

**ANALYSIS OF MANGO VALUE CHAIN: THE CASE OF ARBAMINCH ZURIYA  
WOREDA, GAMO GOFA ZONE, SOUTHERN NATIONS, NATIONALITIES AND  
PEOPLES' REGION, ETHIOPIA**

**MSc. THESIS**

**BY**

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**JIMMA, ETHIOPIA**

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WOREDA, GAMO GOFA ZONE, SOUTHERN NATIONS, NATIONALITIES AND  
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**A Thesis Submitted to the School of Graduate Studies**

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**In Partial Fulfillment of the Requirements for the Degree of Master of Science  
in Agribusiness and Value Chain Management**

**By**

**Kedir Assen**

**June 2017**

**Jimma, Ethiopia**

## **DEDICATION**

I dedicated this Thesis to my mother W/ro Zewdie Abegaz and my sister Rukiya Assen for their unceasing contribution throughout my life.

## STATEMENT OF THE AUTHOR

I declare and affirm by my signature that this thesis is my own work. I have followed all ethical and technical principles of guidelines in the preparation, data collection data analysis and complication of this thesis. Any academic matter that is included in the thesis has been given recognition through citation.

This thesis has been submitted in partial fulfillment of the requirements for the MSc degree in Agribusiness and Value Chain Management at the Jimma University. The Thesis is deposited at the Jimma University Library and is made available to borrowers under rules of the library. I solemnly declare that this Thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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## **BIOGRAPHICAL SKETCH**

The author was born in September 15, 1984 in Dessie town, South Wollo Zone, Amhara Regional State, Ethiopia. He attended his elementary and secondary education at Memihir Akale Wold Complete Primary school and Comprehensive Secondary School at Hotie Secondary School at Dessie town respectively. The author then joined Haramaya University in 2003 and graduated with BSc degree in Agribusiness Management in July 2006. Then he was employed and started work in Kalu Woreda Agriculture and Rural Development as a Monitoring and Evaluation expert, and Socioeconomics expert for 2 years and nine months. Then he joined in South Wollo zone Agriculture and Development Department and worked as Socioeconomics and land use expert for 3 years. He then joined Ethiopian Evangelical Church Development and social Service Commission, European funded project in Arbaminch, and worked as a project marketing officer for 2 years and six months. In addition, he worked as Value Chain Expert in Vita-RTI Ethiopia, Irish Aid Non-Government Organization in Arbaminch for 2 years. Then he joined Jimma University in 2015 to pursue his MSc degree in Agribusiness and Value Chain Management Program.

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## ABBREVIATIONS AND ACRONYMS

CSA	Central Statistical Agency
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agricultural Organization Statistic Division
FGD	Focus Group Discussion
GTZ	German Agency for Technical Cooperation
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Marketing Success
ML	Maximum Likelihood
MOA	Ministry of Agriculture
MoARD	Ministry of Agriculture and Rural Development
MVP	Multivariate Probit Model
NGO	Non-Governmental Organization
SNNPR	Southern Nations, Nationalities and Peoples' Region
SNV	Netherland Development Organization
TGMM	Total Gross Marketing Margin
VIF	Variance Inflation Factor
WB	World Bank



## ANALYSIS OF MANGO VALUE CHAIN: THE CASE OF ARBAMINCH ZURIYA WOREDA, GAMO GOFA ZONE, SNNPR, ETHIOPIA

### ABSTRACT

*This study was designed to analyze value chain of Mango in Arbaminch Zuriya woreda, Gamo Gofa zone, Southern Nations, Nationalities and Peoples' Region. Mango (*Mangifera indica* L.) is a fleshy stone fruit belonging to the panes *Mangifera*. It is grown in Ethiopia and throughout the tropics, and subtropics of the world. The specific objectives of this study were identifying the major mango value chain actors and their roles in the study area; quantifying costs and margins for key mango value chain actors; identifying factors affecting market supply and market outlet choices. The data were collected from both primary and secondary sources. The primary data for this study were collected from 204 sample producers, 24 traders, and 30 consumers. Secondary data were gathered from different district offices and previous research findings and internet. The data were analyzed by using value chain analysis, marketing margin, multiple linear regression and multivariate probit model. Value chain analysis result showed that the main value chain actors were input suppliers, producers, wholesalers, collectors, cooperatives, retailers, and consumers. Cooperatives incurred the highest total cost (78 birr per quintal) than other actors. Producers' gross margin was highest (the shortest channel) when they sold their product directly to consumers. However, it was lowest in the longest channel since a number of middlemen actors were involved. The result of multiple linear regression model indicated that, market supply of mango was significantly and positively affected by number of mango trees, experience in mango production, marketing experience, ownership of transport, extension contact, and market information access, whereas distance to the nearest market affected it negatively and significantly. Mango producers had five market outlet choices that is wholesalers, collectors, cooperatives, retailers and consumers. The result of multivariate probit model indicated that the outlet choices were significantly influenced by underlying common factors. Moreover, the predicted probabilities of household's choosing wholesalers outlet was 14% which is relatively lower than the probability of choosing collectors (69%), cooperatives (32%), retailers (16%) and consumers (19%). This was due to the fact that wholesalers purchase high amount from collectors in the woreda and kebele markets than from producers. The probability of producers jointly to choose and not to choose the five outlets were 4.86% and 0.03%, respectively. The Wald  $\chi^2$  test value of 152.25 which is significant at 1% significance level indicated that separate estimation of choice of five outlets is biased and the decisions to choose the five outlets are interdependent and simultaneous. Therefore, efforts are required improve to marketing knowledge and skill of producers; efforts are required to establish marketing cooperatives to encourage collective action of producers; efforts needed to improve market infrastructure, improving post-harvest handling, and promoting private public partnerships and mango value chain actor's meetings market intelligence are needed to accelerate value chain development of mango.*

**Keywords:** Actors, Arbaminch Zuriya woreda, Mango, Multiple Linear Regression Model, Multivariate probit model, Value Chain Analysis.

# 1. INTRODUCTION

## 1.1. Background and Justification

Mango (*Mangifera indica* L.) is a fleshy stone fruit belonging to the genus *Mangifera*, consisting of numerous tropical fruiting trees in the flowering plant family *Anacardiaceae*. It is grown throughout the tropics and subtropics of the world and also considered to be the king of fruits due to wide ecological range, delicious taste, excellent flavor, very high nutritive and medicinal value as well as great religious-historical significance (Yigzaw *et al.*, 2014). Mango is native to the south Asia from where it was distributed worldwide to become one of the most cultivated fruit in the tropics. The total production area of mango in the world is around 3.69 million hectares. Mango is one of the most widely cultivated and globally traded tropical and subtropical fruit trees in the world (Clarke *et al.*, 2011).

Around 160 varieties of mango are cultivated in more than 90 countries in the world. In 2013, 43,300,000 tons were produced. India is the world's largest producer by wide margin, with more than 40% of global production in 2013. It is followed by China, Thailand and Indonesia with production of 4.45, 3.1 and 2 million tons respectively in that same year (GBD Network, 2015).

About 90,190.69 hectares of land is covered under fruit crops in Ethiopia. Bananas contributed about 59.56% of the fruit crop area followed by avocados that contributed 15.3% of the area and mango covers 14.07%. According to Central Statistical Agency report (2015) more than 7,062,090.47 quintals of fruits were produced in the country. Bananas, Mangoes, Avocados, Papayas, and Oranges took up 68%, 13.00%, 8.00%, 6.00% and 4.00% of the fruit production, respectively (CSA, 2015).

Ethiopia has large tract of suitable land for mango production. It is mainly produced in Oromia, SNNPR, Benishangul Gumuz, Amhara, Harari and Gambela regions. Mango ranked 2<sup>nd</sup> and 3<sup>rd</sup> in total production and area coverage among fruit crops grown in Ethiopia, respectively. From 2003/4 to 2013/14, both its area coverage and total production increased by 208.4% and 247%, respectively. Despite this improvement in

the last one decade, its productivity is very low, 7 tons/ha and Ethiopia produced only 72,187 tons fresh mango in 2013/14 (Yigzaw *et al.*, 2014).

Mango has significant importance with a potential for domestic and export markets and industrial processing. Currently mango is considered as potential crops for export and local market. The crop is being promoted by the Fruit and Vegetables and Horticulture Development Department of the Ministry of Agriculture and Rural Development (MoARD). Furthermore, mango crop was selected as potential commodity for investment based on two overriding yardsticks which are 'potential market opportunity' and 'outreach to smallholder farms'. In addition, high added value either through agro-processing or knowledge, high market value, long term comparative advantage, enhanced group activities and position of women, and social acceptance and support by government policies are the major attributes of Ethiopian mango (Elias, 2007).

The production of mango is challenged by irrigation water scarcity, pest and disease and technology limitation (Seid and Zeru, 2013). In Ethiopia, mango is attacked by many insect and pests. Among the insect pests attacking mango fruit are beetles, fruit flies, seed weevil and termites. Input shortage (water, fertilizer and pesticide), lack of improved technologies, pests (especially fruit fly and anthracnose), postharvest loss and poor marketing were the major problems of mango growers (Tewodros *et al.*, 2014).

Mango trees in most parts of Ethiopia are developed from seedlings and are inferior in productivity and in fruit quality. To alleviate these problems improved varieties named Kent, Keit and Tommy Atkins were introduced from Israel in 1983 and are being commercially produced by the Upper Awash Agro Industry Enterprise (UAAIE). These varieties are widely distributed to different parts of Ethiopia by UAAIE (Tesfaye *et al.*, 2014).

Arabaminch Zuriya, a district (woreda) in the Gamo Gofa administrative zone of the Southern National Nationalities and People Region of Ethiopia, is well known for its high potential in tropical fruit production (mainly mango, banana, lemon and papaya).

About 126,800 quintals of mango were produced and the total coverage of mango in the woreda is 634 ha (Gizachew *et al.*, 2016). The study of Timoteos in 2009 indicated that the study area contributes 10 to 15% of the estimated 135,000 tons' national fruit production however, its potential is much higher and supply to the Addis Ababa market could be as high as 40% of the total amount delivered to the capital city. The marketing structure of mango has only a few dominant buyers. A small number of fruit wholesalers in Addis Ababa decide on the price and indirectly on the quantity of supply to the Addis Ababa retail shops. They use middlemen to influence market equilibrium and farm gate prices for their own benefit (Timoteos, 2009). Because of poor institutional strength, producer organizations have not been able to challenge this situation. The study of Timotoes (2009) also indicated that this situation points to the need for structured market arrangements and strengthened local market actors (producer's organizations) so as to increase the quantity of sales in the markets and increase the income of the smallholder producers in the area.

