COMPARATIVE ANALYSIS OF DIRECT HYBRID MAIZE SEED MARKETING AND CONVENTIONAL SEED DISTRIBUTION SYSTEM IN EASTERN WELLEGA ZONE: THE CASE OF SIBU SIRE AND GOBU SEYO WOREDAS

M.Sc. Thesis

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Haramaya University

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By
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As thesis Research advisors, we hereby certify that we have read and evaluated this thesis prepared, under our guidance, by Arfassa Kiross, titled comparative analysis of direct hybrid maize seed marketing and conventional seed distribution system in Eastern Wellega Zone: The case of Sibu Sire and Gobu Seyo *Woreda*s. We recommend that it be submitted as fulfilling the Thesis requirement.

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DEDICATION

I dedicate this thesis manuscript to my mother W/ro Terefech Wariyo, my Father Ato Kiross Meko, Ato Merid Seyoum of Awassa College of Agriculture, and my mother in-law W/ro Altaye Wakeyo for their continuous contribution throughout my life but whom I lost them at my early stage. May God bless their soul in heaven.

STATEMENT OF AUTHOR

First, I declare that this thesis is my own work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Haramaya University and is deposited at the University Library to be available to borrowers under rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHIC SKETCH

The author was born in April 1976 in Gidami Woreda Kelem Wellega zone Oromia region. He attended his elementary and junior education at Gidami and secondary school at Kelem Comprehensive Secondary School respectively. After passing ESLCE, at diploma level then he joined Awassa College of Agriculture. After graduation he started working at Sinana Agricultural Research Center as research technician. After serving several years, he joined again Hawassa University and graduated in Agricultural Resource Economics and Management with Bachelor of Science in 2008.Again in December 2008 he promoted to junior researcher II in Sinana Agricultural research center. In September 2009 he joined Oromia Seed Enterprise – Integrated Seed Sector Development program as agribusiness expert. He joined Haramaya University in July 2011 to pursue his M.Sc. degree in Agricultural Economics in summer program**.**

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ACRONYMS AND ABBREVIATIONS

AISCO	Agricultural Input Supply Corporation
ASE	Amhara Seed Enterprise
BoARD	Bureau of Agricultural Rural Development
CBSS	Community-Based Seed System
CSA	Central Statistical Authority
CSDS	Conventional Seed Distribution System
CTA	Agricultural Technical Center
DA	Development Agent
DSMS	Direct Seed Marketing System
ESE	Ethiopian Seed Enterprise
FAO	Food and Agriculture Organization
GOE	Government of Ethiopia
ISSD	Integrated Seed Sector Development
LSB	Local Seed Business
MoARD	Ministry of Agriculture and Rural Development
NARS	National Agricultural Research Systems
OSE	Oromia Seed Enterprise
RSEs	Regional Seed Enterprises
SRSE	Southern Nations Nationalities and Peoples Region Seed Enterprise
qt	Quintal
TGMM	Total Gross Marketing Margin

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ABSTRACT

Ethiopia is devoting towards fast development stage including agricultural sector to eradicate poverty, to accelerate growth in national economy. For agricultural sector development, seed is a fundamental and basic element to improve production and productivity using other complementary inputs and innovative systems. In this regard effective seed delivery and market oriented seed system needs considerable attention. Towards that direct seed marketing was designed parallel to conventional seed distribution as an alternative seed marketing and implemented in Sibu Sire Woreda with the joint effort of Ethiopia government and collaborative work of Integrated Seed Sector Development program. This study was conducted objectively to compare the performance of conventional seed distribution and direct hybrid maize seed marketing system and to identify factors affecting the quantity of hybrid maize seed purchased by farmers. Both primary and secondary data were collected. Primary data were collected from 140 randomly selected respondent farmers in the 2012/13 production season. Descriptive statistics and OLS regression model were used for data analysis. The result indicated that quantity of fertilizer used, livestock owned, land size, cost of seed, family size, educational level, annual income, and frequency of extension contact significantly affecting quantity of seed purchased by farmers. In terms of performance, direct seed marketing is more efficient than conventional seed distribution. DSMS is assuring farmers' satisfaction in supplying required varieties, in quantity, quality, place, and time with accountability and traceability. The study revealed the betterment of direct seed marketing compared to the conventional system in terms of benefiting of farmers in saving resources and reducing load of work from the woreda experts. Thus, it is necessary to incorporate direct seed marketing program in to Ethiopia seed system by taking in to consideration the socio-economic characteristics of the country.

Keywords: Conventional seed distribution system, Hybrid maize seed, Direct seed marketing, OLS.

1. INTRODUCTION

1.1 Background of the Study

Agricultural sector being the linchpin of the country's economy continues to be the largest sector and a dominant driving force for the development and growth of national economy. It is a core driver of Ethiopia's economy, supporting 85 percent of the population's livelihoods and accounting for 43 percent of gross domestic product and 90 percent of export value (MoFED, 2011). Given the significant current and future role of the agricultural sector, a vibrant seed system that provides quality seed to meet the demand of farmers is an essential enabler to continued economic and social development of Ethiopia (Sahidur *et al.,* 2010).

Sahidur *et.al*. (2010) denoted that agriculture continues to be the dominant sector in Ethiopia's economy, with cereals playing a central role. Grain production and marketing are particularly important. Several studies show that cereals account for 65 percent of the agricultural value added equivalent to about 30 percent of the national GDP. Among major cereals, maize is one of the largest cereal commodity in terms of total production, acreage, and the number of farm holdings.

Maize is the largest and most productive crop in Ethiopia. In 2013 maize production coverage area was 2,013, 044.93 hectares with total production of 61,583,175.95 quintals (CSA, 2013). Over half of all Ethiopian farmers grow maize, mostly for subsistence, with 75 % of all maize produced being consumed by the farming household. From 2001 to 2011, maize production increased by 50%, due to increases in both yields (+25%) and area under cultivation (+20%). However, estimates indicate that the current maize yield could be doubled if farmers adopt higher quality inputs and proven agronomic practices (Shahidur *et al.,* 2010).

As compared to other cereals, maize can attain the highest potential yield per unit area. Maize is produced worldwide on 162 million hectares in more than 180 countries, including 125 developing countries with a total production of 844 million tones (FAOSTAT, 2012). World average yield for maize is about 4.5 t/ha and that of developed countries is 6.2 tonne/ha. The average yield in developing countries is 2.5 tonne/ha. Currently, Ethiopia is the fourth largest maize producing country in Africa, and first in the

East African region (FAO, 2012). It is also significant that Ethiopia produces non-genetically modified (GMO) white maize, the preferred type of maize in neighboring markets. In Ethiopia, the national average yield is about 3.059 t/ha (CSA, 2012). Maize is mainly grown in the four big regions of the country: Oromia, Amhara, SNNP, and Tigray. Oromia and Amhara contribute to almost eighty percent of the maize produced in 2012 (CSA, 2012*)*. Ten zones found in the two regions contributed to more than half of the national maize production in 2012. Among the top maize producing zones are West Gojjam (5.6 million qt), East Wellega (4.3 million qt), Kaffa (3.8 million qt), East Shewa (3.1 million qt), West Shewa (2.9 million qt), West Arsi (2.7 million qt), Illubabor (2.7 million qt), East Gojjam (2.2 million qt), West Wellega (2.1 million qt), and West Harerghe (2.1 million qt). Other regions such as Benishangul Gumuz and Gambela also grow maize and have the potential to increase their current production level in the future (ATA, 2013)

When we look into the available seed supply system in the country, MoARD employs a bottom-up demand assessment, whereby the regional BoARDs develop annual seed demand statistics with input from woredas, development agents (DAs), and individual farmers about their seed needs. At the end of the cycle, the government allocates supply proportionally through the cooperatives based on the original demand, without considering shifts in demand due to changes in rainfall pattern and market situation. As a result many years, seed supply is well below demand, because of either variation in the original estimates or supply bottlenecks. This shortage of supply created incentives for actors to inflate their demand and for black market sales and corruption to increase. (Dawit, 2010).

To reverse the situation and to strengthen seed distribution system of the country, the Royal Netherlands Embassy (through its formerly Local Seed Business Program, currently Integrated Seed Sector Development (ISSD) is identifying where commercial opportunities may arise and how these can be captured. The effort of the ISSD program is not only limited to seed multiplication/production, but also identification and analysis of seed distribution and seed marketing problems of the country. It has been playing great role in Ethiopia in supporting seed policy development, private seed sector development, local seed business development, partnership and capacity building at different levels (ISSD, 2013**).**

In order to facilitate seed marketing system in Oromia region, pilot test of direct hybrid maize seed marketing project has been operated in Sibu Sire Woreda with the joint effort of Oromia Seed Enterprise and Oromia Bureau of Agriculture by the support of the ISSD program. However, comparative analysis of the performance of pilot direct seed marketing and conventional seed distribution at Sibu Sire and Gobu Seyo Woredas was not conducted. Therefore, this study was intended to fill this gap.

1.2. Statement of the Problem

The agricultural sector is largely characterized by small-scale subsistence farming and low productivity. This low productivity is partly due to limited use of improved crop varieties and associated technologies, so the availability and use of improved varieties and seeds play an important role in this endeavor. Specifically access to and use of seeds are critical factors for the ability of smallholder farmers to increase agricultural production and productivity, ensuring food security and improving livelihoods (Thijssen *et al*., 2008). Farmers' access to seeds characterizes the function of a seed system (Daniel and Adetumbi, 2006).

The need to increase agricultural productivity to enhance food security and reduce poverty in Africa is widely acknowledged (Olaf *et al*., 2011). Improved crop varieties play a critical role in agricultural intensification. Increasing the quality of seeds can increase the yield potential of the crop by significant folds and thus, is one of the most economical and efficient inputs to agricultural development. However, deficiencies have been observed in improved seed supply due to inadequacies in seed varieties demanded and quantity required, prices, and untimely seed delivery (Sahlu and Bishaw, 2008). Ethiopian agriculture requires over 700,000 tons of seed each year to grow cereals and pulse. But the commercial sector supplies 20,000–30,000 tons of seed per year across all crops. For instance in case of maize, over 6 million farmers (80 percent) cultivate land where commercial maize seeds could be used and to productivity, but seeds are available for purchase by only 1.2 million farmers (30 percent) (Dawit, 2010)

Despite improved seed varieties can help to improve the food security and livelihoods of small-scale farm families, successful seed marketing can be hindered by poor road conditions, limited transportation and storage facilities, and rising costs of transportation. The bad roads and long shipping distances limit the transport services and drive up the

cost of carting seeds, a cost that is passed on to farmers in terms of final seed price. This could be one reason for the adoption of improved varieties of major crops such as maize has remained low in Ethiopia. In Ethiopia, it was noted that the public seed organization dominance in improved seed supply is a major reason for a limited access by smallholder farmers to improved varieties and suggested for more involvement of the private sector. The seed system in developing countries including Ethiopia is intricate and a single seed source which does not satisfy the seed needs of the farming community (Spielman *et al.*, 2010).

Despite the release of several improved crop varieties, there has been limited use of improved seeds by the majority of farmers (CSA, 2010). Among others, unavailability of quality seeds at the right place and time coupled with poor promotion system is one of the key factors accounting for limited use of improved seeds, further contributing to low agricultural productivity. Poor availability and promotion of improved seeds is due to inefficiency of the seed system of the country (Atilew and Lijalem, 2010)

In Ethiopia, market oriented seed marketing is not well developed; but it is known as seed distribution through government organization or public channels to reach farmers with improved seed. For example, the seed marketing work of ESE was limited to bulk delivery to the state farms and Agricultural Inputs Supply Corporation (AISCO) at the processing centers. Seed marketing in Ethiopia is characterized by limited competition, insufficient supply of seed relative to demand, limited choice in the few varieties that are available, and excessively high costs of maize seed production (Dawit *et al.*, 2008).

Shortcomings in seed quality and timeliness of delivery have been an issue in Ethiopia for several reasons. For instance, 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 often not being conducted in a timely or coordinated manner. Consequently, seed is either distributed after the optimal planting time, or the varieties distributed are not appropriate to changes in farmers' expectations of weather (Sahlu, and Kahsay, 2002).

Seed quality deterioration, including adulteration and weight reduction in route is common and frequently observable facts. This is further aggravated by use of multipurpose storage by cooperative unions and lack of suitable storage facilities by primary cooperatives,

especially when there is a carry-over of the seed. In addition, seed quality deterioration will also arise during transporting from one place to another (Personal communication)

Thus, to compare centralized seed distribution system through government organization with seed marketing system, this research was conducted to explore information on the performance of direct seed marketing of the Sibu Sire *Woreda* which has been setup by the ISSD program support for the establishment of direct seed marketing (through seed dealer/agent) with the accountability participation of seed suppliers including public seed, private and union. In order to scaling –up the best practice of the programmes to other similar Woredas and to support in formulation of direct seed marketing policy, studying and analysing its merits and demerits are important in terms of on-time availability, quality aspect, and place

1.3. Research Questions

The study was conducted to answer the following specific research questions.

i. How are the performances of direct hybrid maize seed marketing and conventional seed distribution system in terms of availability, quantity, and timeliness?
ii. What are the factors affecting the quantity of seed purchase of farmers?

1.4. Objectives of the Study

The general objective of the study is to compare and analyze conventional hybrid maize seed distribution and direct seed marketing in Sibu Sire and Gobu Seyo Woredas. The specific objectives of the study are:

1. To compare the performance of conventional seed distribution and direct hybrid maize seed marketing system and
2. To identify factors affecting the quantity of hybrid maize seed purchased by farmers.

1.5. Significance of the Study

This study is important to producers and to all actors in the seed marketing system. The performance of marketing of hybrid maize has positive impact on the income of producers, processors, suppliers and consumers. The information generated from the study will be useful for public and private seed enterprises, for government organization policy

makers, Universities, Research Centers, NGOs, seed producer cooperatives, traders, and others.

1.6. Scope and Limitations of Study

The study was limited to Sibu Sire Woreda farmers involved in hybrid maize purchase using direct seed marketing and to Gobu Seyo Woreda for the conventional seed marketing system for maize production purpose. The study focused on maize production area coverage and with the sampled respondent farmers participated in the survey interview schedule in respective of two Woredas. Even though farmers in the study areas produce a variety of crops ranging from annual to perennial, and food and cash crops the study target crop was maize, which takes first rank in area and productivity among cereals and this study limited to maize seed marketing system only due resource constraints.

1.7. Organization of the Thesis

The thesis of this particular research result has been organized as follows. Chapter one focused on introduction of the agriculture and seed system. Chapter 2 presents review of literature on seed, seed system, seed market and empirical study from different sources. Subsequently, description of the study area and methodologies are presented in Chapter 3. In Chapter 4, both descriptive and econometric results are presented and discussed in detail. Chapter 5 summarizes the main findings of the study and draws conclusion with relevant to appropriate recommendations.

2. REVIEW OF LITERATURE

2.1. Basic Definition and Concepts

2.1.1. Seed

The term “seed” is used in the agronomic sense, to include any type of planting material intended for use in producing a crop, i.e. either generative or vegetative, such as roots, tubers, bulbs, cuttings and rhizomes seed. Seed is not only a carrier of the genetic resources for food and agriculture, it is also a basic element of any crop production system and thus fundamental for food security and rural development. In this sense, seed has to be physically available at an affordable price, at the right time, in the right place and in the right quantity, and with the right genetic attributes and quality (purity, physiological and sanitary conditions) for it to have the desired impact (FAO, 1994).

A seed is a living organism that carries the genetic properties of plants. These genetic properties place an upper limit on yield potential and influence the productivity of other inputs by determining the ability of plants to convert sunlight, water, air, soil, and other nutrients into biomass. At the same time, improved seed can make a contribution to productivity independent of other inputs. And also, seed is the indispensable input for all agricultural production. For thousands of years, seeds were selected and preserved in an empirical way, but great progress has been made since the end of the18^{th} century thanks to the systematic improvement of plants. In another field of study, seed can be defined as parts of agricultural, silvicultural, and horticultural plants used for sowing or planting purposes (Mywish *et al.*, 1999)

Seed is an essential, strategic, and relatively inexpensive input to agriculture with a high rate of return on investment that often sets the upper limit for crop production and the access to seed by farmers is a basic human right simply because seed is life (Augustine, 2005).

2.1.2. Seed system

A seed system is a systematic arrangement of the procedures, rules and regulations to ensure adequate seed supply to farming communities. Three types of seed systems are often identified, formal, informal and integrated seed systems (ISSD).The formal system

includes production and distribution of seed through public (government) and private sector organizations. Through this system, seed of standard quality, genetic purity and variety identity is produced and distributed. Seed System represents the entire complex organization, individual and institutions associated with the development, multiplication, processing, storage, distribution and marketing of seed in any country (Amstel *et al*., 1995).

In formal seed system, 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. They help to determine the quantity, quality, and cost of seeds passing through the seed system which influence the structure, coordination and performance of the seed system. Informal seed system comprises a bundle of strategies to improve the quality of seed used by farmers, including the improvement of farmer selected and saved seed, and farmer−managed seed production programs. In this study the term "seed system" refers to both, except where it is referred to specifically as "formal" or "informal." (Mywish *et al*., 1999).

2.1.3. Seed production

The procedures for seed production and processing and the standards for seed certification developed slowly with the realization of the importance of quality seed in agriculture. Seed production follows the same technical process as grain production, the difference being that in the case of seed production the process must be more rigorous and closely monitored. Crop inspection and seed testing must be performed at various levels to preserve the seed's genetic purity and germination capacity (FAO, 1999).

2.2. Historical Seed System Development in Ethiopia

The beginning of a formal system dates back to the 1950s with the establishment of breeding programs at the Jimma and Alemaya Agricultural Colleges (Currently Haramaya University). However, breeding and multiplication activities remained ad hoc until the 1970s. In 1976, the National Seed Council (NSC) was set up by the National Crop Improvement Committee (NCIC) to formulate recommendations for seed production and supply of released varieties from the national research programs (Belay, 2002).

Production of improved commercial seed of cereal, legume and oilseed crops was institutionalized in 1978 through the establishment of the Ethiopian Seed Corporation, which was state owned and later on Ethiopia seed enterprise institutionalized in the same year with the following objectives (Dawit, 2007).

In 1990, a joint venture agreement was signed between the Ethiopian Seed Corporation and Pioneer Hybrid International, USA, to procure, process, condition, distribute and sell seeds and other agricultural products locally. In order to address the food security concerns of the country in general, and to streamline the supply of improved seed, in particular, a mix of formal and informal seed sector development strategies were adopted in 1991.Until 1990, ESE was virtually the sole producer of seeds in the formal seed sector.

In October 1992, the Government of Ethiopia declared a National Seed Industry Policy to facilitate development of healthy seed industry in the national. The dedicated and devoted concern to promote formal and informal seed production through contracting and encouraging farmers to involve into seed side by seed was a noble move made by the Enterprise (Dawit, 2007).

