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**INSTITUTE OF AGRICULTURE AND DEVELOPMENT STUDIES, DEPARTMENT
OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS, MASTERS PROGRAM
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**DETERMINANTS OF FRUIT AND VEGETABLE COMMERCIALIZATION
AMONG RURAL HOUSEHOLDS: - THE CASE OF BORA DISTRICT, EAST
SHOWA ZONE, OROMIA REGION**

BY

WONDUWOSSEN DEMIS NIGATU

ID.NO:-MAEC/0018/2004

MAY, 2014

ADDIS ABABA

ETHIOPIA

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**A THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL
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This is to certify that, the thesis prepared by Wonduwossen Demis, entitled: - DETERMINANTS OF FRUIT AND VEGETABLE COMMERCIALIZATION AMONG RURAL HOUSEHOLDS: - THE CASE OF BORA DISTRICT, EAST SHOWA ZONE, OROMIA REGION, and submitted in partial fulfillment of the requirements for the Degree of Masters in Agricultural Economics complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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DEDICATION

I dedicate this piece of work to my mother W/ro Kelemework Zeleke ,my father Grazemach Demis Nigatu , to my beloved wife Genet T/Mariam , my son Aron, and to all my brothers /sisters , for all their contributions.

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LIST OF ABBREVIATIONS

CIAT	Central International for Agricultural Tropical
CID	Center for International Development
CSA	Central Statistical Agency
FAO	Food and Agricultural Organization
WHO	World Health Organization
EARO	Ethiopian Agricultural Research Organization
EA	Enumeration Area
EIA	Ethiopian Investment Agency
ETB	Ethiopian Birr
F&V	Fruit and Vegetable
Has	Hectares
ICT	Information Communication and Technology
Kg	Kilogram
OLS	Ordinary Least Squares
Qt	Quintal
SPSS	Statistical Package for Social Sciences
TLU	Tropical livestock unit
VIF	Variance Inflation Factor

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ABSTRACT

Enhancing the smallholders' production system into a commercialized production target as a way to raise the smallholder farmer's income and decrease rural poverty has been in the strategy focus of many developing countries, including Ethiopia. But, there are no adequate studies in Ethiopia, particularly, in the potential areas of fruit and vegetable production like Bora District. The study used a fixed reference period of March, 2013 to February, 2014. The data obtained from a sample of 150 smallholders fruit and vegetable farmers were selected randomly from four purposively selected rural kebeles in the District. A Probit double hurdle model was applied to analyze the determinants of the commercialization decision and level of commercialization. In the first case, the result of Probit Regression Model revealed that, sex, distance to the nearest market, and size of cultivated land played a significant role in smallholders' commercialization decision. In the second case, the result of Truncated Regression This study has identified household level determinants of the output side commercialization decision and level of commercialization in fruit and vegetable crops in Bora District, East Showa zone, Oromia Region. The study revealed that, household education, household size, access to irrigation, cultivated land, livestock, and distance to the nearest market were the key determinants of the level of commercialization. The result analysis of above mentioned model showed that farm size and distance to the nearest market were cross-cutting determinants of smallholder fruit and vegetable crops commercialization. It is recommended that extension officials should strengthen the business orientation of farm households coupled with government support in terms of market infrastructure.

CHAPTER ONE – INTRODUCTION

1.1. Background of the Study

Ethiopia has a good year-round climate of sunshine and has good agro ecological zones which are conducive to various agricultural activities. Most fruits and vegetables are still grown regionally, with the major production areas to the South and West of Addis Ababa (EIA, 2012).

It is no mystery where fruits and vegetables come from to Addis Ababa. The Southern part of Ethiopia is the main wholesale and retail distributors in the country. Even though vegetables are not a daily part of the diet and Ethiopia is known for its biodiversity of grains and pulses there are not a great many varieties available at the market. Sometimes varieties change due to seasonality, especially for fruits like oranges which come from multiple regions (Moti , 2007).

Even small-scale peri-urban producers can make a living at the market, selling small quantities of fruits, vegetables and livestock that they raise and harvest them. The efficiency of commercialization for fruits and vegetables in Ethiopia has been of significant concern in the recent years. Poor efficiency in the marketing channels and inadequate marketing infrastructure are believed to be the cause of not only high and fluctuating consumer prices, but also too little of the consumer Birr reaching the farmer (Kaul 1997, Moti, 2007).

Ethiopian farmers typically depend heavily on middlemen particularly in fruits and vegetable marketing. The producers and the consumers often get a poor deal and the middlemen control the market, but do not add much value. There is also massive wastage, deterioration in quality as well as frequent mismatch between demand and supply both spatially and over time . The studies sought to examine various aspects of the marketing of fruits and vegetables in the wholesale and retail market with a view to improve the marketing efficiency.

Fruits and vegetables typically become essential part of the daily diet in Addis Ababa and they are in great demand round the year from most sections of the population in the city.

The commercial value of fruits and vegetables in terms of direct consumption, processing as well as trade has risen substantially in recent years. Their economic importance has also increased and high labor intensity in the production of most fruits and vegetables production also makes them important from the employment angle as well (Sharma,1991). Increase in area allocation under fruit and vegetable crops has often been suggested as a measure for agricultural diversification, increased employment and income (Malik,1998).

In light of these issues, this study sought to examine the determinant factors of small holder farmers' commercialization aspects for fruits and vegetables. This study would examine various aspects of fruits and vegetable commercialization such as market infrastructure, marketing practices, enterprises future prospects or opportunities in the small holder selected households.

1.2. Statement of the Problem

Specifically, vegetable production plays important role in poverty alleviation through employment generation, improving the feeding behavior of the people, and creating new opportunities for poor farmers. Since the labor to land ratio of vegetable cultivation is high, vegetable products are bulky and perishable, and vegetable has continuous demand in the market, its production and marketing allows high productive employment. Increasing fruit and vegetable production and marketing thus contribute to commercialization of the rural economy and create many off-farm jobs (Weignberger and Lumpkin, 2005).

According to CSA (2014), the currently projected population of 88.2 million people in Ethiopia is expected to double within the next 30 years. Almost 80% of the population lives in the country side while the rest situated in urban area. From above mentioned population size an estimated five million people suffer from lack of vitamins and essential minerals, of which 80% are children. Vegetables are the major source of most micronutrient and

the only practical and sustainable way to ensure their supply (Fekadu and Dandena ,2006).

Vegetable crops are valuable sources of vitamins, minerals and proteins especially to a country like Ethiopia where the people experience malnutrition due to heavy dependence on cereals such as teff, maize, wheat, and other cereals.

Abundant intake of fruit and vegetables is clearly a positive solution for problems of poor diet quality in the developing world like ours. Moreover fruit and vegetables are relatively cheap sources of essential micronutrients. They are a cost effective way to prevent micronutrient deficiencies and protect against chronic diseases, the main killers in the world today. Although FAO/WHO recommends minimum fruit and vegetable intakes of 146 Kg/person/year, few countries achieved this level. The level ranges from 27 to 114 in most Sub Saharan Africa countries, and 26.7 Kg/person/year specifically in Ethiopia (Ruel *et al.*, 2005).

Fruit and vegetable commercialization in rural households is mainly with a wide variety of vegetables and fruits. The nature of the product on the one hand and the lack of organized market system on the other have resulted in high and fluctuating consumers' price is the main characteristic of the market .

A number of factors related to technological, institutional, organizational and political situations influence competitiveness of fruit and vegetable commercialization. So, information on factors that affect competitiveness of fruit and vegetable marketing is essential for the design of any strategy or policy that has an objective of intervention. Identification, characterization and evaluation of these determinant factors help's to remove barriers affecting performance and to strengthen strong sides.

Although fruits and vegetables are economically important commodities there was no study made on fruit and vegetable market in the study area to identify the key constraints and potentials on the system in this market.

Investigation of the vegetable and fruit market enterprise in terms of efficiency marketing infrastructure starting and working capital, lack of working premises financing problems, managerial capability, and various policies will, therefore, be used to identify the restricting factors and come up with specific possible solutions or prospects of the market. It is for these specific reasons that the study was designed to be undertaken in the area. This paper seeks to describe their current market situation and highlight some possible solutions to their determinant factors.

Generally, the paper is mainly focused on the main determinant factors confronting small holder farmers in fruit and vegetable commercialization and their future prospect. Therefore, this study attempts to fill this gap and contributes to the literature on the vegetable and fruit commercialization aspects of different projects in Ethiopia.

1.3. Research Questions

This paper wants to answer the following research questions;

What challenging or determinant factors face of smallholder farmers?

How do those factors contribute to market participation decision?

What are the determinant factors of small holder farmers, regarding level of commercialization?

What are the opportunities or prospects for these small holder farmers?

Generally the researcher try to attempt whether there exists a significant challenge determinants that affects the key producers with respect to infrastructure development, market information, commercial and financial extension services.

1.4. Objective of the study

1.4.1. Main Objective

In line with the above arguments, the general objective of this study is to explore the determinants of fruits and vegetables commercialization among small holder agricultural households' in the study area.

1.4.2. Specific Objectives

In particular, this study intends to address the following specific objectives.

- i. To explore factors determining the smallholder farmers' market participation decision in fruit and vegetable crops output.
- ii. To identify the determinants for the level of commercialization among smallholder fruit and vegetable crops market participant in the study area.

1.5. Significance of the Study

Fruit and vegetable crops are becoming attractive for many poor farmers around the world. Worldwide production of fruit and vegetable crops has grown faster than that of cereal crops (Lumpkin *et al.*, 2005). Farmers involved in fruit and vegetable production usually earn much higher farm incomes as compared to cereal producers and per capita farm income has been reported to be five times higher. In addition, fruit and vegetable products are considered income-boosting alternatives to basic grains for smallholder farmers, and they contribute to increasing employment opportunities (World Bank, 2004).

In Ethiopia, although there is huge potential for fruit and vegetable, its importance to the livelihoods of the rural populations in the country is insignificant. This is because fruit and vegetable production in Ethiopia is undertaken dominantly by smallholder farmers and few private sectors, making its overall contribution to the economy limited. For most Ethiopian smallholders, fruit and vegetable cultivation is not the main activity rather it is considered

supplementary to the production of main crops and the cultivation is on a very small plot of land and is managed by a household.

