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**ADDIS ABABA UNIVERSITY**  
**COLLEGE OF BUSINESS AND ECONOMICS**  
**Department of Management**  
**Executive MBA Program**

**Factors Influencing Improved Seed Technologies**  
**Marketing and Access: *The case of Oromia Seed***  
***Enterprise (OSE)***

**A Research Project Submitted to the School of**  
**Graduate Studies of Addis Ababa University in Partial**  
**Fulfillment of**  
**the Requirements for the Degree of Masters in**  
**Executive Business Administration (EMBA)**

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**Department of Management EMBA Program**

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Administration (EMBA)

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*December, 2018*

*Addis Ababa,*

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# LETTER OF CERTIFICATION

**Addis Ababa University**  
**Faculty of Business and Economics**  
**Department of Management**  
**EMBA Program**

This is to certify that the thesis entitled “*Factors Influencing Improved Seed Technologies Marketing and Access System in Oromia National Regional State: The Case of Oromia Seed Enterprise*” submitted in partial fulfillment of the requirements for the award of the degree of Master of Arts in Executive Masters of Business Administration (EMBA) to the Faculty of Business and Economics, Addis Ababa University, through the Department of Management studies, done by **Mr. Teferi Tsegaye Fikre**, is an authentic work carried out by him under my guidance. The matter embodied in this research work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

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**Department of Management EMBA**

This is to certify that the research thesis prepared by Teferi Tsegaye Fikre entitled: “*Factors Influencing Improved Seed Technologies Marketing and Access System in Oromia National Regional State: The Case of Oromia Seed Enterprise*”, Submitted in partial fulfillment of the requirements for the Degree of Executive Masters of Business Administration in Management fulfills with the regulations of the university and meets the accepted standard with respect to originality and quality.

**By: Teferi Tsegaye Fikre**

**Approved by: Board of Examiners**

Advisor	Signature	Date
Examiner	Signature	Date
Examiner	Signature	Date

## DECLARATION

I hereby declare that this research work entitled “*Factors Influencing Improved Seed Technologies Marketing and Access System in Oromia National Regional State: The Case of Oromia Seed Enterprise*” is my own original work. I have carried out it independently with the guidance and suggestions of my research advisor. And it has not been presented in Addis Ababa University or any other Universities.

**Teferi Tsegaye**  
(The Researcher)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

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## **ACRONYMS AND ABBREVIATIONS**

<b>ACISC</b>	Area covered by improved seed of a crop
AgSS	Agricultural Sample Survey
ANOVA	Analysis of Variance
BoANRs	Regional Bureaus of Agriculture and Natural Resources
BoFED	Bureau of Finance and Economic Development
CGRFA	Commission on Genetic Resources for Food and Agriculture
CSA	Central Statistical Agency
ESE	Ethiopian Seed Enterprise
EU	European Union
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
<b>FSS CL</b>	Farm save-seed covered land
FSS	farm-saved seed
GOs,	Governmental Organizations
GTP	Growth and Transformation Plan
ISF	International Seed Federation
ISSD	Integrated Seed Sector Development
MISTMA	mean improved seed technologies marketed and accessed
MoANR	Ministry of Agriculture and Natural Resources
MoARD	Ministry of Agriculture and Rural Development
NCIC	National Crop Improvement Committee
NGOs	Non-Governmental Organizations
NSC	National Seed Council
NSIP	National Seed Industry Policy
ONRS	Oromia National Regional State
OPESA	Oromia Public Enterprise Supervisor Authority
OSE	Oromia Seed Enterprise
RARIs	Regional Agricultural Research Institutes
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa

<b>TACC</b>	Total area under cultivation with crop
<b>TISTMA</b>	Total Improved Seed Technologies Marketed and Accessed
<b>VIF</b>	Variance Inflation Factor

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## ABSTRACT

*Improved seed technologies have two paradoxes (contradictions) in Ethiopia. On the one hand the country is known by shortages of improved seed technologies and widely criticized. On the other hand seed producers like OSE were extremely challenged with improved seed technologies marketing and accessing and with heavy stock carry over (left-over) from year to year.*

*This study was conducted to examine factors influencing improved seed technologies marketing and accessing system of Oromia seed enterprise and evaluate its responsiveness and effectiveness to meet the farmers` demand. Data was collected from a sample of 90 respondents drawn from Oromiya Seed Enterprise Managers and Employees. The data was analyzed using descriptive statistics as well as multiple regression analysis. Multiple linear regressions was employed to assess factors influencing improved seed technologies marketing and accesses of OSE using a computer software "SPSS" version 20. The study findings indicated that inefficient, ineffective, and unresponsive improved seed technologies marketing and accessing operating systems hindered meeting the farmers` real demand. Of the seven independent variables, four predictor variables - infrastructure, distance, seed package and market competitors were found to be statistically significant in predicting the dependent variable, whereas the remaining three predictor variables (educational level, price and extension services) were found to be insignificant. It is concluded that four predictor variables- **infrastructure, distance, seed package and market competitors** are extremely strategic and statistically significant in predicting and determining the dependent variable (**improved seed technologies marketing and accessing**). The result implies that these factors should get great emphasize by OSE to maximize the benefits of the improved seed production and marketing system as shown in the model output. There is, therefore, a definite need for the government of Ethiopia to reform improve seed technologies marketing and accessing system in a way it could be delivered to meet the farmers` real demand, as a strategic input to support the policy of agricultural growth and transformation plan.*

**Keywords:** *Improved seed technologies, marketing and accessing, seed system, formal seed, Oromia seed enterprise, Oromiya.*

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1 Background of the Study

Agriculture is the vital sector on which the livelihood of most Ethiopians agrarian's families relies on. It is also known as the backbone of our country's economic growth and development. Being conscious of this, the Ethiopian government has paid due attention to build up this sector in its both cycle of the growth and transformation program. With this concept, increasing improved seed products (technologies) marketing and accessing quality of agricultural inputs is dominantly important and principal priority. Hence a study under consideration is improved seed products (technologies) marketing and access to farmers through reasonable marketing mechanisms.

The access of adequate and quality improved seeds to a huge number of farmers has a fundamental impact to agriculture for food security and economic development in the country.

Thus, the products marketing and access of improved certified and high quality seeds is critical to attain agricultural production and productivity and in so doing realize food security and economic development. A number of operations are entrenched in this attempt to derive the ultimate objectives. One of such key tasks in accessing improved certified and high quality seeds to farmers is improved seed products (technologies) marketing.

At present, yet, improved seed is accessed to small-scale farmers through a regional delivery mode. Regional, state-run extension and input supply systems deliver improved certified seed to Ethiopian smallholder farmers. These systems function with a degree of guidance from the previous federal Ministry of Agriculture and Rural Development (MoARD) which currently known as federal Ministry of Agriculture and Natural Resources (MoANR). This regional system is constituted of Regional Bureaus of Agriculture and Natural Resources (BoANRs), their woreda (district) offices, and extension (development) agents working at the kebele (peasant association) level. These organizations collaborate intimately with farmer's cooperatives and regional credit and saving institutions in both supplying improved certified seeds and disbursing credit (Spielman et al., 2011).

Hence, the Ethiopian improved seed distribution and marketing system is mainly centralized. Dwelling on the demand planning process, the Ministry of Agriculture and Natural

Resources(MoANR) orients Ethiopian Seed Enterprise (ESE) on the type and quantity of seed to be given to cooperative unions, which access the seed to the primary cooperatives and farmers functioning under them ( Alemu and Tripp, 2010).

Oromia Seed Enterprise (OSE) is one of the recently emerged, regional oriented public seed enterprises that involved in improved seed technologies producing and marketing with massive amount. However, the controlled and centralized of this linear and public oriented seed supply chain to be given to cooperative unions, which access the seed to the primary cooperatives and farmers functioning under them hindered sustainable availability of adequate, good quality maintained improved seed and well-functioning marketing systems that meet farmers` demands. Due to the un functionality of marketing systems, federal and many regional public oriented seed enterprises` are obliged to stock huge amount of un accessed improved seed technologies and manifested to substantial amount of seed leftover from year to year which lastly leads each organization to a great loss.

On the other hand, Integrated Seed Sector Development (ISSD) programme of Ethiopia recognize this overall problem, is working for functional marketing systems and integrated approaches at the local level to promote and consolidate farmer based institutions in collaboration with all other partners. OSE, Integrated Seed Sector Development (ISSD) project is also the result of this country programme.

Formal improved seed product (technologies) marketing and accessing in Oromia regional state is not developed and still at an infant stage. Hence the centralized public oriented seed marketing system does not have been a successful history in accessing and distributing quality improved seed product of diverse varieties and services. To resolve this insistently ongoing problem in the seed system, the regional government has made different efforts. Apart from the foundation of Oromia Seed Enterprise, about sixteen private seed producers have been licensed to work in the region and participating in improved seed product marketing and accessing their technologies; as Oromia Bureau of Agriculture and Natural Resource un published data indicates. This has its own contributions in accessing and distributing seeds to some selected area of targeted beneficiaries. Farmer to farmer`s delivery system also plays vital roles in accessing certified improved seeds.

Since its foundation, OSE has been producing in thousand tons of improved seed products marketing and accessing the technologies through the existing system in the region and out of the region; only the

amounts demanded and requested within the existing system, while others stocked as leftover from year to year. However, this marketing and accessing system of the organization has not been yet researched and acknowledged as a business marketing strategy. So, it is vital to explore how such system is operating and identify the influential factors to fulfill the gap and eventually to suggest the other way to enhance improved seed technologies marketing and accessing system.

## **1.2 Statement of the Problem**

As many of our past history evidence showed us, seed marketing system in Ethiopia has been expressed by the public oriented seed system. Even at present, the domination of the public sector and the formal system continues in spite of the need for integrated ways that interlink all the components, associates, processes, and actors geared towards sound seed marketing and distribution system.

On the other hand, the centralized seed marketing and distribution system is criticized to be unsuccessful and ineffective. This can be demonstrated indifferent ways. First, available seeds stored in farmers unions and primary cooperatives do not reach farmers in the right quantities and at the right time due to the limitation of ineffective distribution mechanisms. Second, the system was so tight that cooperatives and farmers are less likely to determine the type (variety) of seeds they be given, when they take delivery of them, and who deliveries them. Thirdly, the seed allocation and seed price setting has been made centrally by the government and even today the mandate of price setting is felled on the hand of public seed producers which is determined through their forum. The previous regional bureaus of agriculture and rural development (currently regional bureaus of agriculture and natural resource) in this case lead to affect the cooperatives and farmers in some ways. Due to this centrality, cooperatives are burdened by the seed they cannot sell and uninterested to distribute. They also cannot act as independent business serving their farmer members` needs and interests. Likewise, they are unable to take benefit of the high demand for some seeds in the formal market which do not conform to the centralized seed planning. Fourthly, cooperatives are supposed to approve the original seed demand figures given by the regional bureaus of agriculture and rural development; however, this is a distant away from the independent assessment of farmer members` seed demand (Alemu and Tripp, 2010).

Agriculture could be improved through the application of quality seed (Louwaars et al., 2013). Agriculture and rural development in Ethiopia certainly depends on the availability of improved quality seed to the farmers (Alemu & Bishaw, 2015). Use of improved quality seed significantly increases agricultural production (FAO, 2012). However farmers cannot fully accessed as they want in terms of quantity and quality (Emana & Nigussie, 2011; Thijssen et al., 2008). Access to seed includes the types (different crops and varieties), quality (e.g. colour, size, nutrition, value etc.) and quantity (volume of seed) of seed (Alemu, 2010). Seed can contribute to agricultural production if and only if it is available in good quality, in sufficient quantity, at the right time and for the right price (Louwaars & de Boef, 2012). Effective seed systems can improve the availability and supply of quality seed to farmers (ISSD Africa, 2012). These are some of the constraints embedded in the seed marketing and supply chain mechanisms at a national level.

When we come to Oromia National Regional State, seminar No. (05, 2012) found that inaccurate seed demand assessment would lead to heavy left-over or shortage. Between 2008/9 and 2010/11 left over seed of major crops amounted 58,257 quintals; and the cost incurred due to this left over is estimated to be about 60,018,070 Birr. The study indicated that excessive surpluses lead to inventory accumulation and heavy losses in terms of interest and storage charges, quantity and quality losses, re-bagging costs, and above all wastage of the badly needed foreign exchange.

The national and regional level constraints revealed thus, far point toward the lack of integrated marketing and accessing system in the seed sector. This problem is noticeable by the absence of outlooks to efficiently integrate the demand and supply side so that the seed is not produced and distributed in the right quantities and qualities, to the right locations, at the right time, and price and system-wide costs are hardly minimized and service level requirements are less satisfied.

When we look into the case of Oromia Seed Enterprise, being its foundation as improved seed supply capacity increase yearly; the amount of left-over also increase while the quantity of improved seed sold by the existing centralized system of unions and primary cooperatives is dramatically decreasing from 84 % to 15 % in the period of 2009 up to 2017, as annual magazines and report of the organization indicates. This means that the un accessed 85 % of the enterprise improved seed products (technologies) marketing demanding other marketing strategy which is out of the centralized one. From this, we can generally understand the depth of the problem and how much improved seed product/technology marketing and accessing system gap is becoming wider and wider.

The evidences described subsequently and the constraints summarized so far would indicate the lack of a research study that centers on seed marketing and accessing system. This research is anticipated to address discovering factors influencing improved seed product marketing and accessing system.

In Oromia region, improved seed technology marketing and accessing has been exercised by OSE with collaboration and integration of the key actors at regional and zonal levels, since 2009 to increase production and productivity of food and commercial crop. Though, this improved seed technologies marketing and accessing system has not been (well) researched and acknowledged for the organization as business marketing strategy. Subsequently, correct outlooks would give the impression lacking to make the system effective and responsive and then promotes them in a vibrant, commercial, and diverse scheme.

Assessing factors influencing improved seed technologies marketing and access of seed producers and group business activities is useful to develop hypothesis for testing.

There are limitations of empirical research works done in the study areas on factors influencing improved seed technologies marketing and access. From this point of view, review would relatively consider on research conducted previously, like empirical studies on seed supply and marketing, factors influence farmer's participation in seed marketing, formal seed marketing (supply) systems, analysis of factors influencing market participation among smallholders in the study.

Thus, research is essential to examine in what manner improved seed products marketing and accessing system is functioning in the region in collaboration with key stakeholders and identify the tenacious challenges in accessing the technologies. Hereafter it is highly important to determine factors influencing improved seed technologies marketing and the stakeholders` integrated participation in the seed business system. Above and beyond this, the study aims to hypothesize the formulation of appropriate improved seed technologies marketing, accessing, and disseminating system of OSE in the region.

### **1.3 Research Questions**

The following are the main research questions in this study.

- To what level does improved seed products (technologies) marketing and accessing system meet the improved seed demand of farmers; in terms of availability, quantity, quality, variety, timely, and price affordability?
- What are the factors influencing improved seed products marketing, accessing, and disseminating the technologies in the case of Oromia seed enterprise?

## **1.4 Research Objectives**

### **1.4.1 General Objective**

The main aim of this study is to examine factors influencing improved seed products (technologies) marketing and accessing system of Oromia seed enterprise and define its responsiveness and effectiveness to meet farmers` demand through coordinated (integrated) outlooks.

### **1.4.2 Specific Objectives**

- To assess extent to which the improved seed products (technologies) marketing and access systems` functioning (operating) to meet farmers` demand.
- To analyze factors influencing improved seed products (technologies) marketing and accessing structural and practical bottlenecks in the system.

## **1.5 Significance of the Study**

This study is important to all producers and actors in the improved seed technologies marketing and accessing system. The performance of improved seed technologies marketing and accessing system has positive impact on the income of public enterprise producers, private producers, processors, suppliers and consumers in the value chain. The information and findings generated from the study will be useful for all public and private seed enterprises, for government organization policy makers, Universities, Research Centers, NGOs, seed producer cooperatives, unions, agro-technologies dealers, traders, and others

## **1.6 Scope and Limitation of the Study**

The study was limited to Oromia seed enterprise for the improved seed technologies marketing and accessing system. The study focused on improved seed technologies marketing and accessing system of the organization and with the sampled respondent employees participated in the designed questionnaire from head office, branches and farms level of the enterprise. The study areas produce a variety of annual food crops and targeted on major cereals. Thus, the study was highly focused to wheat and hybrid maize improved seed technologies marketing and accessing system only due to its high volume coverage of the improved seed technologies marketing and accessing of the organization.

## **1.7 Organization of the Paper**

The research project will be organized chapter by chapters: the first chapter will be contained the introduction parts dealing with research problems, objectives, and organization of the paper. The second chapter will be discussed the evidence and reviewed of related literatures about the subject matter. In chapter three it might be focused on methodologies, the analysis of the subject matter to investigate and evaluate the problems. Chapter four will be dealt with the result and discussions of the research findings. The last chapter five will be dealt with summary, conclusions and forwards recommendations.