2.3. Current Features of Ethiopian Seed Systems

Seed system in Ethiopia represents the entire complex organizational, institutional, and individual operations associated with the development, multiplication, processing, storage, distribution, and marketing of seed in the country. Farmers, particularly smallholder ones, are involved in multiple kinds of seed systems, which can guarantee them in obtaining the quantity and quality of seeds they need and to market their produce (Abebe and Lijalem, 2010).

Currently, the demand for improved seeds is much higher than the supply. ESE has not been able to meet the growing demands for improved seeds in the country. And even where supply is commonly regarded as adequate as in the case of hybrid maize the number of varieties that are suitable for different agro ecological conditions and farming systems remains limited (Dawit, 2010).

Among the major problems ESE claims to be encountering include dealing with small and dispersed farmers leading to adulteration and inefficiency in operation and transport, default in seed delivery by small farmers in expectation of higher market prices,

substandard quality and quality deterioration during storage at farmer's holdings, inefficient seed demand assessment mechanism, and influence of grain price instability. As future strategy, the ESE considers organizing farmers' seed producer's cooperatives, and intends to limit itself to pre-basic, basic, and parental seed multiplication and intends to strengthen its wholesale and retail activities through opening new stores and nine distribution centers located at strategic locations, use farmer cooperatives as commission agents for seed sales, and increase involvement of private seed dealers (Berhanu *et al.*, 2006).

The seed system in the country is becoming decentralized following the emergence of Regional Agricultural Research Institutes (RARIs) in late 1990s and Regional Seed Enterprises (Oromia seed enterprise, Amhara seed enterprise, South National seed enterprise and Tigray seed enterprise) in early 2009.The experience so far shows that the decentralization of the seed system has the following opportunities over on the national seed system. The opportunities are related to: (i) better research coverage the different agro ecologies;(ii) improved possibility of expanding the production and marketing of seed for all crops; (iii) improving the human and physical capacity at regional level, (iv) improving the possibility of producing locally demanded crop varieties, and (v) the possibility of marketing at relatively lower cost due to reduced cost of transportation (Alemu *et al.*, 2008).

2.4. Seed Marketing System

Marketing is usually seen as a "system" because it comprises several, usually stable, interrelated structures that, along with production, distribution and consumption, underpin the economics of process (Mendoza, 1995).

The term marketing has a variety of meanings. To some shoppers it means purchasing groceries and all other households' needs. From the point of view of farmers or ranchers it means selling their commodities. From the perspective of the handlers of a commodity, it means storing the commodity, transforming the product into a form that consumers want, shipping it to retail outlets, and promoting its sale. All these activities are part of the marketing process (Mendoza, 1995).

Marketing cost include those associated with assembly, transportation, processing, and distribution of farm food to consumers. Marketing is the process of planning and

executing the conception, pricing, promotion, and distribution of ideas, goods, services, organizations, and events to create and maintain relationships that will satisfy individual and organizational objectives (FAO, 1994).

Seed marketing is the most important as well as a challenging aspect of seed industry because of the nature of the product. Seed being a living organism, its quality deteriorate faster. Thus, its shelf life is limited and it must be marketed within the season. Another peculiar feature of seed is that it requires two to three years lead time to meet the specific requirements that is to meet the demand for particular seed, its production has to be organized at least two years in advance. The changes in the weather, price of crop, and price of competing crop, may change the prospects of demand for seed of particular variety at the commencement of sowing season (Singh, 2004).

Seed systems are, by their nature, subject to a variety of unique market and institutional constraints. 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 (MacRobert, 2009).

At present, Ethiopia's formal seed market is still driven by the public sector. The national research system led by the Ethiopian Institute of Agricultural Research and a number of regional research centers and higher learning institutes provides improved varieties in the form of basic (foundation) seed or breeding lines. The ESE then multiplies seed in response to official demand projections articulated by regional bureaus of agriculture (Dawit, 2010).

The subject of seed system development from the farmers' angle, as they are the consumers of seed. It recognizes that the environment in which farmers operate influence their decisions regarding the use of seed, and that based on agro−climatic and resource

endowment factors, they can be broadly classified into different categories. The main objective of agricultural administration relating to seed should be to ensure that farmers of all categories are made "seed secure"; i.e. the seed production and diffusion strategies are consistent with the need to make quality seed available to each of the categories within easy distance, in time, and at a price which they can afford; in other words, the seed system should satisfy the criteria of quality, timeliness, access and affordability. This presupposes a basket of seed development strategies, as the strategy appropriate for one category of farmers might not be so for the others. There is a need for a seed system to be able to meet, the needs of a wide range of farmers (Mywish *et al.,* 1999).

The seed development chain comprises the following components: the first component comprises the agricultural research and varietal release process. Agricultural research develops new varieties, tests them and makes recommendations for their use. The second component consists of the different stages of seed multiplication. Small quantities of breeder seed provided by the breeder are multiplied, first into foundation and then into commercial seed and made available to farmers in commercial quantities. The third component comprises seed processing. In the multiplication of breeder seed to foundation seed and foundation seed to commercial seed, seed is mechanically processed, i.e. dried, cleaned, separated from impurities, sorted, calibrated, treated, packed and labeled, to ensure its quality. The fourth component is market promotion and distribution. It includes regulations relating specifically to varietal release, notification, seed certification, pricing, marketing, subsidies, taxes, import and export. The components of the seed system are highly interdependent − seed legislation, for example, can determine the extent of private sector involvement in varietal development and seed production (Mywish and Howard, 1998).

2.5. Characteristics of Conventional Seed Distribution System

Increased production of agricultural crops depends not only on the development of higher yielding varieties of seeds but also on the efficiency of the systems available to ensure that these seeds reach the farmer on time. Effective seed marketing is thus an essential component of activities to improve food security. No seed production activity can be viable without an adequate marketing and distribution structure. Marketing involves promoting the seed produced by seed producers, and distribution is the physical and logistical exercise of getting the seeds at the right place and the right time. For seed

produced by the public seed enterprises, cooperative unions purchase seeds allocated for them based on the set prices from the store of the enterprises. Then the cooperative unions sell to seed users adding transportation and storage costs as well as profit margin (Amsalu *et al.*, 2011). Some of the characteristics of conventional seed systems are as follow. These include:

Inadequate awareness creation among farmers on potentially existing varieties: Farmers are often not well informed about the potentially available varieties suitable to their target agro-ecologies and more seriously certain DAs compile seed demand simply from past records. Slow adoption of newly released varieties is another concern, which often gives way for repeated compiling of demand only for known old varieties.

Inconsistent and incorrect seed demand assessment: The prevailing practices for estimating seed demand from farmers and subsequent seed production targets are sometimes inconsistent and inaccurate, leading to both over and under-estimation of demand.

Lack of competitive seed distribution system: The major constraints in seed distribution include limited participation of seed producers in the seed distribution process because the existing system for seed distribution gives lion's share for cooperative unions; hence farmers have no options to choose from different suppliers at a competitive price. Moreover, there is no opportunity as such for seed producers to market the seed they produced. As a result, paradoxically, there is large amount of carry-over seed each year in view of unmet demand. For example, in 2010/11, most hybrid maize seed producers suffered the problem of unsold stocks because of weak marketing and distribution arrangements.

Low or no accountability and traceability: Over and above, there is loss of accountability and traceability for seed quality deterioration, including adulteration and weight reduction in route. This is further aggravated by use of multipurpose storage by cooperative unions and lack of suitable storage by primary cooperatives, especially when there is a carry-over.

Long distribution chain: Long distribution chain and shortage of logistics, constraining timely seed delivery to farmers. In other way, the key problems faced by the large-scale

parastatal seed organizations were (1) high costs of production and distribution related to consistently low levels of effective demand, and to the high cost of transport from centralized seed production facilities to rural areas; (2) a relatively narrow range of crops/varieties that did not meet smallholder needs; (3) inconsistent seed quality; and (4) escalating financial problems (Amsalu *et al*., 2100).

2.6. Brief History of Hybrid Maize in the Ethiopia Seed System

Maize was introduced in West Africa in 15 century in East Africa and Ethiopia between16 to 17 century. Several maize parental lines were introduced to Ethiopia from neighboring countries, and were handled solely by ESE to produce F1 hybrid maize for State Farms. They were found to be technically admixed and became considerably different from the original characters due to improper maintenance. Therefore, ESE started to purify the gene pools in order to produce improved versions of the hybrids in the shortest time possible. Maize in Ethiopia is mainly produced for food consumption and for cash. Policymakers consider maize as a crop where huge productivity gains can be obtained to boost domestic production. Also, due to the fact that it cannot be recycled, there is huge demand by farmers, and all public and private seed companies are engaged in its multiplication creating competition among these actors (EARO and CIMMYT, 2001).

The area allocated and the productivity level of maize has been increasing since 1994. The area allocated in 1994 was about one million ha, which has increased to about 1.8 million ha, of land in 2008. Similarly, the average national productivity of maize has increased from 15qt/ha in1994 to about 22qt/ha in 2008/09 mainly due to the strong public push of improved seed and fertilizer (CSA, 2009). Policy makers believed this average can be increased to 80qt/ha if improved hybrid maize hybrid varieties along with the recommended agronomic practices are applied. In the major maize producing areas (East and West Wellega and East and West Gojjam), the average productivity levels under farmers' condition ranges from 60 to 90 quintals/ha due to better use of hybrid maize varieties and associated inputs (ATA, 2013)

Maize is Ethiopia's largest cereal commodity in terms of total production, acreage, and the number of farm holdings. Eight million smallholders were involved in maize production during 2008/09 production season, compared to 5.8 million for teff and 4.5 million for sorghum, the second and third most cultivated crops in Ethiopia. Maize is essential for the

food security of Ethiopian households, and is the lowest cost caloric source among all major cereals, which is significant given that cereals dominate household diets in Ethiopia. The unit cost of calories per US dollar for maize is one-and-a-half and two times lower than wheat and teff respectively. Maize is also a low-cost source of protein in comparison to other cereals: maize provides 0.2 kg of protein per USD, compared to 0.1 kg of protein per USD from teff and 0.2 kg of protein from wheat and sorghum. On average Ethiopian consumes a total of 1,858 kilocalories daily of which four major cereals (maize, teff, wheat, and sorghum) (Sahidhur *et al.,* 2010).

In Ethiopia, different types of traditional maize dishes are available in the major maize growing areas. Maize grain is primarily an energy food because of its high starch content. It is also fairly rich in oil, but has low levels of quality protein and minerals. In areas where maize is a major cereal crop, it is traditionally made into different food products such as *kollo (*cleaned and roasted whole grain*),* injera (leavened, thin, flat spongy pancake-like local bread served with a sauce), *nifro*, *genfo, kitta,* bread, weaning foods, soup, *siljo, kinche (*prepared from coarse flour boiled in water) and *beso*. Traditional beverages are also prepared from maize, including *tella, bordie* and *areke (local beverages or drinks).* In other parts of the world, maize is used for different snack food products. In Ethiopia, most snack foods are prepared from barley and other legumes in both urban and rural areas (EARO and CIMMY, 2001).

2.7. Market structure, Conduct and Performance

Market performance refers to the economic result of market structure and conduct. The indicators of market performance include (1) product suitability in relation to product quality, (2) rates of profit in relation to the margins at the different trading levels, (3) level of output in relation to any deliberate restrictions to influence prices, and (4) price integration between markets and the degree of unpredictable variation of prices in markets including accuracy and adequacy of information flows throughout the marketing system. Performance of the market is reflection of the impact of structure and conduct on product price, costs and the volume and quality of output. If the market structure in an industry resembles monopoly rather than pure competition, then one expects poor market performance (Dijkstra, 1997)

As a method for analysis the SCP paradigm postulates that the relationship exists between the three levels distinguished. One can imagine a causal relations starting from the structure, which determine the conduct, which together determine the performance (technological progressiveness, growth orientation of marketing firms, efficiency of resource use, and product improvement and maximum market services at the least possible cost) of agricultural marketing system in developing countries (Meijer, 1994).

2.7.1. Market structure

Market structure includes those characteristics of the organization of the market that seems to influence strategically the nature of competition and pricing within the market (Bain, 1986). Market structure of the maize seed industry has some main elements, namely: (1) degree of buyer and seller concentration, (2) degree of product differentiation. (3) Barrier to entry and (4) market Knowledge. Market structure determines the behaviour of a firm in the industry while market behaviour, in turn, affects the industry's performance (Bambang, 2006).

The degree of concentration refers to the ownership or control of a large proportion of some aggregate of economic resources or activity either by small proportion of the units which own or control the aggregate, or by small absolute number of such units. Concentration implies the degree of market power. Market power is ability of a firm to influence perceptibly the price and quantity in the market. The degree of product differentiation refers to the buyers differentiate, distinguish or have specific preferences among the competing out puts of the various sellers established in an industry. Market knowledge refers to the seed companies' and distributors' market information includes the types and varieties of maize seeds preferred by farmers, potential seed requirement by region, and the prevailing market price (Suvanichwong, 1997)

2.7.2. Conduct of the market

Market conduct refers to the practices or strategies of traders in maximizing their profits. Among these practices are the use of regular partners, long-term relations with clients, and suppliers, the use of intermediaries, and trade within personalized networks. Market conduct deals with the behavior of firms that are price-searchers are expected to act differently than those in a price-taker type of industry. Price searchers can determine their selling prices or quantity of output they sell. In addition, they could use their market power

to weaken or eliminate competitors example reducing price). However, there are no fixed or constant procedures among researchers for analysing the elements of marketing conduct (Wolday, 1994).

2.7.3. Market performance

Market performance is the assessment of how well the process of marketing is carried out and how successfully its aims are accomplished. It is concerned with technological progressiveness, growth orientation of agricultural firms, efficiency of resource use and product improvement and maximum market services at the least possible cost. In other words, market performance is the appraisal of the extent to which the interactions of buyers and sellers in a market stimulate result that is consistent with social purposes (Olukosi *et al*., 2005). Tweelen (1997) reported that market performance is a reflection of the impact of structure and conduct on product price, costs and volume and quality of output. Onu and Okunmadewa (2001) stated that market performance includes the relative efficiency of production that is, price relative to the average cost of production.

Market performance can be evaluated by analysis of costs and margins of marketing agents in different channels, and market integration. A commonly used system to measure market performance is based on the marketing margin or price spread. Margin or spreads can be useful descriptive statistics if used to show how the consumer's goods and service price is divided among participants at different levels of the marketing system (Getachew, 2002).

2.8. Marketing Margins

Olukosi *et al*. (2005) viewed marketing margin as the difference in price of a given commodity as it moves from the primary producer to the ultimate consumer. Man earns a sort of margin for the duties performed in the marketing channel. The size of the margin is sometimes influenced by the degree of processing of the commodity in question, its bulk and unit values and perish ability.

As Mendoza (1995) argued, when there are several participants in the marketing chain, the margin is calculated by finding the price variations at different segments and then comparing them with the final price to the consumer. The consumer price is then the base or the common denominator for all marketing margins. Computing the total gross

marketing margin (TGMM) is always related to the final price or the price paid by the end consumer and expressed as a percentage.

2.9. Marketing Channels

The term channel is derived from the Latin word canalis, which means canal. A marketing channel can be viewed as a large canal or pipe line through which products, their ownership, communication, financing and payment, and accompanying risk flow to the consumer. Marketing channel is the sequence of intermediaries through which whole locally produced hybrid maize seed passes from producer farmers to final consumers/farmers. The analysis of marketing channels is intended to provide a systematic knowledge of the flow of the goods and services from their origin (producer) to the final destination (ultimate user).A marketing channel is a business structure of independent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Mendoza 1995)

2.10. Empirical Studies on Comparative Analysis of Seed System Elsewhere

There are limitations of empirical research works done in the study areas on comparative analysis of conventional and direct hybrid maize seed marketing systems of hybrid maize seed varieties. From this point of view, review would relatively consider on research conducted previously, like factors affecting and adoption of improved maize in the study areas.

Ndjeunga *et al.* (2000), reported that, seed systems in sub-Saharan Africa indicates that even in countries such as Zimbabwe where the formal seed system is comparatively advanced, seed companies concentrate on crops where they can achieve higher profit margins (e.g., maize, sunflower, soybean) in order to obtain competitive returns on their research and marketing investments. Primary indicators of seed sector performance in Niger and Senegal show that the Senegalese seed sector supplies relatively more improved seed to end-users than the Niger system; and comparatively more improved groundnut seed (28% of the total seed sown) than pearl millet (3.8%). On the contrary, the Niger seed sector supplies a negligible share of the total seed sown to both crops (0.4% for pearl millet and 1 % for groundnut) by small-scale farmers. Performance of groundnut and pearl

millet seed systems at supplying and distributing seed of improved varieties to small-scale farmers in Niger and Senegal, and presents a number of lessons learnt strategies to enhance seed systems in countries located in the semi-arid tropics of West Africa.

Elizabeth *et al*. (1992) also studied that, seed distribution comprises all those activities involved in the physical distribution and marketing of seed to farmers. Seed distribution systems are therefore one of the most important components of the formal seed sector - because they are the major point of contact between farmers and the seed producing organizations. Thus, as well as their direct function of ensuring the timely distribution of improved seed to all the locations where it is required, seed distribution systems have an important indirect function as channels for the flow of information concerning farmers' seed needs, with respect to type and quantity, between the farmers themselves and the producing organizations. Their performance is critically determined by the ability of the other components in seed sector to provide them with right type of seed in the right quantities at right price for timely distribution to seed users.

Distribution is frequently identified as a bottleneck to small farmer use of improved seed, regardless of the type of organization involved, due to the particular logistical and communications difficulties associated with serving this category of seed user. The remoteness of many small farm households from transport and market infrastructure means distant often they cannot be reached through the normal retail distribution system and investment in seed distribution points is required. Timeliness of distribution is particularly critical for small farm households because they have insufficient cash resources to be able to bear the cost of storing seed for long periods and inadequate on-farm storage facilities to maintain seed quality over extended periods (Elizabeth *et al*. (1992)

Abdoulaye *et al.* (2009) found that in Nigeria, the provision of demonstration and extension support ranked highest, followed by the government support to emerging seed companies. In Benin, until seed companies are created, production schemes to strengthen existing community-based seed production is required. In addition, more seed retail outlets in target areas, providing the opportunity to negotiate and sign contracts directly with other farmers, and technical support for information dissemination were the major approaches identified, particularly for areas of high potential sometimes affected by drought, and drought-prone areas of low potential. Furthermore, efforts to increase

effective demand for improved maize seeds by farmers should be intensified through effective extension and seed promotional activities. In Ghana, crucial intervention areas were improved in access to foundation seeds and regulation of the import of seeds to help the newly established companies (Ndjeunga *et al*., 2006).