There is wealth of literature on smallholder commercialization in Ethiopia. Yet, these studies are biased either in focus or in coverage. Most of the existing literature on the area focuses on the commercialization and intensification of grain crops and livestock and livestock products (Pender and Dawit, 2007; Berhanu *et al.*, 2009 and Goitom, 2009). Furthermore, some other studies on the area deal with the issue of commercialization for the whole of fruit and vegetable commodities. However, these studies are less relevant given the fact that some fruit and vegetable items are not produced by the smallholder farmers. Therefore, it is imperative to address the factors that determine the decision and the level of participation in the market for fruits and vegetables among the smallholder farmers in study area. In this paper, therefore, I try to assess the determinants of fruits and vegetables commercialization among the rural smallholders in Bora District.

1.6. Description of the District /Scope of the Study

Bora District is one of the 17 Districts of the East Showa Zone, which is located in Oromia Region. The Districts of Iomme, lake Koka, and Dodota in the East, Dugda in the West, Liben in the North and Zeway Dugeda and lake Zeway in the South surrounds it. Its capital town, Alematina lies 160 and 105 kilometers away from Addis Ababa and Awassa respectively.

The District is administratively divided into 17 rural and 2 urban Kebeles. According to the 2007 report of the Central Statistical Agency (CSA), the total population of the District is 58,748 of which 28,261 (48%) are female. According to CSA (2007), the average family size of a household is 4, which is almost similar to the national figure.

According to the Bora District Agriculture Office, the total area of the District is estimated at 48,469 hectares; out of which, 47% is cultivable, 1.5% grazing land, 31.2% bush and forestland, 9.8% used for settlement, 8.3% water body and the remaining 2.2% is of no use. The altitude of the District ranges from 1,561 to 2,132 meters above sea level.

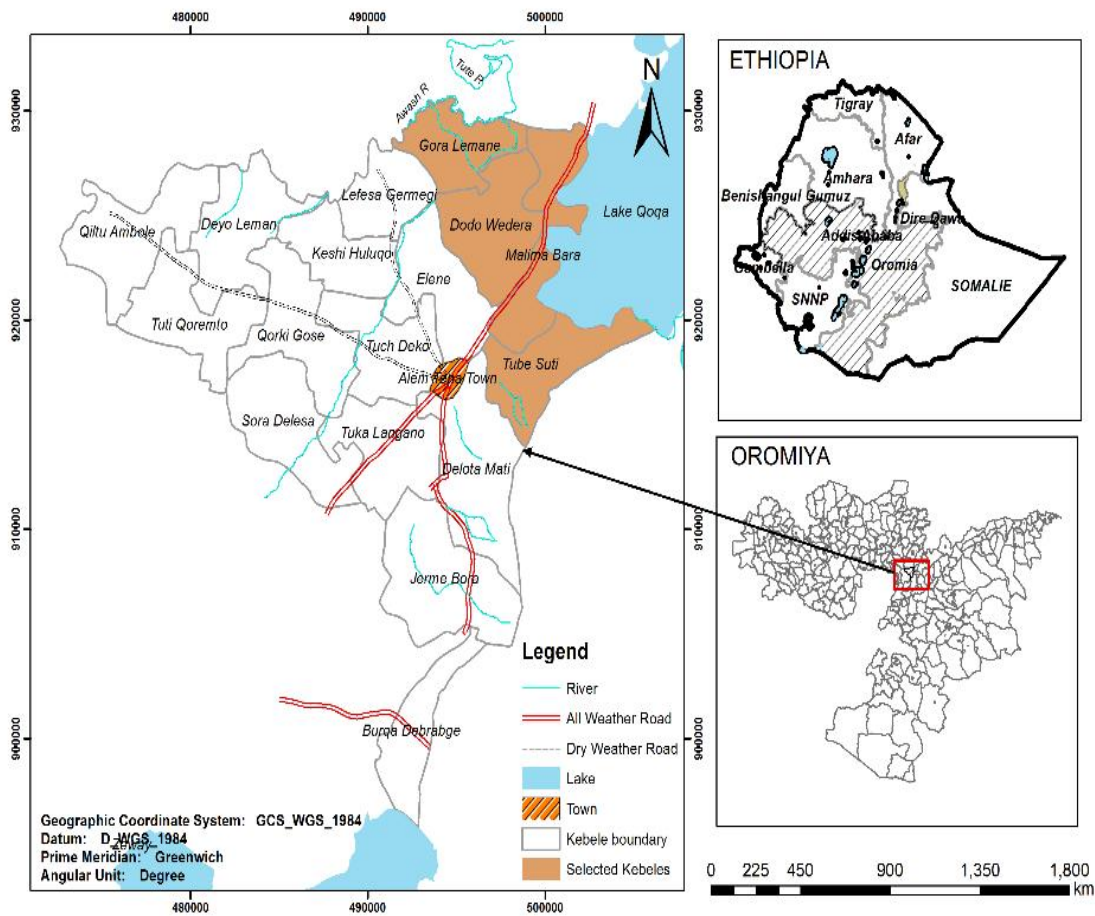
Mixed farming is the dominant household activity in the District and it is mostly confined to production of a few rain-fed crops such as fruit and vegetable crops, wheat, maize, teff, barley, chickpeas, and haricot beans. Fishing is also a common household activity.

The main reasons for selecting Bora District as the area of the study were:

- i. Bore has naturally one of the potential areas of fruit and vegetable producing Districts located within a short distance from Addis Ababa.
- ii. Bore District is surrounded by lakes and Awash River which have significant contribution to produce fruits and vegetables in extensive amount in this area.
- iii. The researcher in different survey projects was actively participated in integrated rural development and health related projects in this District and it supported the researcher in many ways.

The scope of the study was, selected small holder fruit and vegetable producers in the District. The study also emphasizes different determinant factors of small holder vegetable and fruit producers and factors determining supply of fruit and vegetable in the selected households was the center of the study.

Figure 1 Study Area Map



Source Generated using Arc view GIS Software (May, 2014)

1.7. Limitations of the study

Similar to all researches, this study had minor limitation. There was a confront during data collection on the field, when the researcher and data collectors inquires farmers, they were hesitating of the purpose of the study and showed the sort of reluctant to offer correct information regarding amount of land owned and production . But it is very important to note that this limitation do not have any significant interference with the outcome of the study.

1.8. Reliability Test

Cronbach’s coefficient alpha measures internal consistency reliability among a group of items combined to form a single scale and it is a reflection of how well the different items

complement each other in their measurement of different aspects of the same variable or quality.

Cronbach's alpha reliability coefficient normally ranges between 0 and 1. However, there is actually no lower limit to the coefficient. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. Based upon the formula $\alpha = \frac{rk}{[1 + (k-1)r]}$ where k is the number of items considered and r is the mean of the inter-item correlations the size of alpha is determined by both the number of items in the scale and the mean inter-item correlations. George and Mallery (2003) provide the following rules of thumb: " $\geq .9$ – Excellent, $\geq .8$ – Good, $\geq .7$ – Acceptable, $\geq .6$ – Questionable, $\geq .5$ – Poor, and $\leq .5$ – Unacceptable" (p. 231). While increasing the value of alpha is partially dependent upon the number of items in the scale, it should be noted that this has diminishing returns. It should also be noted that an alpha of .8 is probably a reasonable goal. It should also be noted that while a high value for Cronbach's alpha indicates good internal consistency of the items in the scale; it does not mean that the scale is one-dimensional. This research tool is also validated or measured its reliability and fall within the acceptable range.

Table 1 Result of Cronbach's Alpha

RELIABILITY ANALYSIS - SCALE (ALPHA)	
Reliability Coefficients	
N of Cases = 150.0	N of Items = 12
Alpha = .72	

Source Generated using SPSS.

1.9. Concepts and Definitions

Data items of agriculture have to be distinctly defined and identified, so that the information about the item becomes useful. The correct way of stating data items and related terms is a prerequisite for making standards and definitions for the collection and compilation of agricultural data. The purpose of using standard concepts and definitions is not only to provide quality data but also to ensure that the right items are enumerated and measured accurately to reflect the agricultural situation. Standard concepts and definitions used in the survey help to maintain consistent enumeration and measurement of variables of interest. To achieve this, the researcher clarified concepts and definitions to the data collectors through training and instructions. The concepts and definitions used in this study are based on the CSA standards. It includes the following.

Enumeration Area (EA) an enumeration area in the rural parts of the country is a locality that is, in most of the cases less than, and only in some cases equal to a farmers' association in geographical area and usually consists of 150-200 households.

Household a household may be either:

- a) a one person household, that is a person who makes provisions for his own living without combining with any other person to form part of a multi- person household or
- b) a multi-person household, that is, a group of two or more persons who live together and make common provisions for food and other essentials of living. The persons in the group may pool their incomes and have a common budget to a greater or lesser extent. They may be related or unrelated persons or a combination of both. These persons are taken as members of the household.

Agriculture the growing of crops and/or rising of animals for own consumption and /or sale.

Agricultural Household a household is considered an agricultural household when at least one member of the household is engaged in growing crops and/or raising livestock in private or in combination with others.

Holding a holding is all the land and /or livestock kept, which is used wholly or partly for agricultural production and is operated as one legal entity by one person alone, or with others without regard to management, organization, size or location.

Holder a holder is a person who exercises management control over the operation of the agricultural holding and makes the major decision regarding the utilization of the available resources. He/she has primary technical and economic responsibility for the holding. He/she may operate the holding directly as an owner or a manager. Under conditions of traditional agricultural holding the holder may be regarded as the person, who with or without the help of others, operates land and/or raises livestock in his/ her own right, i.e. the person who decides on which, where, when, and how to grow crops or raise livestock or both, and has the right to determine the utilization of the products.

Parcel a parcel of holding is any piece of land entirely surrounded by land and/or water and/or road and/or forest etc., which is not part of the holding. It may consist of one or more cadastral units, plots or fields adjacent to each other.

Field a field is defined as any plot of land which is a parcel or part of a parcel under the same or mixed crops or any other form of land use (private holding).

Crop includes cereals, pulses, oilseeds, vegetables, root crops, fruits, coffee, enset, chat, hops, sugarcane, cotton, tobacco, etc.

Crop production the process of growing and harvesting of the above crops for own consumption and/or sale.

Temporary/Annual Crops Annual/temporary crops are crops, which are grown in less than a years' time, sometimes only a few months with an objective to sow or replant again for additional production following the current harvest. Continuously grown crops planted in rotation are also considered as temporary crops since each is harvested and destroyed by plowing in preparation for each successive crop.

Permanent (Perennial) Crops, which are grown and occupy land for a long period of time, not requiring replanting for several years after each harvest, are considered as permanent crops. All fruit trees (i.e. oranges, mandarin, bananas, etc) and trees for beverages (i.e. coffee, tea, hops (gesho), etc) are considered permanent crops but meadows and pastures are excluded.