## CHAPTER TWO

### 2 REVIEW of RELEATED LITERATURE

#### 2.0 Overview

This part of the research paper dealt with the basic definition and concepts, compromises a summary of historical, notional, and practical issues about the seed business by seeing the main literature has done so far. At the very beginning, it describes briefly the historical part of the subject matter in a very limited context with the corresponding assumptions and problems. It then ascertains the land mark empirical studies indicating central arguments. Ultimately, key questions of the intended research variables are identified followed by a summary of the review. This is followed by the presentation of the conceptual perspectives surrounded in the area. Major issues or central practical problems are demonstrated to see the gap and visualize the nature of research deemed necessary.

#### 2.1 Basic Definition and Concepts

##### 2.1.1 Definitions

The term seed is defined by different scholars differently. The followings are some of them.

**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 the 18th 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).

Unlike other agricultural inputs such as fertilizer and pesticides, the specific characteristics of seed make its delivery to farmers complicated. According to CGRFA (2011), seed is a living organism and requires appropriate handling, processing and storage operations in order to ensure that its viability is maintained until it is sown in the field. Seed quality is an essential element of seed systems: when provided to farmers seed should have high germination and vigor, high levels of genetic and physical purity and be free from pests and diseases.

**Improved Seed:** is the seed developed in research institution through selection, variety choice, variety testing, introduction, seed multiplication, dissemination and monitored or controlled by government policies and regulations.

**System:** the organization's part/sector of an activity and way of doing the seed marketing either in the formal or farmers' marketing activities.

**Local Seed supply sector:** is the farmer saved seed supply. Activities tend to be integrated and locally organized at individual level, in which farmers themselves produce, disseminate, and access seed: directly from their own harvest based on their ancestors and own knowledge. Other names given to informal seed supply systems include: farmer-managed seed system: farm-based; local seed production and supply; traditional seed system; and farmers' seed system (CGRFA, 2011).

Seed Marketing is the final step in a seed program; it takes the seed to the producer farmers, and gets them to buy it and plant it. All seed programs operations exist only to provide high quality seed for marketing. Seed Marketing is critically time sensitive and sensitive to so many factors affecting rural marketing. Seed must reach the farmer at the right time, place, and price, in the right amount and of the highest economic quality. Since seed Marketing is sensitive to so many factors, it has been considered as a high risk-business. Initial decisions are critical; little can be

done without significant financial loss to change or reduce production after the seed multiplication program has started. Too often, good seed is produced and then stays in the storage (Gregg *et al.*, 1997). Therefore, to minimize the high risk-business nature of the seed sector, it is very crucial to implement and follow all the marketing functions and marketing principles.

### 2.1.2 The Concepts of Seed System

A seed system is a systematic arrangement of the procedures, rules and regulations to ensure adequate seed supply to farming communities. There are two different types of seed marketing, widely known as formal and informal (farmers') seed supply. The formal seed supply sector is not well developed in many developing countries, including Ethiopia (Kiros *et al.*, 2009).

However, recent studies are often identified as three types of seed systems; formal, informal and integrated seed systems (ISSD). 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).

**Formal seed marketing system:** is a deliberately constructed system that involves a chain of activities leading to clear products: certified seed of verified varieties, the marketing and distribution take place through a limited number of officially recognized seed outlets. 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. In the formal seed marketing there is a clear distinction between "seed" and "grain." This distinction is less clear in the informal (farmers-saved) seed supply system.

According to Sperling and Cooper (2003), the formal seed marketing is mostly subsidized in developing countries in the case of parastatal seed companies and the private sector also not functioning competitively.

**Informal seed marketing:** is the farmer saved seed marketing; activities tend to be integrated and locally organized at individual level, and the local seed supply sector embraces most of the other ways in which farmers themselves produce, disseminate, and access seed, directly from their own harvest based on their ancestors and own knowledge. Some farmers produce "seed" as special activity, but for majority there is no clear distinction between "seed" and "grain." The

marketing and distribution activity takes place through exchange and barter among friends, neighbors, and relatives; and through local grain markets (ibid, 2003).

Farmers' seed supply sector are by far the most important suppliers of seed, and are particularly important for resource-poor farmers, always available there when needed, best adapted and preferred for their natural aromatic taste. In addition, because of their variability and local specificity to needs and preferences, local seed channels (e.g. household stocks, markets and social exchange networks) provide most of the seed that most small farmers use (Sperling and Cooper, 2003).

Formal seed supply sector, on the other hand, provide taster seed to farmers through an organized and often regulated chain that includes gene-banks, breeders, seed producers, seed marketing and distribution organizations. In practice, these different supply sectors operate side by side to serve the needs of different types of farmers for different types of crops. Both seed systems are distinct but intersecting. Interaction between these two supply sectors provide important ways of combining formal and local knowledge and plant materials, can lead to the creation of site specific solutions (Louwaars, 2007).

One sector is not necessarily "better" or more effective than the other; they meet different kinds of needs, sometimes for different environmental niches or for different types of farmers. Moreover, there are no clear or absolute divisions between the formal and local supply sector, seed and varieties can flow between them; farmers draw upon one or the other depending on need. Therefore, seed-related interventions, whether for "relief", "rehabilitation" or "development" needs to be based on an appreciation of the strengths and weaknesses of each. As several seed specialists advocate, we need to develop proactive strategies to integrate the strengths of both sectors (Almekinders and Hardon, 2000) as it was cited by Sperling and Cooper (2003).

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).

## 2.2 Theoretical Review

### 2.2.1 Background of Seed Industry Globally

Seed is basis of civilizations for Babylonian and ancient Egyptians according to Hussein (2009). In Europe documented history of Seed industry began back to the 17th century in England, and then expanded to France, Netherlands, Germany and the US (Dillon, 2005).

Before 1854, seeds were sourced in the U.S. by way of a small number of horticultural seed catalogs, farmer (or gardener) exchange, on-farm seed saving, that was through the informal seed supply sector. One hundred fifty years ago the United States did not have a commercial seed industry; today it has the world’s largest. A nation once a ‘debtor’ in plant genetics now supplies the world (ibid, 2005).

The US government funded a massive movement of seed industry development from the recognition and objective of feeding an expanding continent which require a diversification of foods to attain food security. The local seed system is dominating the world seed supply. However, for most countries there is no official statistics, how much of the world’s crop area is sown to farm-saved seed (FSS), but according to GRAIN rough estimates can often be made by comparing the sales of certified seed of a crop with the total area under cultivation with that crop. That is: -

$$\% \text{ of FSS CL} = \frac{\text{TACC} - \text{ACISC}}{\text{TACC}}$$

Where

**FSS CL** is Farm save-seed covered land

**TACC** is Total area under cultivation with crop

**ACISC** is Area covered by improved seed of a crop (Le Buanec, 2005)

Figures compiled by GRAIN indicate that most developing countries still mainly depend on FSS, in particular regions with a large peasant farming sector, such as South Asia and sub-Saharan

Africa, where typically 80–90% of planting materials are produced on farm from FSS. What is less well-known is that many rich and middle income countries also still use considerable amounts of FSS. The International Seed Federation (ISF) in 2005 circulated a questionnaire to its seed company members, which yielded estimates from 18 mostly developed countries. Typical figures were in the 20–40% range, but for some crops and countries they were much higher. Several of the major cereal producing countries Argentina, Australia and Canada reported FSS figures from 65% all the way up to 95%. Another notable country was Poland a recent EU member and the largest agricultural power in Europe after France where FSS was reported at around 90% for all major crops except oilseed (ibid, 2005)

The question should here be raised up is that, where is the position of Ethiopia's FSS by this criteria?

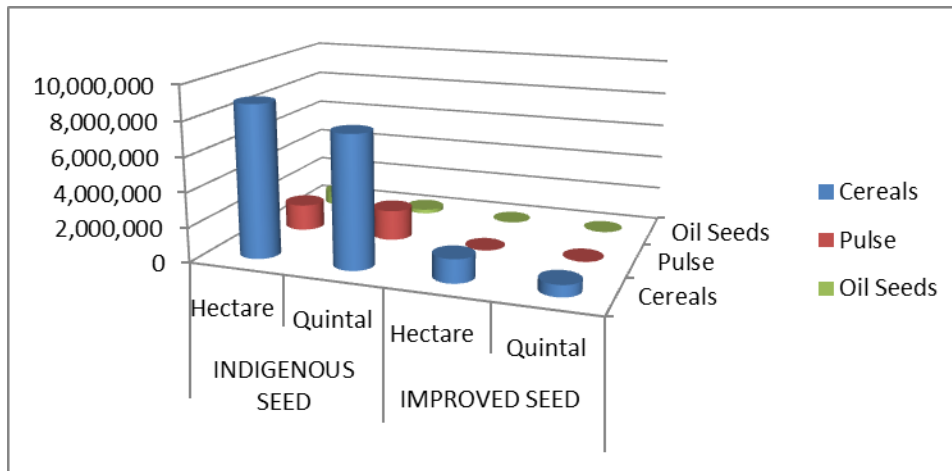
In 2016/17 (2009 E.C) Central Statistical Agency (CSA) has showed Agricultural Sample Survey (AgSS), data on fertilizer, improved seed, irrigation and pesticide applied area and quantity of fertilizers and improved seeds used, total areas covered with crops and areas covered by other indigenous seed (FSS) within the private peasant holdings was collected, processed and summarized.

Based on this survey, as tabulated in the table and figure indicated in the following, in Ethiopia the total area 12,574,107 hectares covered by three major crops (cereals, pulses and oilseeds) of which 11,189,816 hectares crops area is sown to indigenous seed which means farm-saved seed (FSS). According to GRAIN rough estimates in Ethiopia, this can often be reached 89 % of the crops area sown covered by indigenous seed (FSS) and the calculated supports the study of sub-Saharan Africa, where typically 80–90% of planting materials are produced on farm from FSS. In our case when we see this by the three major crops: cereals shares 87 %, pulses and oilseeds each covered 99 % of its area by the indigenous seeds. According to this survey, of the total area covered by three major crops, only 11 % is covered by improved seed technologies, in spite of the technologies left-over by the indicated year.

**Table 1: Area of major crops covered by indigenous and improved seeds in Ethiopia**

Major Crop type	INDIGENOUS SEED		IMPROVED SEED	
	Hectare	Quintal	Hectare	Quintal
Cereals	8,855,232	7,641,111	1,364,212	671,475
Pulse	1,535,055	1,766,151	14,856	17,980
Oil Seeds	799,529	239,379	5,223	687
<b>Total</b>	<b>11,189,816</b>	<b>9,646,641</b>	<b>1,384,291</b>	<b>690,142</b>

**Figure 1: Area of major crops, indigenous and improved seeds utilization in Ethiopia**



**Source:** Adopted from Central Statistical Agency (CSA), 2016/17 (2009 E.C).

### 2.2.2 International and National Seed Policies

Germany was one of the first countries to regulate seed sales in 1905, followed by Switzerland (1913; Schneider, 2002), and the Netherlands (Federal regulations in 1924; Maat, 2001) as it was cited by McGuire (2005).

The importance of seed in agriculture, food security and rural development has made seed an issue in national and international policies. Its multiple roles, moreover, makes it vulnerable to policies that may not be directed at seed itself or even at agriculture (Louwaars, 2007). Louwaars (2007), farther indicate that, seed issues are debated at the international level in today's globalize world. Often this leads to jointly agreed objectives, such as the Millennium Development Goals or rules laid down in conventions and treaties. Recent agreement made globally that specifically deals with seed is the International Treaty on Plant Genetic Resources for Food and Agriculture. Most international policies and institutions do not focus exclusively on agriculture, but they do have a marked effect on crop production and more particularly on seed (ibid, 2007). From the international experience we can learn that even if the formal seed system has been promoted in

an organized way for more than 100 years with the objective of supplying quality seed, remains inadequate to satisfy the demand from farmers in all countries and how much the informal seed system is very important equally for both developed and developing countries in fulfilling the gap of seed demand.

### **Seed Policy in Ethiopia**

The first National Seed Industry Policy (NSIP) in Ethiopia was issued in 1992. The National Seed Police and Regulatory framework were realigned with the Rural Development Policies and Strategies issued by the FDRE Government in 2001. NSIP focuses on the following five key issues: -

1. Plant genetic resources conservation and development,
2. Crop variety development, testing, and release,
3. Seed production and supply,
4. Seed import and export, and
5. Reserve seed stock.

The main objectives set by the NSIP are to: -

- ◆ Ensure the plant genetic resources collection, conservation, evaluation and use by the National Research and Development programs,
- ◆ Enhance and streamline variety development, evaluation, release, registration and maintenance,
- ◆ Develop an effective system for producing and supplying high quality seeds of important crops to satisfy the national seed requirements,
- ◆ Encourage the participation of farmers in germplasm conservation, as well as in seed production and supply system.
- ◆ Create a functional and efficient organizational setup to facilitate collaborative linkage and coordination in the seed industry,
- ◆ Regulate Seed Quality Standards, import and export, seed trade, quarantine and other seed related issues.

According to Marja *et al.* (2008), the objectives of the NSIP clearly indicate the need for encouragement of farmers in germplasm conservation, as well as in seed production and supply, transform the farmers' skill into commercialized seed supply sector through efficient organizational setup. Proclamation No. 380/2004 gave MoARD the authority to supervise and

regulate all government and non-government organs dealing with seed regulation, seed production and seed distribution (ibid, 2008).

### **2.2.3 Historical Background of Seed Industry in Ethiopia**

The historical background of seed marketing and accessing system is obscured with the historical development of seed sectors and systems to address seed demands through time. Louwaars and de Boef (2012) argue that in 1970s and 80s; the formal seed supply system in Sub-Saharan countries was dictated by the public sector. They also note that in this context public sector seed programmes targeted the dissemination of quality seed of improved varieties. This tendency was underpinned by the assumption that the informal seed system would have been declined. In the 1990s, this orientation changed the apparatus and the public sector stepped out. This shift, inclined to encourage the privatization and liberalization of the seed market. However, such a linear seed marketing system and sector failed to adequately meet the seed supply. Experiences in Sub-Saharan African have revealed that the due attention paid to either sector failed to sufficiently respond to the seed supply and access problems.

In Ethiopian, 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.

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.

Thus 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).

### **2.3 Empirical Review**

The role of the private sector in the production and marketing of seeds is low and confined to hybrid maize seed from 25-30% (Dawit *et al.*, 2008).

In many studies, lack of farmers' knowledge on seed supply conditions and preferences, blocks the relationship between breeders, farmers and extension workers, which create negative impact on improvement of seed marketing system (Louwaars, 2007). In his study, Louwaars further mentioned that high cost of seed production; processing and stocking of improved crops reduce the availability of seed in the market or made to have high marketing cost and low marketability.

Wolday (2002) indicates Ethiopia's poor infrastructure, limited financial institutions, weak extension services, absences of market information, excessive price and supply fluctuation greatly restrict effective market development and credit accessibility, which create negative impact on improved technology utilization and hinder farmers' productivity.

Seed access is often seen as the central element in seed security (Sperling and Cooper, 2003). Access largely depends on the assets of the farmer in question: whether or not the farmer has cash or social networks to access seed.

Bishaw and Louwaars (2012) pointed out that wheat and maize make up nearly 64 % and 23 %, respectively, of the total certified seed supply from the formal sector.

A logistic analysis of socio economic factors influencing farmers' participation in development activities, shows that sex, access to credit, landholding size were the main factors that influence people to join the fishing industries as it was cited in Kirub (2008). Deribe (2007) found that education was one of the variables, which increases farmer's ability to acquire, process, and use agricultural related information in better way. Consistent with this, Deribe (2007) found out those farmers with larger farm size, have higher possibility to use combination of technological packages.

Elizabeth *et al.* (1992) 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. McGuire (2005) stated that an Ethiopian seed system was highly affected with problems relating to insufficient investment and infrastructure, and low levels of management experience in both seed systems.

The production and productivity of principal crop is a strategic and an instrumental to attain food security, and economic development. Improved hybrid maize seed is crucial to increase maize production and productivity. For example, improved hybrid maize seed are estimated to have 30 % higher yield than local maize (Holden, 2013). Key to the contributions it makes is its availability, quality, quantity, and price affordability.

Spielman et al., (2011) noted that hybrid maize seed is a lucrative potential seed business available to private innovators or investors. This is so predominantly owing to the innovators` capacity to recap their investments in breeding due to the biological features linked with hybridization that make saving seeds by farmers a relatively undesirable practice. In a similar manner, Alemu and Tripp (2010) state the artificial production of hybrid maize seeds via crossing selected parent lines. They then claim that farmers must purchase these seeds every year, but should not save them seasonally.

According to Deribe (2007), age of farmers was one of the demographic characteristics hypothesized to influence agricultural information. 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)

Study by Getaneh Wubalem and Bekabil Fufa (2007), indicates that educational level of the respondent was positively and significantly related to the probability to participate in bread wheat contract farming, as the level of education increases the ability to obtain, process and use information related to better production practices.

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.

All the above empirical studies show how each factors influence the development of efficient seed supply system in general. Based on which this study designed to examine how the Seed marketing is functioning, what are the factors influence improved seed technologies marketing and access. Hence, to answer these questions testing hypotheses is useful based on the following conceptual framework.

## **2.4 Factors Influence Improved Seed Technologies Marketing**

### **2.4.1 Education Level of the Employees**

Kinyangi (2014) study results show that 28.5% of respondents had diploma educational level, 56.3% had bachelor's degree education level and 15.2% of respondents had masters' degrees. There was a significant ( $p < 0.05$ ) difference in the levels of respondents' education, an indication of respondents' different understanding of how the various factors affect the adoption of agricultural technology among smallholder farmers.

