. Also from public seed supply system participants 15.79% sample farmers agreed that involvement in seed production can increase farmers' income.

Table4.8. Response of farmers on the benefit of participation in seed supply system

| | | Percentage (%) | |
|---|---|---|---|
| **Parameters** | **Farmer groups** | **Habese** | **Felegewayni** |
| **Secure food consumption** | LSB seed supply system participants | 25.53 | - |
| | Public seed supply system participants | 10.53 | 2.08 |
| **Income increase** | LSB seed supply system participants | 23.40 | 10 |
| | Public seed supply system participants | 15.79 | 12.50 |
| **Production increase** | LSB seed supply system participants | 31.91 | 45 |
| | Public seed supply system participants | 63.16 | 37.50 |
| **Produce quality seed** | LSB seed supply system participants | 19.15 | 45 |
| | Public seed supply system participants | 10.53 | 47.92 |
| **Chi-square** | | **5.6381** | **0.7172** |

Source: own computational result

Significance 5% level

In Felegewayni 10% sample farmers reported that involvement LSB seed supply system increase income of seed producer farmer than grain production. In addition, 31.91% of the farmers in Habese and 45% in Felegewayni have perceived that the LSB seed supply system participants by farmers gives better production seed as compared to farmers producing quality seed from grain production. The chi-square result reveal that there is no significant difference between LSB seed supply system participants and public seed supply system

participants sample farmers on perception of income contribution, secured food consumption, producing quality seed and increased production better adaptation than commercially processed seed and better production of farmers multiplied seed than they saved from their own grain production.

### 4.4.2. Farmers opinion on access of quality seed to produce

Both LSB seed supply system participants and Public seed supply system participants expressed their opinion on the access of quality seed to produce. According to the survey result, 82.55% of LSB seed supply system participants and 78.52% of Public seed supply system participant farmers from the sample tabias responded that they received access quality seed from seed suppliers and the capacity of the farmers to produce quality seed, whereas only 22% of total Public seed supply system participants respondent express their disagreement on the idea.

Table4.9. Farmer opinion on quality seed availability

| | | Percentage (%) | |
|---|---|---|---|
| **Seed quality** | **Farmer groups** | **Habes** | **Felegewayni** |
| **Yes** | LSB seed supply system participants | 85.11 | 80 |
| | Public seed supply system participants | 79.95 | 77.08 |
| **No** | LSB seed supply system participants | 14.89 | 20 |
| | Public seed supply system participants | 21.05 | 22.92 |
| **Chi-square** | | **0.3695** | **0.0699** |

Source: own computational result

Significance at 5% level

Moreover, 85.11% of Habese and 85.11% of Felegewayni tabia LSB seed supply system participants' farmers have agreed access of quality seed to produce quality seed. On the contrary, Habese and Felegewayni tabia farmers have no confidence on the availability of quality seed produced 21.05% and 22.92% of the public seed supply system participants' farmers' ability to produce the right seed, respectively. This is due to the fact that there is no any experience with farmers' based seed production and distribution in those areas and

cheap distribution of seed by public suppliers expected to influence the attitude of the farmers.

## 4.5. Actors Mapping and their Linkage within the seed supply System

### 4.5.1. Actors mapping

To map the actors, discussions were made with WARDO staff and farmers in the study area. According to the survey result, actors involved in the woreda are mainly concerned with technology generation, promotion, input supply and knowledge transfer to farmers.

From the result of the discussion; WARDO, ISSD MU, Eastern Zone Agriculture and Rural Development Department (EZARDD), Tigray Agricultural Research Center (TARI), and Hiwet Habese and Shewit Mesno Cooperatives are identified as main actors currently involved in different intervention areas of the woreda in relation to agricultural input supply system.

#### 4.5.1.1. Role of actors in the study area

- **Woreda Agriculture and Rural Development Office (WARDO)**

WARDO is mainly concerned with provision of extension service to farmers through woreda SMSs, and DAs assigned in each PA who are responsible to transfer knowledge about plant production, animal production and natural resource conservation and development using individual and group contact. It is also engaged in facilitation and joint action of activities carried out by partners such as input suppliers, GO and NGOs for the successful accomplishment of their goals and objectives towards improving the livelihood status of farmers in the project area. Moreover, with regard to agricultural input provision, farmers demand would be finalized through DAs and line work process for the timely delivery of inputs.

- **Tigray Agricultural Research Institute (TARI)**

As it is well known that agricultural inputs specially seed technologies are the result of research organizations', efforts have been made to maximize the production and productivity of seed technologies per unit area. In the context of this approach, TARI

played significant role in execution of enormous types of seed technologies which are best fitted to different agro ecological zones.

In the study area, the research organization has provided different types of seed varieties to be selected by farmers. It also works with MU to strengthen farmers to farmers seed exchange system. As a member of Research Extension and Farmers Linkage Advisory Council (REFLAC), the organization started to strengthen the linkage with WARDO and farmers in transferring knowledge through Farmers Research and Extension Groups (FREG).

- **Integrated Seed Sector Development with Mekelle University (ISSD MU)**

The ISSD is working under close supervision of MU Research Center. The main occupation of the research station is to conduct research on barely and diversification with associated crops. The research station provides barely disease resistant improved barely technologies to farmers and in return works for the improvement of the technologies on feedback gained from users. Currently, dissemination of "Fetina and Herity" improved barely variety is on duty in collaboration with ISSD and WARDO staff for barely multipliers and growers.

- **Hiwot Habese and Shewit Mesno Cooperatives**

Those Crop Cooperatives existing in Atsbiwmberta woreda. The main occupations of these cooperatives are supplying inputs to farmers through member cooperatives to farmers and facilitation of market link for grain produce to its primary member cooperatives. As to input supply, these cooperatives is mainly concerned with provision of commercial fertilizer and improved seed from to farmers grass root level on credit and cash bases.

According to a key informant of the organization, the input delivery system is not efficient as expected. This is because, the organization lacks warehouses, trucks and vehicles to damp inputs at farmers disposal, transport inputs for distant areas and to facilitate input delivery system with concerned parties respectively. However, to reverse the situation, the organization tried to deliver inputs through cooperation with public line sectors.

- **Eastern Zone Agriculture and Rural Development (EZARDD)**

The Eastern Zone Agriculture and Rural development Department is concerned with all activities undertaken in the study woreda by line sector office. The department played role in facilitating input credit, input distribution, technical assistance, and monitoring and evaluation of the extension program. It is also involved on capacity building to SMSs and farmers through workshops and refreshment trainings.

#### 4.5.1.2. Linkage

According to Hagmann *et al*., (2002), linkages between service providers in to service delivery system are critical to 'make the system work as a system'. The different roles and mandates of service providers need to be clarified and even more important; they need to 'learn to play the roles' and work together in synergistic way towards making a difference.