Mesfin *et al*. (2011) compared both conventional and direct seed marketing in different Woredas of Ethiopia. The study was focused to compare both conventional seed system and pilot test direct seed marketing in quality service delivery in seed marketing and price of hybrid maize. In direct seed marketing areas in 2011, the availability of hybrid maize seed was very much improved and majority of the farmers reported that there was no problem of availability. For example in Dangla and south Achefer woredas there were enough amounts of hybrid maize seed supply and the required type. On the other hand, in Mecha and North Achefer there was limitation of supply particularly in terms of the type of varieties farmers looking for. For instance, in Mecha Woreda the demand was for BH 540 but what supplied was only BH 660. Due to this there was big left over of BH 660 seed. Based on the survey result, the price was very high because of the monopoly of seed market, in the hands of cooperatives organizations that sell seed and fix high price. Generally, from his it was found that conventional seed system has constraints in serving the farmers in seed supplying on time and thus direct seed marketing is better in serving the farmers in supplying seed on time.

2.11. Trends of Conventional Seed Distribution System

Conventional seed distribution system is a public, formal and an existing seed system through which seed can be distributed with facilitation role of the Bureau of Agriculture at different level. The seed system involves organizations, individuals and institutions performing different functions in the seed value chain, i.e., the development, multiplication, processing, storage, distribution and marketing of seeds. For instance, in Oromia, the major actors in formal seed system are public organizations (ESE, OSE), Farmers' Cooperative/ Unions including Yerer Farmers' Cooperative Union, Lume-Adama Farmers' Cooperative Union, Hetosa Farmers' Cooperative Union, Meki Batu Fruit and Vegetable Producers' Cooperative Union and Jimma Marketing Cooperative Union, Limu Hinaria Cooperative Union], etc and private seed companies (Pioneer Hi Bred Seed, Ano Agro-industry and Hadiya Seed Production (Amsalu *et al*.,2011).

Distribution is the process of moving packaged seed from the stores where it is held following processing and packing to the farmer. This may involve a single step, if sales are made directly to farmers, or a series of steps involving intermediate wholesalers and retailers. Clearly, distribution is a key area of marketing and is a vital part of meeting the customers' needs and requirements. In a large seed organization responsibilities are shared between those working in sales, inventory control, order administration, dispatch and Transport (ideally coordinated by the Marketing Department). In small companies one person may fulfill all of these functions. Essentially, the marketing function takes over from production once the packaged seed has left primary storage. Distribution therefore covers the place element in the marketing mix and relates to getting: the right products, in the right mix, in the right quantity, at the right time, in the right place, in the right condition and at the right price. The route that seed follows to the consumer is often known as the marketing channel (FAO, 1994).

Farmers' demands are seasonal and they generally buy seed just before sowing time, rather than planning ahead, with the result that the transport and delivery system can be put under extreme pressure. Intermediate storage between the seed company's stores and the retailers will therefore need to be considered to make the system more responsive, but this will add to the cost. Another approach is to encourage farmers to buy early so that stock can be moved to the dealers, thus easing the transport problem. For this purpose a 'buy early' promotion campaign could be run (FAO, 1994).

Annual distributed maize seed by the Ethiopian Seed Enterprise (2003-2009)

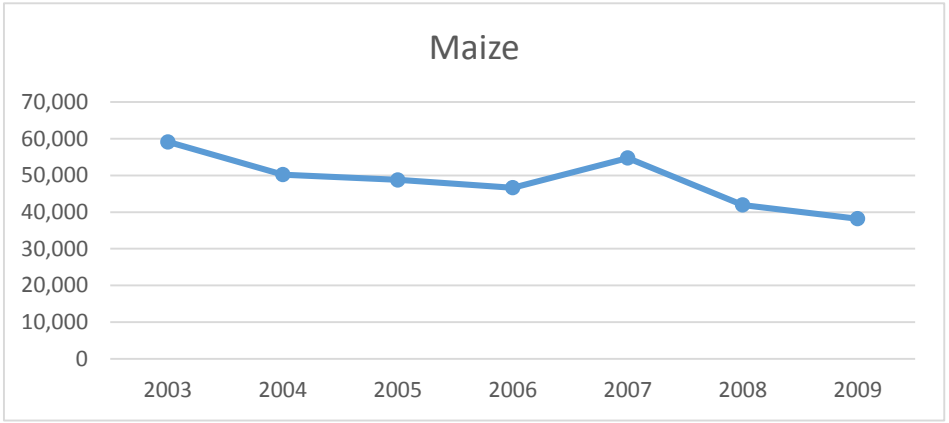

Figure 1. Trends of hybrid maize supply. (Source: (FAO, 2010)

As it is indicated in the above (figure 1) the total supply of maize seed by ESE can be classified in to three phases. From 2003 to 2004 and 2007 showed decreasing trends. From 2006 to 2007 it showed increasing trendies but the supply was less than the supply of year 2003. Again from 2003 to 2009 it decreased sharply as compared to other years. Supply of 2003 was higher than other years and the lowest supply year was in 2009.This showed that it has no stability and consistency over several years. This trend affects and interrupted seed supply and demand of the seed plan system and decision of farmers to use improved seed.

Table 1. Major crop seed leftover by year with estimated cost in Oromia region

Crop seed	2008/9		2009/10		2010/11	
	Amount leftover(Q)	Estimated Cost(Birr)	Amount leftover(Q)	Estimated Cost(Birr)	Amount leftover(Q)	Estimated Cost(Birr)
Wheat	19,839	14,244,402	9171	5181615	1812	1389804
Maize	705	1128000	4938	7397124	18736	28104000
Barley	1011	587391	316	151680	550	419650
Teff	255	336600	711	824760	213	253044
Total	21810	16296393	15136	1355179	21311	30166498

Source: *(Mekonnen Gelaw, 2012).* Seed Demand Assessment. Oromia. Bureau of Agriculture.

As it is indicated in the (Table1) the total seed leftover in the store without any use was 8257 quintals of major crops for the last consecutive years. Of total seed leftover 34 % was wheat followed by barley. Wheat seed leftover has shown declining trend with decreasing rate. Despite other crops seed leftover was at decreasing rate, while hybrid maize seed leftover was increasing at increasing rate. The reason most probably, due to non-demanded variety had been distributed without its adaptation area of the crop, late supply of seed, lack of information and weather condition or rainfall setting pattern. In addition to that other factors, poor demand assessment can aggravate the problem of mismatch of demand and supply.

Table 2. Demand vs supply of certified seeds of hybrid and non-hybrid (qt) over four years

Year	Certifies hybrid maize			Certified non-hybrid crops			Total		
	Demand	Supply	%	Demand	Supply	%	Demand	Supply	%
2006/7	123,777	35,244	28	629,422	205,680	33	753199	240924	32
2007/8	143,387	86,787	60	841,458	246,051	29	985305	332838	34
2008/9	193,079	95,735	50	737,992	278,353	38	931071	374088	40
2009/10	333,249	168,123	50	723,588	433,049	60	1056837	601172	57
2010/11	432,648	365,335	84	930,980	716,512	77	1363,628	1081847	79

Source: (MoARD, 2010, in Abebe Atilaw and Lijalem Korbu, 2010).

As indicated in table 2 when demand and supply of hybrid maize seed compared over years it showed an increasing tendency over five years. This most probably related with awareness of farmers on hybrid maize seed was increased due to training demonstration and field days through extension services provided for them. Moreover, it could be due to the nature of the hybrid maize seed farmers should purchase fresh seed each year, because recycling the hybrid maize causes great loss due to deterioration of second generation of the plant in segregation. However, the average supply of hybrid maize seed was only 54 % within five years. In other way the supply of certified non-hybrid crops was 47 % as compared to certified hybrid maize seed. This most probably farmers can recycle last year's purchased seed due self-pollinated nature of the crops. Hence, self-pollinated crops deteriorates less than hybrid maize seed gradually over years. Another reason may be due to low supply of certified non-hybrid crops. Generally, regarding both cases there is big gap between demand and supply which needs attention.

2.12. Performance of Direct Hybrid Maize Seed Marketing in Ethiopia

As it is illustrated in (table 3) public enterprises, three private Seed companies and one Farmers' cooperative Union supplied their product or variety for the farmers through direct seed market. Hybrid maize varieties 30G19, 30D79 and BH-543 were sold 100%. From the total suppliers Pioneer Hibred, OSE and Ano agro industry dominated the seed marketed of 2012/13 by supplying locally demanded variety in response to farmers need. Out of total seed supplied 81.6% was sold, the remaining seed was transported to other location where it was required on time with the accountability of supplier without damping

Table 3. Seed suppliers in Sibu Sire Woreda by direct seed marketing

No	Supplier	Variety	Quantity Supplied	Quantity sold	% Distributed
1	Homa PLC	BH660	130	34	26
		BH-543	81.5	81.5	100
2	Ano Agro	BH-660	599	558.25	93
3	Pioneer	30G19	550	550	100
		30D79	230	230	100
4	OSE	BH660	60	47.5	79
		BH543	540	533.25	99
5	ESE	BH-660	200	100	50
6	Meki Batu	BH-543	300	62.785	21

Source: (OSE-Oromia south West ISSD, 2012).

in the store of cooperative or dealers. In this regard, direct seed marketing reduced leftover of the seed through improved seed distribution

As it is indicated in (table 4), Ano Agro industry and Pioneer used more number of agents and centres to distribute the seed more than other enterprises. Next to that Homa PLC and Meki Union followed by establishing four centre and agents equally. With these all effort of enterprise and partners, timely delivery of quality seed, better access of alternative source of varieties, trust on quality of seed enterprises lead to costs saved, awareness of direct seed market and sense of competition among them. From this point of view direct seed marketing can be further scaled-up with the involvement of partners.

Table 4. Nnumber of seed distribution centre and agents by enterprises

No	Enterprise/Company	Number of agents and centers
1	Ano Agro industry	5
2	ESE	2
3	Homa PLC	4
4	OSE	3
5	Pioneer	5
6	Meki Union	4

(*Source: OSE-Oromia south West ISSD,*

3. RESEARCH METHODOLOGY

This chapter summarizes description of the study areas, methods of data collection, sampling techniques, procedures and sample size and it also contains methods of data analysis (descriptive and econometric model).

3.1. Description of the Study Areas

3.1.1. Sibu sire

Sibu Sire is one of the 18 districts of East Wellega zone, which is located in the eastern part of the zone. Sire is the capital town of the *Woreda* located on the way along to Addis Ababa at a distance of 280 km; and 50 kilometers far from the zonal capital of Nekemte.
Sibu Sire district is contiguous with Gobu Seyo in the east, Wayu Tuka in the west, Gudeya Bila in the north and Wama Hagalo to the south bordering also some part of Wayu Tuka in the south west. The total area of the district is about 1,054.40 km^2 of land which occupies nearly7.45 percent of the zone's total area having 19 farmers associations and 3 urban centers.

This district is divided in to three distinct geographical areas with different proportions; namely the highland 7.53 percent which is very small part of the district, midland 74.2 percent and the lowland 18.27 percent. The altitude ranges from 1360 to 2500 meters above sea level. The area is experienced with mean annual temperature between 24^0C and 25.5 ^{0}C and means annual rainfall of 1015 to 1050 mm per annum. The dominant soil types found in the District are sandy loam, silt loam, clay loam and clay (Sibu Sire Bureau *Woreda* Agricultural Office, interview).

Of the total population in the district, 83 percent live in the rural areas, where directly sustains their life from the agricultural and similar activities. The dominant livestock productions are cattle, small ruminants, mule, horse and poultry (Sibu Sire Woreda Agriculture Office), Area covered by cereal crops; especially wheat, maize and millet have increased continuously through the production years. Of the total crops grown in the Woreda maize is the major one both in terms of area and production over years. This indicates that maize is an important crop both for food and cash source of the farmer in the district. Figure1 shows trends of maize production from 2008 to 2013 in Sibu Sire.

The sites were selected by considering maize belt agro ecologies of production system. In 2012/13 hybrid maize seed varieties were distributed using conventional and direct seed marketing system in the east Wellega zone. In this cropping year, the number of smallholder farmers involved in maize production in the zone was 214,142 on 115,649.92 ha of land producing 4, 452,790.31 quintals of maize grains. Due to high maize productivity, Sibu Sire was one of the Woredas where pilot test of direct hybrid maize seed marketing was tested and Gobu Seyo Woreda was for conventional seed distribution system (CSA, 2013).

From 2008 to 2013, the trend of maize production is indicated in (figure 1). As indicated in the figure, the maize production showed an increase in the first two years (2008 and 2009). In the next two years (2010 and 2011), it started to decline and finally increases afterwards up to 2013. In 2011 cropping year, lowest maize yield was produced in contrast to 2013 where high yield of maize was produced.

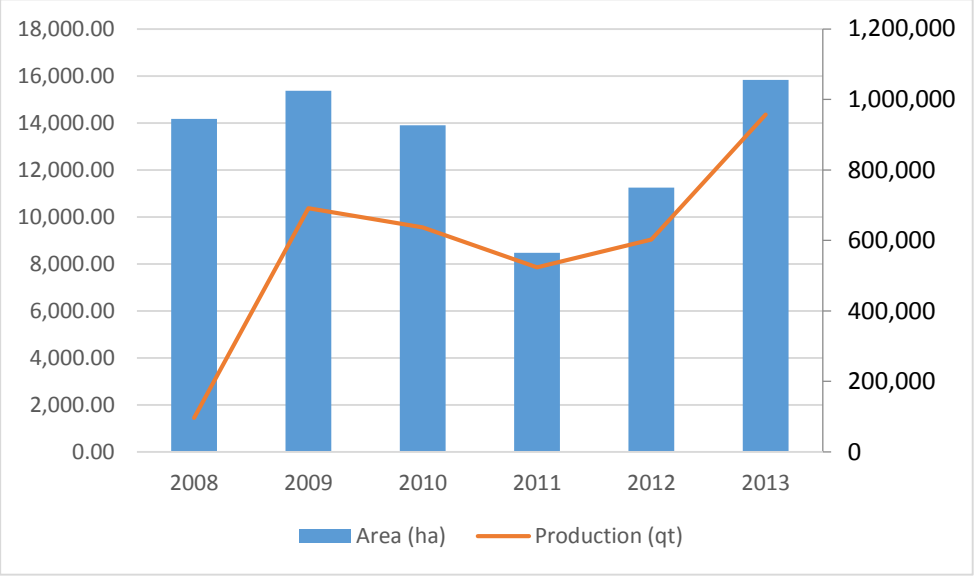

Figure 2. Trends of Maize production in Sibu Sire

Source: (Sibu Sire Bureau Woreda Agricultural Office)

Areal coverage of land used for crop cultivation in Sibu sire woreda is 75,134 hectares whereas 8,743.5 and 19,866 hectares of land is covered by pasture/grazing land and degraded or barren land, respectively. The natural forest of the district covers the total area of 1,336 hectares of land. Manmade type of forest is planted to solve the problem of environmental problem such as soil erosion, desertification, deforestation, and etc. With

the aim of satisfying one of the millennium development goals of United Nations, the inhabitants of the district were participated in planting and protecting trees.

3.1.2. Gobu Seyo Woreda

Gobu Seyo Woreda is sub divided in to 9 farmers associations for all its administrative purposes. It is contiguous with West Shewa (Bako Woreda) zone in the east, Sibu Sire in the west, Gudeya Bila in the north and Boneya Boshe in the south. This woreda has two distinct geographical areas with different proportion; namely, the midland (79.99 percent) and the lowland (20.01 percent). The altitude ranges from 1500 m to 1960 m above sea level. The mean annual temperature of the district ranges between 15°c to 20°c whereas the mean annual rainfall may reach to 2000 mm. Clay loam and loam soil is exceedingly dominating the district (Source: Gobu Seyo Woreda Bureau of agriculture*)*

Trend of maize production in (figure.3) indicated that amount of production was increased starting from 2008 to 2010 at increasing rate. After 2010 it decreased at decreasing rate up to 2013.

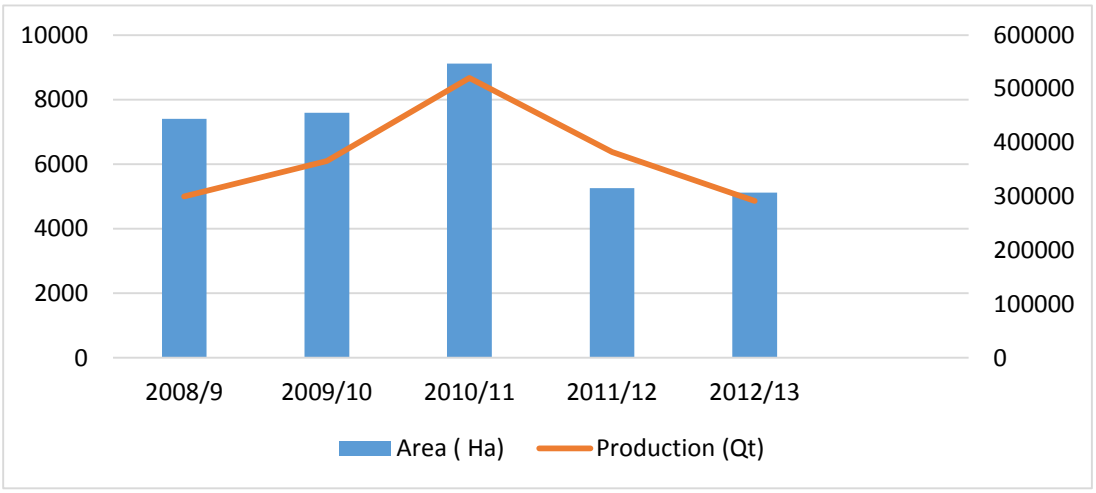

Figure 3. Trends of maize area and production 2008/9 – 2012/13 in Gobu Seyo Woreda *Source: (Gobu Seyo Woreda Bureau of agriculture*)

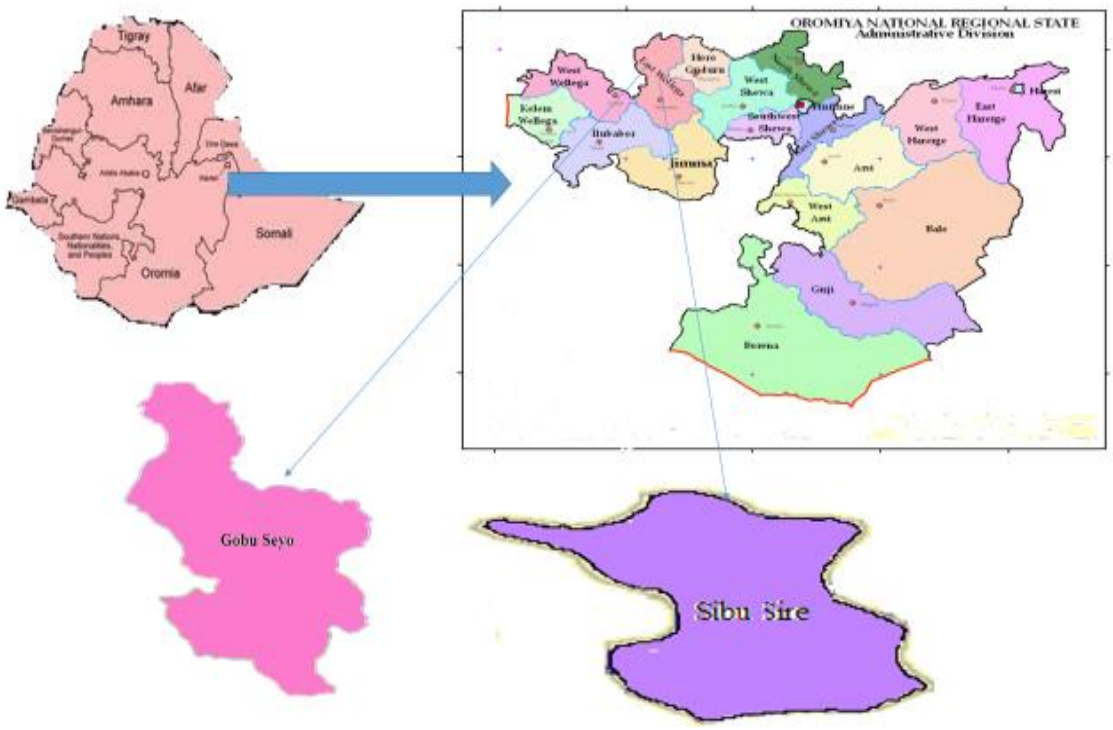

Figure 4. Sketch of the study area

Source: (Gobu *Seyo and* Sibu *Sire Woreda Bureau Agriculture and Rural Development).*

3.2. Data Types, Sources and Methods of Data Collection

For the purpose of this research work, both primary and secondary data were collected. Primary data were collected from randomly selected hybrid maize seed user farmers using a formal quantitative survey. A formal quantitative survey was conducted to capture information from farmers. This was implemented on 140 farmers from four "kebeles*"* of which two were from Sibu Sire Woreda and the others two from Gobu Seyo Woreda). The questionnaire was drafted as part of the preliminary field visit and pre-tested. Insights and prominent issues revealed during this process were used to refine and fine-tune the questionnaire before actual field work.