In the study area, most of the producers have planted two types of local varieties, which are not identified by names. Thus, the marketable supply of mango per annum from the Woreda is estimated to be 24,288 tons. From this potential marketable supply, only 1,440 tons (6%) are formally marketed through Addis Ababa fruits and vegetables wholesalers. The rest is retailed and consumed locally in Arbaminch and other towns in the region (Wolayita, Shashemene, Hawassa, etc.) (Timoteos, 2009).

In the study woreda, the supply of mango to market, selection of profitable market outlets and post-harvest handling practices were affected by different socio-demographic, economic and institutional factors. Therefore, this study investigates the significant factors that affect mango marketing through studying factors affecting market supply, and market outlet choices of producers in the mango value chain.

## **1.2. Statement of the Problem**

Ethiopia's wide range of agro-climatic conditions and soil types make it suitable for

the production of fruits. Unlike durable crops such as cereals, pulses and oilseeds, fresh fruits are highly perishable, and must be either marketed or processed immediately after harvesting (Zeberga, 2010). Although different fruit crops have been grown in different parts of Ethiopia, their distribution and supply to major cities and towns is still inadequate, hence producers were not benefiting from their produce. Poor road conditions, among others, are the major factors that limited their wider distribution from their area of production. This can be ascertained from the current high prices of fruits in the major local market outlets. In turn, it justifies the need to increase production (supply) and improve the limitations so as to conform to the current demand and make the prices affordable to the public at large. This will as well simultaneously enable the growers fetch better profits from the sale of their produce (Deribew and Jeong, 2014). Production of horticultural products is seasonal and price is inversely related to supply. During the peak supply period, prices decline. The situation is worsened by the perishability of the products and poor storage facilities.

Yilma (2009) stated that their cultivation is seasonal and the supply is scanty and volatile even in areas where irrigation is possible. The knowledge gap on fruit production techniques and processing technologies is wide. Also, knowledge of domestic consumers of the benefits of fruits is confined to very few varieties of fruits. Hence, domestic demand, with the exception of few widely known tropical fruits, is generally small and, people generally consume fruits and vegetables on a daily basis, without considering them as basic. Hence, these factors have adversely affected the growth and expansion of the fruit subsector in Ethiopia.

Moreover, due to the highly seasonal nature of the mango crop, and also the tendency to prioritize food security with grain crops, mango growing is not the main livelihood activity for most producers, and is generally considered a complementary activity to other farming practices (James *et al.*, 2008). Mango production in Ethiopia is in fluctuated conditions, because of occurrence of pest and diseases, lack of proper management, irrigation water scarcity and weather conditions (Seid *et al.*, 2013). Input shortage (water, fertilizer and pesticide), lack of improved technologies,

pests (especially fruit fly and anthracnose), postharvest loss and poor marketing were the major problems of mango growers (Tewodros *et al.*, 2014).

In addition, channel choices are heavily constrained by market access limitations such as supporting infrastructures to reach markets, access to demand and price information and specific demands from these markets such as production according to quality standards (Trienekens, 2011). In this respect developing country business relationships are subject to many uncertainties caused by poor physical infrastructures (storage facilities, roads, telecommunication, etc.), weak institutional infrastructures (government support, sanction systems, etc.), unbalanced trade (dependencies, opportunistic buyer behavior) and unfavorable social and political conditions. Transactions are enabled and need to be supported by information exchange about characteristics of the product/service and delivery conditions. However, information exchange between value chain actors in developing countries is in many cases hampered by information asymmetries between chain partners, lacking communication infrastructures, and diffuse market channel structures.

Mango losses after harvest until the mango reach the consumer are significant and affected the development of mango value chain (Yilma, 2009). Post-harvest losses in developing countries can range from 15 percent up to 50 percent. Fruits, such as mango, are perishable products and therefore sensitive which leads to greater losses than for non-perishable crops (Parfitt *et al.*, 2010). To increase the availability, it is therefore not enough to increase the productivity of mango, there is also a need to lower the losses. A problem in the mango value chain and fruits in Ethiopia is that the knowledge about post-harvest handling and value addition is limited and the post-harvest losses are high (ILRI, 2011; Wakijira, 2010). Losses occur in all post-harvest activities such as handling, storage, processing, packaging, transportation and marketing. Handling and processing of the food are of high importance in order to ensure food-safety and reduce losses (Kader, 2003).

In spite of the fact that mango fruit is economically and socially important fruit; value chain analysis, factors affecting supply of mango to market, marketing channel

choices, extent of value addition and post-harvest loss of mango needs to be studied and analyzed for the target study area (Arbaminch Zuriya woreda) where great potential of mango production exists. Therefore, this study analyzed mango value chain in Arbaminch Zuriya woreda, to provide empirical information on the determinants of mango supply to market, and the factors that influence market channel outlet choice decisions for the study area.

### **1.3. Research Questions**

The study has tried to answer the following research questions:

- Who are the actors in the mango value chain and the respective value shares they drive?
- What are the determinates of mango supply to the market?
- What are the factors affecting farmer's mango market outlet choice decision?

### **1.4. Objectives of the Study**

The general objective of the study is to analyze mango value chain of the study area.

The specific objectives of the study are:

- To identify mango value chain actors, their functions and benefit distributions in the mango value chain;
- To identify the determinants of mango supply to the market in the study area;
- To identify factors affecting market outlet choice decisions of mango producers.

### **1.5. Scope and Limitations of the Study**

Value chain analysis includes from input suppliers to the end users covering wide range of geographical areas stretching from local to global markets. However, the study area limited to Arbaminch zuriya woreda (Gamo Gofa zone of SNNPR) by



focusing on mango producers, traders, local retailers and consumers. The data was collected from sample respondents of mango value chain actors and relevant organization of service providers that are involved in the study area only. Although the findings may be used in the areas of similar situation with the study area, the study had geographical limitation to represent wider area of the country and hence, the generalizations of the findings were limited to the study area and locations with similar socio economic characteristics. On the other hand, not all the mango producers and other value chain actors included in the survey but sample and representative groups were included.

Regarding the limitation of the study, this study had financial and temporal limitations. Due to shortage of logistics the study didn't represent the whole value chain of mango in the country and only focus on the mango value chain that originates from major mango producing peasant associations (PAs) in the Woreda. Therefore, the study was undertaken to meet its objectives within the limitations mentioned.

## **1.6.**

## **Significance of the Study**

The study had analyzed the entire mango value chain from input supplier to the consumer within the woreda. It also provides a holistic picture of existing challenges, opportunities and entry points in the mango value chain. Additionally, this study will provide information on the determinants of mango supply to the market, and the factors affecting market outlet choice decisions, marketing margin, benefit share of actors, and identifies opportunities and constraints of mango value chain in the study areas. Therefore, the findings of the study may help different Government organizations and Development partner organizations to understand the current mango value chain, may help as input to design their strategic plan and redesign their mode of operations and ultimately influence the design and implementation of policies and strategies. It also helps to utilize the result of the finding to their activities interventions, to boost mango production, marketing and consumption. It also provides a guideline to improve efficiency of the mango value chain system, producers, traders, policy makers, planners, researchers, and other development stakeholders involved directly or indirectly in promoting mango production. It will also help different actors to identify and analyze new ways of stimulating innovation on mango value chain development. It will shed light on required efforts to enhance the production and utilization of mango at larger scale to bring about economic development in the area. Furthermore, the study can also be used as additional input for further related studies.

### **1.7. Organization of the Thesis**

The thesis has five chapters. Chapter one gives the general background and justification, problem statement, research questions, objectives, scope and limitation, significance of the thesis. In chapter two theoretical and empirical literatures were reviewed. Chapter three details of the methodology used in the study which included description of the study area, types and sources of the data, sampling procedures, sample size determination, data collection methods, data analysis and variable descriptions. Chapter four presents the main findings and discussions of the results.

Chapter five summarizes the main findings of the study and draws conclusion and appropriate recommendations.

**2.**

## LITERATURE REVIEW

This chapter gives theoretical and empirical highlights for the study. It is intended to provide insights on definition and concept of value chain, value chain analysis and review of recent empirical findings on mango value chain analysis, determinants of market supply and market channel outlet choice decision and post-harvest handling of mango.

### **2.1. Definition and Basic Concept of value chain**

#### **2.1.1. Value chain**

The value chain concept entails the addition of value as the product progresses from input suppliers to producers to consumers. A value chain, therefore, incorporates productive transformation and value addition at each stage of the value chain. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally some form of value is added. Value addition results from diverse activities such as bulking, cleaning, grading, and packaging, transporting, storing and processing.

Value chains encompass a set of interdependent organizations, and associated institutions, resources, actors and activities involved in input supply, production, processing, and distribution of a commodity. In other words, a value chain can be viewed as a set of actors and activities, and organizations and the rules governing those activities (Anandajayasekeram and Berhanu, 2009).

Value chain is the sequence of activities required to make a product or provide a service (Vermeulen *et al.*, 2008). The value chain concept simultaneously stresses the importance of three elements. First, it recognizes that Value chains are dynamic, market-driven systems in which vertical coordination (governance) is the central dimension. Second, the concept is applied in a broad way, typically covering a country's entire product subsector. Third, value added and sustainability are explicit, multidimensional performance measures, assessed at the aggregated level (Yilma,

2009).

Commercially, the main objective of value chain is to maximize profits not only by eliminating inefficiencies but also by maximizing aggregate revenues for all actors in a particular value chain by creating products that consumers are willing to pay more for or buy more of. In other words, the main objective of a value chain is to efficiently capture value in end markets in order to generate greater profits and create mutually acceptable outcomes for all farms and firms involved in the value chain from production to consumption and disposal. Furthermore, it should be noted that value can be added or lost at each stage, e.g. post-harvest losses may occur during storage and packing (Yilma, 2009).

### **2.1.2. Value chain Versus Supply Chain**

Value chains include the vertically linked interdependent processes that generate value for the consumer. In contrast, the term supply chain is used internationally to encompass every activity involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer. The primary focus of supply chains is thus on cost and efficiencies in supply, while value chains focus more on value creation, innovation, product development, and marketing. While both concepts describe the same network of companies that interact to deliver goods and services, the value chain is essentially about value.

### **2.1.3. Agricultural Value Chain**

An agricultural value chain is usually defined by a particular finished product or closely related products and includes all firms and their activities engaged in input supply, production, transport, processing and marketing (or distribution) of the product or products. Kaplinsky (2001) defines the value chain as 'the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production, delivery to final consumers, and final disposal after use.

An agricultural value chain can, therefore, be considered as an economic unit of analysis of a particular commodity or group of commodities that encompasses a meaningful grouping of economic activities that are linked vertically by market relationships. The emphasis is on the relationships between networks of input suppliers, producers, traders, processors and distributors (UNCTAD, 2000).