To bring sustainable agricultural development, partners within the sector must develop joint collaborative action to ensure efficient and effective input/service delivery system.

Potential actors like BoARD, Research stations and FREG are participated in joint planning for action. The main aim of the council is to promote farmers participatory research through strong collaborative action by potential actors and to develop area specific technologies through adaptation trials and farmers- to- farmer's seed exchange specifically on cereal and pulse crops. The Integrated Seed Sector Development Project (ISSD MU) is in charge of facilitating joint activities carried out by partners through technical and material support i.e. capacity building, workshops, joint monitoring and evaluations, for members of advisory council and FREG. In the study area, linkage of actors is worked out on the basis of their proximity to the farmers and link for support among themselves.

#### 4.2.1.2.1. Linkage of actors with farmers in the study area

Actor interaction is mapped using both character based map and linkage matrix. By using character based map; here we can look at individual actors and see that they link up with.

Following Anandajayasekeram *et al.*(2008) the actor linkage maps were produced by placing farmers in the center and linking the other actors based on their contribution to the demand sector (farmers). A participatory actor's linkage map was produced by farmers and

other key informants according to the proximities to them and farmers and key informants were asked to identify key actors they have linkage and draw the map (Figure 2).

As indicated in the linkage map, farmers and key informants put the linkage between them and actors as strong with WARDO, ISSD MU and Hiwet Habes and Shewit Mesno coperatives. On the other hand, they put medium for the linkage with, EZARDD,and.TARI The probable reason for this is actors who are involved in input/ service provision prefer to communicate facilitators rather than farmers even if there is room to communicate.

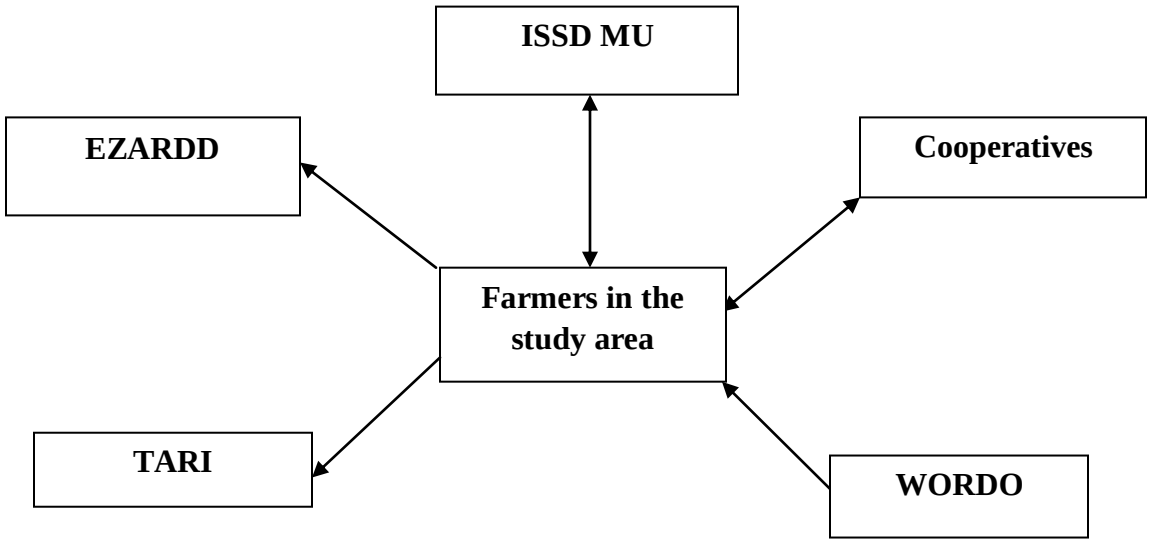


Figure 2: Actors' linkage map developed by FGD and key informants

**Key:**

**Linkage strength**

Strong linkage

Medium linkage

## Linkage description

1. Extension service, farmer's mobilization, input distribution
2. Provision of improved Seed technology
3. Mobilization and administrative support
4. Technical support, training and market link

5. DAP and UREA fertilizer supply

#### 4.2.1.2.2. Linkage among actors in seed supply system

The advantage of linkage matrix over linkage map is it helps to show the linkage and interaction among the different actors (Anandajayasekaram *et al.*, 2008). Thus, actor Farmers in the study area interaction was presented using linkage matrix where major actors in the seed supply system are listed both the row and column of the matrix and their relation and interaction is described in the intersection cells (Table 4.10). Each box/cell in the matrix then represents the linkage between the two actors and the type of linkage. Bolded cells represent strong linkage among the respective actors.

Accordingly strong linkage was observed between actors involved in technology generation and knowledge provision viz. TARI, ISSD MU, EZARDD, WARDO and Hiwet Habese and Shawit Mesno coperatives. The probable reason for this might be the presence of these actors in different plat forms such as REFLAC may contribute to act collectively for joint actions.

Table 4.10: Actor's Linkage Matrix in Seed Supply System

| Actors | **WORDO** | **ISSD MU** | **TARI** | **COPERATIVES** | **EZARDD** |
|---|---|---|---|---|---|
| **WORDO** | | Technical support and Facilitation of improved Seed | Technical support and facilitation seed/seedling distribution | Distribution and purchase of inputs and market link | Technical and administrative support for agriculture technology introduction and promotion |
| **ISSD MU** | | | Collaborate work on research seed technology | Technical support And seed distribution | Collaborative work on transfer of knowledge |
| **TARI** | | | | technical and seed facilitation support | Collaborative work on transfer of knowledge |
| **COPERATIVES** | | | | | Training, market linkage and technical support |
| **EZARD** | | | | | |

**Source:** Own survey result, 2013.

## 4.6. Constraints of seed supply system

Constraints of the system were identified from the perspective of seed providers and users independently. Questionnaires and interview schedules were used to collect the data from seed providers and users respectively. The results of the survey are discussed below.

### 4.6.1. Constraints of seed providers

According to key informants and seed suppliers' survey result, the following are constraints of the supply sector.

- ✓ Unavailability of agricultural inputs at farmers disposal due to lack of transport, storage, etc. facilities Farmers
- ✓ Organizing market follows a very complicated and tedious process that took time and energy of farmers and cooperative is not flexible to take other forms of organization (groups). Absence of strong quarantine for imported and shopped crop varieties' seeds.

### 4.6.2. Constraints of users (farmers)

From FGD and user survey conducted, farmers pointed out the constraints they had. The identified constraints by farmers sector are discussed below.

The constraints of farmers in seed supply system were identified during user survey. From the result obtained, exorbitant seed price, mismatch in kind, inability to deliver timely, insufficient delivery, source from far distance and poor quality of inputs were identified and ranked according to their importance. Table 4.11 illustrates respondents' perception in terms of frequencies, percentage and rank.