Study by Getaneh Wubalem and Bekabil Fufa (2007), indicates that educational level of the respondent was positively and significantly related to the probability to participate in bread wheat contract farming, as the level of education increases the ability to obtain, process and use information related to better production practices.

### **2.4.2 Price (Seed price vs. grain/output price instability)**

Arfassa Kiross (2015) found that an increase of seed price and other associated costs by one birr would decrease seed purchase of farmers by 0.00145 kg. He indicated that as seed price and other costs increased, the quantity of seed purchased by farmer is very small quantity of hybrid maize seed varieties. According to his study, price is one of the determinant factors that influence improved seed marketing, and there are cases when farmers decide to plant non-improved varieties available in their locality due to high seed price and financial constraints.

According to Kinyangi (2014) the cost (price) of technology was a very strong factor affecting adoption of technology among small holder farmers.

According to Randela *et al.*, (2008) availability of price information prior to selling reduces transaction costs and thus increases the quantity of sold.

Kabeto (2014) indicated that price of red beans was positively associated with the quantity of red bean supplied to the market ( $p = 0.072$ ). He supported his finding as it reflects the law of supply,

namely, *ceteris paribus* as the price of a good rises, the quantity supplied rises (Mas-Colell et al., 1995). A unit increase in the price increased the quantity of red bean sold by 33.6 kg. The results are consistent with Mathenge et al., (2010) who found that in Kenya, when tea, coffee, and sugarcane prices increased, the quantity sold also increased. This is justified as higher output price acts as an incentive to sell. Key et al., (2000) found that in Mexico, a one percent increase in the selling price of maize increased the probability that households sell by 0.77 percent. In Mexico an increase in price of maize motivates farmers to sell more.

According to Kabeto (2014) price of red beans turned out to be positively and significantly related to market participation decision ( $p=0.013$ ). A unit increase in the red bean price increased the probability of farmers participating in the market by 12 percent. Onoja et al. (2012) found higher probability of fish market participation with an increase on price of fish in Nigeria. The author justified that households with higher expectation of making profits from price signals are more likely to participate in fish marketing in the study area.

Goetz (1992) observed a significant and positive relationship between grain price and the quantities sold in markets in Sub-Saharan Africa (SSA).

#### **2.4.3 Extension Services (Training /Service Delivery)**

According to Caswell *et al.* (2001), exposure to information about new technologies as such significantly affects farmers' choices about it.

According to Anna (2014), sources of information such as radio, extension officers, seed producers, relatives, project organizations and children which were obtained around the villages. Anna indicated that the majority of the household heads were getting information from extension officers due to the fact that most of the households were living together with these people. According to this study, the majority of the extension officers were helping smallholder farmers in various ways, including giving them information concerning subsidies and prices of improved seeds. She stated awareness is an important stage on technology adoption and a very important factor for access and adoption of improved seeds. She also cited this finding is similar to findings of a study conducted by Babu *et al.* (2011) which found that the major constraints facing farmers in accessing information were poor availability, poor reliability, lack of awareness of information sources available among farmers and untimely provision of information. Further, farmers still lack awareness about improved seed and their higher yields.

Arfassa Kiross (2015) found that 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 has a positive 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.

Mergia (2010) study result indicated that there is highly significant relationship between improved seed marketing participation of farmers and access to extension service. The survey result clearly indicated that farmers who have frequent contact with development agents secured better access to information and could adopt better technology that would increase their marketable supply of seed and utilization. Therefore, he concluded that farmers who have regular extension service, more likely to be motivated to participate in productive activities such as seed production and marketing.

He also cited extension services that promote farmer development and facilitate improvements in crop productivity will therefore probably contribute to increasing farmers' demand for seed (MacRobert, 2009).

Extension service is a key source of linkages with research information such as new/modern technologies. Extension messages promote adoption of recommended improved maize variety practices which determine the proper use of the variety (Tura *et al.*, 2010). This means that lack of access to extension services by farmers reduces their likelihood of using the variety. This finding is consistent with the research result of (Asfaw *et al.*, 2012; Mariano *et al.*, 2012; and Ghimire *et al.*, 2015) who reported that access to extension services significantly affected utilization of improved maize varieties among farm households, underlining the importance of extension services in farming operation because exposure to information reduces subjective uncertainty about the technology. Therefore, the result suggests that the use of improved maize varieties is impacted with access to extension services.

According to Kassie *et al.*, (2012) extension service is not both necessary and sufficient to affect adoption of technologies but also the quality of the extension service matters. Agricultural extension agents provide different information and alternatives depending on prevailing activities which impacts farmers differently and they are expected to choose an option that suits them best

(Baethgen et al., 2003). However, Tura et al (2010) found that the number of visits to farmers by an extension agent, positive significantly influenced the continued use of improved maize varieties.

According to Kubayoo (2009) finding result indicated, as frequency of contact with development agent increases by a unit, input demand-supply index of the farmer would be increased by 0.028 units. This implies when farmers have regular contact with extension agent, probability of using production enhancing inputs would increase through increased awareness from the extension organization. Kubayoo cited this result as it coincide with Kidane (2001) and Techane (2002) who have reported significant and positive relationship of extension contact and use of agricultural technologies.

Kabeto (2014) indicated an increase in the number of extension visits significantly and positively affected farmers' market participation decision ( $p = 0.045$ ). The marginal effect result indicated that an extra extension visit would increase the likelihood of farmers participating in the red bean market by 0.9 percent. This could be attributed to the fact that an increase in the number of extension visits would avail up to date information regarding agricultural technologies that might improve productivity and therefore increase the marketable surplus. He cited his finding corroborates that of Negash (2007) who found that frequent extension visits increased the likelihood of adoption of improved haricot beans in Alaba Special District of Ethiopia.

#### **2.4.4 Infrastructure (Distribution Network)**

According to Mergia (2010) results indicated, there is no significant relationship between seed market participation of farmers and marketing infrastructure. Therefore, he conclude by stating it's safe to say that the differences are due to chance variation, which implies that, each participant and non-participant face the same problem of lacking marketing infrastructure.

Wolday (2002) indicates Ethiopia's poor infrastructure, weak extension services, absences of market information, excessive price and supply fluctuation greatly restrict effective market development, which create negative impact on improved technology utilization and hinder farmers' productivity.

Nega and Sanders, (2006) showed that inadequate infrastructure such as roads is an external factor affecting the continued use of improved seed technologies. Households living near major towns have good access to both physical infrastructure and seed supplies, and can purchase seed from the market; hence they are expected to continue using adopted technologies. It is, therefore,

important to have information on the factors that determine technology adoption by farmers as well as factors that may increase the probability of continued use of these technologies.

According to Kubayo (2009), analysis revealed having road which is inconvenient to transport inputs would decrease the input demand supply index by .110 units. This entails the type of road is negatively influence the dependent variable and hence, having difficulties in transporting agricultural inputs would decrease the probability of purchasing production enhancing inputs. He also cited his result as concurs with the findings of Tesfaye and Shiferaw (2001).

Road infrastructure and transport availability have an influence on smallholder market participation, especially if they are located a distant from the consumption centers (Gabre-Madhin, 2001, as cited in Jari, 2009). One of the most important constraints facing agricultural markets throughout sub-Saharan Africa is transport infrastructure and the need to reduce transport. The majority of villages in rural areas are served by an inadequate and poorly maintained road network (Montshwe, 2006).

#### **2.4.5 Distance (Accessibility)**

According to Mergia (2010) distance from market is a key factor in linking farmers with a market to sell or buy and it has positive influence for expansion of agricultural production and marketing. The study indicated that there is highly significant relationship between participation of farmers and market distance in hours. Therefore, he concluded that the shorter the distance of the marketing center from the farmers' home, the more likely to be motivated to involve in business activities such as seed production and marketing as a business.

Lack of close access to seed retail points has been cited as a major limitation to farmers adopting improved varieties (MacRobert, 2009).

According to Anna (2014) study results showed, majority of smallholder farmers were not accessing improved seeds in their areas due to long distance from the main source of the seeds to their homes. Most of the villages where the research was conducted were not getting improved seeds in time due to poor accessibility. Smallholders were supposed to travel to the nearby towns and districts in order to get improved seeds. In the study area, the majority of the smallholder farmers were blaming the government on the issue of poor accessibility to improved seeds; they were walking for long hours to seek improved seeds and some of the villages rural were travelling 16 km to get improved maize and rice seeds. Anna (2014) found that, this is a constrain to the majority of smallholder farmers in Tanzania and supported the study by the

statement that access to seed is a necessary condition for improved seed adoption (Dontsop-Nguezet *et al.*, 2011).

According to FAO (2009) suggests availability of improved varieties from public sector breeding programmes is one of the key success factors for the growth of smallholder seed enterprises in many countries. It is common for small- and medium-scale enterprises to depend on the public sector, government institutes and universities, for new varieties and even source seed (breeder and foundation seeds), and continuing public sector investment in these activities is required for self-pollinated, open-pollinated and vegetative propagated crops.

Seed access is often seen as the central element in seed security (Sperling and Cooper, 2003). Access largely depends on the assets of the farmer in question: whether or not the farmer has cash or social networks to access seed. This study shows land and physical assets were also considered as determinants of seed access: if a farmer has sufficient land to guarantee self-sufficiency and adequate storage infrastructure, he/she is likely to have sufficient seed access under most conditions. Distance to market is negatively associated with the use of production enhancing inputs. Those who are far from the market may not have a chance to get agricultural inputs comparing to the nearby farmers (Legesse, 2001).

According to Kubayoo (2009) indicated, distance from the nearest input market is positively and significantly associated with the dependent variable at 5% level of significance.

Mussema and Dawit (2012) found that market participation among smallholder pepper producers in Silte and Aalaba in Ethiopia was negatively associated with distance to the market. Martey et al. (2012) in Ghana found distance to nearest market to be significantly associated with a lower level of cassava sales and every additional kilometer reduced the extent of market participation by 0.4 percent. In Ethiopia, it was reported that smallholder households who were away from market centers had lower market participation (Gebremedhin and Jaleta, 2012). 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 seed technologies to be purchased.

#### **2.4.6 Seed packs size**

Availability of certified seed, affordability, availability of a grain market, ability of certified seed to tolerant pest and disease, profitability of grain production and packaging of certified seed are

the factors that were ranked highly by grain farmers as important in influencing their decision to utilize certified seed. Grain size, fertilizer requirement and maturity period were ranked as the least important factors (Etwire *et al.*, 2016, P3-p27-40.pdf).

According to Arfassa Kiross (2015) study result in Ethiopia, 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. of the 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). He concluded that majority of the farmers mentioned the convenience of 25 kg packed size seed container. In the study areas, 25 kg seed package size of hybrid maize is convenient and popular in farmer's communities.

According to Hasan et al., (2014), Katalyst is one of the largest market development initiatives in Bangladesh. It works together with the private and public sectors in order to fully integrate rural farmers in the markets. As a result, poor farmers get better access to quality inputs, services, knowledge and products, which ultimately translates into an increased income. When small farmers are aware of quality seeds, many of them will still use substandard seeds as they do not need the quantity available in the regular packets of quality seed. The requirement for smaller quantities of seed for smaller farmers has led to a practice of selling a small quantity of seed from opened packets. These opened packets are often adulterated (inferior quality seeds mixed with good quality seeds) at the point of sale.

The seed companies were initially reluctant to introduce mini-packets of seed without a guaranteed business case. Market research by Katalyst informed the companies that despite the perceived risks, there was still a clear demand-supply gap for smaller quantities of seed in packets. In March 2011, Katalyst had a breakthrough when it partnered with two leading private seed companies, Lal Teer Seed Limited (formerly East West Seed-Bangladesh Limited) and A. R. Malik Seeds Ltd. Through its facilitation, Katalyst had convinced these two seed companies that they could sell more seeds, probably to an untapped section of farmers, if they had appropriately sized and priced products – in other words, the mini-packets. Reducing opportunities for adulteration by distributors, retailers and vendors was also identified as a major interest of the seed companies. It was also observed that mini-packets could have an impact on a wider range of farmers, boosting their total seed sales.

A stronger distribution channel with appropriate product has a stronger impact on access rather than extensive demonstration and access. The company's own analysis showed growth of its mini-packets sale also contributed to the growth of their normal packets, which has grown by 35% since the introduction of mini-packets. Finally they concluded, it will provide support to the companies to market and distribute mini-packets of quality vegetable seed, and work with farmer organizations and service providers to increase farmers' knowledge of better cultivation practices.

#### **2.4.7 Market Competitors**

Competition between seed producers for market share can occur along several dimensions, including varietal characteristics, price, seed quality guarantees, quality and quantity of information on seed performance and use, the spatial density of seed selling points, timeliness of provision of seed, and payment modalities (Benson *et al.*, 2014).

A seed company rarely exists alone in the market. And, even if it does, it faces competition from farm-saved seed or imported seed. Therefore, a seed company must know who its competitors are and be prepared to compete with them. This requires the attainment of knowledge about the competition and its strategies, and finding out and implementing ways to sell seed ahead of the competition (MacRobert, 2009).

Phiri *et al.*, (2000) project studied described seed delivery to African farmers and to offer suggestions for improving seed access, particularly for seed of new crop varieties. This case study examines the implementation of a strategy in Malawi. The strategy of producing and selling small seed packs of new bean varieties in Malawi has been quite successful. As this study result indicated, in areas where the small packs are available, many farmers have purchased the seed. The majority of these farmers are satisfied with the new varieties that they acquired and they are interested in purchasing other small seed packs. The merchants who have participated in the scheme are enthusiastic and wish to continue to sell the packs.

#### **2.4.8 Quantity of Improved Seed Technologies Marketed and Accessed**

Quantity of improved seed technologies marketed and accessed is measured in kilogram and represents the amount of improved seed technologies marketed and accessed to farming households.

Arfassa Kiross (2015) studied factors influencing the quantity of hybrid maize seed purchased by farmers. Arfassa Kiross's (2015) study has shown that fertilizer, tropical livestock unit, land size, and cost of seed, family size, education level, annual income, and frequency of extension contacts significantly influence the quantity of hybrid maize seed purchased by 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%.

Mergia (2010) also analyzed factors influencing the farmers' participation in seed marketing. The study found that respondents' knowledge about existence of seed producer society in the area, access of household respondents to credit service, age of the household respondents, cooperative membership of the household respondents, and household respondents understanding on importance of seed business for income improvement are significantly related to farmers' participation in seed marketing.

Kabeto (2014) using OLS regression analyzed factors influencing the extent of red bean market participation of Halaba Special District in Ethiopia. His finding indicated that ownership of means of transport, quantity of red beans produced and price of red beans positively and significantly influenced the extent of market participation among the respondents.

Thinah Moyo (2010) results of the multiple regression models on the effect of transaction cost related factors on quantity sold presented in the Limpopo River Basin of Zimbabwe. The results of this model show that previously agreed prices (PRICEAGREE) are significant at five percent level in influencing the quantity of grain sold. Road access (ROADACCESS), confidence and trust in the buyer (CONFIDENCE), and membership in a farmer group (MEMBERSHIP) are not significant in influencing the quantity of grain that a farmer sold. Although these three explanatory variables are not significant and the R-squared value is low (12\_percent), the F-statistic of 6.5 is significant with a p-value of 0. According to him the p-value of the F-statistic indicates that overall the multiple regression models are significant and together all the explanatory variables have a significant impact on the quantity of grain sold.

Aji et al., (2001) the information and data collected was encoded and encountered for subsequent computer analysis using SPSS package. A one way ANOVA followed by Scheffe's test was performed in order to identify any significant differences in the rank order of importance of those

34 variables believed to most influence a farmer's decision to purchase seed. Mean score results show that availability of seed at planting time, was found to be the most important variable influencing East-Javanese farmers' decisions to purchase seed tubers. Such would suggest that there is some degree of farmers' perceived uncertainty regarding the seed supply, as improved seed is often unavailable when it is needed. However, there was no significant difference between this variable and the next 18 variables. As this study result concluded, availability of seed and farm production factors, *i.e.*, land and farm labor, formed a single factor that was found to be the most important factor influencing East-Javanese farmers' decision to purchase seed. Since there is no significant difference between so many of the variables farmers indicated as being important, there is possibility of significant interrelationships between several of the variables under evaluation. Factor analysis of this study result revealed that there are seven factors that collectively accounted for 63 per cent of variation in the farmers' responses.

## **2.5 Conceptual Framework of the Study**

Increasing agricultural productivity, and hence production using improved agricultural technologies, has been identified as a precondition for achieving food security (Langyintuo *et al.*, 2000). Small-scale farmers depending especially on subsistence agriculture have the potential to increase their welfare and food security situation if they utilize improved production technologies.

In a synthesis of 22 adoption studies in Eastern Africa, availability of information on the technology and profitability of the technology, were identified as the main obstacles to technology adoption (Doss, 2003). Due to this fact, the majority of smallholder farmers tend to ignore the adoption of new technologies.