The data were collected formally by individual interview approaches using semi-structured interview schedule and informally through group discussions with key informants using checklist. The questionnaire was translated into local language to make easy the communication between enumerators and the respondents.

To support and triangulate the primary data, secondary data was collected from Woreda Bureau of Agriculture, Cooperative Promotion office, Ethiopia Seed Enterprise, Oromia

Seed Enterprise, Pioneer Private Company, Ano Agro industry and other private seed producers. In addition, published research papers, books, annual reports of the respective office and pertinent websites were visited and used.

3.3. Sampling Technique and Sample Size

A multistage sampling procedure was employed to select the sampling unit. In the first stage, the two Woredas were selected purposely because of the two different hybrid maize seed system operation in 2012/13 production year. Hence, Sibu Sire Woreda was selected for the representative of direct seed market system whereas Gobu Seyo Woreda was selected to represent conventional seed distribution system. In the second stage, four kebeles were selected from the two Woredas based on maize production of the areas randomly. For the purpose of this research work, data was collected from selected four Kebeles. In the selection process of the rural Kebeles both Sibu Sire and Gobu Seyos' Woreda, agricultural office experts were participated and consulted. In the third stage for 2012/13 cropping season, those farmers who purchased hybrid maize seed varieties from direct seed market and conventional seed distribution system were proportionally selected randomly.

From Gobu Seyo Woreda two kebeles (Sonbo Kejo and Ongobo Bekenisa) were randomly selected for conventional seed distribution system, and for direct seed marketing users sampling units were taken from two kebeles of Sibu Sire Woreda namely Bikila and Jarso Wama (Table 5). Subsequently, simple random selection procedures were followed to select the 140 households from the two Woredas. Total sample size was determined by Yamane formula (1967). Proportional allocation was also computed for each selected household per selected kebeles.

$$n = N/1+N (e) \text{ ^2}$$

n= Desired sample size, N = Total number of household, e = Error margin

Table 5. Sample size distribution of the sample kebeles

Name of selected kebeles	No.of HH	Number of sampled households
Bikila	800	32
Jarso Wama	829	33
Sonbo Kejo	974	38
Ongobo Bekenisa	930	37
Total	3533	140

3.4. Methods of Data Analysis

Descriptive and econometric analysis tools were exploited for analyzing the data from the respondent farmers in the study areas.

3.4.1. Descriptive analysis

Descriptive statistics involved using the frequencies command to determine percentiles, measures of central tendency (mean, median, and mode), measures of dispersion (range, standard deviation and variance) and drawing of bar charts. Mean, standard deviation and percentages were employed to compare the two seed marketing systems based on sampled and interviewed farmers with their respect to some demographic and socio-economic characteristics of the respondents. Moreover, most important factors or influential variables that have been hypothesized to affect the quantity of hybrid maize seed purchased by farmers were tested whether they are statistically significant or not using t-test and chi-square (χ^2) tests. The t-test was used to test the significance of the mean value of continuous variables of respondents. Similarly, potential dummy (categorical) variables were tested using the chi-square (χ^2) distribution.

3.4.2. Analysis of total gross marketing margin

In CSDS hybrid maize seed production and marketing, farmers produced raw seed and supplied to OSE according to contractual agreement. OSE purchased the raw seed and processes and store it in its own warehouse till it is sold to union and other organizations. After the seed is certified in the laboratory, Gibe Didessa Farmers' Cooperative union purchase the certified seed and distribute it to primary cooperatives of Sibu Sire and Gobu Seyo farmers by adding transportation cost on price of the seed. In this system, all actors have their own cost like production cost, marketing cost, and margin at different stages. Marketing margin analysis can be used to appraise market performance in the system. The total marketing margin was calculated using the following formula:

$$\mathbf{TGMM} = \frac{\mathbf{End\ buyer\ price - Producer\ price}}{\mathbf{End\ buyer\ price}} \boldsymbol{X100}$$

Where, TGMM = Total Gross Marketing Margin.

Producer's Gross Marketing Margins (GMMP).

Farmer's portion or producer's gross margin (GMMp) which is the portion of the price paid by the end seed users that goes to the seed producer.

$$GMMp = 1 - TGMM$$

GMMP = the grower's share in consumer price

Regarding this issue Mendoza (1995) warns that precise marketing costs are frequently difficult to determine in many agricultural marketing chains. The reasons are that these costs are often both cash costs and imputed costs; the gross and not the net marketing margin is advised to be calculated (Bosena *et al*., 2011)

3.4.3. Econometric analysis

Regression analysis is one of the most commonly used tools in econometric work. It is statistical process of using observations to find the line of best fit through the data in order to make estimates and preconditions about the variables. This line of best fit may be linear (straight) or curvilinear to some mathematical formula.

One of the econometric models used in regression analysis is ordinary least squares method. Ordinary Least Square (OLS) is the method that is used extensively in regression analysis primarily because it is intuitively appealing and mathematically much simpler than the method of maximum likelihood. Under certain assumptions, the method of least squares has some very attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis.

Asfaw (1998) stated that there is no decisive statistical ground for model specification among alternatives. As he further noted, recent studies commonly use regression models to estimate the supply function. Asumugha (2009) adapted this model for analysis of the supply of Seed Yams in Nigeria. And also Kindie (2007) employed this model to analyse the determinant factors of supply of Sesame in Metema woreda, Amhra Region, Ethiopia. Likewise, for this particular study, Ordinary Least Squares (OLS) was employed to estimate the factors affecting the quantity of hybrid maize seed purchased by farmers of the study areas. With the assumption that the disturbance term U interring the regression model is normally distributed (central limit theorem).

The OLS regression is specified as:

$$Y = \alpha + BiX + U$$

Y = f (Age, family size, education level, land size, livestock, fertilizer, frequency of extension contact, credit, time of seed supply, distance to seed source, seed cost, seed bag, income).

Y = Quantity of hybrid maize seed purchased.

3.4.4. Statistical tests of multicollinearity

Before running regression analysis, it is necessary to conduct multicollinearity test because of the fact that multicollinearity may cause lack of significance of individual independent variables, while the overall model may be strongly significant (Monteshwe, 2006). It may also result in wrong signs and magnitudes of regression coefficient estimates and consequently in incorrect conclusions about relationships between independent variables. Different methods are often suggested to detect the existence of multicollinearity problem. Among them, variance inflation factors (VIF) technique was employed to detect multicollinearity in continuous explanatory variables (Gujarati, 2004) and contingency coefficient (CC) for dummy variables (Healy, 1984). Various methods have been used to detecting the problem of multicollinearity in different field of social research studies. The two common tools or measures often suggested in the discussion of multicollinearity are the variance inflation factor (VIF) and the condition number.

$$VIF = \frac{1}{(1 - R^2)}$$

R^2 is the multiple correlation coefficients between X_i and other explanatory variables. For each selected continuous explanatory variables, (X_i) was regressed on all other continuous explanatory variables, and the coefficient of determination (R^2) was constructed for each case. For continuous variables, as a rule of thumb, values of VIF greater than 10, are often taken as a signal for the existence of multicollinearity problem in the model.

In Similar way, the Contingency coefficients (CC), were computed for dummy variables from (Chi-square $x^{2)}$ value to detect the problem of multicollinearity (the degree of

association between dummy variables). According to Heal (1984), the dummy variables are said to be collinear if the value of contingency coefficient is greater than 0.75

$$C.C = \sqrt{\frac{X^2}{N + X^2}}$$

Where, C.C is contingency coefficient,

N is sample size,

X^2 = chi-square values.

3.4.5. Definition of variables and working hypothesis

Dependent variable:

Quantity of hybrid maize seed purchased**:** It is continuous dependent variable measured in kilogram and represents the amount of certified seed purchased by farmers.

Independent variables:

Sex of the household head (SEXHH): It is dummy variable with values of 1for male and 0 for female. The variable is expected to have a positive relation with alternative seed market and volume of seed purchased. Hence, gender included in the explanatory variable would make difference on the quantity of hybrid maize seed demanded due to preferences and participation in maize production. The study by Edmeades *et* al. (2008) showed that men grow significantly more mats for all banana cultivars than do women. In similar way, gender is assumed to be a potential factor influencing quantity of seed to be purchased.

Age of household head (HHAGE): It is a continuous variable and measured in years. Age is a proxy measure of farming experience of household head. Aged households are passive to participate in new marketing system whereas young farmers are relatively active to accept new marketing system. Hence, age is expected to have either of the two (positive or negative) signs on quantity of seed purchased. Etoundi and Dia (2008) reported the positive and significant relation between age group and improved maize variety of CMS 870 in Cameroon. Early adopters of CMS 8704 were mostly adults.

Education level household (HHEDUC): Exposure to education should increase a farmer's ability to obtain, process, and use information relevant to the purchase of hybrid

maize seed. Education is thus thought to increase the amount of seed purchase of a farmer by using new seed marketing system. Abdisa *et* al. (2001) tested that education significantly and positively affected the probability of farmers' adoption of improved maize seed variety.

Livestock size (TLU): It is quantified in tropical livestock unit (TLU) and indicator of wealthier. Better off farmers having livestock have access to purchase seed and can take risk. It enables a farmer to procure inputs required to adopt and to use improved maize varieties, so that increased area of farm plot allocated to improved varieties. Ownership of livestock is hypothesized to be positively related to the purchase of hybrid maize seed (Getahun *et al*., 2000).

Frequency of extension contact (FREEXC): This variable measures whether a farmer received agricultural technical support from development agents or workers**.** Agricultural extension services provided by the BoA are the major source of agricultural information for the farmers. It is used as a proxy for farmers 'access to information. It is hypothesized that contact with extension workers will increase a farmer's likelihood of purchasing hybrid maize varieties. Several studies show that farmers' contact with extension increased the probability of adoption and area allocation to hybrid maize seed varieties (Abdisa *et al., 2001*).

Family size (FSIZE): It is a discrete continuous variable and refers to the total number of family members in the household. Large households will be able to provide the labor that might be required by the improved maize technologies. A farmer with larger number of family size engaged on agricultural activities is more likely to be in a position to use a potentially profitable production enhancing inputs. Thus, household size would be expected to increase the quantity of hybrid maize seed to be purchased by farmer (Abadi and Pannel, 1999).

Income (HHINCOME): It is continuous variable that is measured in terms of birr generated and earned yearly from agricultural activities. The level of income enables farmers to purchase seed and other inputs. Wealthy farmers decide to take risk for using agricultural inputs. Therefore, it is expected to have a positive influence on the quantity of hybrid maize seed purchase (Getahun, 2004).

Land holding size (HHLANDSIZE): This is a continuous variable measured in hectares of farm land owned by individual farmers. It is expected to be positively associated with the purchase of hybrid maize seed. Land size can also encourage farmers to increase their production improved crop varieties. The larger the farm area implies more resources and greater capacity to purchase inputs like fertilizer and improved seed. It can be proposed that this variable has positive relation with the quantity of seed purchased by farmers (Shimelis, 2004).

Credit availability (Credit): It is dummy variables which means (access to credit=1 if not zero). Shimelis (2004) reported that access to input credit has positive effect on quantity of seed to be purchased by the farmers.

Quantity of fertilizer (FERTILIZER): It is continuous variable measured in kilo gram or quintals. As far as production of hybrid maize seed is responsive to fertilizer, based on that fact, farmers will be eager to purchase recommended rate of hybrid maize varieties by considering availability of inputs to increase production (Mywish *et.al.,* 1999).

Time of hybrid maize seed supply (RIGHTTIME): It is the time at which the seed availability and farmers' right planting time matches each other. It is dummy variable taking a value of 1 if supplied at the right time and 0 otherwise.

Seed bag size (SEEDBAG): It is a dummy variable used to indicate convenience of bag where it is 1 if convenient and 0 if not. It is a seed container with known volume of seed. The size of the bag which matches farmer's interest will encourage farmers to purchase the seed with attractiveness and legibility of bag size.

Distance to seed distribution center (DISKM): It is a continuous variable measured in km. It is a distance from the farmers' home to the nearest seed distribution center. Langyintou *et al*. (2005) reported that distance of seed purchasing center negatively affects seed demand. This indicates that far distance will affect negatively the quantity of hybrid maize seed to be purchased. Similarly, Feleke and Zegeye (2005) noted the negative and significant association of market distance with adoption of improved maize.

Cost (COST): Cost incurred by farmers to get the required amount of hybrid maize varieties seed from the seed source. These include seed cost and transportation cost incurred by seed user farmers. It is continuous variable measured in birr per household. If

price of improved seed is high farmer may have limitation to use demanded quantity of seed. That means the high the cost of seed the less quantity of seed farmers might have use.

Table 6. Independent variables

S/N	Variables	Type	Hypothesized sign
1.	Sex of household	Dummy (1=male ,0=female)	+/-
2	Family Size	Discrete Continuous	+
3	Land holding size	Continuous (ha)	+
4	Livestock holding	TLU	+
5	Educational level of farmer	Continuous	+
6	Frequency of extension contact	Continuous	+
7	Time of hybrid maize seed supply	Dummy(supply right =1 no=0)	+/-
8	Distance to seed distribution center	Continuous (Km)	-
9	Quantity of fertilizer used	Continuous (kg)	+
10	Credit use	Dummy(1=Yes,0=No)	+
11	Convenience of seed bag size	Dummy (1=Yes,0=NO	+/-
12	Income	Continuous (in birr per year)	+
13	Age of the farmer	Continuous (in years)	+
14	Cost	Continuous (in birr per year)	-

4. RESULTS AND DISCUSSION

This chapter deals with the analysis of the survey data and interpretation of the analytical findings. As already noted, a structured questionnaire was administered to 140 sample households in Sibu Sire and Gobu Seyo Woreda with the main purpose of comparing the two Woredas seed marketing system in 2012/ 2013.

4.1. Demographic Characteristics

Households' age is considered as a decisive factor, as it determines whether a household benefits from the experience or to have base in its decisions on the risk-taking behavior as compared to younger farmer. The minimum and maximum age of all respondents in the study was 22 and 70, respectively. The mean age of the total interviewed farmers was 37.34 with standard deviation of 9.31. In a similar way, the age of direct market user respondents range from 25 to 70 years. The mean age for the sampled households of direct seed market system users in Sibu Sire Woreda (DSMS) was 37.61 years. Age of conventional seed distribution system users (Gobu Seyo) ranges from 22 to70 with a mean age of 37 years. However, there is no statistically significant mean age difference between the two seed system user farmers (Table 7).

In DSMS users 94.4 % of the sample respondents are married and in conventional seed distribution system (CSDS) users 97.1 % of them have been married. This illustrates that in both seed system users the married household respondents dominate. The married households have better labor force than unmarried households in hybrid maize production operation. However, the result of the chi-square test for the marital status of the two systems was found to be statistically not significant (Table 7).

As it is indicated in Table 8, the sex composition of the total respondents, revealed that 97.1% male and the remaining 2.9% were female. When it is evaluated in case of DSMS users (Sibu Sire), 1.4 % of them are female and 98.6% are male; whereas in the CSDS, the proportion of male and female households covers 95.7% and 4.3% percent, respectively. The result of chi-square test for the distribution of sex between the two marketing systems or study sites shows that there is no statistically significant difference between them (Table 7).

Family size is the total number of family members of the household. The size of the family can affect the livelihood of the household either positively or negatively. If the majority of the family members are in active labor force group, the households can get enough labor force and that enhances the probability to purchase hybrid maize seed. In such cases, family size is expected to have positive effect in hybrid maize farming of the household.

The total family size of the respondents in two seed marketing systems ranged from 1 to 12 persons per household and the mean family size was 6.61 persons per household with a standard deviation of 2.34. The mean family size of DSMS users is 7.16 whereas in CSDS it is 6.07persons per household. DSMS respondents have more family size than CSDS. Family labor is the main input in maize production. About 53.6% of the respondents used only family labor and 26.4 % used both family labor and *dabo* in maize production operation.

About 77.9 % and 15.7 % of them identified the main tedious activity in maize production operation is cultivation and weeding and cultivation and harvesting, respectively. Accordingly, 89.3% of respondents reported that critical labor shortage in June and 7.1% of them said it is in December and January. The major activity in June is weeding and cultivation and in December and January is critical harvesting and collecting the maize cob to home from farm field. Furthermore, the result of t-test analysis reveals that there is statistically significance difference between the two seed systems in the study sites with respect to family size of the household at 1% significance level (Table 8). This signifies that family size per household has a significant implication on quantity of hybrid maize seed purchase pattern of the farmers.

In terms of level of education, about 9.3% of the total sample household heads were illiterate and the rest 90.7% attended formal schooling or at least are able to read and write. The mean educational level of total sample respondents was 4.66 years of attendance of formal schooling with standard deviation of 3.12 years. About 88.4% of total sample household heads in CSDS have attended an average of 4.36 years of formal schooling while 93% of DSMS sample household heads attended an average of 4.94 years of formal schooling. Nevertheless, more number of DSMS sample household heads completed primary education as compared to CSMS; but there is no statistically significant difference between the two groups.

Table 7. Demographic characteristics of respondents

Variables	Category	N = 65 DSMS	N = 75 CSDS	χ^2 value
Sex	Female%	1.4	4.3	1.089
	Male%	98.6	95.7	
	Married%	94.4	97.1	0.55
Marital status	Single%	4.2	2.9	
	Divorced%	1.4	0	
Education	Illiterate%	7	11.6	
	Literate%	93	88.4	0.76
Variables		Mean (SD)	Mean (SD)	t-value
Education(years)		4.94 (3.38)	4.36 (3.13)	0.42
Age(Years)		37.61(9.27)	37.07(9.41)	0.73
Family size		7.16(2.27)	6.07(2.3)	2.79*

Source: (Own survey, 2013).