Table 4.11: Constraints of Farmers in Seed Supply System (N=134)

| S.No | Types of constraints | Frequency | % | Rank |
|---|---|---|---|---|
| 1. | Exorbitant seed price | 40 | 29.85 | 1 |
| 2. | Mismatch in kind | 35 | 26.10 | 2 |
| 3. | Not timely | 25 | 18.65 | 3 |
| 4. | Insufficient delivery | 12 | 8.95 | 4 |
| 5. | Source from far distance | 10 | 7.50 | 5 |
| 6. | Poor quality | 9 | 6.70 | 6 |
| | No response | 3 | 2.25 | |

Source: computed from own survey result, 2013.

From the result obtained, exorbitant seed price was ranked as the first constraint of seed demand by the farmers. The focus group discussion revealed that currently seed price was escalated beyond the affordability of many farmers. The discussant mentioned that the price of seed increased by more than double fold comparing to past 2-3 years. This in return discouraged farmers to demand for production enhancing inputs.

The second constraint described by the sample respondents was mismatch with demand in terms of kind of inputs. During the focus group and key informants discussion, participants pointed out that there was difference between the demands in kind and seed delivered in the study area.

The third constraint of farmers demand for seed supply is timeliness of input delivery. As crop production is associated with planting time, seed should be delivered ahead of time. According to focus group discussants, they suffered with problems regarding to the delay of seed supply which in turn contributed yield loss for lately planted crops.

The fourth constraint of seed supply is insufficient delivery of seed. The focus group discussion revealed that currently farmers suffered with shortage of agricultural inputs.

According to discussants, the amount of seed delivered is by far lesser than the required. The collected down payment from farmers for seed purchase is returned back to farmers due to shortage of seeds. This, in response, seriously exposed farmers to purchase unknown source of seeds from local markets in the name of improved technologies but weak in their yield potential and quality.

The fifth constraint of seed supply was source from far distance. As the survey result showed, there are no seed stores at farmers' disposal. Therefore, farmers tend to move long distance (10- 25kms) to bring agricultural inputs. This may discourage them to search for improved seeds. According to key informants and discussants, unavailability of seed at their disposal forced them to remain on traditional practices.

### 4.7. Policy and Institutional Environment for Seed Supply System

In analyzing the existing seed supply system of the country in general and the study area in particular, policy and institutional environment for channeling the services is crucial.

According to Hagmann *et al*. (2002) as cited by Anteneh (2007), service delivery framework this level is called 'Supporting the Response'. At this level, analysis on the policies and legislation for the institutional arrangements of service provision, monitoring and evaluation and quality assurance of the service for regulating service provision modes and arrangements was undertaken. The analysis was made based on narrative analysis of government policy and strategy documents. It was backed up from public sector input suppliers, MoARD offices existing at different levels and past studies conducted by some scholars.

### 4.7.1. Seed Supply Systems and Policy

From an economic point of view, determining the appropriate role of the state and the private sector in the market for seed is a complex issue. Seed systems are, by their nature, subject to a variety of unique market and institutional constraints (Tripp and Louwaars, 1997, Gisselquist and

Van Der Meer, 2001). First, problematic property rights questions arise from fact that improved seeds can, in many cases, be reproduced by the farmer, thus reducing the ability of breeders to appreciate the gains from their innovative activities and investments. Second, information asymmetries result from the inability of farmers to make *ex ante* assessments of seed quality, since the seller retains such knowledge in the absence of certain types of regulation. Third, coordination problems result from difficulties in monitoring and enforcing contracts for seed use.

Finally, inelastic supply responses result from the inability of breeders to respond effectively to the changes in seed demand that result from expectations of market prices, household incomes, rainfall, and other determinants of farmers' planting decisions. Nonetheless, over time, many of these failures can be resolved through enactment of plant variety rights and truth in labeling laws, eventually allowing developed seed systems to be largely driven by the private sector.

Until 1992, there was no coherent national policy for the development of seed industry. In 1993, a national seed industry policy and strategy was formulated to guide seed sector development.

The National Seed Industry Council (NSIC) was established under Proclamation No 56/1993 and become responsible for advising the Government on policy and regulatory issues that would help improve and build a sustainable national seed supply system. Proclamation No122/98 amended the members of the Council (Getnet *et al*., 2001). The main objectives of national seed industry policy are to:

- Streamline evaluation, release, registration and maintenance of varieties developed by national programs.
- Develop an effective seed production and supply system through participation of public and private sectors.
- Encourage the participation of farmers in germplasm conservation and seed production.
- Create functional and efficient institutional linkages among seed industry participants.
- Regulate seed quality, seed import export trade, quarantine and other seed related issues.

In the national seed industry policy, emphasis have been given to agricultural research institutions, the Ethiopian Seed Enterprise (ESE), state farms, private farms and farmers as major producers and suppliers of seed. The private sector is expected to play an important role in seed sector development.

A Ministerial Regulation No. 16/1997 which was enacted to cover registration of varieties, seed producers, processors, distributors, quality control, seed trade (import-export), etc. has been replaced by Seed Proclamation No. 206/2000. The latest Proclamation is more comprehensive and creates stronger legal framework for the protection and control of the interests of all players in the seed industry. Moreover, field and seed standards prepared for 74 crops are officially issued for implementation.

Shortcomings in seed quality and timeliness of delivery have been an issue in Ethiopia for several reasons. First, the ESE supplies seed with only a limited number of traits capable of addressing the many biotic and abiotic stresses found across these farming systems and

agro ecologies. Second, concerns have been raised regarding the quality of seed provided by the ESE.

Poor cleaning, broken seeds, low germination rates, and the presence of mixed seeds has been commonly reported in ESE supplied seed (DSA 2006). Third, the official process of procuring, stocking, and distributing seed often fails to meet the time-sensitive needs of farmers. Numerous surveys have found that seed procurement and distribution through official channels is often not conducted in a timely or coordinated manner. Seed is either distributed after the optimal planting time, or the varieties distributed are not appropriate to changes in farmers' expectations of weather (e.g. Sahlu and Kahsay 2002; DSA 2006; EEA/EEPRI 2006).

As it was discussed in literature review part, timely delivery of seed with sufficient quantity as per the demand of users would enhance the consistent use of agricultural technologies to boost productivity of individual farmers in particular and the farming community in general.

From the discussion with WARDO and key informants, improved seed delivered to the woreda was not timely and not according to the demand. Though seed policy and legislations are issued regarding quality, due to weak controlling system and inability to implement rules and regulations the demand sector faces this problem repeatedly.

## 4.8. Econometric Model Estimation

The major determinants of seed supply system in the study area context. In this particular subsection, first description is given on the existence of multi co-linearity problems among the continuous and categorical variables. Following, brief explanation is given for the result of obtained from the model.