The value chain concept entails the addition of value as the product progresses from input suppliers to producers to consumers. A value chain, therefore, incorporates productive transformation and value addition at each stage of the value chain. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally some form of value is added. Value addition results from diverse activities such as bulking, cleaning, grading, and packaging, transporting, storing and processing. Value chains encompass a set of interdependent organizations, and associated institutions, resources, actors and activities involved in input supply, production, processing, and distribution of a commodity. In other words, a value chain can be viewed as a set of actors and activities, and organizations and the rules governing those activities (Anandajayasekeram and Berhanu, 2009).

Sub-sector: all the firms who buy or sell from each other in order to supply a particular set of products or services to final consumers. Examples include wood furniture, mango, dried tomatoes, potato, wheat, maize dairy product etc.

#### **2.1.4. Value addition**

Value addition is simply the act of adding value to a product, whether you have grown the initial product or not. It involves taking any product from one level to the next (Fleming, 2005). It refers to increasing the customer value offered by a product or service. It is an innovation that enhances or improves (in the opinion of the consumer) an existing product or introduces new products or new product uses. Adding value does not necessarily involve altering a product; it can be the adoption of new production or handling methods that increase a producer capacity and reliability in meeting market demand. For producers, value addition has a particular importance in

that it offers a strategy for transforming an unprofitable enterprise into a profitable one. The farmer is not only involved in production of a raw commodity but also takes part in value addition and distribution. This allows the farmer to create new markets or differentiate a product from others and thus gain advantage over competitors.

Value addition activities are essentially meant to add such utilities as form utility, time utility, place utility, information utility, among others.

### **2.1.5. Value chain development and up-grading**

A first step to chain development is to support chain actors /producers to improve their farming skills. This helps them produce higher yields of higher, more consistent quality, and produce which is better suited to the market. This enables them to make more money and improve their livelihoods. In developing a growth strategy for the sub-sector under analysis, it is important to distinguish between product and labor markets. It may not always be optimal or feasible to upgrade 'enmasse', but rather it is important to take into account that when zooming in on a particular sub-sector, that growth strategies will likely involve "winners" who create jobs for "losers", either directly or indirectly (through increased need for service firms and the multiplier effect).

**Value chain analysis:** It examines the full range of activities required to bring a product or service from its conception to its end use, actors that perform those activities in a vertical chain and final consumers for the product or service. It is used to identify how poor people, small enterprises or other target groups can play a larger and more active role in a particular value chain and how a value chain's structure or characteristics can be changed to enable it to grow in pro-poor ways. It is increasingly used to help develop a competitive strategy for dairy production. It enables the poor to engage more productively in markets, the thinking goes and poverty be reduced through market engagement. Making markets work for the poor emphasizes the need to unblock access to profitable market opportunities. It is an

original methodological tool that enables design teams in the product definition phase to comprehensively identify pertinent actors, their relationships with each other and their role in the products life cycle (GTZ, 2006).

#### **2.1.6. Value chain actors**

According to GTZ (2007), the term “value chain actors” summarizes all individuals, enterprises and public agencies related to a value chain, in particular the value chain operators, providers of operational services and the providers of support services. Value chain actors are those involved in supplying inputs, producing, processing, marketing, and consuming agricultural products. They can be those that directly involved in the value chain (rural and urban producers, cooperatives, processors, traders, retailers, cafes and consumers) or indirect actors who provide financial or non-financial support services, such as credit agencies, business service and government, researchers and extension agents.

#### **2.1.7. Value Chain Analysis and its Importance**

Value chain analysis is a process that requires four interconnected steps: data collection and research, value chain mapping, analysis of opportunities and constraints, and vetting of findings with stakeholders and recommendations for future actions. These four steps are not necessarily sequential and can be carried out simultaneously. Value chain analysis disaggregates the international structure of production, trade and consumption of commodities and allows for identification of actors and geographical division (Tuvhag, 2008).

Value chain analysis also reveals the dynamic flow of economic, organizational and coercive activities involving actors within different sectors. It shows that power relations are crucial to understand how entry barriers are created, and how gain and risks are distributed. It analyses competitiveness in a global perspective. By revealing strengths and weaknesses, value chain analysis helps participating actors to develop a shared vision of how the chain should perform and to identify collaborative relationships which will allow them to keep improving chain performance. The latter



outcome is especially relevant in the case of new manufacturers – including poor producers and poor countries – that are seeking to enter global markets in ways that can ensure sustainable income growth (UNIDO, 2009)

A value chain analysis is important to assess the existing vertical and horizontal linkages within the sub-sector as well as functions and roles of actors from input supply to the final consumers. It also gives a clear picture of the actors, activities and existing relationships across the board (Tigist, 2009).

## **2.2. Concepts of Market Supply and Demand**

Marketed supply refers to the amount actually taken to the markets irrespective of the needs for home consumption and other requirements. Whereas, the marketable surplus is the residual with the producer after meeting the requirement of seed, payment in kind, and consumption by farmer (Wolday, 1994). Marketed surplus may be equal to marketable surplus, but may be less if the entire marketable surplus is not sold out and the producers retain some stock and if losses are incurred at the farm or during the transit. In the case of crops that are wholly or almost wholly marketed, the output and marketed surplus will be the same. The decision to supply market is one big question but usually is taken after the produce is at hand or if decided earlier some other decisions have to be considered. Among many, the choice of crop to grow, land size to allocate, and to which buyer to sell are some. These choices of crop and market outlet choices are household specific and depend on several attributes like household characteristics, farm resource endowments and access to market. Consumer demand, on the other hand, is defined as the various quantities of a particular commodity that an individual consumer is willing and able to buy as the price of that commodity varies, with all other factors that affect demand held constant.

## **2.3. Concept of Marketing Channel**

Market channel is a business structure of interdependent organizations from the point of product origin to the consumer with the purpose of moving products to their

final consumption destination (Kotler and Armstrong, 2003).

To reach a target market, the marketer uses three kinds of marketing channels (communication channel, distribution channel and selling channels). Communication channels deliver messages to and receive messages from target buyers. They include newspapers, magazines, radio, television, mail, telephone, billboards, posters, fliers, CDs, audiotapes, and the Internet. Beyond these, communications are conveyed by facial expressions and clothing, the look of retail stores, and many other media. Marketers are increasingly adding dialogue channels (e-mail and toll-free numbers) to counterbalance the more normal monologue channels (such as ads). The marketer uses distribution channels to display or deliver the physical product or service(s) to the buyer or user. There are physical distribution channels and service distribution channels, which include warehouses, transportation vehicles, and various trade channels such as distributors, wholesalers, and retailers. The marketer also uses selling channels to effect transactions with potential buyers. Selling channels include not only the distributors and retailers but also the banks and insurance companies that facilitate transactions. Marketers clearly face a design problem in choosing the best mix of communication, distribution, and selling channels for their offerings (Kotler and Armstrong, 2003).

## **2.4. Mango Production and Marketing in Ethiopia**

### **2.4.1. Mango production in Ethiopia**

According to Yeshitela (2004) even if the farmer's livelihood is highly supplemented by the income from their mango trees, there is a declining trend in yield and quality of mango due to old age, poor management and seedling originated nature of the trees. However, there are exceptionally good yielding trees with best quality fruits. Apart from its economic importance, it is forest and environmentally friendly to fight against drought, use as shade and fire wood. Ayelech (2011) indicated that smallholder producers in the area inter crop mango with maize, taro, ginger, chat, cabbage and banana at early stage.

Seid and Zeru (2013) also indicated that most of the time Ethiopian producers did not give attention to spacing. Mango orchards were not well spaced, some mangos are nearer to each other and the others are very far from one mango to the others, according to the oldness of the trees age most of the producers had no knowledge about spacing. Space plays significant role for all activities, absence of proper spacing creates difficulties for production. Mango trees in most parts of Ethiopia are developed from seedlings and are inferior in productivity and fruit quality. To alleviate these problems improved mango varieties named Kent, Keitt and Tommy Atkins were introduced from Israel in 1983 and are being multiplied and distributed to different parts of the country by Upper Awash Agro Industry Enterprise.

Additionally, Seid and Zeru (2013) stated that smallholder's producers use irrigation to produce mango. However, the amount of water and the source is different. However, significant numbers of mango producers in Ethiopia use river water and a small portion of smallholders use pond water. The yield is greater in river water irrigation than pond water irrigated crops. The quantity and quality of water available is on factors that determine the yield. Frequency and amount of irrigation need depends on soil type, property, climate & others. A mango tree bears fruit within three to six years after planted depending on chosen propagation method (Singh *et al.*, 2013). Grafted trees bear fruit earlier and are smaller in size. A bearing mango tree is drought tolerant but young trees require irrigation.

Fertilizer application (either organic or inorganic), irrigation (either river water or pond water), pest and disease control and wind break and pruning are the mango production practices adopted by the smallholder producers in the area. However, use of fertilizers, i.e., both organic and inorganic fertilizer (some innovative producers use organic fertilizer) and use of inorganic fertilizer for the mango production purpose is rare (Seid and Zeru, 2013). But fruit producing mango trees should be fertilized in order to promote healthy growth flushes and flower production. The producer should though be careful not to over fertilize as it can cause problems such as reduced flowering and fruit yields (Crane *et al.*, 2009).

The prevalence of powdery mildew increased since producers intercrop mango with most powdery mildew susceptible crop, chat and since most mango producers did not prune their mango trees. Mango growers as well as most development agents were not able to identify different diseases using their symptoms. Therefore, they have disease identification knowledge gap to apply effective prevention & control measures (Yigzaw *et al*, 2014).

In Ethiopia anthracnose and stem- end rot are important post-harvest diseases in mango production. Anthracnose is caused by fungus and appears both as a pre-harvest and a post-harvest disease (Prusky *et al*, 2009). It is the most severe disease in mango production worldwide and cause large losses. Stem- end rot is another severe disease that causes problems in the mango supply chain (Prusky *et al*, 2009). The symptoms of anthracnose and stem- end rot are similar in avocado and mango production. One of the most important pests in mango production and post-harvest handling are fruit flies. The larva of the fruit fly infests and feed on the fruits and cause significant losses. Fruit flies are a large problem in mango production in Ethiopia. To remove the fruit flies and other insects from the fruit different types of post-harvest treatments are used such as chemical treatments, low and high temperature treatment, controlled atmospheres or a combination of these (Yahia, 1998).