Meher (Main) Season Crop any temporary crop harvested between the months of Meskerm (September) and Yekatit (February) is considered as Meher season crop.

Belg Season Crop any temporary crop harvested between the months of Megabit (March) and Pagume (August) is considered to be Belg season crop.

CHAPTER TWO- REVIEW OF LITERATURE

2.1. Contribution of Fruit and Vegetables to Ethiopian Economy

Production conditions in Ethiopia favor the cultivation of a wide variety of fruits and vegetables. Given the diverse range of altitudes in combination with irrigation potentials in different parts of the country it is possible to produce virtually all tropical, sub-tropical and temperate fruit and vegetable crops. Exports of vegetable products from Ethiopia have increased from 25,300 tons in 2002/03 to 63,140 tons in 2009/10. Value of the fruit and vegetable exports increased with an average of 18% during this period from less than USD 10 to 30 million. So this creates significant assistance to the Ethiopian households and national economy (EHDA, 2011).

Far above the ground yields across diverse climatic conditions are the primary attribute for the economic and social value of fruit and vegetable crops. Root and tuber crops can yield as much as 40-60 tons per hectare and can provide food security especially in times of drought, famine and food shortages. They can be grown throughout the year and provide a continuous food supply, help in balancing nutrition and protecting vulnerable groups of the local populations from disorders associated with low mineral and vitamin intake. Commonly the highest yield of commonly grown teff, the staple food of the country, is on average 1 tons per hectare which is sixty times less yield per hectare of potato (60 ton per ha). The high returns to labor are sufficiently attractive to otherwise idle labor and improve the external trade balance in export value of processed products (Fekadu and Dandena, 2006).

Up to 30% of fruit and vegetable harvests in Ethiopia are reported to be lost due to poor post-harvest handling. Hence, of the fruit and vegetable production value chains should include productive diseases resistant varieties, agronomic practices, postharvest handling capacity for bulking, increased shelf life, new product development and delivery systems to markets (CSA, 2012/2013).

2.2. Constraints to Fruit and Vegetable Crops' Production and Marketing in Ethiopia

In general, the drawback to this sector include social and cultural habits of the population like dietary preferences for meat and other animal products, and distaste for vegetable crops, lack of consumer awareness, economic reasons of the local consumers, absence of nutrition intervention program using vegetables and their processed products and certain environmental limitations. However, many other commodities such as onion, garlic and hot paper are part and parcel of every Ethiopian diet in flavoring and garnishing local food (Fekadu and Dandena, 2006).

According to Fekadu and Dandena (2006), there are drawbacks related to production, marketing, and preservation such as heavy losses that are caused mainly due to price fluctuations, lack of guaranteed prices and unplanned planting patterns. Such constraints are aggravated by underdeveloped infrastructure and weak transportation facilities. Fruit and Vegetable supply to market are yet transported as bad packs on animals and human load. This causes heavy post-harvest losses. Trucks and private buses are also used by traders between local markets, regional and terminal markets but they are not also designed for the purpose (Fekadu and Dandena, 2006).

2.3. Fruit and Vegetable Production in Ethiopia

Although fruit and vegetable crops are important for health and economy the amount and mode of production is still weak in Ethiopia. Fruit and vegetable crops can be differentiated as fruit (permanent crops) and vegetables (short season crops). Accordingly permanent crops are long term crops that occupy the field planted for a long period of time and largely harvested every year and do not have to be replanted for several years after each harvest. These include tree crops such as coffee, Enset, Chat, oranges, Mangoes, Bananas, papaya, Avocados...etc. The trees that yield fruits like orange, Mangoes, Papayas, and others are known as fruit trees (CSA,2012/13).

More than 47 thousand hectares of land is under fruit crops in Ethiopia. Bananas contributed about 60.56% of the fruit crop area followed by Mangoes that contributed 12.61% of the area. Nearly 3.5 million quintals of fruits was produced in the country. Bananas, papaya, mangoes and orange took up 55.32%, 12.53%, 12.78% and 8.35% of the fruit production, respectively (CSA, 2012/2013).

Ethiopia has a variety of fruit and vegetable crops grown in different agro ecological zones produced through commercial as well as small farmers both as a source of income as well as food. However, the type is limited to few crops and production is concentrated to some pocket areas. In spite of this, the production of vegetables varies from cultivating a few plants in the backyards for home consumption up to a large-scale production for domestic and export markets (Dawit *et al.*, 2004). According to CSA (2012/13), 458,486.14 ha was under fruit (61,972.60 ha) and vegetable (396,513.54 ha crops). Papaya, onion and tomato covered 3,254.3 ha, 15,628.44 ha and 5,341.58 ha, respectively. An annual production of 21,637,206.7 quintal was estimated from fruit (4,793,360 Qt) and vegetable (44,821,699.42 Qt) by the same year. Of which papaya, onion and tomato constituted 440,034.99 Qt, 1,488,548.9 Qt and 418,149.53Qt, respectively (CSA, 2012/2013).

Bora District, where this study focused is one of the naturally endowed area in terms of provision of different fruit and vegetable products and other crops. The expansion of modern irrigation from deep wells enhances production of fruit and vegetable crops particularly vegetables. On top of this, the existence of spate irrigation supplements the erratic nature of rain. Major types of fruits and vegetables currently available in the study area are onion, tomato, green pepper, papaya, banana, avocado and watermelon etc....

The productivity of crops is very low compared to the potential yield obtained in the research centers and on farmers' field technology verification studies. For instance, the productivity of onion and tomatoes was about 90 and 70 quintals per hectare compared to the potential yield of 400 and 350 quintal per hectare in research centers (EARO, 2002 as cited in Dawit *et al.*, 2004).

Tropical fruits growing in the region between the 'tropics' of Cancer and Capricorn that is part of the earth which lies between 0 and 20 degree calluses latitudes and North and South of equator. These include Banana, Pineapple, Papaya, Mango and Guava.

Papaya (*Carica papaya*) –Papaya is the most important species of others found in genus *Carica*. Papaya is grown in all tropical countries and in many frosts less sub-tropical regions of the world. Early distribution over wide regions was enhanced by abundance of seeds in the fruit and their long viability (three years).

In Ethiopia papaya is produced in home gardens and semi-commercial level by farmers as well as commercial level by state farms for home consumption and local market (for fresh fruit and juice making). The commercial farms of upper Awash agro industry (Tibila and Awara, Melka farms), fruit and vegetable development enterprise (Ziwai farm) etc. Many growers prefer papaya to other fruit crops due to its early fruit bearing nature and ease of production practices (IAR, 1991). Papaya trees come in to bearing 9-14 months after planting, then bear year round. The ripe fresh fruit of papaya are eaten fresh throughout the tropics and are used in preparation of jam, soft drinks, ice-cream flavoring, and crystallized fruits and in syrup. The seeds are also used for their medicinal value. Unripe fruits and young leaves can be cooked and taken as vegetables and spinach and the juice facilitate digestion and so that it is preferable for older people.

Onion- (*Allium cepa*) is one of the most important commercial vegetables. Onion is a cool season crop. However it can be grown under a wide range of climatic conditions. It grows well under mild climatic without extreme heat or cold or excessive rain fall (Sharma, 2006). The principal *Alliums* ranks second in value after tomatoes on list of cultivated vegetable crops worldwide (Robin with and Currah, 2002). These people also reminded that all plant parts of *alliums* may be consumed by humans (except perhaps the seeds), and many wild species are exploited by local inhabitants. Careful handling and the choice of suitable storage method for the cultivar type in question are vital to ensure that the product retains its quality until it reaches the consumer. "Cosmetic quality" is of increasing importance in competitive markets. The product is produced for both consumption and market. According to CSA (2002) out of a yearly production, 48.2 percent was utilized for

sale, 39.9 per cent for household consumption in contrast to tomatoes where 66.7 per cent of the total production is sent to market.

According to Lemma and Shimeles (2003), in Ethiopia onion is produced in many parts of the country by small farmers, private growers, state enterprise mainly in Awash valley and Lake Region, where the bulk of dry bulbs and seed are produced.

Recent statistical data (CSA, 2012/13) indicated the total hectare under onion was about 20,444 hectare with total production of 2,572,053 quintals dry bulbs per annum. Globally, onion is produced, at nearly 35 million tons per annum (FAO, 2005). However, despite the enormous merits and potential, in Ethiopia the existing crop productivity has been low and variable under farmers' local condition. This is presumably due to lack of improved crop varieties, shortage of adapted varieties to different agro ecologies, lack of inputs, lack of appropriate agronomic package, disease and poor extension activities

Tomato is most important and remunerative vegetable crop in the world. Tomato is a rich source of minerals, vitamins and organic acids; tomato fruit provides 3-4% total sugar, 4-7% total solids, 15-30mg/100g ascorbic acid, 7.5-10 mg/100ml titratable acidity and 20-50mg/100g fruit weight of lycopene.

The importance of cultivated tomato to date is increasing in Ethiopia. It is widely accepted and commonly used in a variety of dishes as raw, cooked or processed products more than any other vegetables (Lemma, 2003, as cited on Abay, 2007).

The bulk of fresh market tomatoes are produced by small-scale farmers. Farmers are interested in tomato production more than any other vegetables for its multiple harvests, which result in high profit per unit area.

Tomatoes vary in visible fruit characteristics important for fresh market and processing values. These include shape, size, color, flesh thickness, number of locules, blossom end shape and fruit quality. The fruits may be globe shaped (Marglobe), oval or

flattened (Marmande), and pear shaped (Roma VF), which differ in acceptability in the local market, quality, and storability.

2.4. Characteristics of Fruit and Vegetable Marketing in Ethiopia

The size of the domestic market for fruit and vegetables is limited and not very diverse. Fruits in the markets of Addis Ababa are restricted to bananas, papaya and mango. Within the group of vegetables mostly potatoes, onions, peppers and tomatoes are sold. (Rolien Wiersinga,2009).

Main fruit and vegetable markets in Addis Ababa are Piassa, Merkato , and Mesalumia Ehil Berenda. These markets have a variety of clients: wholesalers, retailers and consumers are sourcing their fruit and vegetables from these markets. Approximately 50% of the supply originates from smallholder producers or farmers' cooperatives. Production comes from all over the country, but mostly from the Southern part of Ethiopia (Rolien Wiersinga, 2009).