For bivariate association/relation tests are only direction indicator and at the same time has inherent limitation to effectively disentangle the effect of each variable over the dependent variable. It is problematic to accept the effect of each variable over household seed supply participation on bivariate analysis. Furthermore, the variables which were significant in bivariate analysis may be insignificant in the multivariate analysis or insignificant in

bivariate analysis may be significant in multivariate analysis due to the confound factor effect. Thus, in order to overcome these limitations econometric model was employed.

### 4.8.1. Determinants of Participation in Seed Supply System

Based on the theoretical literature factors that are expected to affect the households participate in seed supply system were employed in the model.

However, before the actual commencement of the data analysis in the logistic regression model the following diagnosis were taken. Multicolinearity diagnosis test was taken to filter for variables that are dependent to each other. To this effect, the presence of high co-linearity was checked for continuous variables and categorical variables robest standard error was taken for.

The model result in Table 4.12 below shows that Exp (β) values for five out of thirteen variables significantly affect participants of seed supply system the sample households at different significant level.

**Table4.12**. The Maximum Likelihood Estimates of Binary Logit Model (BLM)

| Variables | B | Standard error | p-value | Odd ratio |
|---|---|---|---|---|
| **AGE** | 0.0270566 | 0.0202974 | 0.183 | 1.027426 |
| **SEX** | 0.5723246 | 0.4842785 | 0.237 | 1.772382 |
| **FAMSIZE** | 0.2967046* | 0.1400528 | 0.034 | 1.345418 |
| **EDUCLEVEL** | 0.9565872 | 0.6478847 | 0.14 | 2.602798 |
| **FCHXFL** | 0.6780931 | 0.4775273 | 0.156 | 1.970117 |
| **OFFINCOME** | 0.0000577 | 0.000057 | 0.329 | 1.000056 |
| **AISOT** | 0.5168476 | 0.53494 | 0.334 | 1.676734 |
| **PRICE** | -0.4315669 | 0.4420267 | 0.329 | 0.6494906 |
| **ACREDIT** | 1.204651* | 0.4834383 | 0.013 | 3.335595 |
| **PQSEED** | 0.6985265 | 0.6143584 | 0.256 | 2.010788 |
| **EXSERVICE** | 1.0226235* | 0.8721116 | 0.037 | 6.16673 |
| **RADIO** | 1.026235* | 0.4984728 | 0.04 | 2.790539 |
| **AMKT** | -0.823882** | 0.444762 | 0.064 | 2.790539 |
| **Constant** | -8.658895 | 3.034765 | 0.004 | |

*** Significant at 1%**

**** Significant at 5%**

**Family size (FAMSIZE):** It was one of the hypothesized variables to significantly contribute to participating in seed multiplication considering their labor requirement than common crop production. However, the result of the model indicates that keeping all other factors constant for one person increase in the number of the household is positively associated with a increasing of participating in LSB seed supply system of the household by the factor of 1.35, which is significant at 1% level. That is, farmers with large number of family size are more probable to participate in LSB seed supply system.

**Credit Access of improved seed (ACREDIT):** Farmers access credit of improved seed as an input to improve their farm productivity. Uses of credit increase productivity of crop per unit area, which would improve total production per household and more food, will be available for farmers who use credit as compared to the non-users. Therefore, it has a positive relationship with household participation in seed supply system. The result from the model indicates that keeping all other factors constant the LSB seed supply system participants have credit access increased by a factor of 3.34 fold as compared to the odd of seed supply system of they haven't access of credit, which is significant at 1% level. Earlier studies also confirm that credit is one of factors influence adoption or participation in application of new technologies (Yishak, 2005).

**Market accessibility (AMKT)**: the distance they travel to sell their agricultural products, to purchase improved seed and the reasonability of price for their products matter most for the rural HH to get their right benefit. Thus, the accessibility of market has a positive relation with LSB seed supply system participation. In other words, as the distance the farmers travel increase, there will be a negative relation to LSB seed supply system participation because they cannot easily transport their agricultural and livestock products and at the same time information about the market situation is not accessible.

The result from the model indicates that keeping all other variables constant for one kilometer increase in the distance that the framer travel from the market is associated with a 2.79 factor decrease in the LSB seed supply system of the household. Islam (1988, as cited in Nyariki and Wiggins, 1997) has documented that the market situation of different households in different infrastructure development area have different access to food. A

similar argument, given by Webb et al. (1992, as quoted in Workneh, 2006) has shown that famine in Ethiopia is induced by isolation of farm households from the major markets together with other limiting factors.

**Extension service (EXSERICE):** Extension service availability or contact of farmers with DA influences the participation of farmers in seed supply system**.** This indicates that farmer who has got better extension service, more willing to participate in seed multiplication than the other. These results go in line with the conclusion of Bahadur (2004).

According to this study, the coefficient of extension service was found positively significant, which implies that regular visit of an extension worker is necessary to enhance the rate of adoption by providing necessary information, knowledge and skills to the farmers. The decomposition results describe a unit changes in availability of extension service increase the participation positively with 6.17 units and the land allocated for seed production increase.

**Radio ownership (RADIO):** Radio ownership indicate accessibility of the participant in seed supply system farmers to information like price of seed which expected to influence the demand for seed. This variable found to influence farmers participation in LSB seed supply system positively. The result from the model indicates that keeping all other variables constant depicts increase in the ownership of Radio improves farmers' participation in LSB seed supply system. The decomposition the result of coefficient (Table 2.12) indicates ownership of radio increase to participate in LSB seed supply system with 2.79 factors.

# CHAPTER FIVE

## 5. SUMMARY AND RECOMMENDATIONS

### 5.1. Summary

The study area Atsbiwomberta woreda is one of the potential for crop producing in the region. To determine the seed supply system of the respondents, inputs required and obtained last year are taken into considerations.

The study was conducted in order to analyze the seed supply system of the area. It also tried to investigate, the status of linkage among actors involved in the system, influential factors for the smooth functioning of the system and the enabling policy environment toward the system. To see the status of linkage among partners, linkage matrix tools were used. For identifying the influential factors both qualitative and quantitative method of data collection were used i.e. for seed suppliers, qualitative analysis was used through questionnaires distributed, and for farmers FGD and interview schedule were conducted to collect data and analyzed using descriptive statistics and logit from econometrics model. As to the enabling policy environment, Government policy content analysis on seed was made using different documents of policy and regulations of the country versus implementations.

According to the result of the study, linkage between farmers and among actors like WARDO, EZARDD, TARI, ISSD MU and Cooperatives found to be relatively strong. As to influential factors for the smooth functioning of the system, from seed providers side; organizational mandatory clarity skilled man power, setback of temporary loan settlement by users, policy environment, efficient marketing system, timely demand claims from users, clearly defined role and responsibilities of each partner, availability of improved seeds in terms of their germination, viability and adaptability, research centers cooperation and willingness to share resources including knowledge, farmers willingness to take risks and demand for improved seed varieties were some of mentioned factors that influence the system positively and/or negatively.