4.2. Farm Characteristics

Different characteristics related to the farm owned by the respondents are among the major determinants of technology use decisions. This is also true in the case of hybrid maize under consideration. From the farm characteristics specified in (Table 8) tropical livestock unit, income of household and distance from seed distribution center were statistically significant among the respondents. This shows that there is variation in respect of farm characteristics which determines quantity of seed to be purchased.

Table 8. Farm characteristics of respondents

Farm Characteristics	**DSMS**	**CSDS**	**T-value**
Tropical Livestock Unit	8.71 (5.1)	5.58(3.87)	4.36***
Size of farm land	2.43(1.81)	2.23(1.58)	1.36
Fertilizer	372.35(201.12)	332.24(150.94)	1.33
Income of households	24683 (26483.20)	17189.3(14699.14)	2.37*
Cost of seed	541.75(380.4)	624.63(424.73)	1.16
Distance in (km)	3.15(2.41)	4.77(3.96)	3.12*

Source: (Own survey 2013 *** denotes significant at 1%,* indicates significant at 5%). Figures in the parentheses indicate standard deviation

In the study area, the minimum and maximum farm land size of household is 0.5 ha and 7.75 ha, respectively. The mean farmland size of total sampled households is 2.43ha with standard deviation of 1.71. About 57.14% maize producers have land that ranges from 1.25 to 4 hectare. When it is observed at DSMS the minimum land size is 0.5 ha and the maximum is 7.75 ha with 2.43 ha mean and 1.81 standard deviation. In Gobu Seyo Woreda, the minimum land size of the sampled households is .0.5 and 7.75 ha, respectively with average value of 2.23ha. It can be concluded that DSMS respondents have more land size than CSDS respondents on average basis (Table 8).The analysis demarcates that land is the most determinant factor in hybrid maize production and utilization of seed. There could be the probability having additional plot obtained through renting and share cropping system due to availability of seed through DSMS program.

The planting period for maize in the area sometimes varies from year to year depending on the early or late onset of rainfall. Maize grower farmers on average plow maize farm plot 3 to 4 times to plant the seed. The seed rate of hybrid maize in the area is 25 kg/ha. Maize harvesting begins in mid-November and ends late December in the study areas. The major reasons farmers are growing improved seed maize varieties are for family food consumption and income source. Maize byproduct or stalk is also used for animal feed, fire wood, construction of rural fences and traditional bee hives in the locality. In crop and livestock mixed farming systems where this crop is grown successfully, the residues obtained from maize constitute the main basal diet for livestock in the dry season at a time when ruminant animals can barely gather sufficient feed from natural grazing and browsing.

In terms of land utilization, the farmers allocated to maize more than other crops. According to respondent's statement, land allocated to maize is increasing from year to year depending on the availability of required varieties for the environment. In relation to the minimum and maximum total sampled households' experience in hybrid maize seed user was one and 26 years respectively with a mean experience of 11.44 years and standard deviation of 5.69.

Livestock Holding Size (TLU): Livestock production is an integral component of the farming system in the study area and highly contributes in maize grain production in particular and to crop production in general. Important animals kept by the sample farmers are cattle, sheep, goats, mule, horses, and donkey. Of all livestock, Oxen are the main

sources of farm power for plowing and harrowing. From the total sampled maize producers, 49.3% of the respondents owned one pair of oxen, 13.6% owned more than two pair of oxen,12.9% owned single oxen, 10% were with no oxen , and the rest percent owned more than two pair of oxen. The total sample respondents have, on average, 2.29 pairs of oxen with standard deviation of 1.74.

Regarding livestock production analysis, tropical livestock unit conversion factor was used to standardize household livestock holding differences. Due to considerable differences between zones, breeds, and management systems, these conversion factors should only be used for gross calculations on an aggregate level. More accurate calculations would also have to take into consideration that feed requirements are more directly determined by the metabolic weight rather than the live weight. Conversion into TLU is given for all species although this is normally only done for ruminant livestock and possibly for equines.

As a result, the average livestock unit of total respondent farmers was 7.13 with standard deviation of 4.77. When the analysis was done at Woreda level, the average livestock unit of DSMS beneficiaries was 8.71 with standard deviation of 5.1 and that of CSDS was 5.58 with the standard deviation of 3.87.This implies that DSMS user respondents have more tropical livestock unit than CSDS user farmers (Table 8). There is also highly significant difference between the two systems at 1% significance level. This indicates that in maize farming system of grain production livestock production plays great role directly and indirectly for household's livelihood.

Annual Income Source: The major annual income source of the two farming system is both crop and livestock sale. Of the total sample, 57.1 % major income generation is both crop and animal sale whereas 42.9% only crop sale. The minimum and maximum annual income included in the interview was Birr 3000 and Birr 100000, respectively. The mean annual income of the total sampled household was 20882.79 with standard deviation of 21588.40.At individual Woreda level, 66.2% and 33. 8% income source of CSDS was crop sale and animal sale, respectively. In DSMS 81.2% income source was from crop sale and 18.8 % from animal sale.

The mean annual income of the respondents of DSMS user was Birr 246838.31 with standard deviation of 24683 and the mean annual income of CSDS was Birr 17189.3 with standard deviation of 14699.14. The comparison shows that farmers in DSMS have better income than CSDS. The t-test also showed that there is statistical difference between the two seed market systems at 10% significance level. Farmers' income level also affects the price they are willing to pay for quality of seed, more wealthy farmers are willing to pay more for seed than are poor farmers.

Seed Cost incurred by farmers: The minimum and maximum cost incurred by the respondent households to get hybrid maize seed was 93.75 and 1800.00 birr in the study area. The average cost incurred by the respondents was 583.78 with standard deviation of 404.18.The average cost incurred by CSDS respondent was 624.63 with standard deviation of 424.73 and that of DSMS was 542.05 with standard deviation of 377.64. The result reveals that CSDS respondents incurred more cost than DSMS. The reason could be probably due to establishment of sub-dealer in farmers' village, so that farmers are able to get required seed variety at shortest distance or nearby. However, there is no statistical difference between the two seed market system in cost incurred (Table 8).

4.3. Institutional Factors

Frequency of extension contact: The maximum and minimum extension contact in the study area was 24 and 2 times per year, respectively. On average the extension contact per year was 9.53 with the standard deviation of 5.55. This indicates that hybrid maize seed user farmers have 9.53 contacts per year for technical support in their farm production including hybrid maize grain production. The type of extension services mainly focus on use of fertilizer, use of improved variety, weed control, use of manure, crop rotation and market information. In DSMS, there are 19 FTC with 57 development agents.

Up to 2013, there were 14 animal science extension workers, 12 plant science extension workers, 16 natural science extension workers, and 12 cooperative management development agents (DA) and 5 supervisors servicing the farmers of the Sibu Sire Woreda. Development agents of the natural resource management are more in number followed by plant sciences and cooperative management equally. This could be due to attention of the government on natural resource management. Each farmers' training

Center (FTC) at kebele is staffed by three DAs, with background of one plant science or crop production, one livestock, and one natural resource management.

According to DSMS user respondents, the average frequency of extension contact per year was 10.54 with standard deviation of 5.76. In Gobu Seyo Woreda (CSDS), the average extension contact per year was 8.49 with standard deviation of 5.15. The result points out that Sibu Sire respondents have more extension contact than Gobu Seyo farmer respondents. The t-test shows that there is significance difference between the two system at 5% ($p = 0.02$) significance level.

Credit Availability: The survey result indicated that 100% of the interviewed farmers need credit both for seed and fertilizer but credit facility is not available in the area. Credit service was stopped by the government due to the problem related to loan repayment of the farmers on time in the past across Oromia region.

Time of seed Supply (availability): Of the total sampled respondents 72.85 % of them reported that seed was supplied on time and the rest 27.15% did not get the seed on time in 2012/13 crop planting season. In DSMS, 88.73% of the respondents have got hybrid maize seed varieties right at planting time due to pilot test of direct seed marketing operation in the Woreda. In CSDS, 65.22 % of them responded that hybrid maize seed was not supplied for the farmer due to absence of full time service of the cooperative committee members. In 2012/13, the major seed supplier or enterprises in direct seed marketing were Ethiopia Seed Enterprise (ESE), Oromia Seed Enterprise (OSE), Pioneer Hybrid Company, Meki Union, Ano Agro Industry (AAI) and Homa Private Limited Company. They were combinations of the two public enterprises, three private companies and one Farmers' Cooperative Union.

In CSDS, hybrid maize seed varieties were supplied through farmers' cooperative union only. The major varieties supplied were BH660, BH543, 30G19 Shone and 30D79 Agar. The benefit obtained from direct seed marketing is alternative variety source and full time service for the farmers. But in CSDS, there was no full time service and it was the only single union which is able to supply the hybrid maize seed. The total seed distributed through DSMS was 2197.5 quintals of hybrid maize with four different types of varieties. Through CSDS users, the total distributed was 613.4 quintals with four varieties by single supplier. There was no carryover of the hybrid maize seed in the store of each enterprise at

DSMS users in 2012/13. The main seed distribution strategy of the DSMS was through seed dealers at Woreda level where as that of CSDS used farmers' primary cooperative store at FTC centers. The study shows that DSMS is relatively efficient than CSDS in terms of time, and alternative seed source by serving the maize producer farmers without carryover of seed.

Convenience of Seed bag/ package size: All the total sampled households reported that the existing seed bag size is convenient both for farmers to carry and transport using different means of transportation. The current hybrid maize seed package sizes are 12.5 kg and 25 kg. The assumption of 12.5 kg pack size is recommended for minimum farm plot size of hybrid maize for small size holder farmers. Whereas 25 kg is recommended for farmers who have more than one hectare of farm size. In 2012/13 cropping year, according to total respondents, 30.7% of them bought seed package size of 25 kg, 23% of them bought 12.5 kg seed package size, 17.1% bought 50 kg seed of seed (2 bag).

It can be concluded that majority of the farmers mentioned the convenience of 25 kg packed size seed container. In CSDS, 37.7%, 24.6% and 18.8% bought seed package size of 25, 12.5 and 50 kg of seed, respectively. In DSMS, 23.9%, 22.5%, 16.9%, and 15.5% preferred seed package size of 25, 12.5 and 50 kg hybrid maize. In the study areas, 25 kg seed package size of hybrid maize is convenient and popular in farmer's communities (Table 9). Hence, in both cases the current seed bag size was not complained in the seed system

Quantity of fertilizer utilized: The minimum and maximum quantity of fertilizer used by the respondent household was 50 and 900 kg. The average amount of fertilizer used on maize farm plot by the respondents was 352.58 kg. According to the respondents, the application rate of UREA per hectare of hybrid maize production is 200 kg and DAP per hectare is 100 kg. Most of the time, fertilizer was supplied through primary cooperative of the *Kebele* with cash on hand based on fertilizer's price set up at FTC distribution center. The mean quantity of fertilizer used in DSMS users was 369.10 kg per household.

The mean quantity of fertilizer used in CSDS users was 336.07 kg with standard deviation of 150.94 (Table 8). In addition to the chemical fertilizers, those owners of livestock farmers use manure for additional inputs in maize production. However, there is no statistical difference between the two seed market users in fertilizer utilization. The main

constraints in fertilizer utilization described by the sampled household were unavailability of credit service in fertilizer (45%), high fertilizer price (34.3%), and 8.6% of them stressed on unavailability of credit service and late delivery of fertilizer.

Distance to seed purchasing center: The survey result indicated that the minimum and maximum kilometers the households were walking on foot ranges from 1 km to 15 kilometers from their home to hybrid maize seed distribution center, respectively. The average distance in kilometers the households were walking to seed distribution center was 3.975 km. According to respondents of CSDS, the frequency of the farmers should come to seed distribution center to get hybrid maize was at maximum 10 times and minimum 2 times with average of 3.85 and 3.38 standard deviation before planting season of the year (Table 8).

In DSMS, the average walking distance of the households to seed distribution was 3.11 kilometers with standard deviation of 2.39. In CSDS, the average walking distance was 4.85 with standard deviation of 3.98. CSDS user farmers are far away from seed distribution center as compared to DSMS. The t-test shows that statistically significant difference between the two seed marketing system at 1% significance level.

4.3.1. Marketing margin analysis in conventional seed distribution system

In this process, the enterprises set their selling price based on cost of production and by government regulation of pricing policy with few margin and sell the seed to the union from processing centre or seed store of the enterprises. In case of Eastern Wellega zone, Gibe Didessa Farmers' Cooperative is responsible to dispatch the seed to primary cooperatives. After the seed reaches store, primary cooperatives distribute the seed to the local farmers. The seed moves from the producer or processor to the end user (final customer) with a lot of cost incurred by the union. When the seed is sold to the farmers, all these costs are included in seed price paid by farmers. Since the seed is distributed to different location, it is associated with different costs. A marketing margin exists as there is price difference between any stages in the marketing chain (Table 11).

Table 9.Farmer's cost components of hybrid maize seed production per hectare 2012/2013

No.	Cost Items	Unit Price (birr)	Quantity	TC in birr	% Cost Share
1	First plowing	700 (oxen + labor)	-	700	6.26
2	Second plowing	600 (oxen + labor)	-	600	5.37
3	Furrowing	500 (oxen + labor)	-	500	4.47
4	DAP (qt)	1270	1qt	1270	11.36
5	UREA (qt)	1065	2qt	2130	19.05
6	Planting and Fertilizer application	35	12 Man power	420	3.76
7	Seed (25 Kg/ha)	875	1 bag	875	7.83
8	Hoeing	35	25 Man power	875	7.83
9	Chemical	450 /liter	2 liter	990	8.86
10	Second weeding	35	10 Man Power	350	3.13
11	Urea Top dressing	35	4 Man Power	140	1.25
12	"Shilshalo"	100	Oxen power	100	0.89
13	De tasseling	35	30 Man Power	1050	9.39
14	Male removal	35	6 Man power	180	1.61
15	Harvesting	35	10 Man power	600	5.37
16	Shelling	20	20 Man power	400	3.58
Total				11180	100.00

Source: (Own survey, 2013)

As illustrated in (Table 9) the major cost of hybrid maize seed production under farmers practice shows that fertilizer cost took the highest rank followed by land preparation. Next to land preparation detasseling or removal of female head. From the table one can understand that hybrid maize seed production needs capital, labor and input investment. The total cost of seed production was 11180 birr per hectare. The average productivity of hybrid maize production seed was 26 quintals per hectare. The average cost of seed production was estimated to 430 birr per quintal. The average selling price of one quintal

was 850 birr. The average gross margin or profit per quintal was 420 birr for seed producer farmers.

Table 10. Hybrid maize seed selling price at different stages in 2011/12

Cost Item	Cost (birr)/quintal	Percentage of total cost
Seed grower's cost/qt	430	26.06
Seed grower's margin/qt	420	25.45
OSE's processing cost/qt	600	36.36
OSE profit margin/qt	200	12.13
Total		100
OSE Selling price	1650	

Source: (Own survey, 2013)

As it was indicated in (Table 10) in conventional seed system, seed passes different stages starting from seed production till it reaches in the hands of end user. For example, Oromia seed enterprise seed production strategy is focused on farmers' contractual growers. OSE supplies inbred parent materials for the farmers after signing agreements with the farmers for seed multiplication on their own farms. At the end of harvesting time, OSE collects raw seed from the farmers based on contractual agreement included in the document with the price, quality and other requirements. OSE purchases the raw seed and transports the seed to seed processing centre for further value addition activities. When cost of production and processing is compared, cost of processing is greater than cost of production.

Table 11. Gibe Didessa Farmers' Cooperative Union seed costs and margin, 2011/12

Cost Item	Cost/ birr quintal	Percentage of cost share
Purchase price of certified seed	1650	97.37%
Bank interest	25.5	1.50
Bank Charge	2.4	0.14
Loading	2	0.11
Unloading	2	0.11
Transport	12	0.70
Other cost	0.56	0.03
Total Cost	44.46	100%
cooperative Union selling price	1694.46	
Cooperative Union Gross Margin	47.46	
Cooperative Union Net profit/qt	3.00	

Source :(Gibe Didessa Farmers' Cooperative union)

Primary cooperative is one of the actor in the seed system in conventional seed channel to distribute to local farmers based on profit margin which can cover the costs. The major cost at primary cooperative level is unloading. This means all the costs before the seed reaches primary cooperatives' store were covered by union. However the margin which goes to union is less as compared to primary cooperative (Table 11).

Table 12. Cost and profit analysis of hybrid maize seed at primary cooperative 2011/12

Cost item	**Cost and profit in birr/quintal**
Purchase price of primary cooperative	1694.46
Unloading	3
Total cost	3
Average selling price of primary cooperative	1702.40
Gross Margin of primary cooperative	7.94
Net profit of primary Cooperative Br/qt	4.94

Source: (Own survey, 2013)

4.3.2. Gross marketing margin of hybrid maize seed

In CSDS, hybrid maize certified seed reaches to farmers through along market chain process. Each seed marketing chain participant accomplishes one or more than one marketing functions. The produced hybrid maize raw seed was collected and transported to the temporary seed collection center of OSE from farmer's production field. OSE purchases the raw seed from seed producer farmers and transports the seed to the center of seed processing plant. Cooperative union purchases the certified seed from seed distribution centers of the OSE and transport it to the primary cooperative store. The primary cooperative distributes the seed for final seed users (farmers) by adding some few margins on the price of the seed. A marketing margin exists as the price difference between any stages in the marketing chain.

Based on price information collected from OSE, Gibe union, and primary cooperatives in conventional seed distribution, the following marketing margins and hybrid maize seed market performance indicators were listed down across market chain (Table 12). Scheme channels of the conventional seed distribution looks like the following:

Seed grower farmer's → OSE → Gibe Union → Primary Cooperatives →Seed user farmers (grain producers)**.**

Table 13. Marketing margin in conventional seed distribution

Actors	Cost	Added Cost	Selling Price	Margin	% Margin
Farmer	430	420	850	420	33
OSE	850	800	1650	800	62.87
Gibe Union	1650	44.46	1694.46	44.46	3.5
Primary coop	1694.46	7.94	1702.40	7.94	0.63
Total	-	-	-	1272.40	100

Source: (Own survey, 2013)

The total margin across the actors was 1272.40 birr per quintal. Based on marketing margin analysis, Oromia seed Enterprise's was higher than other actors in the conventional seed distribution channel. This indicates that the actor which incurred more cost gets greater margin. Next to that the contractual seed grower farmer shared 33% from the consumer of the seed price. However, the Gibe farmers' cooperative and primary cooperatives shared market margin of only 3.5% and 0.63 %, respectively (Table 13). From this, it can be concluded that farmers involved in hybrid maize seed production are beneficial next to Oromia seed enterprise.