#### **2.4.1. Mango harvesting and post-harvest handling in Ethiopia**

Mango fruits need 120 to 140 days after fruit set to mature (India MOA, 2013). Growing and marketing of fresh produce in Ethiopia are complicated by post-harvest losses both in terms of quantity and quality between harvest and consumption. Fresh fruits are perishable and have limited shelf life. To prolong shelf life, various processing and preservation methods such as drying, chemical treatments and various packaging methods are used (Zeberga, 2010). Mango harvesting stages in Ethiopia are harvesting fully ripe fruit, harvesting partially ripen fruit and harvesting unripe fruit. Harvesting the fruit after peak maturity result in shorten shelf life and fruit deteriorated quickly. In order to maintain and develop a high quality of mango it

is significant with good harvest and post-harvest handling (Brecht *et al.*, 2009). This requires knowledge about post-harvest physiology of mango to determine the most appropriate handling practices. It is important to harvest mango fruits at a suitable stage of maturity since this determines the quality of the fruit and its durability. If the fruits are harvested in an immature stage, the mangoes are more susceptible to chilling injuries when kept in a cold storage and the fruit may not ripen properly. Over mature fruit is sensitive to mechanical damages such as water loss, decay and bruising which deteriorate the quality. The final decision when to begin the harvest is determined by factors such as labor availability, market demand, consumer preferences and shipping time and schedule if shipping of the fruit is required (Yahia, 2011).

Methods of harvesting adopted by the smallholder producers in Ethiopia are hand picking, cut by scissor and using stick. Hand picking method of harvesting produce can maintain good quality of fruit and protect the fruit from mechanical damage. Hand picking can produce the fruit with stem and reduce fruit bruising and damage but stick structure result in fruit dropping and leave the fruit without stem which facilitate fruit bruise and mechanical damage (Seid and Zeru, 2013).

Similarly, Ayelech (2011) showed that harvesting usually start after fruit dropping- which is principal maturity index. In consent to this line, producers conduct harvesting subsequently to the maturity index. This nature assists producers to let hang the fruit on the tree before harvest unto best search for markets that can pay better prices. The assessment further depicted that harvesting is largely executed by child labor by climbing on the tree. But use of picking hooks, shaking of trees and knocking down fruits with wooden sticks are also exercised in the study areas; but at lower rate. The later practices cause fruit droppings that may cause physical injury at any time. FAO (2005) which indicated cuts, punctures and bruises has increased ethylene production and hastened fruit softening and ultimately caused mechanical injuries and decay. It is desirable that the fruits are harvested during the cooler parts of the day to reduce the risk of heat injury and sunburn (Yahia, 2011).

## **2.5. Mango Value Chain Development and Its Constraints in Ethiopia**

### **2.5.1. Input supply of mango**

Seedling is one of the important inputs to establish mango orchard. According to Yigzaw (2014), mango producers got mango seedlings from government nurseries, private nurseries, their own nursery, and from different sources. Mango trees in most parts of Ethiopia are developed from seedlings and are inferior in productivity and fruit quality. To alleviate these problem improved mango varieties named Kent, Keitt and Tommy Atkins were introduced from Israel in 1983 and are being multiplied and distributed to different parts of the country by Upper Awash Agro Industry Enterprise.

According to Ayelech, (2011) agricultural inputs are important elements for production and productivity. As a result, the typical inputs utilized for production of the mango were seed/seedling, labor, land, and compost/manure. The major sources of inputs for mango production in Ethiopia are producers by, own endeavors, agricultural offices and markets. In general, the sources of inputs for mango production in Ethiopia are agricultural development offices, markets, agricultural research institutes, own stocks, IPMS, and other producers.

### **2.5.2. Mango Production**

According to Yigzaw *et.al.* (2014) indicated that farmer's awareness about the importance of different agronomic and pest management practices is very low. Additionally, Seid and Zeru (2013) showed that farmer awareness about spacing of orchards, pruning, fertilizer application, access of new varieties and pest and disease control is very low. According to Timoteos (2009) showed that most of the producers have plant two types of local varieties, which are not identified by names. The local varieties are fibrous and have large kernels compared to the ratio of fruit flesh. Most common varieties of mango available in Ethiopia are Kent, Keitt, Tommy Atkins, and Apple mango (FAO, 2010). The source of varieties of mango in Ethiopia can be

categorized into two major groups: exotic and endemic ones. State farms and newly emerged private commercial farms usually use exotic varieties (Tommy Atkins), while the producers are mainly confined to local or traditional varieties (such as kent, keitt, etc) (Elias,2007).

As indicated by Yigzaw (2014) the water availability, proximity of the site for monitoring, and suitability of the land are useful criterion for mango production site selection. In addition, training about agronomic practices such as proper spacing, time of pruning, methods and time of fertilizer application, identification of pest and disease and control mechanism, methods and time of harvesting, kind of packing materials used, are vital to increase the productivity of mango. Distribution of pest and disease resistance and early maturing varieties is another method to increase production potential. Facilities like road, canal and transportation system should be improved for further dimension and to reduce the loss (Seid and Zeru, 2013).

### **2.5.3. Collection /Bulking of mango**

Agricultural production is tied to specific locations due to the resource base is not best suited at other locations. The scale of agricultural production tends to be small, seasonal, and agricultural products exhibit natural variation. Location specificity demand collection followed by distribution, small-scale activity urges assembling, collecting and bulking. Seasonality forced storage and stock holding. The natural variation of products creates the need for sorting and standardization. Yet, by virtue of the spatial dispersion of producers and consumers, the temporal lags between input application and harvest, the variable perishable nature and storability of commodities, and the political sensitivity of basic food staples, agricultural markets are prone to high transactions costs, significant risks and frequent government interference (Ayelech, 2011).

### **2.5.4. Harvesting, Sorting and Grading of mango**

Harvesting the fruit after peak maturity result in shorten shelf life and fruit deteriorated quickly. This result is supported by finding of who found that loss of fruit

is increase dramatically after harvest as the fruit maturity increased. Sorting and loading of mango produce are principally carried out on farming and at primary procurement centers through premises of primary procurers (Local collectors). Thus, it is sorted according to consignment needs of collectors where under-grades such as: Shrunken, smaller sizes, with splits and punctures are reasonably expelled from transactions. But under-grades are commonly consumed in farming household as best child foods and culinary uses (Ayelech, 2011).

### **2.5.1. Mango Transportation**

A study made by Seid and Zeru (2013) showed that mango producers used both pack animal, human back and shoulder, animal drawn cart and car for transportation of their products. Losses occur in all post-harvest activities such as handling, storage, processing, packaging, transportation and marketing. Handling and processing of the food are of high importance in order to ensure food-safety reduce losses.

All mango transport to the local market in Ethiopia is done in human back, animal back, cart (Pulled by animals), non-refrigerated trucks and cars. Temperatures during the mango production season are high, and thus non-refrigerated transport increases the deterioration of quality and causes major losses of fruit, especially when it is done inadequately. Land non-refrigerated transport to local markets may be feasible if the distance is short, and the weather is not very warm. In warm weather transport should be done at night when the temperature is much lower. Non-refrigerated cars and trucks should be covered adequately to protect fruit from wind and high temperature.

Growers transport their produce in synthetic fiber sacks, wooden box and transport to the market by animals like donkey, car and by the producers themselves to the nearby village market. Plastic crates, which are stackable, stable, easy to clean and reuse has been shown to reduce damage of perishable crops from an average of 30% to less than 10% (Kitnoja, 2010).

### **2.5.2. Wholesaling**



A study by James *et al.* (2008) indicated that there are two potential options for growers to sell their fruit, local wholesale and Addis wholesale market. As described by Humble *et al.* (2014) these wholesalers buy mango directly from producers, or from brokers or state farms or from another wholesalers and the wholesaling activity takes place at farm gate level or at Addis Ababa central market.

### **2.5.3. Exporting**

At present, very little mango is exported from Ethiopia with only 4 tons exported in 2006 at a value of less than US\$1000 according to FAO. This represents a significant decline since 2002 when 811 tones were exported at a value of US \$675,000(US \$832per tonne). This appears to have been a particularly high value year however, as the longer term average price for mango exports has been approximately US\$323 per ton. One of the main reasons for the drop in mango exports has been the variable quality of Ethiopian mango exports on arrival in overseas countries. It was reported that Et-Fruit (the state owned Ethiopian Fruit marketing agency) had been exporting mangoes to countries such as Djibouti, Saudi Arabia and UAE but had lost some of those contracts due to the poor quality of the shipments on arrival. This situation highlights the key challenges faced in trying to develop the export market for Ethiopian mangoes: Under-developed packaging and cold chain for exporting, high cost of freight to overseas countries, competing product from Egypt and South Africa and Minimal production of commercial varieties (FAO, 2009).

### **2.5.4. Mango Processing**

As indicated by Zeberga (2010) during peak harvesting seasons, the loss is high and the fruits are sold at low price because of lack of means to preserve and store the products. Besides, the country is not getting foreign currency from horticultural crops due to the low levels of post-harvest technology, which makes the product inferior quality and has no chance of competing in the world market. Therefore, in order to prolong the shelf life of the post-harvest product, processing is necessary. Processing contributes toward expansion of market of the processed products in

availing it during off-seasons and also increasing its value. From marketing point of view, it is desired to have processed products available while the specific fruit is out of season (Elias, 2007).

A study made by James *et al.* (2008) indicated that the mango fruit processing industry in Ethiopia is very weak, considering the substantial amount of fruit that is grown in the country. One of the reasons for this is the highly developed processing industries in other countries which are able to export into Ethiopia and sell the final product at low cost. Indeed, there were a number of imported, long-life mango juice brands available throughout Ethiopia and is certain to act as a competitive entry barrier for domestically produced juice (James *et al.*, 2008).

#### **2.5.5.**

## **Mango Retailing**

A study conducted by Humble *et al.* (2014) showed that the retailing function is one of the last activities in the mango supply chain before consumption. Losses occur in the retailing activities during loading and unloading, at storage, and selling location.

### **2.5.6. Consumption of mango in Ethiopia**

In Ethiopia, the domestic market, consumption is largely in its fresh form due to the fact that the cost increment for processing and packaging would make it beyond the purchasing power of the vast majority of the Ethiopian consumer group (low-income). However, since 1997 the demand for canned fruits in Ethiopia has increased by 7% suggesting there is a sufficient domestic market for canned mangoes to be produced (Tiruneh, 2009).

### **2.6. Mango Marketing Constraints in Ethiopia**

According to Trienekens (2011) there are four main constraints regarding resources and infrastructure faced by markets in developing countries. The first constraint regards little access to input resources, in other words physical resources. The second constraint is the geographic position of many producers where they face long distances to central and valuable markets. Thirdly, lack of human resources in form of educated labor and knowledge is a restraint for markets to advance in developing countries. The last constrain concerns lack of technology, both for production and distribution purposes. Besides from these four constraints there is a lack of adequate infrastructure, both regarding information and distribution. Products distributed in an efficient way and information flow are elementary conditions for a chain to develop.