Moreover, from users' survey, the results of econometric model indicated the relative influence of different explanatory variables on the response variable. A total of thirteen (13) explanatory variables were included into the model, of which four (4) of them had shown significant influence on the dependent variable (participants in seed supply systems). Family size, improved seed credit services, extension service, and radio ownership access to market found to have positive and significant influence on participation in seed supply system.

Regarding to the enabling policy environment, rules and regulations to implement policies and strategies found to be mainly constrained with lack of flexibility and commitment. Though the policy invited actors to involve in the system, especially in seed supply system and markets, due to lack of efficient management system and facilitation role by the bureaucracy, it is found to be not as expected. Accordingly, issues like durations for seed release and registration, cooperative capacity, quarantine measures for imported/shopped seeds and attention to seed biodiversity were some points raised from supply sector and pricing, quantity and credit system were some of issues raised from users to be revisited in the policy to strengthen the system and hence to create efficient and effective seed delivery to farmers as to increase production and productivity of the study area in particular and the nation at large.

## 5.2. Conclusion and Recommendations

To bring sustainable agricultural development and ensure food self sufficiency of the nation, actors involved in the sector should act synergistically. Services like extension, seed supply, credit provision, research and development were amongst all delivered in the project area for the realization of bringing about change at the peasant sector.

Seed supply in line with efficient extension service would lead to ensure enhanced production and productivity. However, the supplies of these productions enhancing seed supply system were constrained with various factors.

These factors together with several personal, situational, socioeconomic, and institutional and organizational factors greatly affected the seed supply system of the sector in the area

under study. Based on the research findings of this study, the following points are recommended to improve participation on seed supply system of the study area.

For the strength of the system, the existence of strong linkage among actors within the system has a vital importance in a way that to transfer knowledge and provision of seed supply system in efficient and effective manner. Therefore, creating strong relationship among relevant actors through platforms, workshops and symposia has to consider with the aim of bringing strong partnership to reverse the existing livelihood status of the peasant sector.

Inaccessibility of credit is found to be serious problem to increase farmers' productivity in the sector. This, in response, disfavored the majority of small scale farmers in lowering their livelihood status and resulting for food shortage. Therefore, by improving the efficiency of credit system, timely and sufficient amount of delivering credit to farmers who engaged on crop production has to be considered as a central and core component of any development intervention in the sector. In line with this, due attention has to given to women farmers group to empower them and participate in productive activities through delivering agricultural input credits as to minimize vulnerability and improve their livelihood status.

Provision of seed timely and at affordable price according as to the demand of beneficiaries is crucial to boost up production and productivity of smallholder farmers. Accordingly organizing farmers groups through primary cooperatives has significant importance to deliver seed via cooperatives at the beneficiary disposal. Therefore, attention has to given for the strengthening of farmers organizations to involve in seed distribution and credit provision for farmers and enhance bargaining power in competitive markets with support of GOs and NGOs involved in the sector.

To resolve problems related to the use of production enhancing inputs by farmers, establishing efficient extension service in the study area is mandatory. In this regard, the extension organization should work in harmony with research centers and NGOs in updating knowledge to be transferred to farmers' research extension groups (FREG) supported with relevant extension methods and approaches. Likewise, the extension

service should give attention in accessing information/knowledge to women farmers through including women groups in its program as to participate in income generating activities and for accumulation of capital at household level.

Moreover, attention has to be given by local administration to rural development and agricultural extension activities in facilitating infrastructures related to road and transportations for market in/outlets to change the life of resource poor farmers in particular and the rural society at large.

With regard to the enabling policy environment, flexibility of laws and changing paper to action is very important for the smooth functioning of the system. Flexible laws that could accommodate and recognize other informal types of organization like 'groups' may enhance the seed supply system by service providers as to assist according to farmers need and willingness to involve in interventions to be conducted. Therefore, to fill the gap, polices related to farmers organization (groups), channeling efficient and effective credit service, time given for release and registration of new seed varieties, appropriate quarantine services to shopped and imported crop varieties, attention to seed biodiversity particularly those of our endemic/indigenous crop varieties, expansion of public and local seed multiplication farms supported with irrigation facilities and promotion of farmers to farmers seed multiplication and exchange has to be given due emphasis to reverse the impediments encountered due to inflexibility and inability to put in action of intended policies for the sector.

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## *Appendix A*

## 1. *Household identification*

1.1. Questionnaire Number_____
1.2. Category_____ 1.LSB participant 2.Public participant
1.3. Name of HH_____
1.4. Date of interview_____
1.5. Enumerator's name _____ signature_____
1.6. Name of the Tabia_____ Special name (Got)_____
1.7. Name of cooperative _____
1.8. Distance of the Tabia from the Wereda center (Kms)_____
1.9. Checked by_____ signature_____

## *2. Member's information*

2.1. Age of HH _____(year)
2.2. Sex 1) Male 2) Female
2.3. Marital status 1) Married 2) Single 3) Divorced 4) Widowed 5) Separated
2.4. Educational level 1) Illiterate 2) Read and write (religious educ) 3) Primary education 4) other
2.5. Religion 1) Orthodox 2) Muslim 3) Other __
2.6. Total family size _____

## *3. Socio Economic Factors*

3.1. Do you own land? 1. Yes 0. No
3.2. If yes, mention the source and size of farmland? 1. Own farm size_____ 2. From share cropping_____ 3. Rented from other source_____
3.3. Total land size covered by crops (in ha) _____
3.4. What are the sources of family income?
1) From farming activities 2) non farming activities 3) others specify_____
3.5. Cash income from off farm /nonfarm works

| S.No | Operations involved | Total income received in years (birr) |
|---|---|---|
| 1 | Daily laborer | |
| 2 | Homemade drink | |
| 3 | Handicraft | |
| 4 | Firewood selling | |
| 5 | Others (specify) | |

3.6. What amount of money you earn annually from your income sources? _____

3.7. For what purpose you are using the money you get?

1) To purchase inputs 2) To purchase cattle 3) Clothing

4) Home consumption 5) others _____

3.8. Is the price of inputs affordable? 1. Yes 0. No

3.9. If your answer is no, what was its impact on you in the use of improved crop inputs?

1) using below recommended level 3) partly use of package inputs

2) Decision for not using 4) Others specify_____

3.10. How many of your family members do permanently work on farm? _____

3.11. Have you used hired labor on farm? 1) Yes 0) No

3.12. For what farm activity did you hire labor?

1) Plough 2) weeding 3) harvesting 4) threshing 5) others _____

3.13. Fertility status and soil character of the plots as perceived by the farmer

1) Good 2) medium 3) poor

3.14. Do you feel that your holding is sufficient to produce the amount required to satisfy your home consumption and for generating funds for purchase of other goods you need? 1) Yes 0) no

3.15. If no, which of the following activity did you perform to raise your income?

1) Selling labor 2) weaving 3) local drink sale 4) trading 5) Nothing 6) others___