4.3.3. Margin analysis in direct seed marketing system

In a direct seed marketing system the key actors are contractual seed grower farmers, OSE, seed dealers and seed user farmers. The major responsibility of seed producer is multiplying certified hybrid maize seed on their own farm plot with full agronomic practices and management according to contractual agreement. The responsibility of OSE is supplying hybrid maize parent materials by signing contractual agreement including seed market after crop harvest. Therefore, the crop is expected to meet certain standard requirements and criteria. The type of pricing structure in a production contract generally involves a price that is related to the price of a public variety. Usually seed price is determined ahead of harvesting time based on cost of production quality and quantity of seed. Contract conditions will vary from enterprise to enterprise based on objectives of the enterprises.

Direct seed marketing is short step process of moving packaged seed from the store of the enterprise where it is to be marketed to the farmer after processed and packed. OSE and other enterprises transport their product to the seed dealer's store where the seed is

required. Next to that, seed dealers sell the seed to the farmers directly. One of the advantages of direct seed marketing is that it relates the elements of marketing mix. Another advantage of direct seed marketing is that the seed is sold to farmers through seed dealer based according to agreement between the enterprise and seed dealers. Seed enterprises deliver the seed to seed dealer to be sold to farmers. The Enterprises pay commission to seed dealers. For that matter, seed dealers open the store for full time service of farmers during peak planting time of maize so that farmers can come and purchase the seed any time. This condition saves farmers' time and effort to get the seed on time in his/her village by reducing distance and frequency of visiting seed distribution center.

In a direct seed marketing system the step through which seed was moved to end user farmers was short as compared to conventional due to few actors involved in seed marketing. For instance, if we take OSE as seed supplier organization the major actors would be seed grower farmers, Oromia Seed Enterprise, seed dealers and seed user farmers. This is a short channel which contributed to the reduction of seed market transaction cost and encouraged farmers to purchase seed with affordable price.

4.3.4. Certified seed pricing strategy

In conventional seed system seed pricing mechanism of hybrid maize seed was determined by joint meeting of public seed enterprises. Public seed enterprises are Ethiopia seed enterprises and regional seed enterprises: (Oromia seed enterprise, Amhara seed enterprise, Tigray seed enterprise and Southern Nation Nationality seed enterprise). The federal and regional seed enterprises supply their average cost of production with detailed discussion made on the issue of seed pricing policy and inform to the government. Since public seed enterprise use public crop seed varieties released from public research centers the government determines seed of whole sell price by considering farmer's ability to purchase seed or affordability. On whole seed selling price transportation and handling cost were added. After Federal and regional enterprises have prepared common minutes the government determines selling price with profit margins for each actor in the seed value chain (Mekonnen Gelaw, (ATA), personal communication)..

In direct seed marketing system seed price was determined by the seed supplier or seed enterprise itself only without involvement of government bodies. Seed supplier enterprise

determine its seed selling price based on the enterprise's objective and cost of production with certain profit margin. That means seed price was determined based on supply and demand of seed without overstatement of seed price. When seed price is determined through competition basis and this indicates seed becomes market oriented. However, since seed quality and equity distribution is serious issue there are cases when government body follows and checks the situation since the DSMS not matured well with seed business ethics among actors (Mekonnen Gelaw (ATA) and Mohammed Hasena (ISSD), personal communication).

In CSDS, the final selling price of seed was 1702.40 birr/quintal at a primary cooperative level. However, the price of seed in DSMS was 1580 birr/quintal at seed selling centre through seed dealers. This price was the price which seed user farmers paid directly to take the seed through cash on hand basis. There was 1220.40 birr/quintal price differences between the two markets as a result of direct seed marketing intervention. This is because of the fact that Union and primary cooperatives were dropped off from the seed system due to inefficiency problem to serve the local farmers. Moreover, the marketing margin analysis was computed as follows in (Table 14).

Table 14. Market margin in direct seed marketing system

Actors	**Cost**	**Added Cost**	**Selling Price**	**Gross Margin**	**% total Margin**
Farmer	430	420	850	420	36.52
OSE	850	730	1580	730	63.48
Total	-	-	-	1150	100

Source: (Own Survey)

When the performance of the two marketing system was evaluated in terms of cost incurred in the seed system, during CSDS the total cost incurred was 1702.46 per quintal including seed purchasing cost and seed operational cost. In DSMS, the total cost incurred was 1580 birr per quintal in marketing the seed through seed dealers by the supplier. In this regard, CSDS incurred maximum cost whereas the cost incurred by the DSMS was minimum as compared to CSDS.As a rule of thumb, the channel with minimum cost is relatively more efficient than the system with maximum cost in the seed system.

4.3.5. Market Concentration Ratio (CR_4)

A market concentration ratio is a measure of the percentage share of the market controlled by a specified percentage of firms ranked in order of market share from the largest to smallest. High concentration and inequality indicate oligopolistic tendencies; while conversely, low concentration suggests tendencies towards competition provide there are no serious barriers to entry in to the market (Karugia, 1990).

Before direct seed marketing implemented in Oromia region the seed was distributed by Gibe Farmers' Cooperative Union (GFCU) in East Wellega zone. That means it was monopoly nature of seed market due to single seller with many buyers. But after the direct seed marketing program was started in Sibu Sire woreda, there are different types of enterprises or hybrid maize seed suppliers in the zone with different varieties. These are namely, Oromia seed Enterprise (OSE), Ethiopia Seed enterprise (ESE), Pioner Hibred Company, Ano Agro industry (AAI), Homa private limited company (HPLC) and Meki Batu Union (MBU).

Hybrid maize seed marketing in the study area was weak based on the C4 measures of market concentration ratio. Out of six certified hybrid maize seed suppliers, the first four largest seed enterprises controlled 84.72 % of the total volume of hybrid maize seed market share (Table 15). This is to mean that top four seed suppliers or seed industries covered 89% hybrid maize seed market share in DSMS operation area. Pioneer Hibred Company alone took 29% market share by supplying 30D79 and 30G19 varieties. Other public varieties that covered the remaining market share were BH-660 and BH-543. From the analysis, it can be concluded that hybrid maize seed market in the study area was weak market condition. However, DSMS is better than CSDS because in conventional seed system the seed was distributed by Gibe union only where as in DSMS six enterprises supplied their production on the sense of seed market competition.

Table 15. Concentration ratio of seed enterprises in DSMS

No	Name of enterprise	Amount sold in (Qt)	% of share market	% cumulative
1	Pioneer Hibred	780	29.00%	29
2	Oromia seed Enterprise	600	22.30%	51.30
3	Ano Agro Industry	599	22.27%	73.57
4	Meki Batu Union	300	11.15%	84.72
5	Homa PLC	211	7.84%	92.56
6	Ethiopia seed Enterprise	200	7.43%	100
	Total sales	2690	100%	

Source: (Oromia Seed Enterprise)

4.4. Determinants for Quantity of Hybrid Maize seed Purchase

A total of 14 variables were chosen as explanatory variables considering economic theory, findings from previous literature and experience of farmers as the combination of these strategies would help to draw the relevant variables for the study. These variables include demographic (age and education of HH, and family size), economic (land size, income, cost of seed, and livestock), and institutional (credit, extension contact, distance to seed distribution centre, time of seed supply, preferred bag size, and availability of fertilizer). Of the total hypothesized variables, eight of the mare statistically significant, and can affect the quantity of seed purchased by farmers. The study shows that most of the explanatory variables are in line with their hypothesized direction.

The regression model explained 95.7 % (R^2 = 0.957) the total variation of quantity of hybrid maize seed purchased by respondent farmers. The coefficient of fertilizer, tropical livestock unit, land size, and cost of seed can affect the dependent variables positively at 1% significance level. Moreover, family size, education level, annual income, and frequency of extension contact affected quantity of seed and significantly at 5% (Table 16).

Quantity of fertilizer utilized**:** Utilization of fertilizers (DAP and UREA) has statistically significant and positive impact on the volume of seed to be purchased by the farmer households. One kg increases in fertilizer utilization can increase quantity of seed to be purchased by 0.0298 kg. In line of fertilizer utilization similar finding showed maize is the

staple food in Zambia and most small-scale farming households are engaged in maize production. Fertilizer is used predominantly on maize and agricultural marketing is dominated by maize sales among smallholders (Govereh et *al.,* 2003).

Livestock holding size (TLU): TLU also showed a significant positive effect on volume of seed of hybrid maize to be utilized. Based on econometric analysis an increases of one tropical unit will increase the quantity of hybrid maize seed to be purchased by 0.119 kg This indicates that livestock owner farmers having more probability to purchase hybrid maize seed varieties than others. Hence, with other factor of production livestock are playing an important role to use hybrid maize seed.

Seed cost: An increase of seed price and other associated costs by one birr would decrease seed purchase of farmers by 0.00145 kg. This indicates that as seed price and other costs increased the quantity of seed purchased by farmer is very small quantity of hybrid maize seed varieties. There are cases when farmers decide to plant non-improved varieties available in their locality due to high seed price and financial constraints.

Income: An increase of farmers' income by 1000 birr would increase hybrid maize user farmers to purchase 0.0513 kg of seeds. The income was significant at 1% significance level. This study is similar with the findings of Feder *et al*. (1985). He said that wealth proxy variables will have a positive effect on the adoption of hybrid maize.

Farm land size: Land is one of the important factors of production. The study reveals that one ha increases in land size of household leads to an increase of the hybrid maize seed by 2.51 kg. The findings in this study correspond with Rahman (2004) who found that the more land a farmer has, the more likely that they would adopt improved technology in Asia. Simtowe & Zeller (2007) also found increasing participation in maize farmers who had land than those who were landless. Besides that the land holding size returned a positive and significant effect in several studies. In similar way Langyintuo and Mekuria (2008) remarked that, households with larger land holdings allocated more land to improved maize.

Family Size: An increase of one family member or family labour per household increases quantity of seed purchased by farmers by 0.3711 kg. From this, it can be concluded that maize production is tedious and labour intensive activities. A household with few labour forces may not have capacity to purchase seed and produce maize grain on large plots.

This is consistent with study done by Simwaka *et al.* (2011). Accordingly, large households can provide more labour on the farm and as such it is likely that those farmers who have large families would provide the necessary labour to cultivate improved seed. In addition to that this finding is similar with Simtowe *et al.* (2010) and Mendola (2007) who consistently found evidence that participation increases with household size among smallholder farmers in Malawi and rural Bangladesh, respectively.

Education level of household: The impact of education of household heads, as hypothesized, resulted into a positive effect on the quantity of hybrid maize purchased since education can increase analytical capability of households to decide on using hybrid maize seed. This finding corresponds with Alene *et al.* (2000) says that education was found to positively affect adoption of improved maize varieties in West Shoa, Ethiopia.

Frequency of extension contact: An increase of extension contact by one unit can lead to an increase of hybrid maize seed quantity purchase by 0.1996 kg. This implies that agricultural extension service can influence household head in the probability of purchasing hybrid maize seed varieties. As it has been reported in several studies, extension contact and access to credit have apositive influence on adoption of improved maize varieties. Yaron *et al.* (1992) stressed that extension services are one of the prime movers of the agricultural sector and have been considered as a major means of technology dissemination.

Table 16. Factors affecting quantity of seed to be purchased

Variables	Coef.	Std. Err.	t	P>t
Fertilizer	0.0298	0.008	3.87	0.000***
Sex	-0.819	2.208	-0.37	0.711
Age	-0.009	0.044	-0.2	0.838
Family size	0.374	0.151	2.48	0.014**
Education	0.431	0.160	2.69	0.008***
TLU	0.452	0.119	3.79	0.000***
Income	0.000513	0.000	1.76	0.081*
Land size	2.526	0.537	4.71	0.000***
Cost incurred	-0.00415	0.001	3.48	0.001***
Right time	1.069	0.822	1.3	0.196
Distance	-0.043	0.072	-0.6	0.552
Extension contact	0.199	0.064	3.09	0.002***
Constant	0.328	2.645	0.12	0.901

***, ** and * indicates significance level at 1%, 5% and 10%; N = 140, R^2 = 95.7, Adjusted R^2 = 0.9604 F (11) = 282.03, Root MSE = 3.2607, DF = 138.

5. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1. Summary

The study mainly focused on analyzing market performance or the effectiveness and efficiency of the functioning of the conventional seed distribution and hybrid maize direct seed marketing of the Gobu Seyo and Sibu Sire Woredas, respectively, in 2012/13 cropping season. In conventional seed system or the existing seed systemhe Ethiopian Seed Enterprise (ESE) has been the government parastatals involved in the production and distribution of improved seeds. The Ethiopian seed sector is characterized by the active participation of several public entities in the seed sector that plays an important role in its coordination. One advantage of this is that it results in major public investments being made in research, seed production and dissemination. However, the situation also has its limitations; it is unable to guarantee farmers' access to seed of improved varieties, in the right quantity, of the right quality, and in a timely manner, mainly because of the highly centralized seed distribution system and virtual absence of seed marketing conducted by the seed producing enterprises and companies.

Thus this seed system is inefficient due to lack of accountability, capacity and long process. To reverse the situation, parallel to conventional seed distribution system it is necessary to look for an alternative seed market which improves seed supply service. This direct marketing system is piloted starting from 2012 in Sibu Sire Woreda. A lot of development work have been done regarding seed sector with efforts of all partners but the achievements were not supported with research study for further scaling-up and good experience documentation.

In order to compare the performance of conventional seed distribution and direct hybrid maize seed marketing system, primary data was collected from 140 sampled households through face to face interview schedule by the experts or enumerators. Secondary data was collected from Woreda Bureau of Agriculture, Cooperative Promotion Office, Ethiopia Seed Enterprise, Oromia Seed Enterprise, Pioneer Private Company, Ano Agro industry and other private seed producers.

Both descriptive and econometric analyses were employed for data analysis. From econometric model; OLS was used to identify factors affecting quantity of seed purchased by farmers. The result showed that significant independent variables which affected the quantity of seed identified were quantity of fertilizer, tropical livestock unit, land size, cost of seed, family size, education level, annual income, and frequency of extension contact.

Performance of hybrid maize seed direct marketing is better than conventional seed distribution system for farmers in supplying required quantity of seed, quality of seed at right time, right place and with good services. Majority of the partners indicated that direct seed marketing improved efficiency of seed system distribution with accountability and saves farmers' time, money and labour. Farmers are able to get enough seed with alternative seed varieties from different source in single trip. Seed enterprises stated that direct seed marketing enable to create seed business ethics with sense of competition among the suppliers in supplying quality of seed to assure customer satisfaction.

Woreda Bureau of Agriculture believe that direct seed marketing enable them to create joint effort among partners in seed market system to plan together and work for common goal. In the year direct seed marketing started in Sibu Sire Woreda, there was no seed leftover in the store. This was because, direct seed marketing facilitated, direct contact between seed producer or agent and farmers improves trust and good relationship between the two in such a way that a lot of work load has been reduced for Woreda office experts. From supply side majority of the enterprises both public and private enterprises sold large volume of seed to their customers based on their variety characteristics. Again from demand side, farmers have got the chance to choose the varieties that they are interested in from the suppliers or seed dealers through a face to face contact.

5.2. Conclusion

This study attempted to show the direction and start of direct seed marketing in Oromia on pilot test. According to this work, it can be concluded that quantity of fertilizer, tropical livestock unit, land size, cost of seed, family size, education level, annual income and frequency of extension contact are the determinant factors on quantity of hybrid maize seed purchased by farmers in both marketing systems.

From focus group discussion with Woreda bureau of agricultural experts, Woreda cooperative promotion office and farmers, there is a difference between conventional seed

distribution and direct marketing in terms of efficiency. Hence, direct marketing is more efficient than conventional seed distribution system. However, in order to make the overall seed market efficient, the two systems can be used in integrated manner depending on the situation and by solving problems in the system from time to time. Good marketing facilities like infrastructure (road network) and services are important to improve the issue of the seed system with the participation of the concerned partners.

According to focus group discussion, in the study area the major hybrid maize production constraints were shortage of land, shortage of finance to purchase inputs, and shortage of oxen. In addition, livestock diseases and pests are serious problems which affect agricultural production of the area directly or indirectly. From market point of view, the main problems are high input price, late supply of seed, or supply of less demanded variety, late supply of fertilizer, high fertilizer price and low grain price at the time of government tax payment.

5.3. Recommendations

Since seed is basic input in agricultural production and development of the country, efficient seed distribution should be in place to support the existing seed system. To overcome seed market inefficiency, direct seed marketing began in Ethiopia since 2012/13. Sibu Sire is one of the pilot test area of the direct seed marketing. Based on this work, in the pilot test Woreda, the new seed market approach has got acceptance by farmers (demand side) and supply side (both public and private enterprises) with partners in the system. Therefore, it is recommended that, direct seed marketing model can be scaled up to other Woredas to promote market oriented seed business system. This is because, direct seed marketing can play an important role in supporting the integration of seed markets, facilitating competition, encouraging investment, and allowing a more efficient allocation of resources and enhancing market oriented production. Therefore promotion of direct seed marketing should be cleared for the farmers as alternative seed source by development practitioners.

In direct seed marketing adopting seed dealer approach is important issue by building capacity of the seed dealer. When the seed dealer employed there should be criteria prepared to screen the competitors without any biasedness of the individuals. In direct seed marketing system where seed dealer is necessary seed dealer should be equipped with

all seed business ethics through training and different workshop to serve the farmers ethically. Guide lines and procedures should be developed, evaluated and prepared in simple language and given for the seed dealer. There should be terms contractual agreement bind legally between seed supplier enterprises and seed dealer to sell the seed on time with actual variety provided with logo of the enterprises. To assess the enhancement, there should be detail record of seed buyer farmers with the type of varieties and specific location.

Direct seed marketing is innovative in seed system which accelerates access of seed for the farmers and the enterprises. DSMS reduces some of the hidden costs incurred and risks currently imposed on government official system for seed supply. These include the costs associated with annual seed demand assessments, seed delivery and distribution operations by DAs and woreda bureau of agriculture (WBoA), and carryover stock management. Thus, partners working in seed system, Bureau of Agriculture, Cooperative promotion Agencies, seed enterprises, seed producer cooperatives and other concerned body can incorporate in their program for father strategic seed marketing development.

From institutional angle, in order to overcome critical financial constraints of the farmers, facilitating credit source, timely delivery of fertilizer with other complementary inputs, improving the local transportation and marketing infrastructure (road networks) and extension service can improve farmers' uptake of quantity of hybrid maize seed varieties demanded in the areas. Demand creating is also important among farmers on new released varieties, through varietal promotion, on-farm demonstrations, and seed exhibitions to raise awareness can encourage farmers to purchase more quantity of seed. In extension program seasonal advertising using government local media (radio, and TV) for both private and public seed companies' products is important in local language including small pamphlets so that they can get information to purchase enough amount of seed.

For accountability purpose all seed supplier enterprises should conduct follow-up programs to assess their varietal performance on farmers' fields with technical services and develop purposive feedback mechanism from the farmers.