In general the development of the domestic fruit and vegetable market is a long-term, gradual process which depends on aspects of economic development, urbanization and possibly related Change in consumer behavior. In the short-term, there is a potential for import substitution of processed fruits, mainly soft drink concentrates and fruit juices. The available processing plants have the potential to produce high quality products for the top segment market in Ethiopia (Rolien Wiersinga,2009).

Being produced both by commercial and smallholder farmers vegetable marketing is influenced by a number of factors that can be attributed to production, product, and market characteristics. Kohl and Uhl (1985) identified these attributes as the following.

Perishability- fruit and vegetables are highly perishable; they start to lose their quality right after harvest and continued throughout the process until it is consumed. For this purpose elaborated and extensive marketing channels, facilities and equipments are vital.

This behavior of fruit and vegetables exposed the commodity not to be held for long periods and fresh produce from one area is often sent to distant markets without a firm buyer or price. Prices may be negotiated while the commodities are en route, and they are frequently diverted from their original destination if a better price can be found. Sellers might have little market power in determining a price. As a result, a great deal of trust and informal agreements are involved in marketing fresh fruit and vegetables. There could not always be time to write everything down and negotiate the fine details of a trade. The urgent, informal marketing processes often leads to disputes between buyers and sellers of fresh fruits and vegetables. Producers are normally price takers and are frequently exposed for cheating by any intermediary.

Price /Quantity Risks- Due to perishable nature and biological nature of production process there is a difficulty of scheduling the supply of fruit and vegetables to market demand. The crops are subjected to high price and quantity risks with changing consumer demands and production conditions. Unusual production or harvesting weather or a major crop disease can influence badly the marketing system. While food-marketing system demands stable price and supply, a number of marketing arrangements like contract farming provide stability.

Seasonality- Vegetables have seasonal production directly influencing their marketing. Normally they have limited period of harvest and more or less a year round demand. In fact, in some cases the cultural and religious set up of the society also renders demand to be seasonal. This seasonality also worsened by lack of facilities to store.

Product bulkiness- Since water is the major components of the product, it makes them bulky and low value per unit that is expensive to transport in fresh form every time. This, therefore, exposed farmers to lose large amount of product in the farm unsold.

These listed characteristics of the product require a special complex system of supportive inputs. It demands a regular marketing preparation process like washing, cooling, proper management from the time of harvest until the produce is put on display. It is frequently believed fruit and vegetable not only remain attractive to the consumer it must also have a shelf life of few days after having purchased by the consumer (Nonnecke, 1989).

Improving vegetables marketing in developing countries is vital for a number of reasons: rapid increase in demand from growing domestic urban populations, opportunities to earn foreign exchange by exporting high value-off-season produce; the income raising opportunities it offer to small farmers and the contribution to employment made by its labor intensive production, handling and sales requirement are some to mention (FAO, 1986, cited on Abay, 2007).

Fruit and vegetable production is profitable. Farmers involved in fruit and vegetable production usually earn much higher farm income as compared to cereal producers. Cultivation of fruits and vegetables allows for productive employment where the labor/land ratio is high, since fruit and vegetable production is usually labor intensive. Increasing fruit and vegetable production contributes commercialization of the rural economy and creates many off-farm jobs.

However, expanding the scale of fruit and vegetable production is often hindered by lack of market access, market information, and many biological factors (Weinberger and Lumpkin, 2005).

Ideally, measures commonly recommended for the improvement of fruit and vegetables marketing are better packaging, handling, and transport; sorting by quality; extending the market season and leveling out gluts and shortages by market delivery planning and storage; developing new markets; installation of refrigerated transport and processing equipment: and establishing marketing enterprises .

Bezabih and Hadera (2007) stated that production is seasonal and price is inversely related to supply. During the peak supply period, the prices decline. The situation is worsened by the perishability of the products and poor storage facilities. Along the market channel, 25 percent of the product is spoiled. From these reviewed literatures severe production seasonality, seasonal price fluctuations, poor pre-and post harvest handling, prevalence of pest and diseases, lack of storage are some of the critical problems encountered vegetable production in Ethiopia.

2.5. Review of Empirical Evidences in Ethiopia

Jema (2008) indicated that limited access to capital markets, high consumer spending, and large family size attributable to lower economic efficiency for the marketed driven production like fruit and vegetables. On top of this, the marketing performance of fruit and vegetable shows that poor performance and contract enforcement was mainly due to mutual trust and broker's mediation. Furthermore, information access, trader-specific investments, and farmer's age, whether the buyer is a trader, dependency on the trader, relationship duration, transaction frequency, and distance to the trader were found to be the significant factors affecting contract enforceability through brokers in eastern Ethiopia. Risk related to perishability and seasonality of supply, illiteracy, and client-buyer's type were found to be the significance factors causing contract breaches by the traders. On top of this Jema (2008), further identified that, existence of considerable economic inefficiency in production, poor contract enforcement, and imperfect completion in the marketing of fruit and vegetables are some of the main problems of fruit and vegetable production and marketing in eastern Ethiopia.

He also added that, volume handle, shipping cost, and time trend be significant factors in explaining variations in the price spreads. Moreover results of his study show that traders share of the marketing surplus increase with the degree of perishability of the produce. That is, the more perishable the produce is, the higher is the share that traders' capture from the marketing surplus.

Jema (2008) indicated further, marketing margins widen as supply increase, supporting the argument that large volume of shipment of perishable commodity reduces farm prices.

Bezabih and Hadera (2007) state low level of improved agricultural technologies, risks associated with weather conditions, diseases and pests, as the main reasons for low productivity. Moreover, due to the increasing population pressure the land holding per household is declining leading to low level of production to meet the consumption requirement of the household. As a result, intensive production is becoming a means of promoting agro-enterprise development in order to increase the land productivity.

Fruit and vegetable production gives an opportunity for intensive production and increases small holders' farmers' participation in the market.

On top of this, Bezabih and Hadera (2007), further identified pest, drought, shortage of fertilizer, and price of fuel for pumping water as the major constraints of fruit and vegetable production in Eastern Ethiopia. Other problems they reported also include poor know how in product sorting, grading, packing, and traditional transporting affecting quality. Many of these findings also hold true for other parts of the country like Bora.

They added absence of direct transaction or linkage between the producer and the large buyer as another property that characterized fruit and vegetable marketing. Buyers follow contact persons who identify vegetables to be purchased, negotiate the price, and purchase and deliver the products. Bezabih and Hadera (2007) categorized actors in the marketing channel as producers, intermediaries/ brokers, traders and consumers.

Brokers play a decisive role in the marketing system and determine the benefit reaching the producer. Onion and tomato are quite often purchased in the field with brokers. According to Bezabih and Hadera (2007), there are three types of brokers: the farm level broker, local broker and urban broker. Each has their one separate task where the farmer level broker identifies plots with good produces and links the producer with a local broker. The local broker in turn communicates with the farmer and conveys the decisions made to the urban broker or collector. In this process the producer have contact with local agents and do not have direct contact with the other intermediaries. The third broker, urban broker, gets the information from ultimate buyers and sets the price. Here neither the farmer nor the traders set actual prices for the products. If the farmer insists on negotiating the price, the brokers gang up and boycott purchasing of the product leaving the product to rot. The farm level and local brokers get 5 ETB while the urban broker gets 10 ETB per quintal.

If there are several brokers in an area, they negotiate not to compete on the price offered by the broker. The changes in the value of products as they move away from production along the marketing channel to the consumer is the increased utility by making the goods available rather than adding value in terms of increased shelf life or increased safety. Similarly, Dawit

and Hailemariam (n.d) stated the importance of fruit and vegetable crops for both domestic and international markets as it was at an increasing rate from time to time associated with the expansion of small-and large-scale irrigation facilities supported by national and regional extension service on the production of fruit and vegetable crops.

In their paper, these researchers analyzed opportunities and constraints of vegetables marketing in the rift valley. They reported three options for selling fruit and vegetable crops similar to Bora District; right in the field (common for onion and tomato), sell at nearby markets, and least proportion option to access distance markets. They added that in terms of volume about 93 percent of the total produce was sold to wholesalers.

Basing farmers report, these researchers also added the major production and marketing constraints to include shortage of chemicals, shortage of commercial fertilizer, shortage of irrigation water, shortage of quality seeds, low product prices, intensive influence of speculators and brokers in reducing the bargaining power of farmers, poor market access, poor access to transportation, and intensive competition among producers.

Million and Belay (2004) indicated that, lack of market outlets, storage and processing problems, lack of marketing information, capital constraints, high transportation cost and price variation are some of the important constraints in vegetable production Moti (2007) In his research report, he documented findings of the role of fruit and vegetable for export earnings stability, farm resource allocation between food crops and cash crops, household decision making in crop choice-land allocation and market out let choice, and the influence of asymmetric price information on bargaining power of fruit and vegetable farmers.

According to Moti (2007) fruit and vegetable could be way out for agricultural commercialization of small-scale farmers with relatively better agricultural resource potential. If small-scale farm household have to move towards the production of fruit and vegetable crops for agricultural commercialization, factors influencing household decisions behavior in resource use should be studied.

He reported that diversifying the export base towards non-traditional agricultural commodities, as fruit and vegetable is important. He added linking small-scale farm household fruit and vegetable production with export could help both in reducing export earning instability and enhancing farm household's income. In addition, he pointed out that the production of high value and labor-intensive fruit and vegetable products contributes to poverty reduction and rural development through generating higher income and better employment opportunities for landless households. He also added that lack of cooling and storage facilities for perishable crops hampers for well functioning markets. He suggested access and availability to market information and alternative market outlets can improve subsistence farming to commercialize.

CHAPTER THREE - RESEARCH METHODOLOGY

3.1. Type and Sources of Data

There were two types of data that was incorporated in this study. These are primary and secondary data. Primary data was collected from small holder farmers vegetable and fruit producers (households). Moreover, officials from District Administration Office of agriculture, Planning sector and other governmental offices were key informants of the study. On the other hand, secondary data was collected from different books, previously undertaken research papers, Central statistical Agency and, publications.

3.2. Method of Data Collection

3.2.1. Interview Method

In this method, both structured and unstructured interview material was prepared and administered. The structured method is believed to enable the researcher to get depth and detail information which was collected during the interview of smallholder selected households. The questionnaire consist different types which are related to the topic of the research and relevant variables that help for the study. After Incorporating comments given from my advisor and field work supervisors the final draft of the questionnaires has been taken to the study area for pre-testing before using the actual data collection. Enumerators who have an educational background above twelve grade, and who have an experience in data collection were employed on contractual basis. Field data collectors and supervisors before, they go to the field, training has been given about how to approach respondents , the ways how to conduct interviews, and how to fill questionnaires . Pre-testing was carried out on 5 percent of the total sample size. During the data collection period the researcher had been engaged in a close supervision to each enumerator.