## *4. Situational Factors*

4.1. Is there road facility which helps you for input purchase and market out late?

1) Yes 0) No

4.2. If your answer is yes, what type of road you are using?

1) all weather road 2) winter season road 3) others specify

4.3. If your answer for question 4.2 is no, how do you cope up?_____

4.4. What do you use to bring agricultural inputs from the source?

1) Transport car 2) Own cart 3) Equines 4) others_____

4.5. How much hour will you spent to reach to the nearest input market from your home?_

4.6. How do you evaluate the facilities related to road and transportation means in relation to input use?

_____

_____

4.7. Do you have access to market for your produce? 1) Yes 0) No

4.8. If no, what is/are the main constraint (s) regarding access to market?

1) Unable to get market information 2) Far distant of market place

3) Unable to get alternative market 4) Lack of means of transportation 5) others

## *5. Organizational and Institutional Factors*

5.1. Are there credit institutions at your disposal? 1) Yes 0) No

5.2. If your answer is yes, what is the name of credit institution? _____

5.3. Are you ever used credit from the organization? 1) Yes 0) No

5.3.1. If your answer is yes, how frequent you are using credit from the institution?

1) Once per a year 2) twice per a year 3) others specify_____

5.3.2. What is the type of credit you obtained? 1) in cash 2) in kind

5.3.3. If it is cash, for what purpose you borrowed the money?

1) to purchase inputs 2) For home consumption 3) Others specify_____

5.3.4. If your answer for 5.3.3 is to purchase inputs, what type of inputs you purchased?

1) Seed 2) Fertilizer 3) Farm tools 4) Pesticides 5) Others_____

5.3.5. If it is in kind, what are the inputs you borrowed?

1) Seed 2) Fertilizer 3) Farm tools 4) Pesticides 5) Others_____

5.4. If your answer for question 5.1 is no, what is the source of your money to purchase inputs?

1) From own farm income 2) Borrowed from neighbors

3) Gift from relatives 4) others

5.5. What type of inputs you purchased last year?

1) seed 2) seedling 3) Fertilizer 4) Farm tools 5) Pesticides 6) Others __

5.6. If your answer for question 5.3 is no, what is your reason to not borrow?

1) High interest rate 2) Presence of own money 3)Lack of collateral 4) Others

5.7. What problem you are encountered related to input credit?

_____

_____

_____

5.8. What is your suggestion for efficient input credit service in the future?

_____

_____

_____

5.9. Is there storage facility nearby to store agricultural inputs? 1) Yes 0) No

5.10. If your answer is yes, what is its contribution to your farming activity?

1) to get inputs timely 2) To minimize transport cost 3) Others specify_____

5.11. If your answer is no, how much time do you spent to reach to the nearest input distribution center? _____

5.12. Does the distance have negative effect on you in using agricultural inputs?

1) Yes 0) No

5.13. If your answer is yes, what do you suggest to improve the service?

_____

_____

_____

5.14. Is there service cooperative in your area? 1) Yes 0) No

5.15. If your answer is yes, are you a member of service cooperative? 1) Yes 2) No

5.16. If your answer is yes, what service do you get from service cooperative?

1) input credit 2) Crop marketing 3) Credit and saving 4) Others specify____

5.17. If the service cooperative works on input distribution, being as a member what are the problems encountered during distribution and what is your suggestion to improve service delivery.

5.17.1. Problems encountered

_____

_____

_____

5.17.2. Suggested solutions

_____

_____

_____

5.18. If your answer for question 31 is no, what possibilities you have, to get services from a service cooperative?

_____

_____

_____

5.19. Did you have any contact with Development agent in your area? 1) Yes 0) No

5.19.1. If yes, frequency of contact?

1) Once in a week 2) Once in two weeks 4) Once in a month 5) other

5.19.2. If no, why? 1) No DA nearby 2) No need for service 3) Others (specify)

5.20. What types of service most of the time you are getting from DAs?

1) Technical support 2) Theoretical information 3) Input Supply

4) Experience sharing 5) others specify_____.

5.21. Are you ever participated in extension training? 1) Yes 0) No

5.22. If yes, in what area of extension training you have participated?

_____

_____

_____

5.23. Was the training contributed for the use of improved agricultural inputs?

1) Yes 0) No

5.24. If yes what are the significant contribution of the training in using agricultural inputs?

1) increased the demand for fertilizer use 2) increased the demand for seed use

3) Increased the demand for farm tools use 4) increased the demand for pesticide use

5) Others specify_____

5.25. If your answer for question 5.23 is no, why?

1) Not invited to participate 2) No interest in the program 3) Others _____

5.26. Have you ever attended any farmers' field day last year? 1) Yes 0) No

5.27. If no, why

1) Not invited to participate 2) No interest in the program 3) Others specify___

5.28. Have you ever hosted, extension demonstration, or on farm experiments on your field last year? 1) Yes 0) No

5.29. If not, why?

1) Not invited to do 2) Not interest in the program 3) Others specify_____

5.30. Did you have a radio/television? 1) Yes 0) No

5.31. If your answer is yes did you follow agricultural program on the radio/television?

1) Yes 0) No

5.32. Did you share your experience with the community members? 1) Yes 0) No

5.33. Did you follow new technology that is integrated in the woreda? 1) Yes 0) No

## *6. Improved seed availability to the household*

6.1. Did you get improved seed during the last production season? 1) Yes 0) No

6.2. If your answer is yes, how many quintals used? _____

6.3. How did you perceive the price of the improved seed? 1) Cheap 2) Fair 3) Expensive

6.4. If your answer is no, why?

1) I did not need improved seed 2) I have not got improved seed on time

3) Because of the improved seed are very expensive 4) I did not hear about it

5) There are no suppliers of seed in the area 6) Less yielding compare with the normal seed

7) Their quality is not good

6.5. Is there adequate number of supplier? 1) Yes 0) No

6.6. If your answer is yes, how many were there? _____

6.7. If your answer is no, from where the improved seed you get it? _____

6.8. Did you use improved seed on your farm? 1) Yes 0) No

6.9. If your answer is no, state your reason.

1) I did not need improved seed 2) I have not got improved seed on time

3) Because of the improved seed are very expensive 4) I did not hear about it

5) There are no suppliers of seed in the area 6) Less yielding compare with the normal

7) Their quality is not good

6.10. Did you share /sale part of the inputs to other (relatives and friends)? 1) Yes 0) No

6.11. If your answer is yes, how much (Qts)? _____

6.12. How much improved seed used in one hector?

1) 10-15 Kg 2) 15-20Kg 3) 20-25 Kg 4) Other /specify_____

6.13. Did you get improved seed you requested on packed? 1) Yes 0) No

6.14. Did you have the experience of using improved seed credit? 1) Yes 0) No

6.15. If your answer is yes for how long did you use improved seed credit? _____years.

6.16. If your answer is no, why?

1) Interest rate is high 2) I don't need credit 3) credit delivery is not convenient 4) others_____