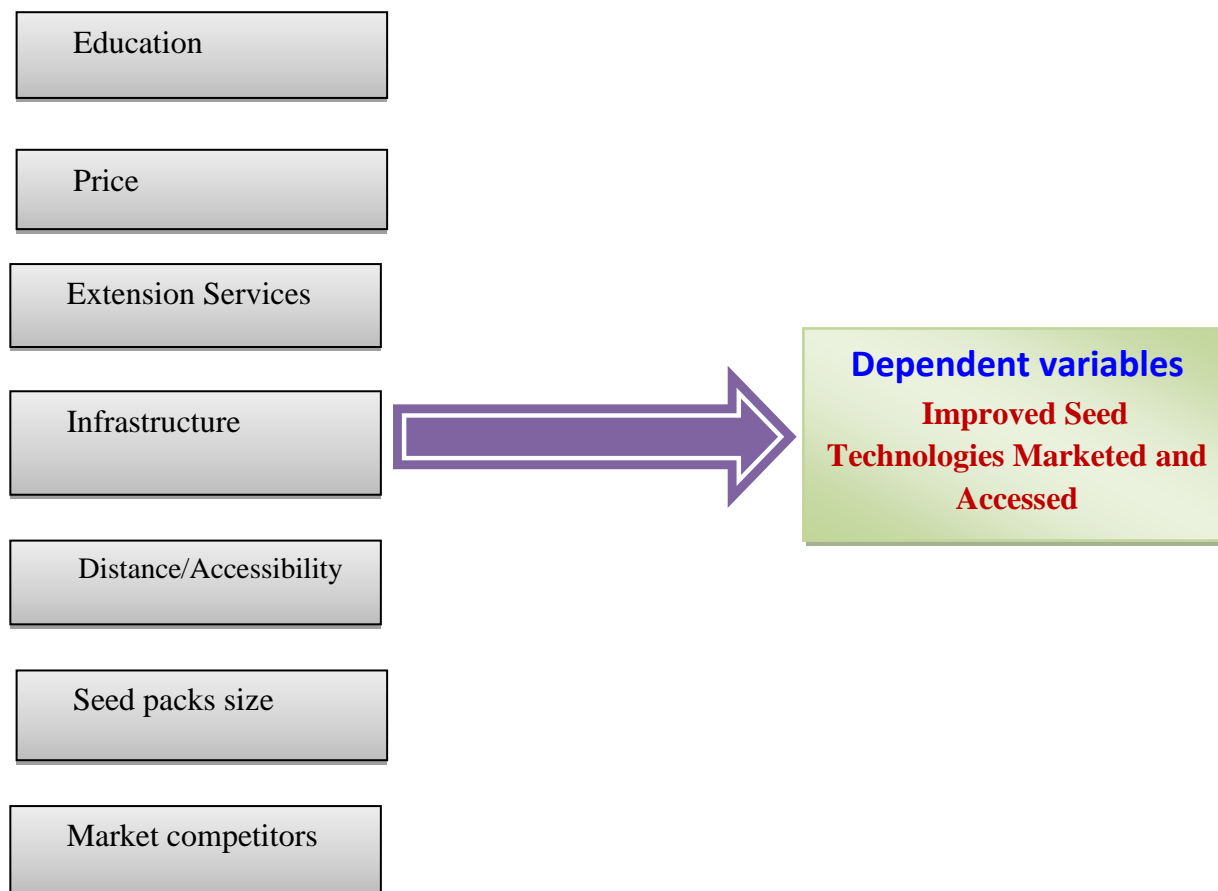
Improved seed technologies marketing and accessing has been identified as its cause and consequence of development for the reason that when markets are accessible they provide an opportunity for households to sell their surplus output which increases their incomes.

Conceptual framework is a set of ideas that shows the relationship between the dependent and independent variables; used as a basis for making analytical discussion and conclusion on the relationship of the variables of the study.

The conceptual framework presented in Figure 2 was used in the research on which this thesis is based. It shows the relationships between independent variables, and dependent variable. The independent variables are supposed to influence the dependent variable (improved seed

technologies marketing and accessing) to technology users (smallholder farmers). The independent variables as indicated in Figure2 include: price (grain), extension services, infrastructure, distance (accessibility), seed packs size, and market competitors. This study assumed that the probabilities of change in the dependent variable (improved seed technologies marketing and accessing) is highly dependent on changes in the independent variables, which are listed in Figure 2.

**Figure 2: Conceptual Framework of the Study**



Source: *Own sketch based on literature review*

## **CHAPTER THREE**

### **3. RESEARCH METHODOLOGY**

#### **3.1 Description of the Study Areas**

##### **3.1.1 Description of Oromiya Regional State**

Oromiya region is one of the nine regional states of Ethiopia. The Region is administratively classified into 18 zones and 304 districts (39 towns considered as districts).

Agro-climatically, the Regional State is characterized by Semi-Desert, Tropical, Sub-Tropical, Temperate and Alpine (Cool) zones. The climatic types of the National Regional State of Oromiya may be grouped into three, with their respective sub-divisions. They are dry climate (the hot arid and hot semi-arid climates), tropical rainy climate (the tropical humid and tropical per humid climates) and temperate rainy climate (the warm temperate humid, the warm temperate per humid and the cool highland climates).

Oromia is endowed with good fertile and irrigable arable land, and different types of agro-ecological zones and climatic conditions that favor for the growth of different agricultural productions. Agricultural crops include cereals, pulses, oilseeds, vegetables, root crops, fruits, coffee, enset, chat, hops, sugar cane, cotton , etc. that are produced for food, making drinks, stimulation, and making fabrics and clothing. However, the sector is characterized by small scale peasant holdings and low productivity. The production fails to catch up with the rapidly growing population size and needs.

Improved seeds are the key input that contributes to an increase in agricultural productivity. The total volume of improved seeds used in 2016/17 (2009 E.C) in the region was estimated about 320,583 quintals which is covered 46.5% improved seed utilization of the country. The crop area it was applied estimated 693,669 hectares of which become 48% of the country covered by improved seed technologies. The larger volumes of improved seeds technologies used were that of wheat and maize which amounted 125 thousand and 161 thousand quintals, respectively. The largest area of the region to which improved seeds technologies applied were under maize and wheat estimated about 578, 903 hectares and 65,936 hectares, respectively (adopted from CSA, 2016/17).



### 3.1.2 Description of Oromia Seed Enterprise



The availability and increased use of seeds of improved varieties is underlined as a pivotal instrument to attain fast and sustainable agricultural development in the country. The Ethiopian government thus, has identified improving the efficiency of the seed systems as the most effective means of meeting the Growth and Transformation Plan (GTP). Different studies undertaken by different responsible bodies were clearly indicated the wide gap that exists between seed demand and supply nearly for every crop varieties. These studies results were the main directives for the establishment of Oromia Seed Enterprise (OSE) by the Government of Oromia National Regional State through the Regulation No 108/2008 to fulfill the seed demands and contributing to the overall agricultural development and poverty alleviation strategy of the region. OSE was established to ensure the fast and sustainable economic development through the implementation of agricultural and rural development policy and strategy of the country by the production, processing and supplying improved and market-oriented seeds of food and forage crops to farmers and agro-pastoralist. It also provides a technical support for strengthening and building the small-scale farmers' capacity for the production and commercialization of quality seeds in the region.

As public enterprise, Oromia Seed Enterprise has double responsibilities. It has a mission to fulfill the government obligation of seed demands of the regional state and as well as operate, competing, and sustaining as commercial business entity. The government needs the enterprise to produce large quantity of low-profitable (non-profitable) self-pollinating crops for strategic purpose to support the extension and food-security programs. As business entity, it has also expected to increase production, and productivity of improved seed technologies and markets (sales) with the aim of achieving marginal profits in order to sustaining within the country's seed industry.

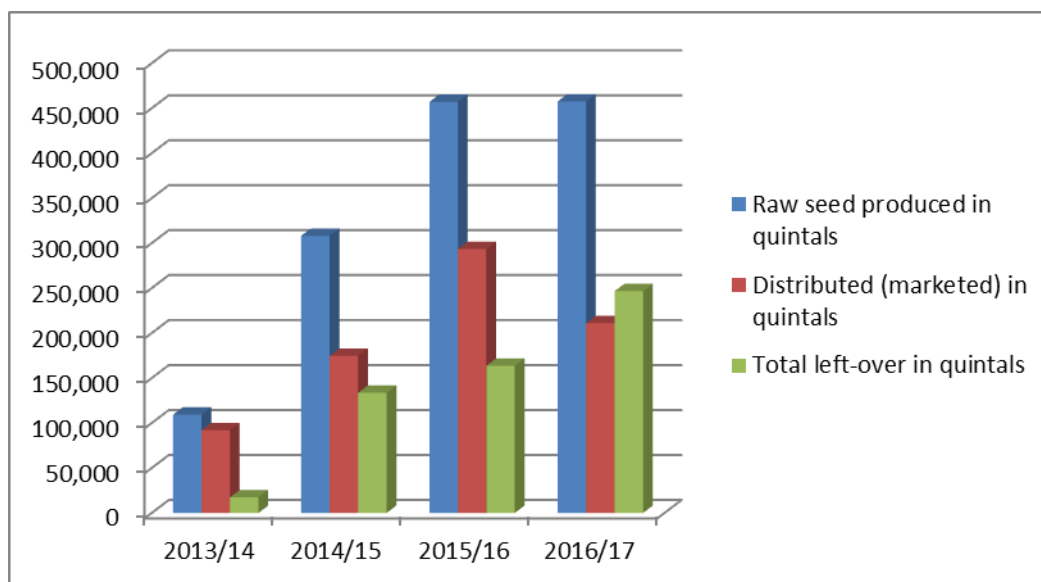
Therefore, a viable strategy is required to produce and disseminate the required quantity of the strategic crops (self-pollinate, low-margin crops) besides achieving higher profits in order to sustain the enterprise in the seed business.

Accordingly, OSE has the following performance both in producing and marketing the technologies in the last four years. As indicated in the table 2 and Figure 3 below, in the years (2013/14 to 2016/17) the trend of improved seed production of raw seed technologies is becoming increase more than technologies marketed. The trend of marketing improved seed technologies was increased less than the increase in production in the first three years and became decline at the fourth year. In spite of the increase in production, the left-over of improved seed technologies highly increase yearly and the gap between the two became wider and wider. As indicated below both in the table and figure in the trend, the quantity of left-over improved seed technologies was become greater than the quantity of marketed in 2016/17.

**Table 2: Trends of improved seed technologies production, marketing and left-over**

Production years	Raw seed produced in quintals	Distributed (marketed) in quintals	Total left-over in quintals
2013/14	109,332	91,932	17,400
2014/15	308,164	174,574	133,590
2015/16	457,035	293,402	163,633
2016/17	457,559	210,982	246,576

**Figure 3: Trends of improved seed production, marketing and left-over of OSE**



Source: (OSE, Seed Marketing and Distribution Annual Magazines and report, 2016/17)

## **3.2 Research Design**

The main aim of this research is to examine factors influencing improved seed products (technologies) marketing and accessing system to determine its responsiveness and effectiveness with respect of the enterprise sides. This can be subsequently done by looking in to the extent of the improved certified seeds access to farmers and its availability, quantity, quality, timely, and price affordability. Thus, it incorporates both quantitative and qualitative design characteristics and methodological approaches in all its process stages.

## **3.3 Data Sources**

This improved seed product (technology) marketing and accessing system research pulls multiple quantitative and qualitative data from various sources that can be categorized in to primary and secondary.

The primary data sources and units of analysis for the research will be the participant of targeted sample in marketing improved certified seeds of the enterprise in the proposed framework. These shall be encompassed three hierarchical organization structures yet working together in integrated system for the common envisioned goals. They would be head office located at Finfinnee, three branches located at (Assela, Roobe and Nekmte) and different agro- ecological farms under these branches.

Secondary data for this study could be obtained from documentary, graphical and numeric documents on programs, and practices regarding the certified improved seeds products (technologies) marketing and accessing system, and the constraints and diagnoses obtained (observed) in the way of.

Both sources deal with multiple quantitative and qualitative evidences to address the research objectives and questions in a usable and applicable mode (manner).

## **3.4 Samples and Sampling Procedures**

In this sampling procedures, certified improved seeds products (technologies) marketing and accessing system and factors influencing them will come to be the major article in this study. To collect usable and reliable data from multiple sources, multi stage sampling procedures will be implemented. In this multi stage sampling procedures, purposive, random sampling and other important tools could be taken into consideration.

OSE Structure (the three levels; Head Office, Branches, Farms) taken as the first stage sampling unit. In organization, Head Office, 3 branches (Arsi, Bale and Wallega), and 10 farms were purposely selected and stratified into technology marketing participants and non-participants employees. All key contributors and actors of marketing technology employees were identified. Then, considering their job position managers and non-manager employees of head office, 3 branches and only 4 farms were taken as the target population because of its strategic importance. Finally, the number of managers and non-manager employees were determined based on probability proportional to size of total managers and employees in each selected level. Following the target population, employee’s association representatives were considered in non-manager employees as they represent the whole employees of their location and due to their high concern (stake) of technologies marketing benefits.

Subsequently, selection procedures were followed to select and the 90 samples were taken from all the three levels (Head office, 3 Branches and 4 farms). Total sample size was determined by Yamane formula (1967). Proportional allocation was also computed for each manager and non-manager employees per selected levels.

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

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

The study assumes that the margin of error 5% and confidence level or error free of 95%. Using the above described statistical formula, the sample size of the study computed as follows.

$$n = \frac{150}{1 + 150(0.05)^2} = 109 \quad \underline{\underline{= 109}}$$

Due to resource and other limiting factors, only about **82 %** of the calculated sampled was considered; which is = **90** sampled.

**Table 3: Sample size distribution of the target population**

Name of selected position	No. of employees	No. of sampled employees
Managers level employees	84	45
Non –Manager employees	66	45
<b>Total</b>	<b>150</b>	<b>90</b>

### **3.5 Data Collection Methods and Procedures**

Within the framework of this study objectives and questionnaires formulated, both qualitative and quantitative data collection methods will be engaged to collect adequate data from both primary and secondary sources at targeted level.

### **3.6 Method of Data Analysis**

This part of the paper analysis and interprets the data acquired from different sources with respects of the research objectives and related literatures. The collected data will be analyzed and interpreted by using both qualitative and quantitative techniques. In this process various tools and approach will be accompanied based on its reliability and importance.

Descriptive and econometric analysis tools will be applied for analyzing the data from the respondent employees in the study areas.

#### **3.6.1 Descriptive Analysis**

Descriptive statistics involved using the frequencies command to determine percentage, measures of central tendency (mean, median, and mode), and measures of dispersion (range, standard deviation and variance). Minimum, maximum, mean standard deviation and percentages were employed to compare the seed marketing technologies based on sampled and interviewed employees with their respect to some demographic and socio-economic characteristics of the respondents.

#### **3.6.2 Econometric Analysis**

Regression analysis is one of the most commonly used tools in econometric work. Its best fit may be linear (straight) or curvilinear to some mathematical formula.

One of the econometric models used in regression analysis is multiple regression analysis. Nowadays, many scholars preferred this model for marketing analysis especially the supply functions. As a result, for this particular study, multiple regression models will be employed to estimate the factors influencing the quantity of improved seed technologies marketed and accessed by Oromia Seed Enterprise in the study areas.

The regression model would be specified as:

$$Y \text{ (Dependent Variable)} = f \text{ (Identified Factors Influencing/Independent Variables).}$$

Where;

Y (Dependent Variable) = Quantity of Improved Seed Technologies Marketed and Accessed.

Independent Variables = f (X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub>, X<sub>4</sub>, X<sub>5</sub>, X<sub>6</sub>, X<sub>7</sub>).

### **Multiple Regression Model**

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \epsilon$$

Where;

$\beta_0$  ,  $\beta_1$ ,  $\beta_2$  ,  $\beta_3$  ,  $\beta_4$  ,  $\beta_5$  ,  $\beta_6$  ,  $\beta_7$  are referred to as the parameters of the model, and  $\epsilon$  (the Greek letter epsilon) is a random variable referred to as the error term.

### **3.6.3 Definition of variables and working hypothesis**

#### **Dependent variable:**

Quantity of improved seed technologies marketed/sold and accessed: It is continuous dependent variable measured in kilogram and represents the amount of improved seed technologies marketed by OSE.

#### **Justification of hypothesized Independent Variables:**

##### **X<sub>1</sub> = Social- economic factors (Education Level)**

##### **Education Level of the employees:**

Education is operationalized as the maximum education possessed by the employees, in the questionnaires at the time of interview. This variable will be measured using formal schooling of the employees and hypothesized to influence marketable seed technologies positively. Education is a crucial factor for skill development and enhancing effective production and marketing performance. Education is a continuous variable measured as the extent to which the respondents received formal education.

Therefore, it is hypothesized that education positively influences the seed technologies marketed by employees.

##### **X<sub>2</sub> = Price (Seed price vs. grain/output price instability)**

Price is the value given to improved seed technologies marketed in the formal seed marketing system. This is also continuous variable measured in Birr per quintal and is expected to affect the marketable improved seed technologies and farmers utilization of seed negatively. Because, high price discourages farmers to purchase the technologies and the low price encourages farmers

more to utilize the technologies. 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.