Unstructured questions raised due to some issues needed further explanation or the interviewee initiated some relevant issues which were not prepared by the interviewer.

Accordingly, the researcher has got a chance to get the potential determinant factors for commercialization and tried to incorporate in the analysis part of the study.

3.3. Sample Design

A sample design is an exact plan for obtaining a sample from a given population before data is collected (Kothari, 2004). The study was used both random and non-random sampling method. Non random sampling technique was applied to collect data from the concerned government offices.

The 2007 Population and Housing Census, conducted by the CSA, provided the sampling frame from which the study sample was drawn. Administratively, regions in Ethiopia are divided into zones, and zones, into administrative units called Districts. Each District is further subdivided into the lowest administrative unit, called kebele.

During the 2007 census each kebele was subdivided into census enumeration areas (EAs), which were convenient for the implementation of the census. This study sample was selected using a stratified, two-stage cluster design, and EAs will be the sampling units for the first stage. The random sampling technique was applicable to collect data from smallholder vegetable and fruit producers' in the study area.

The sample cluster included 5 EAs, in rural areas as shown in Figure 2. Households comprised the second stage of sampling. A complete listing of households was carried out in each of the 5 selected EAs 30 households were selected and all conventional households were listed. Finally the selected households were administered using questionnaires through interview method.

Figure 2 Selected Kebeles and EAs

Region Name	Region Code	Zone Name	Zone Code	District Name	District Code	Kebele Name	Kebele Code	EA Code
Oromia	4	East Showa	7	Bora	10	Gora leman	006	01
Oromia	4	East Showa	7	Bora	10	Dedo Wedera	007	03
Oromia	4	East Showa	7	Bora	10	Malima Bari	008	01
Oromia	4	East Showa	7	Bora	10	Malima Bari	008	03
Oromia	4	East Showa	7	Bora	10	Tubi Suti	009	02

A standard sample size calculation formula was utilized to arrive at sufficient representative sample size and to scientifically justify for the already set sample size for the survey. Since no accurate information was available about the magnitude of the survey estimate, a best case scenario was taken to get a large sample assuming for example the probability of participating in fruit and vegetable commercialization or knowledge of the vegetable market in the survey area, which was estimated to be, $p=80\%$; while the probability of this is not occurring is $q=20\%$. This assumption was estimated based on reviewed related literatures. The minimum sample size is, therefore, determined using the following formula.

$$n = \frac{Z^2 * (P) * (1-p)}{E^2}$$

Where n =desired sample size

Z =confidence level (1.96 for 95 % confidence interval)

P =percentage of picking choice

E =tolerable error of margin

In order to get a sample size sufficiently large to guarantee an accurate prediction, p is assumed to be 0.2. Choosing a 95% confidence interval, the value of Z is 1.96. So to be within tolerable range of margin, $E=5\%$ (or 0.05). Hence the minimum sample size required for the survey was calculated as follows.

$$n = \frac{Z^2 * (P) * (1-p)}{E^2} = \frac{(1.96)^2 (0.2)(0.80)}{(0.05)^2} = 245$$

This means 245 vegetable and fruit smallholder producers must be sampled. Nevertheless, the formula calculated the minimum sample size independent of the target population. This value can be used for an infinite population. But since the researcher had finite population (household size) of the District, he could apply the corrected formula for finite population. So the total household size of the District is 13,238 households.

$$n = \frac{n}{\{1+(n-1)/\text{household size}\}}$$

$$n = \frac{245}{\{1+(244)/13,238\}}$$

$$n = 240$$

The non response rate has to be, therefore, determined at certain percentage of the sample which was difficult to estimate given the paucity of previous research. It is however possible to take non-response rate documented in the different surveys, which ranges from 5-10%. Based on that, the expected response rate in this survey was estimated to 93%-97%, which means (3%-7% non response). We must consider the average 95% response rate. Then the actual sample (na) determined after providing for non response is shown below.

$$n^a = n * 100 / \text{re}\%$$

Where n^a = the actual sample size finally set for implementation

n = minimum sample size adjusted to target population

$\text{re}\%$ = estimated response rate (100%-5% non response)=95%

$$n^a = n * 100 / \text{re}\%$$

$$= 240 * 100 / 95$$

= 252 HHs were required for the entire survey.

Therefore, because of time and finance constraint the researcher covered only 150 households the sample size covered 150 small holder farmers from the survey area (District) altogether. Sample kebeles were purposively selected by the researcher. The sampling technique used to identify sample respondents from each selected kebele, was systematic random sampling. This was done using sample size interval that helps to take the n^{th} of sample unit from the frame list. This was possible by dividing the total number of small holder households within the selected EA for 30. 30 is the minimum sample size in statistics this was because, it was impossible for the researcher to include all elements or sampling units of the kebeles in the study area due to scarcity of resource and time.

3.4. Data Processing and Analysis

The data collected from the field was edited coded and entered in to the computer. The data entry was done by using CPro software. Using edit specification commands the raw data was cleaned and verified.

Finally the data was exported and generated using tabulation plans for further analysis purpose. The analysis was done through using Statistical Package for Social Sciences (SPSS version 20) and STATA. This was done by using appropriate statistical methods. Descriptive statistics such as percentage mean and standard deviations and inferential statistics were employed.

3.4.1. Empirical Model

The literature on commercialization of fruit and vegetable products indicate that the decision to participate in fruit and vegetable market and the quantity supplied to the market (measured in terms of cash earned from crop sales) is a linear function of a set of household characteristics and other sociological and economic factors. Hence, a linear functional form could reflect the relationship between the dependent and independent variables. Numerous empirical studies show that, in Ethiopia, smallholder commercialization is determined by household specific factors, household resource endowments, institutional factors, infrastructural and market related factors (Pender and Dawit, 2007; Berhanu *et al.*, 2009; Goitom, 2009; Adam *et al.*, 2010; Berhanu and Moti, 2010). In this context, I could specify the following linear functional relationship between the dependent and independent variables:

$$\begin{aligned} FV_i = & \beta_0 + \beta_1 Age_i \\ & + \beta_2 Sex + \beta_3 Educ_i + \beta_4 HHSz_i + \beta_5 FrmSz_i + \beta_6 Oxen_i + \beta_7 Irrga_i \\ & + \beta_8 DRoad_i + \beta_9 Dmrkt_i + \beta_{10} Credit_i + \beta_{11} Exts_i + \beta_{12} Mktinfo_i \\ & + \beta_{13} NoFincom + \varepsilon_i \end{aligned}$$

Figure 3 Descriptions of Variables Included in the Analysis Model

Variables	Description	Measurement
FVPAR	Indicator variable, equal to 1 if household sell fruit and vegetable products ; 0 otherwise	D = 1 if yes; 0= if No
FVSIZE	Value of fruit and vegetable crops sold	Ethiopian Birr
Age (AGE)	Age of household head	Number of year
Sex (SEX)	Sex of the household head	D =1 if Male; =0 if Female
Education (EDUC)	Educational status of the household head	Categorical Variable
Household size (HHSZ)	Household family size	Number
Total size of farm land owned (FRMSZ)	Cultivated land under fruit and vegetable	Hectare
Number of oxen owned (OXEN)	Total number of oxen owned by household	Number
Irrigation (IRRGA)	Household access to irrigation	D = 1if yes; 0 = otherwise
Distance from main road (DROAD)	Distance from household residence to main road	Walking hours
Distance to the nearest market (DMRKT)	Distance from household residence to the nearest market	Walking hours
Credit access (CREDIT)	Household access to credit	D =1if yes; 0 = otherwise
Extension service (EXTS)	Household access to extension services	D = 1if yes; 0 = otherwise
Market information access (MKTINFO)	Household access to market information	D = 1if yes; 0 = otherwise
Non-farm and off-farm income access (NOFINCM)	Household access to non-farm and off-farm income	D = 1if yes; 0 = otherwise

ETB = Birr, D = dummy variable, Timad is a local unit for land holding size measurement as per study area (1timad = 0.25ha), Source: District agricultural office.

Where FV_i is the total value of output sold, $X_{i,s}$ are factors or variables that affect quantity supplied to the market (i.e. the degree of farmers' participation in the output market), $\beta_{i,s}$ are estimable parameters, and ϵ_i is the error term.

The dependent variable FV_i is unobservable, but has an observable realization of one if it takes on a positive value and zero otherwise. Therefore, the model is an equation system with dependent variable censored by latent variables. Estimating a censored system of equations is no easy task and poses two major problems. First, as it is common in most cross-section surveys, there are significant numbers of households with zero value of output sold (Pender J, Dawit A, 2007). This could be the case either because of infrequency of participation in the market or abstention due to individual or household unobservable characteristics that prevents it from participating in a given market (selection model). In such cases, estimating a linear regression involves additional computational complications (Cameron and Trivedi, 2009). In particular, OLS will not yield consistent parameter estimates because the censored sample is not representative of the population. Moreover, statistical inference on the estimated parameters of the model involves significant extensions of the standard theory. Second, the distribution of the income from fruit and vegetable sale data is asymmetric because of the large number of observations with low values. In such cases the distribution is highly skewed with thick tail on the right. However, standard estimation techniques assume normally distributed error terms and hence inferences based on parameter estimates from such data will be invalid.

A Tobit model is popular empirical model used for censored data. Yet, Tobit model estimation makes strong assumption that the same probability mechanism generates both the zeros and positives (Pender J, Dawit A ,2007.). In reality, however, the mechanism that determines zero or nonzero income may not be the same as the mechanism that determines the amount of positive incomes. Consequently, it is more flexible to allow for the possibility that the zero and positive values are generated by different mechanisms. Numerous applications have shown that an alternative model, the two-part model or the hurdle model, can provide a better fit by relaxing the Tobit model assumptions. Furthermore, unlike the Tobit model, neither the homoskedasticity nor the normality assumption will be needed for consistency of the hurdle model estimators. Therefore, this study was adopted the two-part modeling technique because it separates the mechanisms that generate zero and positive

values of incomes, on top of its parsimony as it doesn't impose stringent conditions for consistency.