6.17. Did you face shortage of improved seed to enhance your production and consumption purpose and took improved seed credit to alleviate the shortage of improved seed during the year? 1) Yes 2) No

6.18. If your answer is yes, for what purpose?

1) To improve production 2 ) for consumption purpose 3 ) to store for the next year
4 ) it have better quality 5 ) to increase my income 6) Others (specify) _____

6.19. From whom and how much improved seed did you borrow to alleviate the shortage of seed?

6.19.1. List on the following table

| s/n | Source of credit | Amount in quintal | interest | Total repaid | Arrear |
|---|---|---|---|---|---|
| | | | | | |
| 1 | From cooperatives | | | | |
| 2 | From BOA | | | | |
| 3 | From relatives | | | | |
| 4 | Others | | | | |
| | Total | | | | |

6.20. Why did you borrow from the above mentioned sources?

1) Less collateral required 2 ) Easier to get loan 3) they provided high quality seed
4) it's nearer 5 ) they provided on time

6) Cheapest source of credit that could be found 7) other reasons _____

6.21. Did you get different variety of improved seed you requested? 1) Yes 0) No

6.22. If your answer is yes from mostly you get it?

1) Cooperatives 2) BOA 3) others _____

6.23. Did you get the amount of credit of improved seed you requested? 1) Yes 0) No

6.24. If your answer is yes, how much? _____If not, why?

_____
____

6.25. Did you get credit improved seed service on time? 1) Yes 0) No

6.26. Did the use of credit bring significant change in your living standard? 1) Yes 0) No

6.27. If your answer is yes, in what aspect?

1) I secure my food consumption 2) my income is increased 3) I produced high quality seed

4) my production has increased 5) other_____

6.28. Did you support the community through distribution of the improveseed?1)Yes 0) No

## 7. ACTORS MAPPING, AND THEIR LINKAGE

7.1. Who are the actors in relation to seed supply system? Indicate their function and strengths of linkages with you? (to indicate use "√ ")

| No | Name of the actors | Function | Status of linkage | | | |
|---|---|---|---|---|---|---|
| | | | V/strong (3) | Strong (2) | Weak (1) | None (0) |
| 1 | WARDO | - Knowledge transfer and input and extension service | | | | |
| 2 | EZARDD | - Knowledge transfer and input and technical support | | | | |
| 3 | Farmers' service cooperatives | - input delivery, purchase of crop produce and credit service service | | | | |
| 4 | ISSD MU | - Knowledge transfer & input and technical support | | | | |
| 5 | TARI | - Knowledge transfer & input delivery | | | | |
| | Others (specify) | | | | | |

7.2 How do you evaluate the frequency of participation of actors in delivering improved agricultural knowledge? (to indicate use "√ ")

| No | Name of the actors | Frequency | | |
|---|---|---|---|---|
| | | Frequently (2) | Sometimes (1) | Rarely (0) |
| 1 | WARDO | | | |
| 2 | TARI | | | |
| 3 | ISSD MU | | | |
| 4 | Others specify | | | |
| | | | | |

## 8. Questionnaire for actors involved in seed supply system

Name of the organization_____

Address_____

_____

Major occupation

_____

_____

_____

1. Types of seed supply system to the farmers for last one year's according to farmers demand (only applicable for material input providers)

| S.No | Types of inputs delivered | Unit | 2004 E.C | | Total | |
|---|---|---|---|---|---|---|
| | | | Demand | Supply | Demand | Supply |
| 1 | Type of Improved seed<br>1.<br>2.<br>3. | | | | | |
| 2 | Fertilizer<br>- DAP<br>- UREA | | | | | |
| 3 | Plant protection chemicals | | | | | |
| 4 | Credit | | | | | |
| 5 | Others (specify) | | | | | |

2. What are the opportunities for the organization to achieve the proposed goals?

_____
_____
_____
_____
_____
_____
_____
_____
_____

3. What are the major factors that influence the smooth functioning of the organization? Justify how each factor affects.

_____
_____

4. Does your organization has any integration /linkage with related organizations.

1) Yes 2) No

5. If your answer for question 4 is yes, fill the following table? Use (□ ) to indicate

| SN | Name of the organization | The status of linkage | | | |
|---|---|---|---|---|---|
| | | V. Strong | Strong | Weak | None |
| 1 | WARDO | | | | |
| 2 | TARI | | | | |
| 3 | ISSD MU | | | | |
| 4 | EZARDD | | | | |
| 5 | Cooperatives | | | | |
| 6 | Others specify | | | | |

6. What support you get from each of mentioned actors?

_____
_____
_____
_____
_____
_____

7. Is/are there constraint/s in relation to policy environment? 1/ yes 2/ no

8. If your answer is yes what is/are the constraint/s?

_____
_____
_____
_____
_____

9. What do you suggest for improvement of your organization service in relation to seed supply system?

_____
_____
_____
_____
_____

10/ Do you have a trend in collecting feedbacks from users? 1/ yes 2/ no

11/ If your answer is yes, what are the feedbacks for your services?

| S.No | Types of service delivered | Feedbacks from users |
|---|---|---|
| 1 | Input supply | |
| 2 | Credit provision | |
| 3 | Knowledge transfer | |

12/ Does your organization incorporate users feedbacks in its plan, for better service?

1) yes 2) no

13/ If your answer is yes, what changes are made as the result of perceived feedbacks?

| SN | Perceived Feedbacks | Changes made |
|---|---|---|
| 1 | Improving the quality of inputs | |
| 2 | Improving the quantity of inputs | |
| 3 | Improving input delivery network | |
| 4 | Improving input delivery timeliness | |
| 5 | Improving input credit delivery network | |
| 6 | Improving the type of knowledge delivered | |
| 7 | Improving the frequency of knowledge delivered | |
| 8 | Others specify | |

14/ Does your organization has compensation plan for farmers who faced crop failure due to low quality of your inputs? 1) yes 2) no

15/ If your answer is yes, explain?_____

_____

_____

_____

_____

16/ Does your organization encourage users by giving incentives for better adoption of your inputs? 1) yes 2) no

17/ If your answer is yes, what criteria are used to select users and what type of incentives are given so far?

_____

_____

_____

_____

_____

18/ How do you evaluate your users satisfaction? Put (X) mark in the most appropriate column.

| SNo | Types of service delivered | Level of user satisfaction | | | |
|---|---|---|---|---|---|
| | | Very | Good | Fair | Ba |
| 1 | Input supply | | | | |
| 2 | Credit provision | | | | |
| 3 | Knowledge transfer | | | | |

19/ what is your suggestion for the smooth functioning of seed supply system?