Grain/output price also has great influence on marketability of the seed technologies. Generally, grain markets are poorly developed in Africa, such that on a local scale, price fluctuations are highly influenced by available grain stocks. In Ethiopia grain price influence farmers utilization of improved seed technologies in two ways. Primarily, if the price of grain is approached to the price of improved seed technologies purchased, farmers preferred to sale his own farm-saved seed changes it to improved seed technologies; i.e., promoted marketability of improved seed technologies and farmers utilization as an alternative of his FSS. Secondly, when grain/output price increase, farmers are encouraged to produce more in the coming seasons for supply to market and attracted to utilize the technologies more. Thus it is hypothesized that grain/output price influence the marketable improved seed technologies and farmers utilization of seed positively.

**X<sub>3</sub> = Extension Services (Training /Service Delivery)**

This variable measures whether a farmer provided agricultural technical support from development agents or workers. The variable extension service measured as a dummy taking value of 1 if the household head has contact with development agents or workers and 0 otherwise. Agricultural extension services provided by the BoANR are the major source of agricultural information for the farmers. It is used as a proxy for farmers 'access to information. Study under taken showed that farmers' contact with extension increased the probability of adoption and area allocation to improved seed varieties (Abdisa et al., 2001). It is hypothesized that a dummy variables, positively influence as contact with extension workers will increase a farmer's likelihood of purchasing improved seed technologies increase.

**X<sub>4</sub> = Infrastructure (Distribution network)**

This is measured as a dummy variable taking a value of 1 if the users (farmers) had access to technologies market infrastructure and 0 otherwise. Farmers' access to efficient and cost effective storage facilities, transportation, marketing information services is critical to their effort to integrate their economy to the market. Availability of various transport services for seed marketing will be considered

In an era when buyers and sellers alike seek speedier sales transactions, marketing channel technologies (including automated inventory and storage systems) and the internet are adding value by expediting the flow of physical goods, ownership, payment, information, and promotion (Rayport, and Sviokla, 1994.)

Thus, infrastructure is hypothesized to influence positively seed technologies marketing and enhance utilization of the farming families.

**X<sub>5</sub> = Distance**

It is a distance from the farmers' home to the nearest seed distribution center. In this study distance was measured using subjective statements of the farmers' (such as far or closer) distance. 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 seed technologies to be purchased. In this study, distance is hypothesized negatively influence marketing of improved seed technologies.

**X<sub>6</sub> = Seed packs size**

It is a continuous variable used to indicate convenience of pack size. It is a seed container with different volume that contains improved seed technology marketed and accessed measured in quantity of kg it contains. The size of the pack which matches farmer's interest will encourage farmers to purchase the seed with attractiveness and legibility of pack size. In this study, seed pack size was hypothesized to positively influence improved seed technologies marketed and accessed if it is convenient and negatively if it is inconvenient.

**X<sub>7</sub> = Market competitors (Other source /Informal Seed /FSS)**

Market competitors are measured as a continuous variable by its competition levels (low, medium, high, very high) and determinant in marketing the technologies. Accordingly, identifying and characterizing marketing competitors is very important to design better strategy. Market competitors assumed in the context of competing for the existing real and potential demand customers to maximize its on market share of the technology and show its strong negative influence on marketing of improved seed technologies. In this study, consequently, market competitors are hypothesized as negatively influence marketing of improved seed technologies.

**Table 4: Definition of variables hypothesized factors influence improved seed technologies**

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**Dependable Variable**

Regression Model (Improved Seed Technologies Marketed/Sold and Accessed)

<b>Independent Variables</b>	<b>Type</b>	<b>Hypothesized Sign</b>
X <sub>1</sub> = Education Level of the employees	1= complete, 6= PhD	+
X <sub>2</sub> = Price	Five point Likert scale	-/+
X <sub>3</sub> = Extension Services	Five point Likert scale	+/-
X <sub>4</sub> = Infrastructures	Five point Likert scale	+
X <sub>5</sub> = Distance	Five point Likert scale	-
X <sub>6</sub> = Seed packs size	Five point Likert scale	+/-
X <sub>7</sub> = Market Competitors	Five point Likert scale	-

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## CHAPTER FOUR

### 4. RESULT and DISCUSSIONS

In this chapter the results of the study are presented and discussed in detail based on the results of descriptive statistics and econometrics model analysis to address the objectives of the study.

Descriptive statistics, frequency, percentage, mean standard deviation, chi-square, etc. and econometrics model analysis were examined to study the relationship between the dependent variable (Quantity of Improved Seed Technologies Marketed and Accessed) and explanatory variables, the differences in their characteristic explanatory variables, identify the existence of significant relationship between variables and measure their significance levels. Multiple linear regression models was the main econometric analysis tool employed to see the factors influencing improved seed technologies marketing and accessing of Oromia Seed Enterprise in the Regional State, using computer econometric software called "SPSS" version 20.

#### 4.1 Results of Descriptive Statistics

##### 4.1.1 Characteristics of Background Variables

**Table 5 : Frequency and Percentage of Background Variables**

Background variable	Group	Frequency	Percent
Gender	Female	8	9.4
	Male	77	90.6
	Total	85	100.0
Age	Under 25	1	1.2
	25 – 35	38	44.7
	36 – 45	26	30.6
	46 – 55	16	18.8
	56 and over	4	4.7
	Total	85	100.0
Educational level	1 – 12 Complete	2	2.4
	Diplomas	4	4.7
	BA/BSC	59	69.4
	MA/MSC/MBA	20	23.5
	Total	85	100.0
	Head Office	29	34.1

Work place	Branch	36	42.4
	Farm	20	23.5
	Total	85	100.0
Job position	Manager level	44	51.8
	Non-Manager/Expert	41	48.2
	Total	85	100.0
Total work experience	less than 5 years	3	3.5
	6 – 10 years	28	32.9
	11 – 20 years	34	40.0
	21 – 30 years	10	11.8
	31 and over	10	11.8
	Total	85	100.0
Service year in Oromia Seed Enterprise	less than 2 years	12	14.1
	2 – 5 years	38	44.7
	6 – 10 years	35	41.2
	Total	85	100.0

**Source:** Results of descriptive statistics from own survey data

Table 6 shows frequency and percentage of background variables of OSE employees participated in this study. From the total of 85 OSE employees participated in this study, more than ninety percent (90.6%) was male and the remaining 9.4% were female. Relatively, majority of the enterprise employees (44.7%) were in the age range of 25-35 years old. 30.6% and 18.5% of employees were in the age range of 36-45 and 46-55 years old respectively. Minorities of employees, 4.7% and 1.2%, were 56 and above years old and 25 and below 25 years old respectively. As one can observed from the table 6 above, majority of the enterprise employees three-fourth (75.3%) were in the age range of 25-45 years old. This indicates that there is a potential advantage for working by young employees especially to achieve future objectives of the company's marketing strategy and the young employees are more eager to work. Thus it's an opportunity of owning fertile work force i.e., proxy for education, information, change, etc. and is considered as an existing exploiting potential.

Regarding educational level of enterprise employees participated in this study, the majorities, 69.4%, were having educational qualification of Bachelor Degree, 23.5% of workforces were having educational level of MA/MSc/MBA whereas the remaining minorities, 4.7%, and 2.4%, were having educational level of Diplomas and 1-12 complete respectively. Here, we can

conclude that all the respondent employees are educated and about 93% were first and second degree holders. This implies that it is a good advantage for marketing strategy application and gives the enterprise a competitive advantage because nowadays the seed industries are in a highly competitive market. In addition to, all respondents were expected to understand the questionnaire and respond correctly.

As far as the work place of participant employees is concerned, 42.4% were working at branch offices, 34.1% of participants were working at head office and the remaining 23.5% were working at farm level. This shows that the sample taken tried to cover the three structural level of the organization to make the study representatives.

For job position, almost half of the total participant employees, 51.8%, were working at manager level while the remaining 48.2% of participant employees were working at non-manager or expert level. This indicated that the sampled population is considered to balance the two positions of the enterprise employees so as to protect the finding difference that might come as the result of imbalance of the two positions.

Regarding total work experience, 40% and 32.9% were having total work experience of 11-20 and 6-10 years respectively. Equal proportions of 11.8% of participants were having total work experience of 21-30 and 31 and above years. The remaining minorities were having total work experience of 5 years and less than 5 years.

Finally, participants' Service year in Oromia Seed Enterprise was asked. 44.7% and 41.2% of participants reported that they have been working at Oromia Seed Enterprise since 2-5 years and 6-10 years ago respectively. The remaining minorities, 14.1%, reported they have been working at Oromia Seed Enterprise since 2 and less than 2 years ago.

Generally, senior workforces, Managers' and Employees' staffs (who have direct/indirect linkage with Improved Seed Technologies Marketing and Accessing), are knowledgeable about the Improved Seed Technologies marketing strategy practices and activities of the enterprise which in turn contributes a lot in securing marketing system.

#### 4.1.2 Employees' Knowledge and Awareness of their Business Environment

**Table 6: Frequency and Percentage of Questions**

Knowledge and awareness question	Group	Frequency	Percent
2.1 Are seed prices and grain prices different?	Yes, they are different	85	100.0
3.1 Did farmers get an extension service in OSE seed marketing areas?	No,	25	29.4
	Yes,	60	70.6
	Total	85	100.0
7.1 Has OSE market competitors in its seed business in the region?	Yes, it has	85	100.0

**Source:** Results of descriptive statistics from own survey data

Some questions were designed to identify whether the employees' have knowledge and awareness of their business environments. Accordingly, employees were asked whether seed prices and grain prices different. As table 7 shows 100% of the employees' participated in this study reported that as seed prices and grain prices were different. Because of seed can incurred certain additional cost factors like cleaning, management cost, transportation, selling cost and other expense, under any circumstance the price of improved seed technologies is higher than grain prices. The result indicated that employees' have full knowledge and awareness as price of improved seed technologies is higher than grain prices in the seed business.

In the same way, employees were asked whether farmers get an extension service in OSE seed marketing areas. The majority of participated employees', 70.6%, said that farmers get an extension service in OSE seed marketing areas while the remaining 29.4% said that farmers didn't get an extension service in OSE seed marketing areas. This is a challenging question hence there is no clear indication of base of measure for the employees to determine and answer whether farmers get an extension service in OSE seed marketing areas. Majority of the employees answered farmers get an extension service in OSE seed marketing areas from their own observation and analysis shows that employees level of knowledge and awareness of their business environments.

Employees were also asked whether there was OSE market competitors in its seed business in the region. Consequently, 100% of the employees were reported that OSE had market competitors in its seed business in the region. From the above three question feedback, we have a good evidence to conclude that the employees' have knowledge and awareness of their business environments.

#### 4.1.3 Mean of Factors

**Table 7: Descriptive Statistics of Factors**

<b>Influencing Factors</b>	<b>n</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
6 Seed packs size (bags)	85	1.00	5.00	4.0824	1.73351
1 Education Level of the Employees	85	1.00	5.00	3.4353	2.03801
5 Distance (Accessibility)	85	1.00	5.00	3.3529	1.73003
4 Infrastructures (distribution networks)	85	1.00	5.00	3.2471	1.77218
7 Market competitors	85	1.00	5.00	2.9412	1.92325
2 Price (Seed price vs. grain/output price instability)	85	1.00	5.00	2.7294	1.60645
3 Extension Services (Training /Service Delivery/promotion)	85	1.00	5.00	2.6471	1.75055

**Source:** Results of descriptive statistics from own survey data

Employees were asked to rate the importance of each factor rank from 1 up to 5. In this rating factors, 1 represents the highest influencing factors in the rank while 5 represents the least influencing factors in the rank. Later in the mean of factors logic, we see the mean column; the least mean value meaning that has the highest influencing factors and the big mean value meaning represents the least influencing factors in the rank. Accordingly, as table 8 indicated, among the seven factors, Extension Services (Training /Service Delivery/promotion) factor was rated by the employees as the first highest influencing factor in the rank. Price and market competitors were factors that were rated as the second and third highest influencing factor in the

rank. Infrastructures (distribution networks), Distance (Accessibility) and Education Level of the Employees were factors that were rated respectively as the next influencing factor in the rank. On the other hand, Seed packs size (bags) was a factor that rated as the least influencing factors in the rank.

#### 4.1.4 Correlation /Relationship among Variables

**Table 8: Correlation statistics of dependent and independent variables using Total value**

<b>Variables</b>	<b>Total Improved Seed Technologies Marketed and Accessed (TISTMA)</b>
Total Price	<b>-.305<sup>**</sup></b>
Total Extension Service	<b>.342<sup>**</sup></b>
Total Infrastructures	<b>.503<sup>**</sup></b>
Total Distance	<b>-.579<sup>**</sup></b>
Total Seed Pack Size	<b>.449<sup>**</sup></b>
Total Market Competitors	<b>-.525<sup>**</sup></b>
Total Improved Seed Technologies Marketed and Accessed	<b>1</b>

**\*\***. Correlation is significant at the 0.01 level (2-tailed)

**Source:** Results of descriptive statistics from own survey data

Correlation analysis estimates the extent of the relationship between any pair of variables (Reimann, Filzmoser, Garrett, & Dutter, 2008). The correlation coefficient is a measure of this relationship and depends on the variability of each of the two variables. Covariance, correlation coefficient can take a number with + or – sign (Reimann et.al, 2008). One of the widely-used methods to calculate a correlation coefficient is the Pearson product moment correlation. This method result in a number between –1 and +1 that expresses how closely the two variables are related, ±1 shows a perfect 1:1 relationship (positive or negative) and 0 indicates that no systematic relationship exists between the two variables (Reimann et.al, 2008). In relation to the magnitude of correlation coefficient, Cohen (1988) stated that a correlation coefficient from **0.10** to **0.29** can be considered as small or weak relation, from **0.30 to 0.49** medium and from **0.50 to 1** large or strong relation of the paired variables.

Table 9 shows correlation between independent and dependent variables. As can be seen in table 9, Total Improved Seed Technologies Marketed and Accessed (TISTMA) had statistically positive significant relationship with three independent variables such as, total extension service, total infrastructures, and total seed pack size. This implies that as one variable increase, the value of other variable also increases and vice-versa. There was medium correlation between TISTMA and extension service,  $r = 0.342$ ,  $p < 0.01$ . The correlation between TISTMA and total seed package size was moderate,  $r = 0.449$ ,  $p < 0.01$ , whereas the correlation between TISTMA and Total Infrastructure was strong,  $r = 0.503$ ,  $p < 0.01$ .

On the other hand, the correlation between TISTMA and three independent variables i.e., total price, total distance, and total market competitors were negatively and statistically significant. This also implies as the total of one variable increase, for instance, as the total distance increases TISTMA decreases and vice-versa. The correlation between TISTMA and total distance was strong,  $r = -0.579$ ,  $p < 0.01$ . Similarly, the correlation between TISTMA and total market competitors also strong,  $r = -0.525$ ,  $p < 0.01$ . But, the correlation between TISTMA and total price was moderate,  $r = -0.305$ ,  $p < 0.01$ .

#### **4.1.5 Relationship between Background Variables and Dependent Variable**

A one-way between groups analysis of variance was used to explore whether there was mean score difference between groups of background variables on Total Improved Seed Technologies Marketed and Accessed. Preliminary assumption testing was conducted for normality, linearity and homogeneity of variance, and there was no serious violation noted.

Correspondingly, a one way between-group analysis of variance was conducted to explore whether there was a statistically significant mean difference between groups of background variables on TISTMA. Table 10 below shows that there was a statistically significant Total Improved Seed Technologies Marketed and Accessed mean score difference between groups of background variable, **on job position,  $F(1,83) = 10.73$** . The mean score of non-manager/expert ( $M = 43.90$ ,  $SD = 6.24$ ) was significantly higher than the mean score of manager level ( $M = 38.82$ ,  $SD = 7.90$ ). However, there was no statistically significant mean score difference between others groups of background variables; like gender, age, educational level, work place, total work experience and service year in Ormia seed enterprise on TISTMA.

**Table 9: Mean Difference between Groups of Background Variables on TISTMA**

Background variable	Group	N	Mean	SD	df	F	Sig.
Gender	Female	8	45.7500	7.92374	1,83	3.186	.078
	Male	77	40.8052	7.41272			
Age	< = 35	39	42.3590	6.33074	2,82	1.321	.272
	36 – 45	26	41.3846	7.94520			
	>=46	20	39.0000	9.00877			
Educational level	Diplomas	6	44.6667	5.68038	2,82	.703	.498
	BA/BSC	59	40.8475	7.65825			
	MA/MSC/MBA	20	41.5000	7.77648			
Work place	Head Office	29	41.7931	8.05951	2,82	1.318	.273
	Branch	36	42.1667	7.34263			
	Farm	20	38.9000	7.02552			
<b>Job position</b>	<b>Manager level</b>	<b>44</b>	<b>38.8182</b>	<b>7.90429</b>	<b>1,83</b>	<b>10.729</b>	<b>.002</b>
	<b>Non-Manager/Expert</b>	<b>41</b>	<b>43.9024</b>	<b>6.24021</b>			
Total work experience	6 – 10 years	31	43.4194	5.59031	3,81	1.557	.206
	11 – 20 years	34	40.6471	8.17936			
	21 – 30 years	10	38.7000	10.86329			
	31 and over	10	39.3000	6.00093			
Service year in Oromia Seed Enterprise	less than 2 years	12	40.8333	5.71813	2,82	2.042	.136
	2 – 5 years	38	43.0263	6.19715			
	6 – 10 years	35	39.5143	9.05009			

**Source:** Results of descriptive statistics from own survey data

## 4.2 Assumption for Multiple Regression Analysis

Assumptions of the multiple regression analysis were tested to check the healthiness of the model. Tests of assumptions for Multicollinearity, Outliers, Normality, Linearity,

Homoscedasticity, and Independence of Residuals were undertaken for this study. The assumptions were briefly discussed and tested here below.