The first part of the two-part model is a binary outcome equation that models the probability of positive incomes, $\Pr(FV > 0)$ using any of the binary outcome models. The second part on the other hand uses linear regression to model $E(\ln FV | FV > 0)$. Therefore the two parts will be assumed to be independent and usually address two independent questions. Let FV denotes income from fruit and vegetable and define a binary indicator, d , of positive income such that $d = 1$ if $FV > 0$ and $d = 0$ if $FV = 0$. When $FV = 0$, we observe only $\Pr(d = 0)$. For those with $FV > 0$, let $f(y/d = 1)$ be the conditional density of e . The two-part model for e is then given by:

$$f(FV|x) = \left\{ \begin{array}{l} \Pr(d = 0|x) \text{ if } FV = 0 \\ \Pr(d = 1|x) f(y|d = 1, x) \text{ if } FV > 0 \end{array} \right\}$$

The first part is usually estimated by Probit or Logit model. The result from this model identifies factors that determine the probability of positive income from fruit and vegetable. The lognormal model, which will be estimated by simple OLS, on the other hand, traces the relationship between income levels and household characteristics such as income and assets. The same regressors can appear in both parts of the model, yet this can be relaxed if there is an obvious exclusion restriction.

Since the focus of the present research is on the determinants of commercialization of fruit and Vegetable among rural households, the unit of interest was the household. The key dependent variables of interest for the empirical analysis were the decision to participate in fruit and vegetable market and the level of participation. To uncover possible determinants, a set of other variables capturing the characteristics of the household head and the household as a unit was constructed. These included demographic characteristics such as age of the household, household size and sex of the household head. Similarly, some economic and sociological factors such as highest level of education attained by the household head, cultivated land under fruit and vegetable, total livestock owned by household, household access to irrigation, distance from household residence to all-weather road, distance from

household residence to the nearest market, household access to credit, household access to extension services, household access to market information, household access to non-farm and off-farm income and others were included.

In every survey data the researcher looked ahead to encounter many troubles. The problems may include, multicollinearity and heteroscedasticity are very common in cross-section data. Data should be cleared before it is issued for purpose of analysis.

Test for multicollinearity to detect multicollinearity problem for continuous variables, Variance inflation factor (VIF) $=1/1-R_j^2$, for each coefficient in a regression as a diagnostic statistic is used. Here, R_j^2 represents a coefficient of determination the subsidiary or auxiliary regression of each independent continuous variable X. As a rule of thumb, Gujarati (2003) stated that if the VIF value of a variable exceeds 10, which will happen if R_j^2 exceeds 0.90, then, that variable is said to be highly collinear. Therefore, for this study, Variance inflation factor (VIF) was used to detect multicollinearity problem for continuous variables. On the other hand, for dummy variables contingency coefficient was used. While fitting important variables in the models a test for multicollinearity problem among variables was performed using VIF and there was no serious problem as indicated in appendix I. In estimating the preferred model, robust method was employed in order to correct the possible problem of heteroscedasticity. Outliers were checked using the box plot graph so that there were no serious problems of outlier and no data get lost due to outliers.

3.4.2. Hypothesis and Definition of Variables

Age (AGE) - Age of the household, a continuous variable, was taken as one of the explanatory variables to influence participation to production. The expected sign was positive as age is one of the parameters of human capital. As an individual stays long, he would have better knowledge and would decide to participate.

Sex of the household head (SEX) - a dummy variable taking zero if female and 1 if male was one variable to be considered. No sign would not attach with this variable. It would be negative or positive.

Education (EDUC) –education level of the farmer has a great impact on the decision and level of participation .It has positive relationship. Education develops the skill and his capacity to adopt different technologies and inputs. As educational level increases the awareness, knowable, and capacity would developed. This further upgrades farmers’ exposure to market information. This is a categorical variable.

Household family size (HHSZ) - Family size of a respondent was one variable (continuous variable) proposed to influence participation decision. The more number of family members an individual had the more probable to participate in production participation. This is because he would have a labor source.

Total size of land owned (FRMSZ) - Total size of land a respondent owned, continuous variable, taken as another variable to influence participation decision. The expected sign was positive. The more land owned the more will be the probability to participate in the decision.

Number of oxen owned (OXEN) - being a power for plowing, participation probability would increase as farmers increased their number of oxen ownership. The expected influence is positive. It was discrete continuous variable.

Irrigation (IRRGA)–Access to irrigation has a positive relation with the market participation. This is because, a farmer using irrigation would have a better productivity and will also produce two or more times per year this may lead to excess production for consumption and will supply to the market. This variable is dummy variable.

Distance from main road (DROAD) – this was another continuous variable suggested to be included in the model. Measured in walking distance hours, the more time needed to reach a main road the lesser would be the probability to participate in production. Hence the expected sign was negative.

Distance to nearest market (DMRKT) - This variable was considered to see the intensity of market access. The nearer a farmer is to a market the more frequent would be his chance to get an access. Hence, the expected sign for this continuous variable measured in walking

hours was negative. As a farmer dwelled far the lesser would be the probability to participate in production and marketing decision.

Credit access (CREDIT) –credit access is the availability of the microfinance institutions like credit association within the kebele or within a short distance to the farmer. If the farmer has an access, he could borrow the money and be able to engaged in off-farm activities and can make money and would secured for his consumption and provide his product to the market. So it has a positive sign .This variable is a dummy variable, 0 if the farmer had an access to this, 1 otherwise.

Extension service (EXT_SER) - this was a dummy variable indicating extension service farmers were getting. This variable was expected to influence participation positively. Obviously, as farmers learned more and knew much it would be direct obvious to participate in marketing of fruit and vegetable crops.

Market information (MKTINFO) – This was a variable proposed to influence decision to participation positively. If a farmer could get updated information , he would be able to participate. The variable was considered dummy. Assigning 1, if a farmer got information, and zero if not.

Non-farm and off-farm income access (NOFINCM) –farmer’s access to different income sources, has a probability to feel secured regarding his economic aspect. It is a dummy variable and a strong positive relationship to the decision to participate and level of commercialization.

CHAPTER FOUR- RESULTS AND DISCUSSION

4.1. An Overview of the Chapter

In this chapter, the results of the findings from are discussed thoroughly followed by the discussion of the respective issues of interest. First, descriptive and statistical analyses of the demographic and socioeconomic characteristics of the sample households are presented. Next, econometric (empirical) analyses of the market participation of smallholder farming households are presented.

4.2. Demographic and Socioeconomic Characteristics of Household Heads

The results of descriptive statistics analysis indicated that, about 85% of the respondents sold their output while the rest 15% did not sell fruit and vegetable products as indicated in Table 2. On average the value of fruit and vegetable products sold per sample fruit and vegetable household head was estimated to be about ETB 7,513. The mean age of the sample respondents was about 52 years with the youngest being 23 and the oldest 80 years. The average number of family size for the sample respondents were about 5. The average land size allotted under fruit and vegetable crops per sample household head was about 2.63 timad while the mean livestock possession was about 4 TLU. The average distance to all-weather roads and distance to the nearest market was estimated to be 1.5 and 1.85 walking respectively.

This sub-part of the chapter explains the demographic and different socio economic characteristics of the research area 150 selected households. The following variables or socio economic indicators will have a significant impact; it will be positive or negative on the performance of smallholder farmer's commercialization. The demographic and socioeconomic characteristics also have an importance in showing evidently the conditions of the target population or the respondents' actual characteristics. The demographic and socio economic characteristics may include sex, age educational status, and household size, etc...

Table 2 Descriptive Statistics of Selected Variables Used in the Empirical Analyses.

Variable	Number HHs	Mean*	Std. Dev.	Min	Max
Decisions to participate or not in fruit and vegetable crops market (1 = Yes, 0 = No)	150	0.85	0.40	0	1
Value of fruit and vegetable crops sold (Birr)	150	7513	5239	0	17,451
Age of household head (year)	150	52	10.24	23	80
Sex of household head (1 = male, 0 = female)	150	0.75	0.41	0	1
Household size (no.)	150	5.71	2.30	1	11
Education of household head (1 = literate, 0 = illiterate)	150	0.554	0.51	0	1
Total cultivated land (<i>timad</i>)	150	1.14	0.48	0.25	5
Oxen owned (no)	150	1.61	1.19	0	5
Access to use irrigation (1 = yes 0 = no)	150	0.59	0.49	0	1
Access to nonfarm and off farm income (1 = yes 0 = no)	150	0.23	0.42	0	1
Distance from settlement centre to the nearest main road (hrs)	150	1.30	1.08	0.01	4
Distance from settlement centre to the nearest market place (hrs)	150	1.46	0.90	0.05	3.5
Access to market information (1 = yes, 0 = no)	150	0.58	0.49	0	1
Access to credit (1 = yes, 0 = no)	150	0.41	0.49	0	1
Involvement in extension services previous year (2013/14) (1 = yes, 0 = no)	150	0.5	0.47	0	1

*Mean indicates the proportion of those variables coded 1 for dummy variable. Source: SPSS result from survey data, 2014.

According to the above Table 2, or survey result, the male headed households is 75.5% and the female headed one is 24.5%. This shows that the larger proportion of the sample is a male headed household which is very relatively similar proportion as different census and survey results proved. As far as the average age limit of the sample respondents is 52 years, which implies that the youngest is 23 and the oldest age is 80 years old.

The educational status of the respondents was measured in the number of years of schooling. Based on this idea, the result indicates that, 55.4% are illiterate whereas the 44.6% are literate indicating that most of the household heads cannot read and write which is a key determinant factor in the commercialization of farming. The fact that 100% of the respondents own land is not as such surprising because the selected respondents were filtered out during the sampling methodology based on the criteria of whether they have engaged in fruit and vegetable cropping.

Another household characteristic which can depict the background of the household is the land holding size. The sample result shows, despite the fact that, the minimum and the maximum landholding size are 0.25 and 5ha of land respectively, the average holding size is 2.63 ha of land per household. While according to CSA, at national level the average holding sizes in all cropped area, per household and per holder were 1.17 and 1.13 hectare during 2012/13(2005 E.C) survey year in each respective order.

4.2.1. Land Ownership and size

The principal data that were collected were related to fruit and vegetable crop area size and production agricultural inputs utilization (irrigation) and, land use and number of livestock owned at household level among the selected households within the District. The aforementioned attributes are the factors determining the level of output and level of commercialization among the private holders. Even though the holding size varies across land holders, as it is indicated from the table below, all respondents own land regardless of the size.

Table 3 Status of land Ownership of Household Heads

Item	Response	Freq	Percent (%)
Own land (1=yes 2=no)	Yes	150	100

Source: survey result 2014

Table 4 shows that, the large proportion of the selected households own land below 2 hectares of farm land size.