Conducting farmers' field days can facilitate farmer's interaction with seed supplier and builds up long run relationship on variety selection for specific location. This information helps them to incorporate, in their seed production plan, the provision of quality services which meets farmer's interest.

Whenever variety is released from research centers and distributed by seed enterprises, it is better to take in to consideration overall socioeconomic farming system and specific adaptation area of the crop variety.

Establishing on-farm seed multiplication and seed dealership center can improve seed availability of improved seed at local levels and reduces cost of transporting seed from other places both for the farmers and seed suppliers. This can help timely supply of the demanded variety and facilitates the farmers to use improved seed

Frequent training of farmers on intensive current agricultural technologies utilization can improve productivity per unit area of the farmers to overcome shortage of land. Training and adopting double cropping system can be a solution for shortage of land to use improved seed.

Intercropping can support to use improved seed and fetches good income and encouraging farmers which have access to irrigation to use their land efficiently by combining improved agricultural technologies.

Promoting improved livestock production like artificial insemination, improved feeding strategies and establishing livestock clinic is important for integration of livestock and crop production.

6. REFERENCES

Abadi,A.K. and D. J., Pannell, 1999. A conceptual frame work of adoption of an agricultural innovation. *J. Agricultural Economics*, University of Western Australia, Perth. 2(9): 145-154.

Abdissa Gemeda, Girma Aboma, H. Verkuijl, and W. Mwangi. 2001. Farmers' Maize Seed Systems in Western Oromia, Ethiopia. Mexico, D.F.: *International Maize and Wheat Improvement Center (CIMMYT) and Ethiopian Agricultural Research Organization (EARO)*.

Abebe Atilaw and Lijalem Korbu, 2013. Recent development in seed systems of Ethiopia, 2013.Ethiopian Institute of Agriculture Research, Debrezeit, Ethiopia.

Alemu, D., S. Rashid, and R. Tripp. 2010. Seed system potential in Ethiopia: Constraints and opportunities for enhancing the system. Washington DC: IFPRI.

Alene AD, Poonyth D & Hassan RM, (2000). Determinants of the adoption and intensity of use of fertilizer.

Amsalu Ayana, Ashinie Bogale, Abdo Woyema, 2011. Analysis of Seed System in Oromia: *Opportunities for Improvement*, Finfinne.

Amstel, V., Bottem, J. W. T., Sidik, M. and Santen, C. E. (1995). Integrating seed systems for annual food crops. Proceedings of a workshop, 24-27 Oct 1995. Malang, Indonesia: CGPRT Center, Bogor, Indonesia. 311pp.

Asfaw Negassa, (1998).Vertical and spatial integration of grain markets In Ethiopia: Implications for Grain Market and Food Security Policies, Working paper No.10. Addis Ababa, Ethiopia.

Asumugha, G.N, M.E, Njoku B.C., Okoye, (2009). An Analysis of the Supply for Seed Yam in Nigeria: *African Journal of Business Management*, 3:128-031.

ATA (Ethiopian Agricultural Transformation Agency), 2013 – 2017). Maize Sector Development Strategy (Working Document 2013-2017).

Augustine langyituo, (2005). Analysis of the Maize Seed Sector in South Africa: Paper presented at a Rockefeller foundation workshop on Biotechnology, Breeding and Seed systems for Africa Crops. Nigeria

Bambang, S., (2006). Market structure of the corn seed industry on East Java: *Journal of Agro- economy*, 24(2):133-156.

Belay Simane. 2002. The national seed industry policy and strategy: current status of sorghum and millets. Paper presented at the 1st sorghum and millet national workshop held at Melkassa Agricultural Research Center.

Berhanu Gebremedhin, Dirk Hoekstra and Azage Tegegne, 2006. Improving the Competitiveness of Agricultural Input Markets in Ethiopia: Paper prepared for presentation at Symposium on Seed-fertilizer Technology, Cereal productivity and Pro-Poor Growth in Africa: *Time for New Thinking 26th Triennial Conference of the International Association of Agricultural Economics* (IAAE).

Bosena, D.T. Bekabil, F. Berhanu G. and .Dirk, H, 2011. Structure-Conduct-Performance of Cotton Market: The Case of Metema District, Ethiopia. Journal of Agriculture, Biotechnology & Ecology, 4(1): 1-12.

CIMMYT ITTA. (2007). Improving maize seed marketing in eastern and southern Africa, Policy Brief (03). Drought-Tolerant Maize for Africa (DTMA) Project. Accessed at www.cimmyt.org/english/docs/eco_paper/ssanalysisAfrica.pdf on April 28, 2015.Company, California.

Daniel, I. and Adetumbi, J. (2006). Maize Seed Supply Systems and Implications for Seed Sector Development in Southwestern Nigeria. *Journal of Sustainable Agriculture* 28(2): 25-40.

Dawit Alemu, 2007. Quality Seed and Grain Production and Creating Better Market Opportunity for Agro-pastoral Communities in the Somali Regional State. Somali Region Pastoral and Agro Pastoral Research Institute Jijiga, Ethiopia.

Dawit Alemu, Shahidur Rashid, Rob Tripp, 2010. Seed system potential in Ethiopia. Constraints and opportunities for enhancing the seed sector. International Policy Research Institute.

Dawit Alemu, Shahidur Rashid, Rob Tripp, 2010. Seed system potential in Ethiopia Constraints and opportunities for enhancing the seed sector. *International Food Policy Research Institute* (IFPRI).

Dawit Alemu, Wilfred Mwang, Mandefro Nigussie and David J.Spielman, 2008. The maize seed system in Ethiopia: challenges and opportunities in drought prone reas. *African Journal of Agricultural* Research 3 (4): 305-314.

Dijkstra, T. (1997). Trading the Fruits of the Land: Horticultural Marketing Channels in Kenya. Aldershot, England: Ashgate Publishing Limited.

EARO and CIMMY, 2001.Mandefro Nigussie, D. Tanner, and S. Twumasi-Afriyie (eds.). 2002. *Enhancingthe Contribution of Maize to Food Security in Ethiopia: Proceedings of the Second National Maize Workshop of Ethiopia*, *12-16 November 2001, Addis Ababa, Ethiopia*. Addis Ababa, Ethiopia.

Edmeades,S.D.J.Panuef,M.Simale, and M.Renkow,2008.Modeling the crop variety demand of Semi-subsistence households: Banana in *Uganda.Journal of Agricultural economics.*

Elizabeth Cromwell, Esbern Friis-Hansen and Michael Turner, 1992. The seed sector in developing countries: a framework for performance analysis. Overseas Development Institute. Working Paper 65. *Results of ODI research presented in preliminary form for discussion and critical comment*.

Etoundi SMN, Dia BK (2008) Determinants of the adoption of improved varieties of Maize in Cameroon: case of CMS 8704. Proceedings of the African Economic Conference 2008. 397-413.

FAO, (1999). Seed marketing. FAO Corporate document repository. Available on: http://www.fao.org/docrep/V4450E/V4450E00.

FAO, (1999). Sustainable Seed System in SSA, Food and Agriculture Organization of the United Nations, Rome, Italy.

FAO, (2006). Seed Multiplication by resource poor farmers. Food and Agricultural Organization of the United Nations, Rome, Italy.

FAO, 2012. FAOSTAT, Food Supply. Cited on May 02, 2015. Available on http://www.faostat.fao.org/site/345/default.aspx.

FDRE (CSA) (2010). Agricultural Sample Survey 2009/2010 (2002 Ethiopian Calender). Report on Area and Production of Crops (Private Peasant Holdings Main Season). Vol. IV, Addis Ababa.

FDRE CSA,(2012). Agricultural sample survey: Volume i report on Farm Management Practices Statistical

FDRE CSA.2013.Agricultural Sample Survey. Report on Area and Production of Major Crops. Volume 1, Statistical bulletin 532. Addis Ababa, Ethiopia.

Feder G, Just RE & Zilberman D (1985). Adoption of agricultural innovations in developing countries: A survey. *Economic Development and Cultural Change* 33(2):255-298.fertilizer among rural dwellers in Afijio Local Government of Oyo State. Unpublished B.Sc. Project in the Department of Agric. Extension and Rural Development, University of Ilorin. Fertilizer use in Benin and Malawi. International Food Policy Research Institutes US.

Feleke, S. and Zegeye, T. (2005). Adoption of improved maize varieties in Southern Ethiopia: Factors and strategy options. *Food Policy* 31: 442-457.

Getachew, B. (2002). Cattle marketing in West Showa. M.Sc. thesis presented to School of Graduate Studies of Haramaya University, Haramaya, Ethiopia.

Getahun D. 2004. Assessment of Factors Affecting Adoption of Wheat Technologies and Its impact. The Case of Hula District, Ethiopia. M.Sc. Thesis (Unpublished) Presented to School of Graduate Studies of Haramaya University, Ethiopia.

Getahun, D., Mwangi,H. Veruil and Abdishekur Wondimu, 2006. Participatory rural Appraisal (PRA) on the use of Maize as food and feed in Sidama and Wolayita

Mixed Farming System, Ethiopia. A joint of ILRI CIMMYT and ECAMAW fund by the German Federal Ministry of Economic Cooperation Development.

Getahun, D.,Mwangi,H. Veruil and Abdishekur Wondimu, 2000. An Assessment of the adoption of seed and fertilizer packages and the role credit in smallholder maize production in Sidama and Norther Omo Zone, Ethiopia. Mexico, D.F; *International maize and wheat improvement Center (CIMMYT) and Ethiopia Agricultural Research Organization (EARO).*

Govereh, J., Jayne, T.S., Sokotela, S. Lungu, O.I., 2003. *Raising maize productivity of Smallholder farmers.*

Govereh, J., Jayne, T.S., Sokotela, S. Lungu, O.I., 2003. *Raising maize productivity of smallholder farmers.*

Gujarati, D.N., (2004). Basic Econometrics, 4th Edition. McGraw-Hill, New York.

Healy, F.J. 1984. Statistics: A Tool for Social Research. Wadsworth Publishing

ISSD (Integrated Seed Sector Development) in Ethiopia, 2013**.** Internal Document for *Review.* Centre *for Development Innovation of Wageningen UR.*

Karugia,J.T.,(1990). Competition and efficiency in beef retailing in a metropolitan area: The case study of the city of Nairobi. Ph.D.Thesis of Nairobi

Kindie,A.,(2007). Sesame Market chain Analysis: The case of Metema woreda North Gondar Zone, Amhara National Regional State, Ethiopia. An M.Sc Thesis presented to the school of Graduate Studies of Alemaya University, Ethiopia. 37pp.

MacRobert, J.F. 2009. Seed business management in Africa. Harare, Zimbabwe, *CIMMYT*.

Meijer, P.W.M., 1994. The Function of Maize Market in Benin, Bert Broundjin, Benin, pp. 11-32.

Mekuria M. 2008.Assessing the influence of neighborhood effects on the adoption of improved agricultural technologies in developing agriculture. Af JARE 2 (2), 151-169.

Mendoza and Mark Rosegant, (1995). Pricing conduct of spatially differentiated markets. Prices, Products, and people. Internationak Potato Center,Lima, Peru pp. 343-356.

Mesfin Astatike, Ahmed Yimam, Dawit Tsegaye, Minilek Kefale, Demeke Mewa Tadesse Desalegn and Mohammed Hassena , 2012. Experience of direct seed marketing in Amhara region. Bahir Dar University ISSD Project**,** ISSD National Partnership Coordinator.

MoARD, 2010, Abebe Atilaw1 and Lijalem Korbu, 2010. Recent Development in Seed Systems of Ethiopia.

MoFED (Minstry of Finance and Economic Development), 2011. Macro-economic development in Ethiopia. Annual report. Addis Ababa.

Monteshwe, B.D., 2006. Factor affecting participation in mainstream cattle market by Small-scale cattle farmers in South Africa, M.Sc. Thesis presented for Department of Agricultural Economics, University of Free State, and Bloemfontein, pp.118

Mywish Maredia, Julie Howard, and Duncan Boughton, with Anwar Naseem, Mariah Wanzala, and Kei Kajisa, 1999. Increasing seed system efficiency in Africa: concepts, strategies and issues. MSU International Department of Agricultural Economic Development Department of Economics Working Paper No. 77. *Michigan state university East Lansing, Michigan 48824.*

Ndjeunga, J. Anand Kumar, K. and Ntare, B R., 2006. Comparative Analysis of Seed Systems in Niger and Senegal J Ndjeunga, K Anand Kumar and B R Ntare. *SAT/ ejournal.icrisat.org*, 2(1): 1-31

Ndjeunga, J., Anand Kumar, K., and Ntare, B. R. 2000. Comparative analysis of seed systems in Niger and Senegal. *International Crops Research Institute for the Semi-Arid Tropics*. 36 pp.

Olaf Erenstein, Girma Tesfahun Kassie and Wilfred Mwang, 2011. Challenges and opportunities for maize seed sector development in eastern Africa. *International Maize and Wheat Improvement Center* (CIMMYT), Addis Ababa, Ethiopia.

Olukosi, J.O.; Isistor, S.U. and Ode, M.O.2005. Introduction to Agricultural Marketing and prices, principles and applications G.U. Publications Abuja, Nigeria.

Onu Ji Okunmmandew Fy. 2001. Efficiency in cotton marketing in Northern Nigeria. International. Jjournal of .Economic Development 1(1).

Rahaman, J and Marcus, N. D., (2004). Gender Differentials in Labor Contribution and Productivity in Farms.

Sahlu, Y. and M. Kahsay. 2002. Maize seed production and distribution in Ethiopia. In: Proceedings of the second National Maize Workshop, Addis Ababa, Ethiopia, November 12 - 16, 2001, pp. 160 - 165.

Sahlu, Y., Simane, B. and Bishaw, Z. (2008) 'The Farmer-based Seed Production and Marketing Schemes: Lessons Learnt' in M. Thijssen, Z. Bishaw, A. Beshir, and W. de Boef (eds), Farmers, Seeds and Varieties: Supporting Informal Seed Supply in Ethiopia. Wageningen: Wageningen International.

Shahidur Rashid, Kindie Getnet, Solomon Lemma, 2010. Maize Value Chain Potential in Ethiopia Constraints and opportunities for enhancing the system. *International Food Policy Research Institute* (IFPRI). pp. 1-64.

Shimelis Kebede, 2004. Demand for fertilizer in Oromiya: the case of two districts in North Shoa Zone. Thesis submitted to Haramaya Department of Agricultural Economics, Haramaya University.

Simtowe, F., & Zeller, M. (2007). The Impact of Access to Credit on the Adoption of hybrid maize in Malawi: An Empirical test of an Agricultural Household Model under credit market failure. *AAAE Conference Proceedings* (pp. 131-145). Pretoria: African Association of Agricultural and Applied Economists

Simtowe,F. Mduma J, Phiri MAR, Thomas A, and Zeller M. 2006. Can Risk-aversion Towards Fertilizer Explain part of the Non-adoption Puzzle for Hybrid Maize? Empirical Evidence from Malawi. *Journal of Applied Sciences,* 6(7):1490-1498.

Simwaka, K., Ferrer, S., & Harris, G. (2011). Maize production differentials among Malawi rural households: A difference in difference estimation approach. *Journal of Development and Agricultural Economics*, 222-229.

Singh,S, 2004. Rural marketing focus on agricultural inputs, Institute of Rural management.

Spielman, D., Byerlee, D., Alemu, D. and Kelemework, D. (2010). Policies to promote cereal intensification in Ethiopia the search for appropriate public and private roles. *Food Policy* 35: 185-194.

Suvanichwong, (1997).Structural changes in market organization and performance of the Thai Animal feed Industry, Ph.D. Dissertation (unpublished), University of The Philippines Los Banos.134pp.

Tahirou, Abdoulaye, Diakalia Sanogo, Augustine Langyintuo, Simeon A. Bamire, and Adetunji Olanrewaju. 2009. Assessing the constraints affecting production and deployment of maize seed in DTMA countries of West Africa. *IITA, Ibadan, Nigeria. 40 pp*.

Teshome Lakew and Dawit Alemu, Yoshiaki Nishikawa, Mekonnen Gelaw, Mesfin Astatike, Regassa Feyissa, 2012. Seed Demand Assessment. *Ethiopian Institute of Agricultural Research, FRG II Project Empowering Farmers' Innovation Series No. 5. Addis Ababa, Ethiopia*.

Thijssen, M.H., Z. Bishaw, A. Beshir and W.S. de Boef, 2008 (Eds.). Farmers, seeds and varieties: supporting informal seed supply in Ethiopia. *Wageningen, Wageningen International.* pp. 348.

Tweelen ,G.1997.Marketing of Agricultural commodities ,in Gramer, G.I,Jenen, W.C and South gate ,D.O.(eds), Agricultural economics and Agribusiness.

Wolday Ameha, (1994). Food Grain Marketing Development in Ethiopia after Reform1990. A case study of Alaba Siraro. The PhD. Dissertation Presented to Verlag Koster University. Barlin. pp. 293.

Yaron, D., Dinar A., & Voet H. (1992). Innovations on family farms*: The Nazareth Regionin Israel.*

Yonas Sahlu and Mulugeta Kahsay, 2001. Maize seed production and distribution in Ethiopia. *Ethiopian Seed Enterprise*. *Addis Ababa, Ethiopia*.

7. APPENDICES

Appendix Table 1. VIF

Variable	VIF	1/VIF
Fertilizer	7.85	0.127
Landsize	5.61	0.178
TLU	3.01	0.333
EDUC	2.57	0.389
Cost	2.53	0.395
INCOME	2.44	0.41
FSIZE	1.63	0.612
Frext	1.56	0.64
Righttm	1.52	0.659
AGE	1.48	0.677
DisKm	1.14	0.88
SEX	1.03	0.975
Mean VIF	2.7	

Appendix Table 2. Sibu Sire Maize area and production 2008 /9 to 2013/14

Year	**Area (ha)**	**Production (qt)**
2008	14,172.5	96,830
2009	15,374	691,723
2010	13,898	637,325
2011	8475	524,062
2012	11,242	602,482
2013	15,832	957,084

Appendix Table 3. Gobu seyo maize area and production trends 2008/9 to 2009

Year	Area (Ha)	Production (Qt)
2008/9	7398	300013
2009/10	7593	365496
2010/11	9114	520129
2011/12	5257.5	382173.5
2012/13	5113	291390
2013/14	5934.5	368062

Appendix 4. Tropical Livestock unit Conversion Factor

Type of Livestock	Conversion Factor
cow	1
oxen	1
calves	0.25
heifer	0.75
sheep	0.6
goat	0.6
donkey	0.7
horse	1.1
mule	1.1

SURVEY QUESTIONNAIRES

SURVEY QUESTIONNAIRES ON "COMPARATIVE ANALYSIS OF DIRECT HYBRID MAIZE SEED MARKETING AND CONVENTIONAL SEED DISTRIBUTION SYSTEM IN EASTERN WELLEGA ZONE: THE CASE OF SIBU SIRE AND GOBU SEYO WOREDAS."