#### **4.2.1 Multicollinearity**

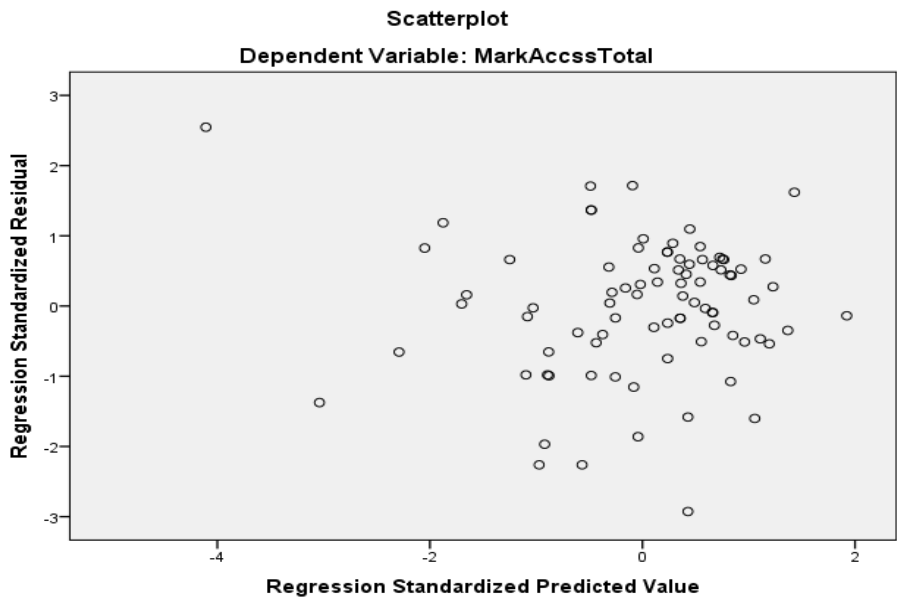
The variables Total (Price, Market Competitors, Distance, Extension Services, Infrastructures, Seed Pack sizes) have shown significant relationship with each other which was a correlation coefficient of not greater than 0.80 (see table 9). This shows that the assumption of multicollinearity was not violated. In addition, the assumption of multicollinearity can also be assessed using SPSS as part of multiple linear regression procedure. In the collinearity statistics section, Tolerance and Variance Inflation Factor (VIF) values are given. Tolerance is an indicator of how much of the variability of the specified independent is not explained by the other independent variables in the model and is calculated using the formula  $(1 - R \text{ squared})$  for each variable. If this value is small (less than 0.10), it indicates that the multiple correlation which other variables is high, suggesting the possibility of multicollinearity. In the present study the tolerance value for each independent variable was not less than 0.10. Therefore, this also suggests that the assumption of multicollinearity was not violated (see Appendix 2).

The other value given is the Variance Inflation Factor (VIF), which is just the inverse of the Tolerance value. VIF was computed to detect the problem of multicollinearity for significant continuous explanatory variables based on t-test. Since, the VIF values for continuous variables were found to be very small; **less than 10**, indicating that no serious or absence of multicollinearity between explanatory variables. VIF values above 10 would indicate the existence problem of multicollinearity. Again in the present study, the VIF value was less than 10 for all independent variables (see Appendix 2). This also indicted that the assumption of multicollinearity was not violated.

#### **4.2.2 Homoscedasticity**

Here "Homogeneity of variance" assumption or homoscedasticity of the study was analyzed. It stated that the variances of the same variable, selected from independent samples, will be equal. In regression analysis, this assumption states that the variances of the  $Y$ 's, for each  $X$ 's, will be equal. The standard suggestion for examining the assumption of homoscedasticity in regression analysis is to plot the predicted  $X$  values against the residual  $Y$  values. Heteroscedasticity is indicated, when these values were spread or fan out from left to right or right to left. The

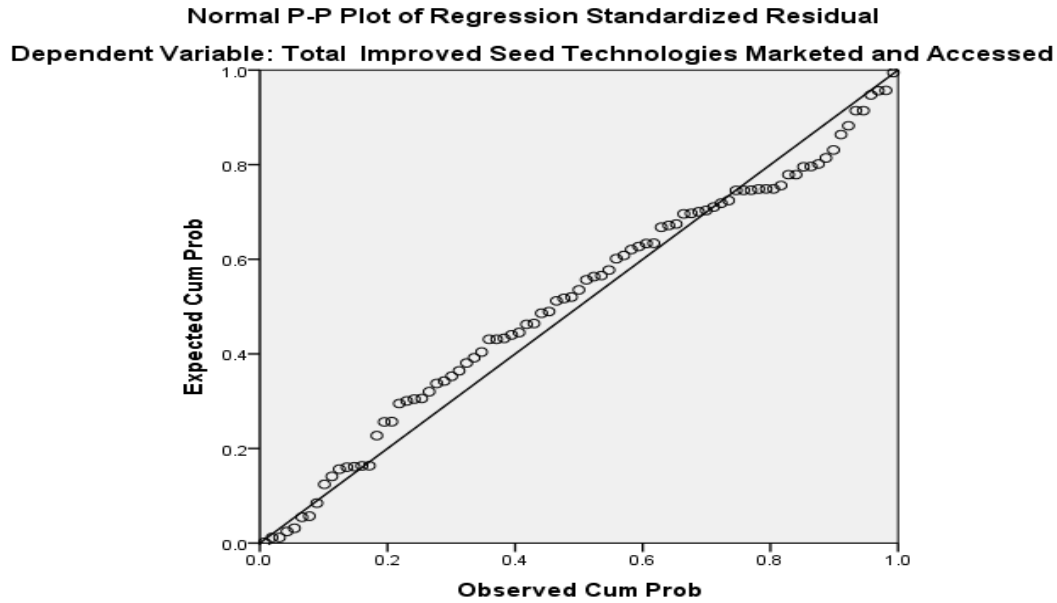
scatterplot shows that the points are concentrated around 0, which shows that no violation of homoscedasticity (see figure 4).



**Figures 4: Scatterplot of Total Improved Seed Technologies Marketed and Accessed**

#### **4.2.3 Outliers, Normality, Linearity, Independence of Residuals**

These assumptions can be checked by inspecting the Normal Probability Plot (P-P) of the Regression Standardized Residual and the Scatterplot shown as part of the analysis. If points lie in a reasonably straight diagonal line from bottom left to top right in the Normal P-P plot, no major deviation from normality can be suggested. In the present study, we can easily inspect from the Normal P-P plot that, points line in a reasonably straight diagonal line from bottom left to top right for dependent variables (see figure 5). This suggests that the assumption of normality was not violated. In the Scatterplot of the standardized residuals, the residuals were roughly rectangular with most of the scores concentrated in the center, along the line 0. This also suggests no violation of the assumption of independence of residuals. Outliers can also be detected from the Scatter plot. From this Scatter plot we can find that there were no major outliers.



**Figure 5:** P-P Plot of Total Improved Seed Technologies Marketed and Accessed

**Source:** Output of preliminary multiple regression from own survey data

#### 4.2.4 Test for the Fitness of the Model

Therefore, to determine the explanatory variables that are good predictor of total improved seed technologies marketed and accessed, multiple regressions' model was estimated. R-squared or coefficient of determination, adjusted R-squared, standard errors and F-test are used as criteria to evaluate the best fit of the model in multiple regression. The result indicated that the model is fit, because all these indices exceed the criteria.

**Table 10 :** Influence of Predictor Variables on **TISTMA**

Model	R	R -Square	Adjusted R- Square	Std. Error of the Estimate
1	.658 <sup>a</sup>	.432	.381	5.94378

a. Predictors: (Constant), Total Seed Packs Size, Education Level, Total Price, Total Market Competitors, Total Distance, Total Extension Service, Total Infrastructures

b. Dependent Variable: Total Improved Seed Technologies Marketed and Accessed (TISTMA)

All the independent variables those predicted have been entered into regression analysis to generate the predictive model of **Total Improved Seed Technologies Marketed and Accessed**

(TISTMA). As shown in the table 11, the coefficient of multiple determinations value of R - square is **0.432**. This value tells how much of the variance in the dependent variable **TISTMA** is explained by the model independent variables Total (Market Competitors, education level, Price, Distance, Extension Services, Infrastructures, and Seed Pack sizes). In other words, multiplying R -Square value by 100, the model explains **43.2%** of the variance in the dependent variable **TISTMA**.

**Table 11:** Goodness of Fit – ANOVA Result

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	2072.478	7	296.068	8.380	.000 <sup>b</sup>
Residual	2720.299	77	35.329		
Total	4792.776	84			

a. Dependent Variable: Total Improved Seed Technologies Marketed and Accessed

b. Predictors: (Constant), Total Seed Packs Size, Education Level, Total Price, Total Market Competitors, Total Distance, Total Extension Service, Total Infrastructures

**Source:** Output of preliminary multiple regression from own survey data

The goodness of fit results of linear multiple regressions with Total Improved Seed Technologies Marketed and Accessed as the dependent variable and the variables Total (Market Competitors, Education Level, Price, Distance, Extension Services, Infrastructures, and Seed Pack sizes) as predictors is reported in table 12. The model reveals a statistically significant relationship between **Total Improved Seed Technologies Marketed and Accessed** and predictor variables, **F (7, 77) = 8.38, p < 0.001**. In other words this showed that, the hypothesized model was significant.

#### **4.2.5 Factors Influencing Improved Seed Technologies Marketed and Accessed**

Hence, to analyze factors influencing improved seed technologies marketing, the data collected from 85 sampled employees respondents of the three sample structural areas were subjected to regression analysis using Statistical Package for the Social Sciences (SPSS version 20).

In order to assess the influence of hypothesized predictor variables on dependent variable (Improved Seed Technologies marketed and accessed), multiple linear regression analysis was

computed using predictor variables and dependent variable total value. The model results showed that the multiple linear regression models correctly **predicted 43.2 %** of the total sample. In this analysis to find the significant explanatory variables, the model was run using the seven variables with enter method. Out of the hypothesized variables, four variables were found to be statistically significant, while the remaining three variables were found statistically insignificant in explaining the variations in the dependent variable in the model. The study shows that most of the explanatory variables are in line with their hypothesized direction using total value of predictors and dependent variables.

As the table 13 shows we have Unstandardized Coefficients and Standardized Coefficients. Among the seven predictor variables, four variables like; **total infrastructure**, **total distance**, **total seed package** and **total market competitors** were made a statistically significant prediction in predicting the **dependent variable** (total Improved Seed Technologies Marketed and Accessed). Hence, unstandardized Coefficients of **total infrastructures with value of 0.838**. This means that for every one unit increases in **total infrastructures**, the value of **dependent variable** (total Improved Seed Technologies Marketed and Accessed) will increase by **0.838**. Hereafter, Standardized Coefficients are used for comparing the effects of independent variables, to evaluate the contribution or influence of each independent variable /predictor variable to the dependent variable; one can see the Beta value. In the table 14 below, the Beta value for predictor variable, infrastructure was **0.456**. This implies, for every one unit increases in standard deviation of **total infrastructures**, the value of **dependent variable** (TISTMA) will increase by **0.456** and this predictor variable made the first strong positive and statistically significant influence in explaining or predicting the dependent variable (TISTMA) when the variance explained by all other variables in the model is controlled.

In addition, seed package made a statistically significant positive prediction to the dependent variable with Beta value of **0.455**. This implies that seed package made the second strong influence in predicting the criterion variable, of Improved Seed Technologies Marketed and Accessed. Furthermore, distance made the third strong negative influence/contribution in predicting the dependent variable, with Beta value of **-0.452**. Finally, market competitors made the fourth strong negative influence/contribution in predicting the dependent variable, with Beta value of **-0.362**. However, the remaining three predictor variables (Educational level, price and

extension services) statistically insignificant contribution/influence in determining the dependent variable in this study, hence  $p > 0.05$ .

**Table 12 :** Factors Influencing Improved Seed Technologies Marketed and Accessed

Regression coefficients of predictor variables in predicting the dependent variable, Total Improved Seed Technologies Marketed and Accessed (TISTMA)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
<b>(Constant)</b>	<b>33.753</b>	<b>13.048</b>		<b>2.587</b>	<b>.012</b>
Education Level	.860	1.247	.060	.690	.492
Total Price	.119	.181	.078	.661	.511
Total Extension Services	-.113	.324	-.050	-.348	.729
<b>Total Infrastructure</b>	<b>.838</b>	<b>.351</b>	<b>.456</b>	<b>2.385</b>	<b>.020</b>
<b>Total Distance</b>	<b>-1.206</b>	<b>.353</b>	<b>-.452</b>	<b>-3.412</b>	<b>.001</b>
<b>Total Seed Pack Size</b>	<b>.807</b>	<b>.375</b>	<b>.455</b>	<b>2.150</b>	<b>.035</b>
<b>Total Market Competitors</b>	<b>-.508</b>	<b>.181</b>	<b>-.362</b>	<b>-2.800</b>	<b>.006</b>

a. Dependent Variable: Total Improved Seed Technologies Marketed and Accessed

**Source:** Multiple Regression Model Output from own survey data

As a result, Unstandardized Coefficients are used in the prediction and interpretation of the model output; consequently, one would examine the coefficients table to examine and interpret the results. The prediction equation would be formulated based on the unstandardized coefficients, as follows.

**Estimated Multiple Regression Equation:**

$$\text{TISTMA} = 33.753 + 0.86 \text{ Education Level} + 0.119 \text{ Price} - 0.113 \text{ Extension Service} + 0.838 \text{ Infrastructure} - 1.206 \text{ Distance} + 0.807 \text{ Seed Pack size} - 0.508 \text{ Market Competitors}$$

$$y = 33.753 + 0.86 X_1 + 0.119 X_2 - 0.113 X_3 + 0.838 X_4 - 1.206 X_5 + 0.807 X_6 - 0.508 X_7$$

Extension service negatively influences in the model b/c no contact with extension workers.

### **4.3 Analysis Descriptive Using Mean Values**

#### **4.3.1 Correlation/Relationship among Variables by Mean Values**

MISTMA had statistically positive significant relationship with three independent variables with mean extension service, mean infrastructures, and mean seed pack size. Similarly, the correlation between MISTMA and three independent variables i.e., mean price, mean distance, and mean market competitors were negatively and statistically significant. This result is also similar to using total (sum) value as explained under sub title 4.1.5 on table 9. This shows that there is no result difference using total (sum) and mean value of predictors and dependent variable.

### **4.4 Multiple Regression Analysis Using Mean Values**

#### **4.4.1 Model Fitness Test by Mean Value**

Multiple regressions' model was estimated by mean values to determine whether explanatory variables are good predictor of mean improved seed technologies marketed and accessed (MISTMA). By multiple regression evaluation criteria, the mean values result indicated that the model is fit, because all these indices exceed the criteria.

All the independent variables those predicted have been entered into regression analysis to generate the predictive model of MISTMA. Like table 11, the coefficient of multiple determinations value of R -square is **0.432**. The R -Square value result tell us the model explains **43.2%** of the variance in the dependent variable (MISTMA).

Linear multiple regressions goodness of fit results of MISTMA as dependent variable and all predictors variables is almost similar with TISTMA as reported on table 12. The model showed a statistically significant relationship between dependent variable MISTMA and predictor variables,  $F(7, 77) = 8.353$ ,  $p < 0.001$ , indicated that, the hypothesized model was significant.

#### **4.4.2 Factors Influencing MISTMA**

In order to assess the influence of predictor variables on MISTMA, multiple linear regressions were computed and the model result predicted **43.2 %** of the total sample. Out of the hypothesized variables, mean of four predictor's variables statistically significant, and explained mean of dependent variable, while the remaining three predictor's variables were insignificant in explaining the variations in dependent variable.

Similar to TISTMA, mean multiple regression computed Coefficients of the seven variables, mean of four predictor variables; **infrastructure**, **distance**, **seed package** and **market competitors** were made a statistically significant prediction in predicting the mean of dependent variable. The Beta value for predictor variable, **Mean Seed Packs Size** was **0.483** the predictor variable made the first and **Mean Infrastructure** was **0.435** the second strong positive and statistically significant influence in explaining or predicting the **mean dependent variable** (MISTMA) despite the fact that the variance explained by all other variables in the model is controlled. Furthermore, mean distance made the strong negative influence/contribution in predicting the dependent variable, with Beta value of **-0.457**. Finally, mean market competitors made the fourth strong negative influence/contribution in predicting the dependent variable, with Beta value of **-0.364**.

However, the remaining three predictor variables (educational level, mean price and mean extension services) resulted in statistically insignificant contribution/influence in determining the mean dependent variable in this study, hence  $p > 0.05$ .