Growing and marketing of fresh fruits like mango in Ethiopia are complicated by post-harvest losses both in terms of quality and quantity between harvest and consumption. The quality of fresh fruit depends up on the harvesting activities, post-harvest handling, transportation and storage (Haider and Demisse, 1999). Traders

complained that the infrastructure, such as access and storage, in the markets is very poor, information flow is poor, and there is cut throat competition yet they have to pay high taxes to the municipal authorities and the business is seasonal. On top of this, the fresh produce business is inherently rife with technical problems such as perish ability (James *et al.*, 2008).

The inadequate infrastructure for transportation, cold-storage and processing are some of the greatest reasons for waste in the agri-fresh supply chains in developing countries. Besides from these infrastructure problems the lack of information infrastructure is a constraint for the possibility of upgrading the supply and value chains in developing countries. One of the greatest problems regarding this is the large gap of information about consumer's demand to the producers, which results in difficulties to match supply and demand in the chain.

Similarly, a study by Ayelech (2011) indicated that at the farm-level, lack of clean seedlings and grafted seedlings have compelled producers to use inferior and low yielding materials. Storage facilities and absence of collective bargaining power has also forced individual producers to accept unfavorable deals.

## **2.7. Fruit Processing Sector in Ethiopia**

According to Zeberga (2010) the key challenges for developing a fruit processing sector in Ethiopia were lack of technical knowledge in processing, low level of technical support for maintenance, low capital base from which to invest and many low priced mango juice imports.

## **2.8. Review of Empirical Studies**

### **2.8.1. Determinants of Mango market supply**

Derib *et al.* (2014) employed Heckman two-stage model to analyze determining factors of quantity of avocado supply to market and identified age, sex, education, family size, distance from market, land size, quantity of avocado produced, labor, extension frequency, price of avocado, market information, and experience in fruit

farming as the main factors influenced the quantity of mango supply to market. On the other hand, different researchers like (Wolelaw, 2005; Yimer, 2015) used linear multiple regression model to analyze factors affecting marketable supply. Similarly, Abraham (2013) used multiple linear regression model to identify factors that affected the market supply of vegetables and identified access to market information, vegetable farming experience, sex of the household head, age of the household head and amount of fertilizer application affects positively and significantly the amount of potato produced whereas access to extension service reduces the quantity of potato produced.

Yimer (2015) identified quantity of fruit produced, education level of the household head, market information, distance to the market, and extension service are variables that significantly influenced the marketable supply of fruits by household and discovered that quantity of fruit produced, education level of the household head, market information, and extension service had positive effect whereas distance to the market negative relationship with supply of fruit. The same as the previous researchers, in this study, linear multiple Regression model was applied to identify factors affecting quantity of mango supplied to the market.

### **2.8.1. Factors affecting market outlet choice decision**

A number of studies have been carried out on choice of market channels, revealing institutional, Socio-economic, technical and financial factors influencing marketing channel choice decisions by producers. Davis (2015), for instance used Multinomial logit model (MNL) to study determining factors that influence farmer choice of marketing channel in the mango sub-sector, and identified distance to the nearest tarmac road, household income, number of mango trees that farmer has, access to market information, contact with agricultural extension personnel, access to training, membership to mango marketing group, time period that farmer has been involved in mango farming, and ownership of a means of transport as the main factors and significantly influenced farmer choice of supply channels.

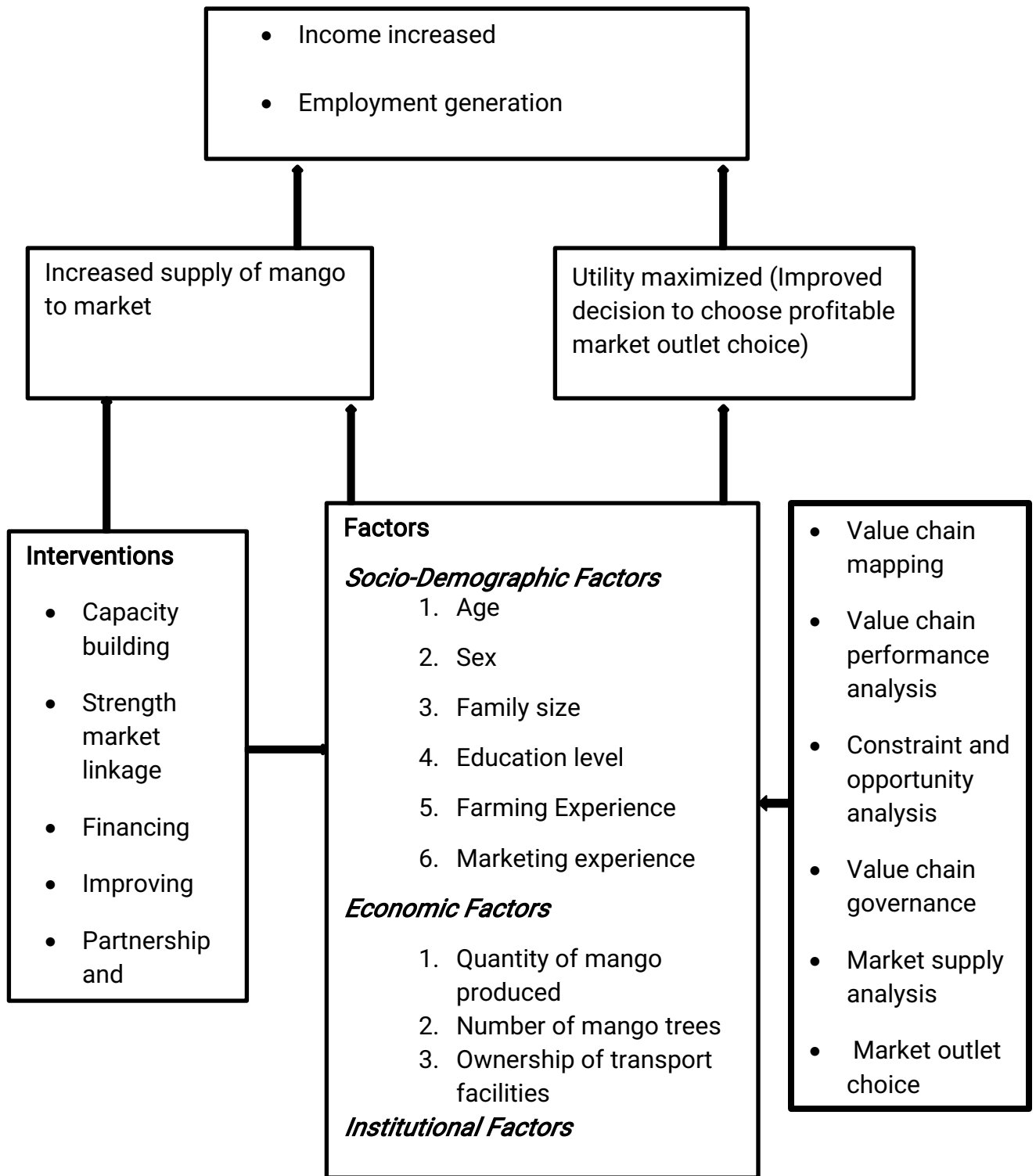
In addition, Takele *et al.* (2017) indicated that the probability of choosing wholesaler

market outlet was influenced by family size, distance to the nearest market center, quantity of mango produced and price; the probability of choosing collector market outlet was determined by the family size, distance to the nearest market, quantity of mango produced, price and access to non-farm income; the probability of choosing retailer market outlet was determined by the quantity of mango produced and price; and the probability of choosing consumer market outlet was determined by quantity of mango produced, access to market information and price. The study used multivariate probit model to determine mango producers market outlet choice decision.

Therefore, this study also considered similar explanatory variables like age, sex, education level, family size, access to credit, price, ownership of transport, and quantity of mango produced as determining factors for choice of marketing outlet decision and employed multivariate probit model.

## **2.9. Conceptual Framework of the Study**

The conceptual framework is the foundation on which the entire research was based. It identifies the network of relationships among the variables considered important to the study of given problem. The important factors that are usually considered as factors affecting the dependent variables for this study are; socio-demographic, economic, and institutional factors. All these variables were expected to have direct and indirect impacts on factors affecting dependent variables, quantity of mango supply to market, and factors affecting market outlet choice decisions by producers.



**Figure 1.** Conceptual framework

Source: Own sketch, 2016

**3.**



## METHODOLOGY

This chapter discusses the research methodology used in the study including location and description of the study areas, data types and data sources, sampling techniques, sample size determination, methods of sampling, methods of data collection and analysis.

### 3.1. Description of the Study Areas

The study was conducted in Arbaminch Zuriya Woreda. It is one of Woreda's found in Gammo Gofa zone of the Southern Nation's Nationalities and Peoples Regional State (SNNPR). The Woreda is located at a distance of 275 and 505 km from the regional city, Hawassa and the country capital, Addis Ababa, respectively. Geographically, the Woreda is located between 5°42' and 6°13' North latitude and 37°19' and 37°41' east longitude (Figure 2.). It is bordered on the South by the Dirashe special Woreda, on the west by Bonke, on the north by Dita and Chench, on the Northeast by Mirab Abaya Woredas, and on the Southeast by the Amaro special Woreda. The Woreda covers 1001 km<sup>2</sup> and has twenty-nine rural kebeles and one Woreda town (Mestewat, 2014). This woreda also includes portions of two lakes and their islands, Abaya and Chamo. Nechisar National Park is located between these lakes. City of Arba Minch is surrounded by Arbaminch Zuriya.

Based on 2007 housing and population census of CSA, Arbaminch Zuriya Woreda has a total population of 164,529 of whom 82,199 are men and 82,330 are women (CSA, 2007). And the town of Arba Minch has a total population of 74,843 of whom 39,192 are men and 35,651 are women. The population density of the study area varies from 172 person/km<sup>2</sup> to 2268 person/km<sup>2</sup>.

According to the fifteen years (1999 to 2013) climatic data, particularly temperature and rainfall which was obtained from National Meteorological Services Agency (NMSA), the average monthly temperature of the study area ranges between 25.8°C in March to 23°C in July. The mean monthly maximum and mean monthly minimum

temperature of the study area ranges between 33.8°C in February to 28.1°C in July

producers, traders, retailers, consumers and government stakeholders.

The primary data were collected from producers and key informants. The survey was undertaken with randomly selected producers, traders and consumers using a pre-tested semi-structured questionnaire.