Table 4 Distribution of land holding Size in hectares

Land size in Hectares(ha)	Freq.	Percent (%)
1 and under	31	21
1.1- 2	43	29
2.1-3	20	13
3.1-4	29	19
4.1-5	27	18
Total	150	100.00

Source: survey result 2014

4.3. Results of Econometric Model Analysis

There are a number of determinants in commercializing smallholder agriculture. These determinants are broadly categorized as external and internal factors. The external ones are factors beyond the smallholder's control like population growth and demographic change, technological change and introduction of new commodities, development of infrastructure and market institutions, development of the non-farm sector and the broader economy, rising labour opportunity costs, macroeconomic, trade and sectoral policies affecting prices and other driving forces. In addition, development of input and output markets, institutions like property rights and land tenure, market regulations, cultural and social factors affecting consumption preferences, production and market opportunities and constraints, agro-climatic conditions, and production and market related risks are other external factors that could affect the commercialization process (On the other hand, factors like smallholder resource

endowments including land and other natural capital, labour, physical capital, human capital etc. are household specific and considered to be internal determinants Pender *et al.* 2006). Some of these factors are briefly discussed in the following subsection.

4.3.1. Determinant of Household Commercialization Decision

The outcome of Probit model inference for the determinants of the likelihood of household to sell fruit and vegetable outputs or not are presented in Table 5. Marginal effect was used as a useful measure to explain the result as coefficients of the Probit model are difficult to interpret since they measure the change in the unobservable y^* associated with a change in one of the explanatory variables (that is, not partial effects). The decision to participate in the fruit and vegetable products market was estimated by maximum likelihood method. The model chi-square tests applying appropriate degrees of freedom indicate that, the overall goodness-of-fit of the Probit model are statistically significant at 1% probability level.

Pseudo R^2 values indicate that, the independent variables included in the regression explain 24% variations in the likelihood to sale fruit and vegetable outputs. The result of Probit estimation shows that, the likelihood of household participation in fruit and vegetable crop market as a seller was influenced by sex of household head, farm size and distance to the nearest market, all with expected signs.

Sex of the household head was found to be a positive and significant factor in explaining fruit and vegetable crops commercialization decision at 1% level. The positive coefficient on sex indicated that, male headed households are more likely to sell fruit and vegetable crops. Male headed households were more likely to participate in fruit and vegetable crops marketing by about 27.9 % points higher than that of female headed households. This may be due to the female headed households are vulnerable to resource constraint like labour, capital and skill for fruit and vegetable crops operation.

Farm size was also found to have a positive and significant influence on farmers' likelihood to participate in fruit and vegetable crops market at 10% level. The result implies that, a one timad (0.25 ha) additional land the household allocate for fruit and vegetable crops would

increase the farmers' likelihood of market participation by 9.7 %.This may be due to access to more arable land will encourage farmers to grow more fruit and vegetable crops, which leads to surplus production for the market.

Table 5 Marginal Effects of Probit Regression for Commercialization Decision

FVmkt	Coef.	Robust Std. Err	z	P > z 	Marginal effect
AGE	-0.001	0.101	-0.01	0.301	-0.000
SEX	1.234***	0.489	2.52	0.001	0.279
EDUC	0.211	0.056	3.77	0.212	0.035
HHSIZE	0.004	0.021	0.19	0.834	0.021
IRRG	0.124	0.061	2.03	0.212	0.030
FRMSZ	0.271*	0.028	9.68	0.082	0.097
LVST	0.015	0.012	1.25	0.451	0.010
DROAD	0.001	0.032	0.03	0.342	0.031
DMKT	-0.088 **	0.032	-2.75	0.017	-0.074
MKTINFO	-0.067	0.061	-1.10	0.652	-0.031
CREDIT	0.281	0.061	4.61	0.440	0.051
EXTS	-0.086	0.054	-1.59	0.615	-0.014
NOFINC	0.082	0.061	1.34	0.723	0.025
Cons	-.0228	0.681	-0.48	0.562	

Note ***, ** and * implies statistically significance at 1, 5, and 10% level respectively, Log pseudo likelihood = -59.32, Pseudo R² = 0.24, Wald chi-square (14) = 54.83, Prob > chi² = 0.0001, N = 150. Source: Model result, 2014.

Distance to the nearest market was negatively affect households' likelihood to sell fruit and vegetable crops and statistically significant at 5% level. An increase in the distance that the households would travel to arrive at the nearest market by one walking hours would decrease the probability of the households by 7.4 % to market participation. In spite of the perishable nature of the products and the unavailability of post-harvest technologies

that improve the shelf life of the crops resulted in increase in travel time and cost. Thus, those farmers located in distant and remote villages had less likelihood to participate in fruit and vegetable markets.

4.3.2. Determinants of the level of commercialization

This section deals with results of truncated regression model estimating the determinants of the level of commercialization that was measured in sells value of fruit and vegetable crops. It is worth mentioning at this stage that only farm households who sell fruit and vegetable crops are considered in this analysis.

Table 6 Results of Truncated Regression for the level of Commercialization.

FV valu	Coef.	Robust Std. Err.	Z	P > z
AGE	250.624	84.528	2.96	0.523
SEX	119.015	652.864	.18	0.834
EDUC	2143.323*	964.197	2.22	0.049
HHSIZE	-689.011***	201.258	-3.42	0.000
IRRGGA	1894.040***	960.243	1.97	0.000
FRMSZ	3540.450***	325.851	10.87	0.001
OXEN	983.754***	144.002	6.83	0.000
DROAD	752.026	689.824	1.09	0.451
DMKT	-2563.854**	987.108	-2.60	0.025
MKTINFO	566.712	983.389	0.58	0.321
CREDIT	-452.349	687.568	-0.66	0.350
EXTS	-329.524	183.208	-1.80	0.651
NOFINC	-493.951	741.267	-0.67	0.521
Cons	-2321.524	1967.057	-1.18	0.483

Note, *** 1% significance level, ** 5% significance level, and * 10% significance level. N=127, Log Pseudo likelihood = -1137.206646, Wald chi-square χ^2 (13) = 90.06, Prob > χ^2 = 0.0000, R2 = 0.5476

A result showed that, the model was statistically significant at 1% level indicating the goodness of fit of the model to explain the relationships of the hypothesized variables, in terms of at least one covariate. The estimation result also showed that, level of fruit and vegetable crop commercialization was influenced by household education, household family size, irrigation, farm size, livestock, and distance to the nearest market all with expected signs (Table 6).

The education of the household head was found to be of positive impact on the sales value of fruit and vegetable crops and statistically significant at 10% level. On average, literate household earn about ETB 2,143 more as compared to illiterate household head from sales of fruit and vegetable crops. Education increases the ability of farmers to gather and analyze relevant market information which would improve the managerial ability of the farmers in terms of better formulation and execution of farm plans, and acquiring better information to improve their marketing performance.

Family size was found to be statistically significant at 1 % level and influence negatively on the sells value of fruit and vegetable crops. The negative impact of household size indicated that, the higher the number of household members, the more they will consume their production. In other way round, an increase in family size may also increase in the number of dependent family members which would in turn increase in the number of mouths to be feed and disproportionate volume of production and hence contribute to a decrease in the level of market participation. Adding an additional person to the household would decrease the value of crop sales by about ETB 689.

Irrigation was also found to be positive and statistically significant implication on the value of fruit and vegetable output sold at 1% level. Households with access to irrigation earn, on average about ETB 1,894 more than those households with no access to irrigation. Smallholder fruit and vegetable producers with access to irrigation have more opportunities to supply more fruit and vegetable products than farmers without access irrigation due to improvement in fruit and vegetable cropping intensity and economies of scale. This could have a big impact in the push for rural household's participation in fruit and vegetable commercialization to diversify their livelihood and generate better income.

Farm size the result shows that, land holding size significantly influences the intensity of fruit and vegetable market participation. Under fruit and vegetable crops was positively and significantly associated with sales value of fruit and vegetable products at 1% level. This is expected since land is a critical production asset having a direct bearing on production of surplus due to economies of scale. An additional timad (0.25 ha) of the household allocate for fruit and vegetable crops would increase the value of fruit and

vegetable output sold by about ETB 3,540. It is recommended that policy should improve the functioning of the land lease market and development of the land sales market and consolidation of fragmented farm structures. Policies should also promote the development of non-farm activities, as this would help in transfer of labour from farm to non-farm thereby increasing the availability of land for farming.

Livestock possession was also found to be positively influence the level of fruit and vegetable crops commercialization and statistically significant at 1% level. The positive coefficient of livestock possession implies that an increase in livestock possession by one TLU would increase the value of fruit and vegetable outputs the household sold by about ETB 983. One reason could be that, livestock provides manures as manure is the main nutrient used by farmers for crop production in study area and livestock are the main source for this nutrient, the increase in the number of livestock owned would improve the fruit and vegetable crops productivity and hence increases the marketable surpluses. One of the key finding also regarding causality between farmers level of productivity and commercialization is that productivity becomes a function of commercialization in a significant manner. This is possibly associated with lack of diversified livelihood in rural Ethiopia where farmers are largely relied on subsistence agriculture. Consequently, improved income has a potential of progressing the wellbeing of households in terms of food security, assuming other factors constant.

Distance to the nearest market was again found to be negatively and statistically significant influence on the value of fruit and vegetable output sold at 5% level. The shorter the time taken to reach the nearest market would result to a greater degree of commercialization of fruit and vegetable crops. Distance to market was negatively affecting the value of fruit and vegetable product sold possibly because of the increased transaction costs associated with marketing of the farmers' agricultural produce. Additional one kilometer distance from the nearest market will decrease the level of commercialization by ETB 2,563. This implies that the location of farmers in respect of potential markets is an important factor in encouraging farmers to increase their sales.

4.4. Major Constraints and Opportunities in Fruit and Vegetable Production and Marketing

Fruit and vegetable production and marketing in Bora District are constrained by so many factors. The respondents were asked about the major challenges during the survey period. Accordingly, major problems are discussed below.

Regardless of the availability of several improved fruit and vegetable seed varieties, Bora District is constrained by the non-existence of improved varieties in some selected kebeles that properly fits the District agro ecology. Besides, lack of agro chemicals supply at the right time and at fair prices is the other chronic problem identified during the study. Shortage of rainfall problem has been reported by respondents as a challenge that has been a contributing factor for the reduction of output, yield and thus marketed supply. Producers are not confident to produce fruit and vegetable constantly due to the fear of failure of local price.

In the discussion part it is tried to show that the total average land holding size is 2.63 ha per household. The study farther showed that 50% of the targets own less than 3 hectares of land. Despite this potential, 62% of the households reported scarcity of land and complained the ongoing fertilizer utilization endeavor.