## **4.5 Analysis of Statistically Significant Factors Influencing in this Model**

### **4.5.1 Infrastructure (Distribution network)**

Farmers' access to efficient and cost effective storage facilities, transportation, marketing information services is critical to their effort to integrate their economy to the market and availability of various transport services for seed marketing was considered. Thus, the impact of infrastructure, as hypothesized, resulted into positively influence, marketing quantity of improved seed technologies. An increase of infrastructures /distribution network availability by one unit can lead to an increase of the dependent variable (Quantity of Improved Seed Technologies Marketed and Accessed) by 0.838 kg, on condition that the variance explained by all other variables in the model is controlled.

This finding corresponds with Nega and Sanders, (2006) showed that inadequate infrastructure such as roads are an external factor affecting the continued use of improved seed technologies. Households living near major towns have good access to both physical infrastructure and seed supplies, and can purchase seed from the market; hence they are expected to continue using adopted technologies. It is, therefore, important to have information on the factors that determine

technology adoption by farmers as well as factors that may increase the probability of continued use of these technologies.

Likewise, this finding match with Kubayo (2009), analysis revealed having road which is inconvenient to transport inputs would decrease the input demand supply index by .110 units. This entails the type of road is negatively influence the dependent variable and hence, having difficulties in transporting agricultural inputs would decrease the probability of purchasing production enhancing inputs. He also cited his result as concurs with the findings of Tesfaye and Shiferaw (2001).

Road infrastructure and transport availability have an influence on smallholder market participation, especially if they are located a distant from the consumption centers (Gabre-Madhin, 2001, as cited in Jari, 2009). According to Bachmann and Earles (2000), one of the most important constraints facing agricultural markets throughout sub-Saharan Africa is transport infrastructure and the need to reduce transport.

This also has similarity with the finding that verify, in an era when buyers and sellers alike seek speedier sales transactions, marketing channel technologies (including automated inventory and storage systems) and the internet are adding value by expediting the flow of physical goods, ownership, payment, information, and promotion (Rayport, and Sviokla, 1994.)

#### **4.5.2 Distance (*Distance*)**

Distance from market is a key factor in linking farmers with a market to sell or buy agricultural production and marketing. In this study, distance as hypothesized resulted in negatively influence marketing quantity of improved seed technologies. An increase of distance by 1km, can lead to a decrease of the dependent variable (Quantity of Improved Seed Technologies Marketed and Accessed) by 1.206 kg. This indicates that far distance will affect negatively the quantity of seed technologies to be purchased. Lack of close access to seed retail points has been cited as a major limitation to farmers adopting improved varieties (MacRobert, 2009).

Likewise, this finding match with many others, Anna (2014) study results showed, majority of smallholder farmers were not accessing improved seeds in their areas due to long distance from the main source of the seeds to their homes. In the study area, the majority of the smallholder farmers were blaming the government on the issue of poor accessibility to improved seeds; they were walking for long hours to seek improved seeds and some of the villages rural were

travelling 16 km to get improved maize and rice seeds. Anna (2014) found that, this is a constrain to the majority of smallholder farmers in Tanzania and supported the study by the statement that access to seed is a necessary condition for improved seed adoption (Dontsop-Nguezet *et al.*, 2011) and the adoption of improved seeds is an important component of agricultural productivity, food security and sustainable economic growth (Falter Meier and Abdulai, 2009).

Distance to market is negatively associated with the use of production enhancing inputs. Those who are far from the market may not have a chance to get agricultural inputs comparing to the nearby farmers (Legesse, 2001). Kubayoo (2009) indicated distance from the nearest input market is positively and significantly associated with the dependent variable at 5% level of significance.

Mussema and Dawit (2012) found that market participation among smallholder pepper producers in Silte and Aalaba in Ethiopia was negatively associated with distance to the market. Martey et al. (2012) in Ghana found distance to nearest market to be significantly associated with a lower level of cassava sales and every additional kilometer reduced the extent of market participation by 0.4 percent. In Ethiopia, it was reported that smallholder households who were away from market centers had lower market participation (Gebremedhin and Jaleta, 2012).

Therefore, it is safe to conclude that the shorter the distance of the marketing center from the farmers' (seed users'), the more likely to be motivated to involve in purchasing Improved Seed Technologies, which in turn has big influence in increasing OSE Quantity of Improved Seed Technologies Marketed and Accessed.

### **4.5.3 Seed packages**

It is a seed container with known volume of seed technology. The pack size matches farmer's interest encourages farmers to purchase the seed with attractiveness and legibility of pack size. In this study, seed pack size as hypothesized, resulted in positively influence marketing quantity of improved seed technologies. As table 14 showed above, a unit increase of convenience of seed pack size, can lead to a 0.807 kg, increase of the dependent variable (Quantity of Improved Seed Technologies Marketed and Accessed). This study is also supported by previous studies.

Availability of certified seed, affordability, availability of a grain market, ability of certified seed to tolerant pest and disease, profitability of grain production and packaging of certified seed are

the factors that were ranked highly by grain farmers as important in influencing their decision to utilize certified seed (Etwire *et al.*, 2016, P3-p27-40.pdf).

Arfassa Kiross (2015) study result in Ethiopia, reported that the existing seed package/bag size is convenient both for farmers to carry and transport using different means of transportation. He concluded that majority of the farmers mentioned the convenience of 25 kg seed package size of hybrid maize is convenient and popular in farmer's communities.

Hasan *et al.*, (2014), Katalyst is one of the largest market development initiatives in Bangladesh. The requirement for smaller quantities of seed for smaller farmers has led to a practice of selling a small quantity of seed from opened packets. These opened packets are often adulterated (inferior quality seeds mixed with good quality seeds) at the point of sale. Market research by Katalyst was observed that mini-packets could have an impact on a wider range of farmers, boosting their total seed sales.

Phiri *et al.*, (2000) project studied described seed delivery to African farmers and to offer suggestions for improving seed access, particularly for seed of new crop varieties. This case study examines the implementation of a strategy in Malawi. The strategy of producing and selling small seed packs of new bean varieties in Malawi has been quite successful. As this study result indicated, in areas where the small packs are available, many farmers have purchased the seed. The majority of these farmers are satisfied with the new varieties that they acquired and they are interested in purchasing other small seed packs. The merchants who have participated in the scheme are enthusiastic and wish to continue to sell the packs.

#### **4.5.4 Market Competitors (Other source /informal seed /FSS)**

Competition is determinant in marketing the technologies. As a result, identifying and characterizing marketing competitors is very important to design better strategy. Market competitors assumed in the context of competing for the existing real and potential demand customers to maximize its on market share of the technology. In this study, consequently, market competitors as hypothesized resulted in negatively influence marketing quantity of improved seed technologies. An increase of market competitors by one unit can bring a decrease of the dependent variable (Quantity of Improved Seed Technologies Marketed and Accessed) by 0.508 kg. This indicates that high marketing competitors would affect negatively the quantity of seed technologies to be purchased. This finding related to the finding by previous scholars referred in

the literature. Benson *et al.*, (2014), finding indicated that, competition between seed producers for market share can occur along several dimensions, including varietal characteristics, price, seed quality guarantees, quality and quantity of information on seed performance and use, the spatial density of seed selling points, timeliness of provision of seed, and payment modalities.

A seed company rarely exists alone in the market. And, even if it does, it faces competition from farm-saved seed or imported seed. Therefore, a seed company must know who its competitors are and be prepared to compete with them. This requires the attainment of knowledge about the competition and its strategies, and finding out and implementing ways to sell seed ahead of the competition (MacRobert, 2009).

#### 4.5.5 Improved Seed Technologies Marketed and Accessed (ISTMA)

Improved Seed Technologies Marketed and Accessed is a continuous dependent variable measured in kilogram and represents the amount of improved seed technologies marketed and accessed.

The study shows that most of the explanatory variables are in line with their hypothesized direction. As multiple regression output of table 14 showed, the result is complemented with hypothesized and the prediction equation ensured the total improved seed technologies marketed and accessed. The Estimated Model Equation Result will be:

$$\text{TISTMA} = 33.753 + 0.86 \text{ Education Level} + 0.119 \text{ Price} - 0.113 \text{ Extension Service} + 0.838 \text{ Infrastructure} - 1.206 \text{ Distance} + 0.807 \text{ Seed Pack size} - 0.508 \text{ Market Competitors}.$$

The **Constant** is the predicted value of the dependent variable, when all of the independent variables/ predictor variables have a value of zero. In the context of this analysis, for all predictors variables **education level, price, extension service, infrastructure, distance, seed package** and **market competitors** with zero value, the predicted Total Improved Seed Technologies Marketed and Accessed (TISTMA) would be 33.753 kg. This study finding is also supported by previous studies.

Arfassa Kiross (2015) study results showed, of the total hypothesized variables, eight of the more statistically significant, and can affect the quantity of seed purchased by farmers. His findings indicated, 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%.

Mergia (2010), to determine the explanatory variables that are good predictors of farmers' participation in seed marketing, Binary Logistic regression model was estimated using the Maximum Likelihood Estimation Method. The study model results indicated that the logistic regression model correctly predicted 93.9% of the total sample.

Ten explanatory variables were selected in the model to explain farmers' participation in seed marketing of sample household respondents. Out of which, six variables were found to be significant, while the remaining four were non-significant in explaining the variations in the dependent variable.

Kabeto (2014) using OLS regression analyzed factors influencing the extent of red bean market participation of Halaba Special District in Ethiopia. As his finding the R-squared is 0.47, indicating that 47 percent of the variations on dependent variable (extent of red bean market participation) was explained by the independent variables. According to him, ownership of means of transport, quantity of red beans produced and price of red beans positively and significantly influenced the extent of market participation among the respondents.

Thinah Moyo (2010) results of the multiple regression models on the effect of transaction cost related factors on quantity sold presented in the Limpopo River Basin of Zimbabwe. The results of this model showed that previously agreed prices (PRICEAGREE) are significant at five percent level in influencing the quantity of grain sold. Road access (ROADACCESS), confidence and trust in the buyer (CONFIDENCE), and membership in a farmer group (MEMBERSHIP) were not significant in influencing the quantity of grain that a farmer sold. According to him the p-value of the F-statistic indicated that overall the multiple regression models were significant and together all the explanatory variables have a significant impact on the quantity of grain sold.

Aji et al., (2001) the information and data collected was encoded and encountered for subsequent computer analysis using SPSS package. A one way ANOVA followed by Scheffe's test was performed in order to identify any significant differences in the rank order of importance of those 34 variables believed to most influence a farmer's decision to purchase seed. Mean score results show that availability of seed at planting time, was found to be the most important variable influencing East-Javanese farmers' decisions to purchase seed tubers. As this study result

concluded, availability of seed and farm production factors, *i.e.*, land and farm labor, formed a single factor that was found to be the most important factor influencing East-Javanese farmers' decision to purchase seed. Factor analysis of this study result revealed that there are seven factors that collectively accounted for 63 per cent of variation in the farmers' responses.

## CHAPTER FIVE

### 5. CONCLUSION and RECOMMENDATION

#### 5.1 Summary

This study was conducted to examine factors influencing improved seed technologies marketing and accessing system of oromia seed enterprise and define its responsiveness and effectiveness to meet farmers` demand through coordinated (integrated) outlooks. Specifically, the study set out to address the objectives: (i) to look in to the extent improved seed technologies marketing and accessing systems` functioning (operating) to meet farmers` real demand within the set framework; (ii) to search out factors influencing improved seed technologies marketing and accessing practical bottlenecks in the system. This chapter presents the summary, conclusions and recommendations based on the findings obtained from the mentioned objectives.

The national and regional level constraints revealed the existence of lack of integrated marketing and accessing system in the seed sector. As the result of inefficient and ineffective improved seed technologies marketing and accessing operating systems, heavy left-over of OSE on average has been 140,300 quintals yearly from 2013/14 to 2016/17 for the last four consecutive years (OSE Annual Magazines and Report, 2016/17).

Correlation between independent and dependent variables; had statistically positive significant relationship with three independent variables with extension service, infrastructures, and seed pack size; while, the correlation of three independent variables i.e., price, distance, and market competitors were negatively and statistically significant.

The descriptive statistics result showed that there was a statistically significant mean score difference between groups of background variable, **on job position,  $F(1,83) = 10.73$** . Thus, mean score of non-manager/expert ( $M = 43.90$ ,  $SD = 6.24$ ) was significantly higher than the mean score of manager level ( $M = 38.82$ ,  $SD = 7.90$ ). However, there was no statistically significant mean score difference between others groups of background variables; like gender, age, educational level, work place, total work experience and service year in Oromia seed enterprise on Improved Seed Technologies Marketed and Accessed.

From econometric model; multiple regressions was used to identify factors affecting improved seed technologies marketing and accessing. Preliminary assumptions of multiple regression

analysis tested to see the healthiness of the model, of Multicollinearity, Outliers, Normality, Linearity, Homoscedasticity, and Independence of Residuals, and the results of all showed there was no serious violation distinguished.

Multiple linear regression analysis was computed using both sum values and mean values of hypothesized explanatory variables. The model output approved that there was no change on value of R-Square and value of significance, on relationship between dependent variable and predictor variables because of using either of the two sum values or mean values methods.

Linear multiple regressions goodness of fit results model revealed a statistically significant relationship between dependent variable and predictor variables,  $F(7, 77) = 8.353$ ,  $p < 0.001$ , indicated that, the hypothesized model was significant.

To assess influence of predictor variables on dependent variable, multiple linear regression were computed and the model result appropriately predicted **43.2 %** of the total sample. This R - Square value result tell us the model explains **43.2%** of the variance in the dependent variable. Of these seven variables, four predictor variables; **infrastructure, distance, seed package** and **market competitors** were made a statistically significant in predicting the dependent variable, whereas, the remaining three predictor variables (educational level, price and extension services) resulted statistically, insignificant contribution/influence in determining the dependent variable in this study, hence  $p > 0.05$ .

Finally, unstandardized coefficients are used in the prediction and interpretation of the model output; consequently, the coefficient table examined, results interpreted, and prediction model equation was formulated.

## 5.2 Conclusion

The preliminary objective of the study was to look in to the extent of improved seed technologies' marketing and accessing systems' functioning to meet farmers' real demand. With regard to this, national and regional level studies have revealed the existence of some constraints including the lack of integrated marketing and accessing system in the seed sector. Similarly, the results of this study also indicated that there is an inefficient, ineffective, and unresponsive improved seed products (technologies) marketing and accessing functioning (operating) system

that hindered meeting the farmers' real demand. Hence, explanatory variables of the model that are found significant mainly explained by this.

The descriptive statistics result showed that there was a statistically significant mean score difference between groups of background variable, **on job position**; the mean score of non-manager/expert was significantly higher than the mean score of manager level, in OSE on Improved Seed Technologies Marketed and Accessed.

The second objective of the study was to investigate factors influencing improved seed technologies marketing and accessing and the practical bottlenecks in the system. In order to evaluate influence of predictor variables on dependent variable, econometric model of multiple linear regressions was estimated and the model result appropriately predicted R -Square value **0.432** of the total sample. This result told us that the model explains **43.2%** of the variance (variation) in the dependent variable. Of the seven variables, four predictor variables; **infrastructure, distance, seed package** and **market competitors** were statistically significant in predicting the dependent variable whereas the remaining three predictor variables (educational level, price and extension services) are insignificant in contribution/influence in determining the dependent variable.

Hence, the study result showed there was inefficient, ineffective, and unresponsive improved seed products (technologies) marketing and accessing functioning (operating) systems to meet farmers' real demand. The study confirms a good evidence and implication for corrective measure that should be taken. This is demanding either reforming the existing systems or newly re-engineering to cure and found responsive, efficient and effective improved seed technologies marketing and accessing system that meet farmers' real demand.

The Human capital (senior workforces) of the enterprise, and its resources and facilities, and the existing agricultural development potential and opportunities should be fully exploited and utilized by the organization and transformed to advantage for improved seed technologies' marketing and accessing.

The multiple linear regressions model result predicted R -Square value of the total sample, explains **43.2%** of the variance in the dependent variable. The four predictor variables - **infrastructure, distance, seed package** and **market competitors** were extremely strategic and statistically significant in predicting and determining the dependent variable. These factors need

to get great emphasize by OSE to maximize the service and benefits of improved seeds production and distribution.

### **5.3 Recommendation**

This section presents recommendations and implications, which seek to give a framework on how to ensure improved seed technologies marketing and accessing system; and lastly, highlights future research areas to be conducted as continuations.

1. Infrastructure (distribution network), distance, seed package and market competitors have to be among the central areas of attention to enhance improved seed technologies marketing and accessing. This is because they are particularly strategic and, as found in the model, statistically significant in predicting and determining the dependent variable and play major role in enhancing improved seed technologies marketing and accessing operating systems so as to meet the customers' demand and expectations.
2. OSE has to more focus on human capital (senior workforces), to more exploit and utilize the potentials and transform to advantage for improved seed technologies' marketing and accessing because **job position** is an area where statistically significant mean score difference appeared between groups of background variable.
3. The government of Ethiopia has to transform improved seed technologies marketing and accessing system in a way it will satisfy the farmers' demand; minimize seed technologies left-over and cost, support policy of agricultural growth and transformation plan. This is because, the study result showed the presence of inefficient, ineffective, and unresponsive improved seed products (technologies) marketing and accessing functioning (operating) systems to meet farmers' real demand.
4. Even though this study was conducted on OSE, this could also be applicable in other seed industries in Ethiopia where improved seed technologies marketing and accessing system is believed to be weak and constrained. This can also help researchers, policy makers and others as a reference on improve seed technologies marketing and accessing in Ethiopia and Africa.