Questionnaires were designed for producers selected from three randomly selected Kebeles in Arbaminch Zuriya Woreda, mango traders and fruit and vegetable cooperatives at different levels. During the course of field visits, the questionnaires were tailored to all market and mango producer's conditions of the area. The study used data on different variables such as inputs for mango, mango production, harvesting and handling information, mango marketing, mango prices, and distance to Woreda market, distance to all weather roads, age of the household head, extension service, educational status of the household head, family size, access to market information, credit facility, and type of sellers and buyers. The survey was conducted to obtain this information's. Enumerators were selected, trained and employed for the data collection purpose.

**Household survey (Mango farmer's survey):** A household survey, which is aimed at measuring quantitative and qualitative data at household level, was conducted in the three sample Kebles (Chano Mille, Chano Dorga and Ocholo Lante). The data include demographic, production, marketing, input, access to extension services, etc. of the sample households.

**Key informant interview (KII):** Key informant interview was made both at woreda and kebele level with Woreda Agriculture and natural resource Office and Kebele administration, extension and NGOs. The purpose of key informant interview was to collect expert information on mango production and marketing, challenges in mango market development. About five agriculture office DA and expert, two trade and industry office experts, three sample kebele administrators, one expert from Vita, one from cooperative office expert, one from Arbaminch plant health clinic, and one from Arbaminch agricultural research center, totally 14 persons were interviewed.

**Focus Group Discussion (FGD):** Focused Group Discussions (FGD) was made at kebele level with mango producers in order to obtain their views, opinions and suggestions on mango production and marketing constraints and opportunities in the sub-sector. Open-ended discussion questions employed and the discussions was facilitated and recorded by the study to gather qualitative information. In each sample kebeles one FGD was conducted. Totally, three FGD were conducted in the three sample kebeles (Chano Mille, Chano Dorga and Ocholo Lante) to gather information about the mango production, harvesting and marketing. The selection process was made in collaboration with kebele development agents and kebele administration. In the three kebeles, about 36 (12 per kebele) male headed, female headed and youths were participated at the discussion. About 25% of the participants were female headed and 15% were youths and the remaining 60% were male headed households.

### **3.3. Sampling Procedure and Sample Size**

#### **3.3.1. Producers sampling**

For this study, in order to select a representative sample multi-stage sampling techniques were used to select mango producer kebeles and sample mango producers. Primarily, Arbaminch Zuriya woreda was selected purposively as there is large number of mango producers existed. Secondly, out of 29 kebeles, 10 rural kebeles again selected purposively for the study at the first stage. In the third stage, three kebeles were selected by simple random sampling technique since they were located in similar agroecology area and producers of mango hence they have equal chance of selection and in the fourth stage 204 producers were selected by using simple random sampling technique. The number of samples in each kebele determined by proportionally to the number of mango producer's in each Kebele.

To decide the sample size for this study, all mango producers, who are value chain actors in the mango producer kebeles of the woreda were used as the target population and Yamane formula was employed. Yamane's (1967) formula was used

to determine the sample size of the household with 7 % error term.

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

Where, 'n' is sample size, 'N' is total mango producers, and 'e' is level of precision.

For this particular case where, N is the total mango producers i.e., confidence level of 95% was used.

Hence, out of the total population of mango producers, a sample size of 204 were taken from three kebeles and sample of each kebele was determined based on probability to proportional to the number of population of mango producers.

**Table 1.** Sample size determination of mango producers

Kebele	Number of mango producers (N)	Proportion (%)	Sample size (n)
Chano Mille	753	0.44	90
Ocholo Lante	738	0.42	85
Chano Dorga	245	0.14	29
Total	1736	1.000	204

**Source:** Woreda Agricultural and natural resource Office, 2016 and own computation

### 3.3.2. Traders and consumers sampling

For this study, data from wholesalers, traders, processors, retailers and consumers were collected. The sites for the trader surveys conducted at market towns in which a good sample of mango traders existed. According to woreda Trade and industry office (2016) there are around 60 wholesalers, those who are registered and had legal trading license. From 60 wholesalers, fourteen wholesalers and three primary cooperatives were selected purposively based on the quantity they are supplying to the market. In addition, from 15 retailers and seven also purposively selected based on the quantity they are supplying to the market. Thus, data were collected from 24 traders for the study. Accordingly, 30 were consumers selected randomly to be interviewed from Arbaminch town.

**Table 2.** Sample size determination of mango traders

Traders	Population (N)	Sample(n)
Wholesalers	60	17
Retailers	15	7

Source: Woreda trade and industry Office, 2016 and own computation

### 3.3. Methods of Data Analysis

Descriptive statistics and inferential statistics (multiple regression model, and multivariate probit model) were applied and STATA software version 12 used to analyze the data collected from mango producers, traders and consumers. Primary data collected, entered and cleaned for irregularities. Moreover, the software was employed to analyze the multiple linear regressions and multivariate probit models to identify significant factors affecting the dependent variables (market supply and market outlet choice).

#### 3.3.1. Descriptive analysis

This study used STATA software's version 12 to analyze the collected data and described using percentage, means, standard deviation, tables, and graphs. The mango value chain map and market channel were described using value chain mapping and the performance of each actor calculated and displayed using tables and percentages.

##### *3.3.1.1. Value chain mapping*

As products move successively through the various stages, transactions take place between multiple chain actors, money and information are exchanged and value will be progressively added. The analysis of mango value chains highlights the need for enterprise development, enhancement of product quality, and quantitative measurement of value addition along the chain, promotion of coordinated linkages among producers and improvement of the competitive position of individual enterprises in the marketplace.

Moreover, individual enterprises may feed into numerous chains; hence, which chain (or chains) was/were targeted depends largely on the point of entry for the research inquiries (Kaplinsky and Morris, 2001). The main aspects of mango value chain

analysis were conducted by applying some quantitative and qualitative analysis. First, an initial map was drawn which depicts the structure and flow of the chain in logical clusters. This exercise was carried out in qualitative and quantitative terms through graphs presenting the various actors of the chain, their linkages and all operations of the chain from pre-production (supply of inputs) to consumption. After having developed the general conceptual map of the value chain, the next step was analyzing the chain's economic performance and benefit share of actors.

### ***3.3.2.1. Analysis of mango value chain performance***

Estimates of the marketing margins are the best tools to analyze the performance of market. Marketing margin is calculated by taking the difference between producers and retail prices. The producers' share is the commonly employed ratio calculated mathematically as, the ratio of producers' price to consumers' price. Mathematically, producers' share can be expressed as:

$$PS = \frac{P_p}{C_p} = 1 - \frac{MM}{C_p} \dots \dots \dots (1)$$

Where: PS= Producer's share

Pp= Producer's price

Cp = Consumer price

MM = marketing margin

The above equation tells us that a higher marketing margin, diminishes producers share and vice versa. It also provides an indication of welfare distribution among producers and marketing agents. Calculating the total marketing margin was done by using the following formula. Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage (Mendoza, 1995).

$$TGMM = \frac{\text{Consumer price} - \text{producer price}}{\text{Consumer price}} \times 100 \dots \dots \dots (2)$$

Where, TGMM=Total gross marketing margin

Net Marketing Margin (NMM) is the percentage over the final price earned by the intermediary as his net income once his marketing costs are deducted. The equation tells us that a higher marketing margin diminishes the producer's share and vice-versa. It also provides an indication of welfare distribution among production and marketing agents.

$$NMM = \frac{\text{Gross marketing margin} - \text{Marketing cost}}{\text{Consumer price}} \times 100 \dots \dots \dots (3)$$

Where NMM= Net marketing margin

From this measure, it is possible to see the allocative efficiency of markets. Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution, which depresses market participation of smallholders. An efficient marketing system is where the net margin is near to reasonable profit.

To find the benefit share of each actor the same concept will be applied with some adjustments. In analyzing margins, first the Total Gross Marketing Margin (TGMM) was calculated. This is the difference between producer's (farmer's) price and consumer's price (price paid by final consumer) i.e.

$$TGMM = \text{Consumer's price} - \text{Farmer's price} \dots \dots \dots (4)$$

Then, marketing margin at a given stage 'i' (GMM<sub>i</sub>) will be computed as:

$$GMM_i = \frac{SP_i - PP_i}{TGMM} \times 100 \dots \dots \dots (5)$$

Where, SP<sub>i</sub> is selling price at i<sup>th</sup> link and PP<sub>i</sub> is purchase price at i<sup>th</sup> link.

Total gross profit margin also computed as:



$$TGPM = TGMM - TOE \dots \dots \dots (6)$$

Where, TGPM is total gross profit margin, TGMM is total gross marketing margin and TOE is total operating expense.

Then profit margin at stage “i” is given as:

$$GPM_i = \frac{GMM_i - OE_i}{TGPM} \times 100 \dots \dots \dots (7)$$

Where,  $GPM_i$  =Gross profit margin at  $i^{th}$  link

$GMM_i$  =Gross marketing margin at  $i^{th}$  link

$OE_i$  =Operating expense at  $i^{th}$  link

TGPM=Total gross profit margin

### 3.3.3. Econometrics analysis

Econometrics analysis refers to the use of different economic and statistical tools or models for testing hypothesis related to the objective of the study. It used to estimate the causal relationship between the dependent and explanatory variables (Guajirati,2004).

#### *3.3.3.1. Multiple linear regression model*

In this case, **multiple linear regression model** was applied to analyze factors affecting market supply of mango since the dependent variable is continuous and all mango producers supplied mango to the market during the survey year. Econometric model specification of supply function in matrix notation is the following.

$$Y = X'\beta + \varepsilon \dots \dots \dots (8)$$

Y= quantity of mango supplied to the market

X= is the vector explanatory variables

$\beta$ =is a vector of parameters to be estimated

$\varepsilon$  = is the disturbance term

### ***3.3.3.2. Multivariate probit model***

Determinants of the market outlet choices were identified by using multivariate probit model. Some recent empirical studies of market outlet choices assume that producers consider a set (or bundle) of possible outlets and choose the particular marketing outlet that maximizes expected utility. They also assume that the addition or deletion of alternative outcome categories does not affect the odds among the remaining outcomes and the odds of choosing a particular market outlet over the other do not depend on which other outcomes are possibly chosen.

However, in the present study more than one marketing outlets are available in the study area and producers are more likely to simultaneously choose more than one market outlet in order to address their multiple needs. In this case, the dependent variables are the dichotomous variables indicating whether sales are made through the relevant marketing chain.

The market outlets have been categorized into five groups: wholesalers, collectors, cooperatives, retailers and consumers. Each farmer can use one or more marketing outlets or several combinations of different outlets which maximize the expected utility and due to this there is some overlapping and many producers sell on more than one market outlet. This is to mean that producers do not sell mango permanently to the particular market outlet and use the available market outlets alternatively in the absence or presence of the possible choices. Thus, the decision of choosing market outlets is inherently multivariate and attempting univariate modeling excludes useful economic information contained in interdependent and simultaneous choice decisions. Failure to capture unobserved factors and interrelationships among choice decisions regarding different market outlets will lead to bias and inefficient estimates (Menale *et al.*, 2012).