Fruit and vegetable production and marketing, is labor intensive by nature and seeks huge labor from land preparation to threshing. However, shortage of labor and capital are few of the critical problems of production and marketing mentioned during the study. For example, 50.2% and 60.5% of the target households were reported shortage of labour and lack of market access and infrastructure respectively.

Bora District, has the advantage of having good local varieties, favorable growing conditions, vast suitable area for fruit and vegetable growing and surrounded by watershed like Lake Koka, Zeway and Awash river to produce fruit and vegetable, are few of the opportunities of the District have at hand. The District proximity to the main road and Addis Ababa city also gives it an advantage over some other Districts.

Given that fruit and vegetable is largely commercially grown in the country, its level of potential is higher to enhance the income of the smallholder farmers when compared to other crops where production is predominantly performed by small holder producers in Ethiopia.

The organic nature of Ethiopian fruit and vegetable is another preferred trait in the international market which can fetch higher price to the country. Besides, the yearly new ads of exporters into the export market are few of the opportunities that we could explore. The increasing world demand of fruit and vegetable by 5% yearly (World bank, 2004) and special offer of free import tariffs by EU countries market made the Ethiopian fruit and vegetable fortunate and opportunist.

CHAPTER FIVE - CONCLUSIONS AND IMPLICATIONS

This survey result revealed the prevalence of direct association between smallholder commercialization and agricultural productivity, as the former plays a significant role in improving the later one. Changing the subsistence-oriented production system into a market-oriented production system as a way to increase the smallholder farmer's income and reduce rural poverty has been in the policy spotlight of many developing countries, including Ethiopia. This implies that any policy effort aimed on creating efficient tie between farmers and market will improve the performance of agricultural production particularly in a situation where financial and credit constraints widely prevail. Thus, increasing farmer's educational level, creating sufficient access of ICT tools including radio and cell phone significantly contributes for higher degree of market participation.

This study has identified household level determinants of the output side commercialization decision and the level of commercialization in fruit and vegetable crops in Bora District, East Showa zone, Oromia National Regional State. Some appropriate policy implications can be drawn from the findings of this study that can help to design right intervention mechanisms to improve the smallholder commercialization of fruit and vegetable crops in the study area. The truth that distance to the market places has become important determinants of farmers participation in the marketing of fruit and vegetable crops suggests the role of policies geared towards improving physical access to market places could yield positive results towards improving commercialization of smallholder farmers of fruit and vegetable crops. As a result, improving rural infrastructure in developing market infrastructure in the form of establishing produce collection points across rural areas would assist poor farmers for faster delivery of farm outputs especially perishable commodities of fruit and vegetable crops.

Government policy should aim at periodic up-grading of the skills of extension agents on most effective way of technology package and delivery. Extension agents must also be well motivated to regularly visit and monitor the progress of farm households. This is because; the researcher investigated that sex is significant factor in determining Commercialization decision.

Therefore, policies should aim at supporting the female headed households by way of providing inputs, knowledge about the fruit and vegetable crops. As a result empowering access to education, institutional services, and market access and market information is required to improve their production and productivity in fruit and vegetable crops and improve their market participation of fruit and vegetable crops. Household size is an important determinant of the level of fruit and vegetable crop commercialization. Therefore, interventions aimed at promoting family planning amongst farm communities are required to advance the commercialization process in agriculture through increased productivity of family labor. On the other hand, provision of rural employment opportunities is essential to reduce high dependence by households on farm output only. This is a critical step in generating more marketable surplus.

Farm size and irrigation was positive implication on households' market participation of fruit and vegetable crops. The size of land allocated for fruit and vegetable crops affected the smallholder commercialization of fruit and vegetable crops positively and significantly. Therefore, intervention aims to increase productivity of fruit and vegetable crops per unit area of land through proper utilization of land resource in the district. Increasing the productivity of fruit and vegetable crops per unit area of land through promoting and delivering technology packages to smallholders that would increase productivity of smallholders and enables them to link up with crops output market would be a better alternative for smallholder commercialization. This intensification of agricultural production should be supported with small scale irrigation development to increase the cropping intensity as to enhance the comparative advantage of smallholders in the production of fruit and vegetable crops.

The education of the household head also plays a prominent role in the intensity of fruit and vegetable crop sales, thus, the policies should aim in upgrading the knowledge of the household head through training. Livestock possession is also an important determinant of the sales value of fruit and vegetable crops which calls for enhancing the livestock assets of the household as it provides manures for the farm, means of transportation of their products to the market, and provide financial liquidity for the farmers.

Generally, commercialization is supposed to bring a large impact on increasing farmer's income level which can be used as a source of fund for food purchase with better quality and quantity.

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APPENDICES

Appendix A VIF for Multicollinearity Test.

Variable	VIF	1/VIF
AGE	2.01	0.32
SEX	1.74	0.39
EDUCA	1.45	0.41
HHSZ	1.36	0.43
FRMSZ	1.23	0.46
OXEN	1.23	0.51
IRRG	1.21	0.55
DROAD	1.11	0.61
DMRKT	1.07	0.68
CREDIT	1.05	0.76
EXTS	1.01	0.89
MKTINFO	0.92	0.96
NOFINCM	0.75	0.98
MEAN	VIF 1.86	

Appendix B List of Households, Agricultural and Fruit and Vegetable Crop Holder

1	2	3	4	5	6
Household	Name of Household Head	Is there fruit and Vegetable holder in the household? Yes = 1 No = 2	Holder's Name	Fruit and vegetable crop holder ID	Selection Order

	Name	Signature	Date
Data collector			
Supervisor			
Researcher			

1. Total Number of Fruit and Vegetable Holder _____
2. Random Interval _____
3. Random Start _____

ii. ____ page(s) out of ____ pages

Appendix C Main Questionnaire

Section I. General Information: Household Demographics.

The Reference Period of the Survey: March, 2013-February 2014 (Megabit 2005-Yekatit 2006)

1.	What is your current residence: [1]. Urban [2]. Rural					
2.	What is the total number of the household size:					Male
						Female
3.	What is your marital status? [1].Married [2].separated 3.single [4]. Widowed [5]. Divorced					
4.	What is the sex of the household head? [1] .Male [2]. Female					
5.	Age of the household head [in years]					
6.	What is the educational status of the household head? [1]. Non –literate (illiterate) [2]. Read and write only [3]. Primary (1-6) [4]. Junior secondary(7-8) [5]. Secondary (9-12) [6]. Tertiary (college and Universities)					Completed Grade
7.	What is the ethnicity of the household head? [1].Oromo [2].Amhara [3].Guraghe [3]. Others					
8.	Family Members	Relationship to Head of HH 1.Head 2.Father/Mother	Sex 1.Male 2.Female	Age(in years)	Educational Status(grade)	

	3.Son 4.Doughter 5.Others			level)	
01					
02					
03					
04					
05					
06					
07					

Section II. Land and Livelihood Activity

9.	Do you have land that you own in the past two years? [1] Yes [2] No						
10.	How big is that land in hectares you possess?						
	Plot Number	Holding size (hectare)	Crop cultivated on this plot	Purpose of cultivation: Market [1] vs. Consumption [2]	Total output (KG)	Amount of the crop sold (KG)	Value of the sold amount [Birr]
	Plot 1						
	Plot 2						
	Plot 3						
	Plot 4						
	Plot 5						
	Plot 6						
	Plot 7						
	Plot 8						

11.	Do you have livestock population? [1] Yes [2] No	
	Cattle	
	Cows	
	Oxen	
	Sheep	
	Goat	
	Donkey	
	Horse	
	Poultry	

Section III: Structural Information

12.	Do you have irrigable land? Or Do you have access to irrigation facilities? [1] Yes [2] No	
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13	Which of your plots are irrigable?
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Plot Number	Holding size (hectare)	Is this land Irrigable? [1] Yes [2] No	If yes to the previous, was this plot cultivated under irrigation facilities in the previous year [1] Yes [2] No
Plot 1			
Plot 2			
Plot 3			
Plot 4			
Plot 5			
Plot 6			

14.	Do you have irrigable land? Or Do you have access to irrigation facilities?	
------------	---	--

	[1] Yes [2] No	
15.	How far is your place of living from all weather roads? [In hours of walking]	
16.	How far is your place of living from the market where you sell your produce? [In hours of walking]	
17.	Do you have access to credit in case you need it? [1] Yes [2] No	
18.	If yes, what is/are the sources of these credit accesses? [1]. Friends and families [2]. MFI [3]. Banks [4]. Government's agencies [5]. NGOs [6]. Others	
19.	Do you have off-farm income? [1] Yes [2] No	
20.	If yes, what type of off-farm income do you have? [1]Self-employment [2] Employee in industry [3] Employee of government organization [4] Employee of non-government [5] Daily laborer [6] Remittances [7]. Rental income [8]. Other specify;	
21	Did you have access to the followings information/market facilities?	
	Radio: [1] Yes [2] No	
	Television [1] Yes [2] No	
	Internet: [1] Yes [2] No	
	Telephone: [1] Yes [2] No	

Market information: [1] Yes [2] No	
Public transport services:[1] Yes [2] No	
Municipal services:[1] Yes [2] No	
Bank service::[1] Yes [2] No	

Section IV: Major production and marketing problems Please specify the

A) Major production problem

- 1.
- 2.
- 3.
- 4.
- 5.

B) Major marketing constraints

- 1.
- 2.
- 3.
- 4.
- 5.

Thank you in advance!!!!!!!!!!!

BIOGRAPHICAL SKETCH

The author was born on November 11, 1980 in Bahir Dar. He attended his elementary school at Fetaworari Mengesha Jemberi Primary and Junior Secondary School, and Secondary Comprehensive High School at Dangila .He joined Addis Ababa University; he graduated with B.A. degree in Geography and minor Demography. Starting from his graduation, he is working for Central Statistical Agency

DECLARATION BY CANDIDATE

I hereby declare that the thesis:

DETERMINANTS OF FRUIT AND VEGETABLE COMMERCIALIZATION AMONG RURAL HOUSEHOLDS THE CASE OF BORA DISTRICT, EAST SHOWA ZONE, OROMIA REGION, has not been submitted to any other Universities than the University of Saint Mary for any type of academic degree.

Name: Wonduwossen Demis

Signature_____

Place: Saint Mary University, Addis Ababa.

Date of submission: May, 2014

ENDORSEMENT

This thesis can be submitted for examination with my approval as a University`s advisor.

Advisor`s Name: Bekabil Fufa (PhD)

Signature: _____