### **5.4 Limitations of the study and Suggestion future research**

Henceforth, this model explains only **43.2%** of the variance of the dependent variable, there would other un accommodated factors influencing improved seed technologies marketing and

accessing. Therefore, further studies should be conducted in broadening factors influencing improved seed technologies marketing and accessing so as to provide chance of accommodations and increase the model explains variance of the dependent variable.

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## APPENDICES

### Appendix 1: Correlation Matrix of Dependent and Independent Variables

Correlations								
		Total Price	Total Extension Services	Total Infrastructures	Total Distances	Total Seed Pack Sizes	Total Market Competitors	Total Improved Seed Technologies Marketed and Accessed
Total Price	Pearson Correlation	1						
Total Extension Services	Pearson Correlation	-.620**	1					
Total Infrastructures	Pearson Correlation	-.648**	.764**	1				
Total Distances	Pearson Correlation	.473**	-.541**	-.680**	1			
Total Seed Pack Sizes	Pearson Correlation	-.546**	.749**	.859**	-.739**	1		
Total Market Competitors	Pearson Correlation	.445**	-.533**	-.622**	.626**	-.729**	1	
Total Improved Seed Technologies Marketed and Accessed	Pearson Correlation	-.305**	.342**	.503**	-.579**	.449**	-.525**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Source:** Pearson Correlation Results from own survey data

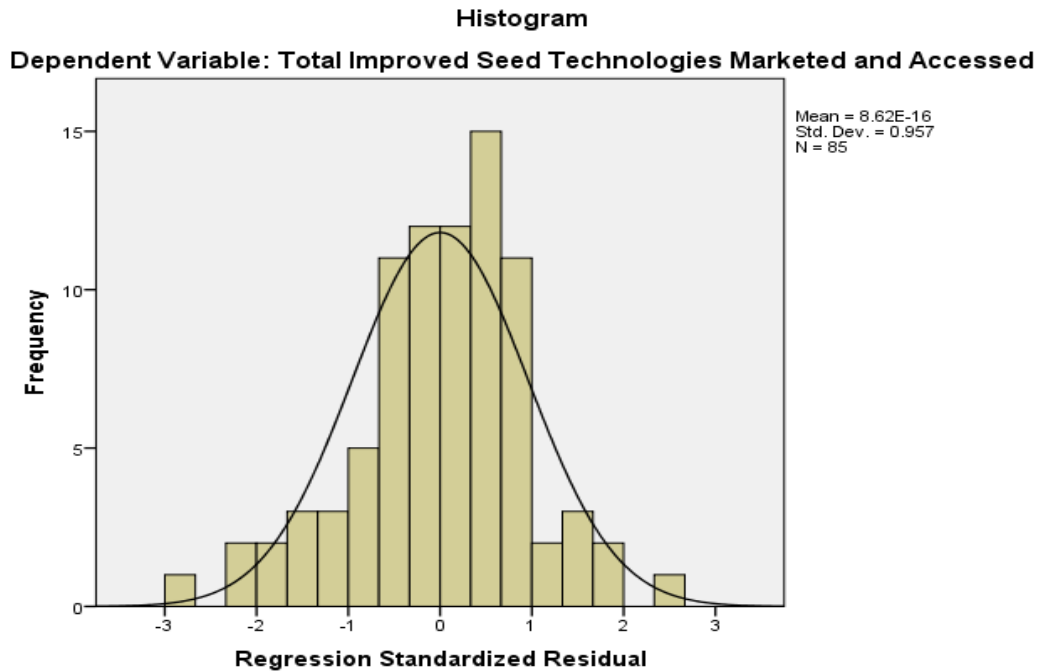
## Appendix 2: Collinearity Test/ Variance Inflation Factor (VIF), Regression Model Results

Coefficients <sup>a</sup>										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	<b>(Constant)</b>	33.753	13.048		2.587	<b>.012</b>	7.772	59.734		
	Education Level	.860	1.247	.060	.690	.492	-1.623	3.344	.958	1.043
	Total Price	.119	.181	.078	.661	.511	-.241	.479	.524	1.908
	Total Extension Service	-.113	.324	-.050	-.348	.729	-.758	.532	.350	2.854
	<b>Total Infrastructures</b>	.838	.351	.456	2.385	<b>.020</b>	.138	1.537	.202	4.955
	<b>Total Distance</b>	-1.206	.353	-.452	-3.412	<b>.001</b>	-1.909	-.502	.421	2.376
	<b>Total Market Competitors</b>	-.508	.181	-.362	-2.800	<b>.006</b>	-.870	-.147	.440	2.271
	<b>Total Seed Packs Size</b>	.807	.375	.455	2.150	<b>.035</b>	.060	1.555	.164	6.085

a. Dependent Variable: Total Improved Seed Technologies Marketed and Accessed

Source: Multiple Regression Model Output from own survey data

## Appendix 3: Normality Test of Regression Model Output Histogram



Source: Multiple Regression Model Results from own survey data

## Appendix 4: Questionnaires filled by OSE Managers' and Employees'



**Addis Ababa University**  
**Faculty of Business and Economics**  
**Department of Management**  
**EMBA Program**

Questionnaires to be filled by Managers' and Employees' have Direct/Indirect Linkage with Improved Seed Marketing of Oromia Seed Enterprise (OSE).

**Dear Respondent;**

I'm conducting a study entitled "*Factors Influencing Improved Seed Technologies Marketing and Access System in Oromia National Regional State: The Case of Oromia Seed Enterprise*" to fill the requirement for the completion of Master program in Executive Masters of Business Administration (EMBA), on Marketing. The primary aim of this study is to examine *Factors Influencing Improved Seed Products (Technologies) Marketing and Accessing System* of Oromia Seed Enterprise and define its responsiveness and effectiveness to meet farmers' demand through coordinated (integrated) outlooks. In the course of your participation, I ultimately hope to acquire the necessary information and data.

Enclosed with this letter is a brief questionnaire that asks a variety of questions about your attitudes & experience to evaluate how improved seed technologies marketing and accessing system of OSE operates/functions in the region. Your responses will not be identified with your personality and be disclosed.

I hope you will take time and concern to complete this questionnaire and if you have any questions or doubts about completing the questionnaire, you may contact me at (+251) 0911-30-99-52 or at [teferitsega@yahoo.com](mailto:teferitsega@yahoo.com). I express thank you in advance for sparing your precious time and your genuine cooperation.

***"Your filling all questions fully, help for analysis and final conclusion"***

Sincerely,

***Teferi Tsegaye***

**A. Please indicate your preference by putting “x” mark in the box**

x

**1. Social-economic Questions**

1.1 What is your gender?

1= Male  2= Female

1.2 Where do you categorized your age (in years)?

1= Under 25  2 = 25 – 35  3= 36 – 45   
4= 46 – 55  5= 56 and over

1.3 **Educational level:** What is your highest level of education?

1=1 – 12 Complete  2= TEVT/Certificate  3=Diplomas   
4=BA/BSC  5=MA/MSC/MBA  6= PhD

1.4 At which level is your permanent work place?

1=Head Office  2= Branch  3= Farm

1.5 If you are at Branch level, under which Branch are you working?

1= Arsi Branch  2= Bale Branch  3= Wollega Branch

1.6 Please, indicate your Job Position!

1= Manager level  2= Non-Manager/Expert

1.7 Under which do you categorize your total work experiences?

1= less than 5 years  2 = 6 – 10 years  3= 11 – 20 years   
4 = 21 – 30 years  5= 31 and over

1.8 Your service years as an employee of Oromia Seed Enterprise (OSE)?

1= less than 2 years  2 = 2 – 5 years  3= 6 – 10 years

**2. Price (Seed price vs. grain/output price instability)**

2.1 Are seed prices and grain prices different on your local markets most of the time?

1= Yes, they are different  0= No, not different

The following will be some statements concerning seed price vs. grain price. **Please mark (X)** the most appropriate response for each of the questions in the table below with the scores in the box. **Strongly disagree (SD) = 1, Disagree (D) =2, undecided (U) = 3, Agree (A) = 4 and strongly agree (SA) = 5**

No.	Question	SD	D	U	A	SA
2.2	The difference between grain price and improved seed price of wheat reached <b>up to 6.5 birr/kg</b> in 2016/17.	1	2	3	4	5
2.3	The difference between grain price and improved hybrid maize seed price reached <b>up to 20 birr/kg</b> for some variety in 2016/17.	1	2	3	4	5
2.4	OSE improved seed technologies price affordable to farmers (beneficiaries).	1	2	3	4	5
2.5	The prices of wheat/hybrid maize improved seed in 2016/17 are fair compared to grain/output price.	1	2	3	4	5
2.6	Low grain prices compare to improved seed technologies has high influence on marketed/sold of improved seed.	1	2	3	4	5
2.7	Price is one of the limiting factors for OSE improved seed technologies marketed/sold.	1	2	3	4	5

Please confirm the following questions by circle the number/s of your choice.

### 3. Extension Services(Training /Service Delivery)

3.1 Did farmers get an extension service in OSE seed marketing areas? 1=Yes 0=No

The following will be some statements on extension service. Please **mark (X)** the most appropriate response for each of the questions in the table below with the scores in the box.

**Strongly disagree (SD) = 1, Disagree (D) =2, undecided (U) = 3, Agree (A) = 4 and strongly agree (SA) = 5**

No.	Argument statements /Question	SD	D	U	A	SA
3.2	Package of extension services are provided by BOANR (WOANR, Das), Unions , NGOs, OSE	1	2	3	4	5
3.3	Frequency of extension services contact (total number of visits per year) can be frequently at the time of operation, weekly basis, monthly basis, or once in a year.	1	2	3	4	5
3.4	Farmers provided extension services in relation to	1	2	3	4	5

	improved seed technologies utilization and importance's.					
3.5	Less extension services provided have high influence in reducing quantity of OSE improved seed technologies marketing.	1	2	3	4	5
3.6	Lacks of promotion and poor extension services provision have great contribution to OSE seed left-over.	1	2	3	4	5
3.7	We can generalize promotion and extension services are one of the limiting factors influence for OSE improved seed technologies marketed/sold.	1	2	3	4	5

#### 4. Infrastructure (distribution networks)

The following will be statements on existence of infrastructures (distribution networks). Please **mark (X)** the most appropriate response for each of the questions in the table below with the scores in the box. **Strongly disagree (SD) = 1, Disagree (D) =2, undecided (U) = 3, Agree (A) = 4 and strongly agree (SA) = 5**

No.	Argument statements /Question	SD	D	U	A	SA
4.1	Infrastructures (distribution networks); like road facility, transportation, marketing information services and other communication tools, are exist for improved seed technologies marketing.	1	2	3	4	5
4.2	Infrastructures have influence in increasing quantity of OSE improved seed marketing.	1	2	3	4	5
4.3	Lacks of infrastructures are influencing in reducing quantity of OSE improved seed technologies marketing.	1	2	3	4	5
4.4	OSE improved seed left-over became increasing, as the result influence of unavailable infrastructures in the previous four years.	1	2	3	4	5
4.5	Infrastructures are one of the factors influence OSE improved seed technologies marketed/sold.	1	2	3	4	5

## 5. Distance (Accessibility)

The following will be statements on distance seed beneficiaries travelled to access seed technologies. Please **mark (X)** the most appropriate response for each of the questions in the table below with the scores in the box. **Strongly disagree (SD) = 1, Disagree (D) =2, undecided (U) = 3, Agree (A) = 4 and Strongly agree (SA) = 5**

No.	Argument statements /Question	SD	D	U	A	SA
5.1	Farmers (seed users) get OSE seed technologies at near distance.	1	2	3	4	5
5.2	Farmers travelled average distance from <b>1 km up to 5km</b> to purchase OSE improved seed technologies in 2016/17.	1	2	3	4	5
5.3	Distance can be a factor for farmers not to purchase OSE improved seed.	1	2	3	4	5
5.4	Distance is a factor for OSE marketing less quantity of improved seed technologies and for heavy seed left-over in the previous four years.	1	2	3	4	5

## 6. Seed packs size

The following will be statements on seed packs size beneficiaries purchased seed technologies. Please **mark (X)** the most appropriate response for each of the questions in the table below with the scores in the box. **Strongly disagree (SD) = 1, Disagree (D) =2, undecided (U) = 3, Agree (A) = 4 and strongly agree (SA) = 5**

No.	Argument statements /Question	SD	D	U	A	SA
6.1	OSE improved seeds were packed from <b>minimum 5 kg up to maximum 62.5 kg</b> .	1	2	3	4	5
6.2	OSE improved seed packing materials as standard as its formal seed competitors of the industry in the region.	1	2	3	4	5
6.3	Type of its packs size (bags) of improved seed container convenient for the enterprise customers (farmers).	1	2	3	4	5
6.4	Packs size (bags) a factor for farmers not to purchase OSE's improved seed in the previous four years.	1	2	3	4	5
6.5	Inconvenience of packs size (bags) can reduce, OSE improved seed marketing.	1	2	3	4	5

## 7. Market Competitors

7.1 Has OSE, market competitors in its seed business in the region? 1 =Yes, it has 0 = No

The following will be statements in regards of market competitors in the seed technologies.

Please **mark (X)** in your level of agreements for each of the questions in the table below with the scores in the box. **Strongly disagree (SD) = 1, Disagree (D) =2, undecided (U) = 3, Agree (A) = 4and Strongly agree (SA) = 5**

No.	Argument statements /Question	SD	D	U	A	SA
7.2	Both formal and informal seeds are OSE strong market competitors.	1	2	3	4	5
7.3	Informal/Farmers Saved-Seeds (FSS) are OSE strongest market competitors in the seed business.	1	2	3	4	5
7.4	Informal/Farmers Saved-Seeds (FSS) highly influence in substituting reduces, improved seed marketing.	1	2	3	4	5
7.5	There is high competition in the seed industry to market improved seed technologies for OSE in Oromia Region.	1	2	3	4	5
7.6	OSE is at strong position, relative to its formal seed competitors in the seed industry, by marketing improved seed technologies in Oromia Region.	1	2	3	4	5
7.7	The enterprise has market competition strategy and distribution system for marketing its improved seed technologies.	1	2	3	4	5
7.8	Government marketing through unions/cooperatives, agro-dealers/ agents, and OSE sales points are its market competition strategy and distribution system.	1	2	3	4	5

**B. Improved Seed Products (Technologies) Marketing and Accessing**

**8. The following items are about the marketing and accessing situations of improved seed products (technologies).**

<b>No.</b>	<b>Argument statements /Question</b>	<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>
8.1	Seed technologies marketing in quality, quantity, availability, price affordability, and timely supply has become improving for the last four years.	1	2	3	4	5
8.2	Marketed and accessed improved seed technologies are conducive to farmer's agro-ecological conditions and geographical location for the past four years.	1	2	3	4	5
8.3	The marketing situation for improved seeds technology has improved in the last four years.	1	2	3	4	5
8.4	The access situation of farmers for improved seeds technology has improved in the last four years.	1	2	3	4	5
8.5	Improved seed accessed by OSE matches with the demand and preference of farmers in the last four years.	1	2	3	4	5
8.6	OSE Internal integration in seed marketing and accessing systems growing in the last four years.	1	2	3	4	5
8.7	OSE External coordination in seed marketing and accessing systems growing in the last four years.	1	2	3	4	5
8.8	OSE seed marketing and accessing strategies, increase efficiency and effectiveness of its improved seed marketing system for the last four years.	1	2	3	4	5
8.9	Improved seed technologies marketing and accessing systems functioning (operating) in an efficient and responsive approach in the previous four years.	1	2	3	4	5
8.10	Farmers are happy about the distribution of improved seeds technology in the last four years.	1	2	3	4	5
8.11	OSE employees are happy in their improved seed products marketing and accessing performance in the last four years.	1	2	3	4	5
8.12	The enterprises performance of improved seeds technology marketing and accessing was growing in the last four years.	1	2	3	4	5

**C. The following are the explanatory variables selected among those factors influence marketing of improved seed technologies. In the rank of 1 - 5, where 1 represents “in the rank highest influencing factors”, while 5 represents “as the rank least influencing factors”. How would you rank the following selected factors influence on OSE marketing of improved seed technologies? (Please “Circle” or put “X” mark for each provided box for preferred Ranks).**

No.	Selected factors influence OSE improved seed technologies marketing and accessing	Expected Influence Ranks				
		1	2	3	4	5
1.	Education Level of the Employees	1	2	3	4	5
2.	Price (Seed price vs. grain/output price instability)	1	2	3	4	5
3.	Extension Services (Training /Service Delivery/promotion)	1	2	3	4	5
4.	Infrastructures (distribution networks)	1	2	3	4	5
5.	Distance (Accessibility)	1	2	3	4	5
6.	Seed packs size (bags)	1	2	3	4	5
7.	Market competitors	1	2	3	4	5

**THANK YOU INDEED!**