The multivariate probit model takes into account the potential interdependence in market outlet choices and the possible correlation in the choice of alternative outlets.

The probability of preferring of any particular market outlet is estimated conditional on the choice of any other related outlet. The multivariate probit model assumes that each subject has distinct binary responses, and a matrix of covariates that can be any mixture of discrete and continuous variables. Generally speaking, the multivariate probit model assumes that given a set of explanatory variables the multivariate response is an indicator of the event that some unobserved latent variable falls within a certain interval. The multivariate probit is an extension of the probit model (Greene, 2003) and is used to estimate several correlated binary dependent variables jointly. The model is specified as follows:

$$Y_{im}^* = \beta_m x_{im} + \varepsilon_{im} \dots\dots\dots (9)$$

Where  $Y_{im}^*$  ( $m = 1 \dots k$ ) represent the unobserved latent variable of market outlets chosen by the  $i^{th}$  farmer ( $i=1 \dots n$ ). Therefore, in this case  $k =$  wholesaler, collector, cooperatives, retailer and consumer outlets,  $X_{im}$  is a  $1 \times k$  vector of observed variables that affect the market outlets choice,  $\beta_m$  is a  $k \times 1$  vector of unknown parameters to be estimated,  $\varepsilon_{im}$ ,  $m = 1, \dots, M$  are the error terms distributed as multivariate normal, each with a mean of zero, and variance-covariance matrix  $V$ , where  $V$  has values of 1 on the leading diagonal and correlations (Cappellari and Jenkins, 2003). Equation (9) is a system of  $m$  equations that as shown in Equation 10 below;

$$\begin{aligned}
 Y_1^* &= x_1 \beta_1 + \varepsilon_1 Y_1 = 1 \text{ if } Y_1^* \text{ is } > 0, Y_1 = 0 \text{ otherwise} \\
 Y_2^* &= x_2 \beta_2 + \varepsilon_2 Y_2 = 1 \text{ if } Y_2^* \text{ is } > 0, Y_2 = 0 \text{ otherwise} \\
 Y_3^* &= x_3 \beta_3 + \varepsilon_3 Y_3 = 1 \text{ if } Y_3^* \text{ is } > 0, Y_3 = 0 \text{ otherwise} \\
 Y_4^* &= x_4 \beta_4 + \varepsilon_4 Y_4 = 1 \text{ if } Y_4^* \text{ is } > 0, Y_4 = 0 \text{ otherwise.} \\
 Y_5^* &= x_5 \beta_5 + \varepsilon_5 Y_5 = 1 \text{ if } Y_5^* \text{ is } > 0, Y_5 = 0 \text{ otherwise} \dots\dots\dots (10)
 \end{aligned}$$

This system of equations is jointly estimated using maximum likelihood method.

### **3.4. Variables and working hypothesis**

In the course of identifying factors influencing mango supply to the market, and market channel choice decisions of mango the main task is exploring which factors potentially influence and how (the direction of the relationship) these factors are related with the dependent variables.

#### **3.4.1. Dependent variables**

##### ***3.4.1.1. Market supply of mango***

It is continuous dependent variable which can be measured by quintals and represents the actual amount of mango supplied by mango producer household during the survey year.

##### ***3.4.1.2 Marketing outlet choice***

It is the set of an unordered binary dependent variables and measured by the probability of selling mango to either of the given market outlets. The outlet choices might be along farmer's decision involving in the number of alternative market outlets available in the area. It is represented in the model as  $Y_1$  for producers who either sell mango to wholesalers or not,  $Y_2$  for producers who either sell mango to collectors,  $Y_3$  for producers who either sell mango to cooperatives or not,  $Y_4$  for producers who either sell mango to retailers or not and  $Y_5$  for producers who either sell mango to consumers or not.

#### **3.4.2. Independent Variables**

**Age of household head:** It is a continuous variable and measured in years. Aged households are believed to be increased knowhow on mango production and marketing, resource allocation and it is expected to have positive effect on quantity of mango supplied to market, and market outlet choice. According to results of Ayelech (2011) 20.8 percent of the producers are youth viz. amid of 18 and 30 years of age whereas 49.2 percent of them are amid of 30 and 50 years and positive effect on market supply.

**Sex of the household head:** This is a dummy variable takes a value 1 if the household

head is male and 0 if female. It is expected to influence the decision to supply the product to market, and decision on market choice outlet. Both men and women participate in fruit production. Male households contribute more labor input in the production management, sorting and grading, transportation, and therefore this study assumes being male HHs is expected to affect mango supply, and market outlet choice positively. A study by Thomas (2015) revealed that males are more likely to sell directly to the NGOs and itinerant wholesalers than to the sedentary wholesalers and microprocessors. Females on the other hand are also more likely to sell directly to the NGOs and the itinerant wholesalers as compared to the microprocessors, but with no possibility of selling to the sedentary wholesalers.

**Family size:** This variable is continuous and affects the quantity of mango supply negatively. When the number of family members is large probability of consumption of mango fruit is very high and reduced the quantity of mango supplied to market. Abay (2007) finding indicated that as the number of family increased by one percent the probability of onion production decreased by 2 percent.

**Education level of the household:** It is a continuous variable measured in years of schooling. It refers to formal education level of the respondents. Which means those producers who had formal education understands new marketing ideas, easily interpreted market information and can produce market oriented products. Ayelech (2011) indicated in her study that, education has improved the producing household ability to acquire new idea in relation to market information and improved production, which in turn enhanced productivity and thereby increased marketable supply of avocado and mango. Therefore, this variable is expected to influence mango supply, and market outlet choice positively.

**Mango production farming experience:** This a continuous variable measured in number of years. As the experience of the farmer's increases, the amount of mango production is high and the supply to the market increases and this study analyzed the positive effect of experience on supply of fruit, and market out let choice. According to Ayelech (2011) study, when the farmer's experiences increase by one year, the

avocado supplied to market increased by 5.980 quintals. Similar study conducted by Abraham (2013) showed that, as farmer's experience increased by a year, potato supplied to market increased by 0.57qt.

**Extension contact:** This is a continuous variable representing extension services as source of knowledge and skill on mango production, harvesting, disease and pest management, and post-harvest handling. It is measured in number of contacts per month. When producers get more extension service their knowledge and skill in production and post-harvest handling of mango improved so that the supply to market increased. Access to extension service increased the ability of producers to acquire important market information as well as other related agricultural information which in turn increases farmer's ability to choose the best market outlets for its product and to increase the supply of mango to market, and expected to have positive relationship. The study made by Nega *et al.* (2015) and Ayelech (2011) indicated that if a mango producer gets more extension contact the amount of mango supplied to the market increased by 0.522 and 9.595 quintals, respectively. Similarly, the study made by Davis (2015) indicated that access to extension service increased farmer's likelihood of selling to the export channel relative to the broker channel; the probability of selling to the export channel increased by 11 percent for every extra contact with extension personnel.

**Distance to nearest market:** This is a continuous variable measured in hours of walking time. It will be expected to affect mango supply to market and market outlet choice negatively. This is because as the market distance increases from the producer's supply decreased therefore distance and fruit supply are inversely related. To access the far and profitable market producers as well as consumers are expected to invest high transportation cost. In addition, due to the perishable nature of the product producers are influenced to sell their product at the nearest market or to wholesalers with minimum profit. Abraham (2013) indicated in his study that as the distance from nearest market increases the supply of cabbage decreased. Similarly, Ayelech's (2011) findings showed that distance to market caused market

surplus to decline.

**Access to market information:** This is a dummy variable that takes the value 1 if producers get access to market information and 0 if not. It affects the decision to choose market outlet and the decision to increase the supply of mango to the market positively. The findings of Davis (2015) showed that access to market information is significantly associated with producers selling to direct market channel relative to broker i.e. it increases the probability of a farmer selling to the direct market relative to brokers.

**Access to credit:** This is a dummy variable that takes the value 1 for access to credit and 0 for no access to credit and is expected to affect dependent variables (mango market supply, and market outlet choice) positively. Ayelech (2011) finding showed that around 62% of avocado and mango producers responded that they didn't have credit access and as a result they lack capital and discourages entry into trading.

**Membership to vegetable and fruit marketing farmer's cooperatives:** It is dummy variable that takes the value 1 when the producer is membership in cooperatives and 0 if not. The study made by Abraham (2013), stated that membership in cooperatives determine the HHs market outlet choice decision. Those producers, who are the member of the cooperatives, have less probability of selection of another market outlet and have positive effect on the supply of market supply.

**Experience in marketing:** This is a continuous variable measured in number of years. As the marketing experience of the farmer's increases, by using market information and searching better market alternatives they produce product for market purpose so that the market supply increases, and select better market outlets. Geoffrey *et al.* (2014) study result revealed that the producers with more years in marketing have higher ability to sell more pineapple produce in the market which is marketing experience positively and significantly influenced the extent of market participation. An increase in a farmer's marketing experience by one year increase the proportion of pineapple sale by 0.0098. Dagne (2014) indicated that contrary to sole proprietors,

marketing experience is significant and negatively and positively affected spawn suppliers and supermarkets, respectively. Relative to the base alternative market, if marketing experience increases, the probability of choosing supermarkets will also increase whereas the probability of choosing spawn suppliers will decrease.

**Ownership of market transport facilities:** It is a dummy variable that takes value 1 if the producers or traders or cooperatives owned transport like donkey cart and vehicle and 0 if none. Access to transport services enables producers to transport and sell their product with better price. Ownership of transport affects the mango supply to the market positively. If the producers, traders or cooperatives use cold transport, they can add value and increases the shelf life of the fruit. Thus, the effect of transport ownership on quantity of supply, and market outlet choice is positive. The study of Geoffrey *et al.* (2014) vehicle ownership positively and significantly influenced the extent of market participation and the result shows that an increase in vehicle ownership by one vehicle increases the proportion of pineapple sale by 0.0459.

**Selling Price:** This is a continuous variable measured by ETB and affects the quantity of market supply. As the price of mango increases, the amount of fruit supplied to the market increases; enable producers to decide and supply more mangos to earn better payment. The study results of Derib *et al.* (2014) revealed that as the purchase price increase the demand for avocado consumption decreased and supply to the market increased.

**Quantity of mango produced:** It is a continuous variable measured in quintals and it was expected to affect the dependent variables market outlet choice positively. As illustrated by Abraham (2013), Abay (2007), Adugna (2009) and Ayelech (2011) an increase of tomato, mango, avocado and papaya production by farming households has augmented marketable supply of the commodities significantly.