_____
_____
_____
_____
_____

## 9. Check list for focus group discussions (FGD) for MHH

Name of PA_____

Name of farmers participated in FGD Occupation in PA

1._____ _____

2._____ _____

3_____ _____

4._____ _____

5._____ _____

6._____ _____

1. What are the possible agricultural inputs you use in your area and how do you explain seed supply system related to improved seed?

2. Who are the actors involved in agricultural seed supply system? How is the status of linkage and knowledge sharing with you?

| SN | Name of the actors | Function | Status of linkage with farmers | | | Frequency of K flow | | |
|---|---|---|---|---|---|---|---|---|
| | | | V. strong | Strong | Weak | Freq. | Sometimes | Rarely |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

3. What are the influential factors related to seed supply system and what constraints do you have in using inputs/services?

4. How do you rank the influential factors regarding seed supply system?

| SN | Name of actors | Frequency of knowledge flow | | |
|---|---|---|---|---|
| | | Frequently | Sometimes | Rarely |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

5. What are your suggestions to improve the situations?

6. What are the opportunities, which can be capitalized?

## 10. Check list for focus group discussions (FGD) for FHH

Name of PA_____

Name of farmers participated in FGD Occupation in PA

1._____ _____

2._____ _____

3_____ _____

4._____ _____

5._____ _____

1. Do you have access and utilization to agricultural inputs/services? 1/ yes 2/no

2. If your answer is yes, what are the possible agricultural inputs you use in your area and how do you explain agricultural input/service delivery related to improved seed?

3. If your answer is no, what are the reasons?

4. From whom do you share information/knowledge?

| SN | Influential factors | Score | Sum | Rank |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

5. What are the influential factors related to seed supply system and what constraints do you have in using inputs/services?

6. What are your suggestions to improve the situations?_____

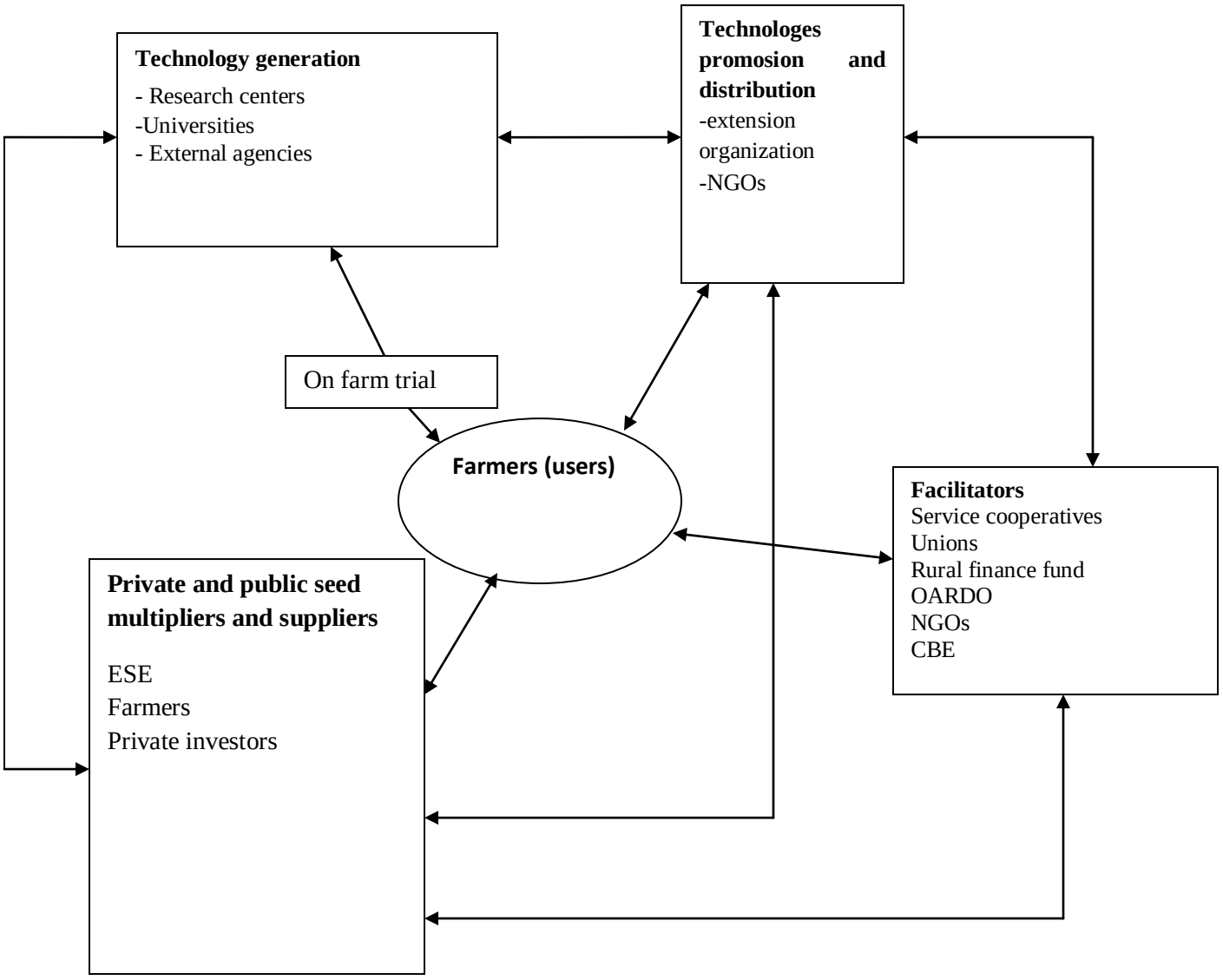
## Appendix B

Appendix Table 1: Descriptions of independent variables

| Variables | Variable type | Expected sign | Value |
|---|---|---|---|
| Age | Continuous | + | Measured in years |
| Education level | Categorical | + | Measured in categorical scale |
| Family Size | Categorical | + | Measured in number |
| Fertility characteristics land | Categorical | + | Measured in hectares |
| Sex | Dummy | + | Takes a value of 1 for male |
| | | | 0 otherwise |
| Radio ownership | Dummy | + | Takes a value of 1 for yes |
| | | | 0 otherwise |
| Available seed on time | Dummy | + | Takes a value of 1 for yes |
| | | | 0 otherwise |
| Access to market | Dummy | + | Takes a value of 1 for yes |
| | | | 0 otherwise |
| Access to credit | Dummy | + | Takes a value of 1 for yes |
| | | | 0 otherwise |
| Seed price | Dummy | - | Takes a value of 1 for yes |
| | | | 0 otherwise |
| Extension contact | Continuous | + | Measured in number of contact |
| Availability Quality seed | Dummy | + | Takes a value of 1 for yes |
| | | | 0 otherwise |

# Appendix C Supportive Figures

Appendix Figure 1: Map of agricultural input – supply system




Source: EZARDD, 2009.

Key:

⟷ Two way communication