1- General Information

1.1 Research Site: Region _____ Zone _____ Woreda _____

PA _____ Village/Got _____

1.2 Enumerator full name: _____ Signature _____

1.3 House-hold Head: a) Full name _____ b) Sex: male=1 female=0.

C) Mobile number _____d) Age: _____ (completed years) e) Religious 1= Muslim 2= Christian

f) Marital Status: _____ married=1 single = 2 divorced = 3 widowed = 4

1.4 Family Size in Sex, Age, Education and (including the household head), Relation to household head, and Main occupation

Nº	Name of HH member (1)	Sex		Age in years (4)	Education level (7)	Relation to HH Head (8)	Main occupation (9)
		Male (2)	Female (3)				
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Code for (8) · Son/Daughter=1 · Wife/husband=2 · Parent=3 · Relative=4 · Employee=5

·Others = 6 specify ----------

Code for (9) · Farming = 1 · Animal rearing = 2 · House work = 3 · Student = 4

· Handicraft including Weaving/spinning/pottery = 5 others = 6 specify----------

1.5 Type of house you are living in. Grass roofed =1 Corrugated tin roofed = 2 both = 3

2. Income Source

2.1 What are your family major sources of income? Rank in order importance Sale of crops =1 Sale of livestock and/or products = 2 Off-farm income = 3 Non-farm = 4 5(specify).

Household Livestock production

Livestock type	Total number	Remark
Cow		
Oxen		
Calves		
Bulls/heifer		
Sheep		
Goat		
Donkey		
Horse		
Mule		

2.2 What are major crops grown for your family (Rank in order of importance)

Rank	**Reason for ranking**	**Remark**
1st		
2nd		
3rd		
4th		
5th		

2.3 What amount of money you earn annually from your income sources?

2.4 Provide the information on the area covered and the yield obtained from the crops cultivated in 2012/13

2.5 Do you have experience in hybrid maize seed production? Yes = 1 No = 0 .If yes _____ years

2.6 How did you get the information of hybrid maize seed varieties for the first time? _____

2.7 When did you start using hybrid maize seed varieties for the first time? _____

2.8 What is your annual income from hybrid maize grain production in birr _____

2.9 In your opinion, which food crop would improve household incomes in your area? _____

2.10 Which crop do you produce for market in order of the importance _____?

2.11 What makes this crop suitable for commercial /marketing? _____

2.12 What are the major problems in maize hybrid seed marketing? Price fluctuation = 1 High Costs of transportation 2 = Inaccessibility of market 3 = lack of rural road 4 = All of the above 5= others

3. Farm Characteristics

3.1 Do you own land? 1 = Yes 0 = No. If yes, mention the source and size of farmland? 1. Own farm size_____ 2. From share cropping_____3. Rented from other source_____

3.2 If you do not have pair of oxen, how did you solve the problem of oxen shortage? Renting from others = 1 borrow from others = 2 support from relatives 3 share of my lands = 4 Exchange of oxen with my family 5 = Others----------

3.3 Do you use irrigation or rain fed for maize production? Irrigation=1 Rain fed=2 both=3

Irrigation land _____ha and rain fed_____

3.5 How did you allocate land to hybrid maize before 2012/13 1 = more than other crops 2 = equal to

Other crops 3 = less than other crops

If more than, other crops why? _____

If less than other crops why? _____

3.6 How did you allocate land to hybrid maize in 2012/13 1= more than other crops 2 = equal to other crops 3 = less than other crops.

If more than other crops why? _____

If less than other crops why? _____

4. Availability of hybrid maize seed

4.1Where did you get your hybrid maize seed in 2012/2013 production year? (Circle) OSE =1 ESE=2 Pioneer =3 BOARD=4 Union =5 Union = 6 Anno= 7

Why selected this seed source? _____

4.2 How did you get the hybrid maize seed? During 2012/13(circle) Purchase=1 Loan/credit=2 Gift= 3 Barter=4 other =5specify _____

4.3. How many kg of hybrid maize seed did you purchase in 2012/20113_____

4.4 How many kg of hybrid maize seed did you plant in 2012/13_____

4.5 Do you use local varieties or improved varieties 1= improved hybrid 2 = OPV 3 = local varieties

4.6 If local varieties why? Shortage of hybrid maize seed=1 price of hybrid maize seed was high = 2 lack of timely supply of hybrid maize seed=3 lack of credit to purchase hybrid maize seed=4 cost of local seed was cheap = 5 other = 6 specify

4.7 If hybrid maize varieties why? _____

4.8 Which hybrid maize varieties are preferred to you _____

4.9 If OPV varieties why? _____

4.10 How many OPV maize varieties do you cultivate? _____

4.11 What is the average productivity of hybrid varieties on your land _____/ha

4.12What is the average productivity of OPV varieties on your land _____ /ha

4.13 What is the average productivity of local varieties on your land _____/ha

4.14 Which factors will motivate you to buy hybrid maize seed varieties? 1=Lower price 2= Better seed quality 3= New variety 4= Good extension advice 5=5Good awareness about Variety/seed 6= productivity 7= marketability

4.15 Do you buy the same hybrid maize varieties every year 1=yes, 0=No what were the Varieties? If no every what year you change new variety? _____

And why _____

4.16 Did you get the required hybrid maize variety of seed in 2012/2013? Yes =1 No=0 If no which Varieties did you demand effectively and supplied to you? _____

_____

4.17 Did you get the required quantity of hybrid maize seed in 2012/13? Yes =1 No = 0 if no why? 1= less quantity 2 = excess quantity.

4.18 Did you get hybrid maize at right time in 2012/13? Yes = 1, 0 = No

4.19 Did you get the required quality of hybrid maize seed in 2012/13? Yes = 1 No=0

4.20 Did you get hybrid maize seed at the right place in 2012/13 yes = 1 No = 0

4.21 Did you get hybrid maize seed with affordable price in 2012/13 Yes =1 No=0

4.22 Did you get the required varieties, quantity, and quality of seed with affordable price at right time and place in 2012/2013? Yes = 1 No = 0

4.23 If yes, what benefit did you achieve? _____

4.24 Have you ever interrupted growing improved maize varieties since your start? Yes = 1 No = 0 If yes why? Seed not available = 1 Seed too expensive = 2 not adaptable varieties = 3 Susceptible to diseases = 4 Poor quality of seed = 5 other = 6 (specify) ____

4.25 What did you do when hybrid maize seed you required is not available? 1 = shift to other crops 2 = purchase from local market 3 = lending from relative or neighbor

4.26 In which years did you take this decision? _____

5. Bag size (Pack and Labeling)

5.10 Packaging

5.11 What was the packaging material for hybrid maize seed in 2012/13 crop season? Sisal sack/ 'Cloth bag = 1 Plastic sack 'Madaberya' = 2 Sisal sack 'jonia' = 3 others =4 (specify) ------

5.12 How many kg of hybrid maize seed was packed in one package during 2012/13 crop season? (Minimum) ----------Kg (Maximum) ----------kg

5.13 Was the type of bags or seed container convenient for you? 1= yes 0 = No, if No, what were the reasons _____

5.14 What is your preference of packaging weight in kg? In order of importance 0.5 kg = 1, 1 kg = 2, 2.50 kg = 3, 5 kg = 4, 6 kg = 5, 10 kg = 6, 12.5 kg = 7 others = 8 specify

5.15 What is your reason to prefer----------kg package?

1. ----------

2. ----------

3. ----------

5.14 What are your criteria to judge good quality of hybrid maize seed? Specify

1. ----------

2. ----------

3. ----------

5.15 How was the Physical quality of your hybrid maize seed used in 2012/13? Free from undesired materials and broken (%) 70-79% = 1 80-89% = 2 90-96% = 3 97-99% = 4

5.26 How was the physiological purity of your hybrid maize seed used in 2012/13? Germination% 70-79% = 1 80-89% = 2 90-96% = 3 97-99% = 4

5.16 How was the Genetic purity of your hybrid maize seed used in 2012/13? Varietal purity (%) 70-79% = 1 80-89% = 2 90-96% = 3 97-99% = 4

5.17 Did you observe any problem in getting hybrid maize seed 2012/13? If any state 1= Quality problem 2 = Quantity of supply problem 3 = Timely supply problem 4= required variety (Type) supply problem

Due to the above problem did you lost any economic benefit? Specify----------

5.29 What measures to be taken to mitigate the above problem?

1. Quality problem ----------

2. Quantity of supply problem ----------

3. Timely of supply problem----------

4. Supply of required variety problem----------

5. If not supplied at right place _____

5.30. To what extent are you satisfied with the supplying system of the hybrid maize seed before 2011/2012? Not satisfied at all = 1, poorly satisfied = 2, averagely satisfied = 3, highly satisfied =4

5.31. Did you get the required hybrid maize variety of seed in 2012/2013? Yes =1 No = 0

5.32. Did you get the required quantity of hybrid maize seed in 2012/2013? Yes =1 No = 0

5.33 Did you get the required quality of hybrid maize seed in 2012/2013? Yes =1 No = 0

5.34 Did you get the hybrid maize varieties at the right place in 2012/13 yes = 1 No = 0

5.35 Did you get the hybrid maize seed with affordable price in 2012/13 Yes = 1 No = 0

5.36 Did you get the required variety, quantity, quality of seed with affordable price at right time and place in 2012/2013? Yes = 1 No = 0

5.37 Did you observe any problem in getting hybrid maize seed in 2012/13? If any state Quality problem = 1 Quantity of supply problem = Timely supply problem = 3. Required variety (Type) supply problem = 4

5.38 To what extent are you satisfied with the supplying system of the hybrid maize seed in 2012/2013? 1. Not satisfied at all = 1, poorly satisfied = 2, averagely satisfied = 3, Satisfied = 4

5 = highly satisfied

6. Timeliness and source of Hybrid maize seed

6.1 Is there demand assessment every year practically? Yes = 1 No = 0

6.2 How did you submit your hybrid maize varieties demand in 2012/13? _____

6.3 In which month your demand was collected before 2012/13 _____

6.4 Who did collect your seed demand before 2012/13? _____

6.5 Which month is the best to collect your demand _____ and why ___

6.6 In which month the seed varieties were supplied in 2012/2013 _____

6.7 In which month do you plant maize seed varieties in 2012/13_____

6.8 What are the factors which influence you to shift your first demand assessment in terms varieties and quantity of seed? _____

6.9 How often did you fail with your first assessment? Sometimes = 1 every year = 2 every 2 year s =3

What were the reasons _____

7.10. Do you think that the formal system is efficient to get the hybrid maize seed? Yes = 1 No = 0

If no, what are the reasons _____

7.11 How did you observe quality of seed from formal seed system before 2012/2013? 1 = V/ Good, 2 = Good, 3 = fair 4 = poor

7.12 If it was poor quality in terms of what? 1= broken seed 2 = rotten seed 3 = storage pest damage 4 = poor germination 5 = mixture 6= shriveled seed, 7 = Fake seed, 8 = Other (Specify)

_____

7.13 How do you rate the quality of seed from formal seed system in 2012/13? Rank as 1 = very good, 2 = good, 3 = poor

7.14 Would you rank the problems from your practical point of view by varieties and year?

7.17 How did you cope up with poor quality of seed mostly? _____

_____

7.18 Did you buy seed of hybrid maize varieties to sow from local market? Yes=1 no=0

7.20 How do you distinguish whether seed or grain from local market _____

8. Price of Hybrid Maize seed Varieties

8.1 Is seed price and grain price are different on local markets most of the time? Yes = 1, no = 0

If yes when seed price _____ birr/ kg grain price_____ birr/ kg

8.2 What was the average price of hybrid maize seed before 2012/13production year? _____Birr/kg

8 .3 was the price of the seed from formal seed system affordable to you? 1 = Yes, 0 = No

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

1= using small quantity of hybrid seed 2 = using local varieties 3= decision for not using

4= others (specify) _____

8.4 What was the average price of hybrid maize seed in 2012/13production year? _____Birr/ quintal.

8.5. What is your opinion on the prices of maize hybrid in 2012/13? Fair = 1 expensive = 2 very expensive = 3

9. Road Infrastructure

9.1 Is there road facility which helps you for seed & inputs purchase and market out late?

Yes = 1 No = 0

9.2 What is the range of distance you travel to get hybrid improved varieties from your home before 2012/13 _____ kms or _____ hours?

9.3 What are the different means of transport you use to transport fertilizers and seed from the distribution center (FTC?) 1. Car _____ birr including you 2. Own pack animals, if rented _____ birr /day 3 on foot/human load

9.4 How frequent often you should go to seed distribution center to get the farm inputs before 2012/13_____

9.5 How about condition of main road during travel to seed distribution center?

1= Good all weathered condition 2 = only good during dry season 3 = Poor both during dry and wet condition

9.6 If the road is poor how do you cope up? 1 = walk on foot 2 =_____

9.7 Does the distance have negative effect on you to use agricultural inputs? 1. Yes 0. No

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

_____

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

9.10 Problems encountered _____

_____

9.11 Suggested solutions _____

_____

9.12 Where did you purchase hybrid maize seed in 2012/2013? 1 = Conventional 2 = Direct marketing/dealer 3 = Other_____

9.13 If you purchased seed from conventional seed system from which enterprise/organization did you purchase in 2012/13_____

Why _____

9.13 If you purchased seed from direct seed marketing system from which enterprise 1= Anno 2= Homa 3 = Pioneer hybrid Ethiopia 4 = Nonno , 5 = Hadiya, 6 = Meki-Batu, 7 = OSE, 8 = ESE

Why _____

9.14 How many kilometers did you go to get hybrid maize variety and other inputs in 2012/13

_____

9.15 Do you think that direct seed marketing is useful in supplying and distributing the seed on time? Yes = 1, No = 0

If yes, in what form _____

_____

9.16 What were the main problems of conventional seed distribution _____

_____

9.17 What are strengths of conventional seed distribution system? _____

_____

_____

9.18 What were the constraints of direct seed marketing as pilot test project? _____

_____

10.19 What were the advantages of direct seed marketing of pilot test? _____

_____

10. LABOR AVAILABILITY AND UTILISATION

10.1 What was source of labor for maize production? 1 = family labor 2 = hired labor 3 = *Dabo*

10.2 If you hired labor, what type of labor did you hire? Casual = 1 permanent = 2 both = 3

10.3 If permanent labor was hired, how much did you pay him per season? A) In cash _____ (birr) B) in kind_____ (Specify)

10.4 What was the wage rate/day? _____birr.

10.5 What is the tedious activity in maize production _____

10.7 Which month is critical period for shortage of labor? _____

10.8 How did you thresh maize? 1= using hand 2= Hand maize Sheller 3 = Maize Sheller machine

10.9 If you shell maize using hand what is the reason? _____

10.10 If you shell maize using Sheller machine, how did you get it? 1 = Purchase 2 = rented 3 gift, 4 = 3 on credit bases =, _____

11. Quantity of fertilizer used

11.1 What kind of inputs do you use in maize production? 1 = Herbicides 2 = Fertilizers 3 = Compost 4 = others (specify)……

11.2. Did you use fertilizer in your maize plot in 2011/12? Yes = 1 No = 0

11.3 If yes, type and quantity of fertilizer applied on maize plot (2012/13) 1 = DAP, 2 = UREA

11.4 How many kg of DAP & UREA did you use on your maize plot? _____

11.5 What was the reason for the above rate of fertilizer? Own experience = 1 Recommended = 2 others = 3 (Specify) _____

11.6 How about trends of your fertilizer utilization over time? Increased = 1 decreased = 2 Constant =3 stopped using =4

a) If increased why? To use full package = 1 enough supply = 2 reasonable price = 3 to improve productivity=4

b) If decreased why? Availability of compost = 1 land is fertile = 2 Fertilizer not available =3 expensive fertilizer price = 4, reduction in grain price = 5 others = 6 (specify) _____

11.7 .What was the price of fertilizers in 2012/13 production year? a) DAP _____ Br/Qt; UREA _____ Br/Qt

11.8 How much kg of DAP & UREA fertilizers did you use for grain maize production in 2012/13? DAP _____ Kg & UREA _____

11.9 What constraints did you face on fertilizer use of maize? Inadequate supply = 1 high price = 2 absence of fertilizer on credit base = 3 bad weather = 4 no benefit = 5 late delivery = 6 others (specify) _____

11.10 Did you get fertilizers in time 2012/13? Yes = 1 no = 0

11.11 Did you get enough amount of fertilizer last season? Yes = 1 no = 0

11.12 Which method(s) do you use to control weeds in maize production? Hand weeding = 1, Herbicides = 2, both = 3, others = 4 (specify) _____

12. Credit services

12.1 What are your sources of finance for purchase of inputs? Crop sales =1 Livestock sales =2 Off-farm activities = 3 Credit = 4, Others = 5 (specify)

12.2 Have you received formal credit so far? Yes = 1 No = 0. If yes, your experience in formal credit? _____ (years).

13. Extension and information services

13.1. Did you get an extension service? Yes = 1 No = 0

13.2. If yes, frequency of contact? _____ (total number of visits per year)

13.3. Types of extension service given by the agents? Use of fertilizer =1 use of insecticide = 2 use of hybrid maize seed = 3 use of manure = 4 Weed control = 5 Crop rotation = 6 Home economics = 7 Use of credit =8 market information = 9 others =10 (specify) ____

13.4 Have you ever hosted demonstration or any other trials? Yes =1 No = 0 if yes which organization _____on _____ crop

13.5 Have you ever attended a field day or demonstration trial? Yes =1 No = 0.If yes, which organization _____ on _____ crop.

13.7 Did you attend any training program about hybrid maize seed production and marketing? Yes =1 No = 0 If yes, who organized the training for you. Das = 1 *Woreda* agricultural Office =2 woreda cooperative promotion office = 3 Multipurpose Coop = 4 Agricultural research Centers =5 University researchers = 8 contractor / Enterprise = 9 others =10 (specify) 13.8 If not why?

13.9 If yes, on how many training workshops did you participate per year _____

13.10 Where do you sell your maize grain mostly? 1= local market 2 = nearest town 3 = at farm gate 4 = central market

13.11 How many hours do you walk to sell your maize produce from home? _____ hr

13.12 When do you sell your maize grain production? Immediately at harvest =1, three month after harvest = 2, after storage at peak planting time = 3

13.13 Why you sell your maize grain production immediately at harvest time? Financial constraint s = 1, Lack of improved storage facility = 2, Fear of price drop due to weather condition =3, Storage pest = 4 _____

13.14 Who determines the price of your maize grain? _____

13.15 Who are the most purchaser of maize grain produce 1= Wholesalers 2= retailers 3=consumers 4= processors 5 = cooperative

13.16 At what time maize grain demand increases mostly? _____ Why? 13.17 How do you get maize grain market information? _____

13.18 Do you have a radio to listen to any agricultural marketing program?? Yes =1 No =0

13.19 Do you have a TV to watch to any agricultural marketing program? Yes =1 No =0?

13.20. If literate, do you have access to any written materials discussing about improved maize seed? Yes =1 No = 0

13.21 If yes, how often? _____ (days/year)

13.22. What are the major factors/problems influence hybrid maize seed marketing efficiency systems in your areas? _____

THANK YOU!