**Number of bearing fruit mango trees:** It is a continuous variable measured in number and it was expected to affect the dependent variables, mango market supply, positively. As illustrated by Davis (2015) producers with large number of mango trees



were more likely supply more to the market since the product is perishable.

**Table 3.** Hypothesized relationship of dependent with independent variables

Independent variable	Description	Type of variables	Measurement	Hypothesized Effect	
				Mango market supply	Market outlet choice
AGE	Age of household head	Continuou s	Years	+	+
EDUCATN	Education of household	Continuou s	Years of schooling	+	+
FAMSIZE	Family size	Continuou s	Number of household	-	-
SEX	Sex of household head	Dummy	1= male,0=otherwise	+(Male)	+(Male)
DISTNMKT	Distance to nearest market place	Continuou s	Hour	-	-
QPRODUCT	quantity of mango produced	Continuou s	Quintal	+	+
EXPRMPRD	Farming experience of HH	Continuou s	Years	+	+
MRKTEXP	Marketing experience	Continuou s	Years	+	+
OWNTRANS	Ownership of transport	Dummy	1= own,0=otherwise	+	+
COOPMEM	Membership to cooperatives,	Dummy	1=member,0=otherwise	+	-
ACCSCRDT	Access to credit	Dummy	1=recieve,0=otherwise	+	+
PRICE	Selling price	Continuou s	ETB	+	+
EXTENSION	Extension contact	Continuou s	No. of contact	+	+
NMTREES	No. Of mango trees	Continuou s	No of bearing trees	+	+
MKTINFO	Access to market	Dummy <sup>48</sup>	1= have	+	+

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Source: Own computation from survey result, 2016.

### **3. RESULTS AND DISCUSSION**

This chapter presents the major findings of the study and discuss it in comparison with the results of other similar studies. It has four main sections. The first section deals with descriptive and inferential statistics of the sample households' characteristics. The second section presents value chain analysis of mango which includes value chain map, actors and their roles, and value chain governance. The third section presents marketing channel and performance analysis of the value chain which includes marketing costs and margins, and benefit shares of actors in the value chain. The fourth section presents result of the econometric analysis which contains the determinants of market supply of mango by using multiple regression and the determinants of market outlet choice of mango producers by using multivariate probit model.

#### **4.1. Socio-Economic and Demographic characteristics**

##### **4.1.1. Demographic characteristics of sample households**

As depicted in Table 4, the proportions of sample male and female household heads were 85.3%, and 14.7%, respectively. Male headed households were dominantly involved in mango production and marketing in the study area. The mean age of sample household heads was 53.5 years. Age structure of the sample household heads indicated that, 72.5% (18-64 years old) were economically active, and 27.5% were above (64 years). The average family size of the surveyed household was 7.77, which is greater than the national mean family size of 4.7 (CSA, 2007). As indicated in Table 4, 27.5 % of the sample household heads were illiterate while the remaining 74% of the sampled households had different level of education which ranges from read and write up to degree holder. The majority of sample producers were 24.5% which is under the category of lower level education (grade 5-8). It was only 1% of the

sample respondents hold degree; 4.4% had diploma;4.9% had certificate; 16.2% attended secondary education (grade 9-12) and while 21.6% of the household attended primary level education (grade 1-4).

**Table 4.** Demographic characteristics of sample mango producers

<b>Total (N=204)</b>		
<b>Variables</b>	<b>Mean</b>	<b>Std. Deviation</b>
Age(Years)	53.5	13.6
Family size(Number)	7.7	2.8
Education of the HH (Years of schooling)	2.7	1.7
Distance to nearest market (Hours)	2.3	1.4
Mango production(Quintal)	89.4	71.9
Number of trees(Number)	24.2	21.8
Mango production experience(Years)	13	4.5
Marketing experience(Years)	12	4.5
Price(Birr)	176	21.4
Extension contact (Number of contact)	1.8	0.9
	<b>N</b>	<b>Percent</b>
Sex	Female	30 14.7
	Male	174 85.3

Source: Own computation from survey result, 2016.

#### **4.1.2. Economic Characteristics of Sample Households**

##### ***4.1.2.1. Mango production***

The study area is commonly known in mango production. The result in Table 5 illustrates that mango is harvested twice per year in the study area. The average number of mango tree per household was 26.92 trees. The total mango produced by

sampled households and mean were 18,243.72 quintals and 89.43 quintals respectively. Out of the total quantity produced 11,785 quintals (64.5%) was supplied to the market, 5,720 quintals (31.2%) was wasted and the rest 784 quintals (4.3%) was consumed at home.

**Table 5.** Mango production of sample households

<b>Mango production</b>	<b>Mean</b>	<b>SD</b>
Number of mango trees	26.92	27.197
Average production per tree in quintals	4.4749	3.843
Harvesting frequency per year	2	0.00
Total mango production in quintals	89.43	71.92

Note: SD- Standard deviation

Source: Own computation from survey result, 2016.

#### ***4.1.2.2. Labor sources and their roles***

Labor used for mango production and marketing activities by labor source is presented in Table 6. The source of labor was mainly family labor and hired labor which were used by producer households for pre and post-harvest management, harvesting, loading unloading, sorting and grading, and transporting. As indicated in Table 6, about 86.3% of the sample household operated mango management activities by family labor source, both women and men; and children were participated in harvesting, transporting, loading and unloading and marketing activities. The survey result also revealed that 40.2% of the sample producer households hired additional labor to undertake harvesting, transportation and loading and unloading activities.

**Table 6.** Labor sources in mango sample producers

<b>Labor source</b>	<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
Family labor source	Yes	176	86.3
	No	28	13.7
Hired labor source	Yes	82	40.2
	No	122	59.8

Source: Own computation from survey result, 2016.

#### ***4.1.2.3. Means of transportation in sample producers***

As indicated in Table 7, about 76 % of the respondents used donkey cart and 23 % used human back and shoulder to transport their produce from farm to local market, collection center and their home. Only 2 respondents (1%) used vehicles to transport their product from farm to local market and central market.

**Table 7.** Transportation means

<b>Means of transportation</b>	<b>Frequency</b>	<b>Percent</b>
Donkey cart	155	76.0
Human back and shoulder	47	23
Vehicle transport	2	1

Source: Own computation from survey result, 2016.

#### ***4.1.2.4. Packing materials of sample producers***

As indicated in Table 8, majority of the respondents (92.2 %) used basket to transport the fruit from farm to local market and the remaining 7.8% used sack. The surface of the basket is rough, it causes physical damaged, and it is a cause of contamination because it is difficult to clean the surface and the sack have no enough ventilation which increase losses.

**Table 8.** Packaging materials

<b>Type of packaging material</b>	<b>Frequency</b>	<b>Percent</b>
Basket	188	92.2
Sack	16	7.8
<b>Total</b>	<b>204</b>	<b>100.0</b>

Source: Own computation from survey result, 2016.

### **4.1.3 Access to Institutional Services**

In the study Woreda's, agricultural and natural resource development office provides

agricultural extension services to producers through development agents. The office provides advisory service, facilitate access to inputs and provide technical support in crop protection, animal rearing and other important information. But the service provision as the key informants said is not enough to cover such the whole producers. Even the service itself is general agricultural knowledge.

Extension service in Arbaminch Zuriya Woreda is provided by Woreda agriculture and natural resource office, Woreda cooperative promotion office, and innovative producers. Though, three development agents institutionally assigned to work in crop production, animal production and natural resources management, the service has no significant impact on the production of mango.

The result in Table 9 indicated that producers contacted by extension workers on average by 1.8 days. This result shows that producers were not get enough extension support from development agents in agronomic practice, harvesting and post-harvest handling so that the production system and post-harvest handling was poor and producers supplied poor quality product to the market. The survey result also revealed that majority of respondents (63.2%) were not a member of cooperatives while the remaining percentage (36.8%) were members of the cooperatives.

**Table 9.** Access to institutional services

Total(N=204)			
Variables		Mean	Std. Deviation
Extension contact (Number of contact)		1.8	0.9
Institutional services	Response	N	Percent (%)
Cooperative membership	Yes	75	36.8
	No	129	63.2

Source: Own computation from survey result, 2016

#### 4.1.4. Socio-Demographic Characteristics of Sample Traders

As depicted in Table 10, the average age of the sample traders were 28.4 years. The



respondent minimum and maximum age was 19 and 45, respectively. Trading experience in this study considered as the trader's years of stay in buying and selling of mango where their produce are sourced from the study woreda. Accordingly, the average experience of traders was 5.4 years. Trading experience enables traders to be equipped with business knowledge and skills as well as to have local, regional and national trade linkages and networks with various stakeholders. The study revealed that 79.16% of the traders attended formal education from 4-12 grade whereas 20.84% did not attended formal education. The study also indicated that among the traders 58.33 % were female and 41.67% are male this indicated that the trading activity was done by women.

**Table 10.** Socio-demographic characteristics of sample traders

Characteristic		Frequency	Percent
Sex	Male	10	41.67
	Female	14	58.33
		24	100
Education	Formal	19	79.16
	Non formal	5	20.84
		24	100
Age	Mean age	28.4	
Experience of marketing	Mean experience	5.4	

Source: Own computation from survey result, 2016.

## 4.2. Value Chain Analysis

This section discusses the value chain actors in each stage, description of their roles and relationships, opportunities and major constraints of mango value chain.

### 4.2.1. Mango value chain actors and their roles

The focus of value chain actors and their roles in this study was to develop an

effective way of coordinating the hierarchical stages in the value chain to meet consumer demand in an efficient manner. As illustrated in Figure 3, mango value chain map encompasses three main components i.e. value chain functions, main value chain actors and value chain support service provider institutions/enabling environments.

Value chain actors include direct chain actors, which are commercially involved in the chain and indirect actors which provide financial and non-financial support services. The direct actors of the value chain are designated by boxes. These actors are generally vertical chain and are connected starting from input suppliers, producers, collectors, wholesalers, cooperatives, retailers, and consumers. The indirect actors that facilitate to the main chain actors such as support institutions and enabling environments are also involved.

**Input suppliers:** At this stage of the value chain, there are many actors who are involved directly or indirectly in agricultural input supply in the study area. The main role of input suppliers was to provide mango seedling, nursery equipment's, harvesting tools, chemicals, packaging materials, grafting tools, etc. to producers thereby earn their income from mango sales. Woreda agriculture and natural resource development office, Arbaminch research center, producers fruit and mango marketing cooperatives and NGOs (Vita) are the main source of inputs like improved seedlings, grafting materials, harvesting tools, packaging materials, etc. In the study woreda, there is only one government improved seedling producer nursery site which was found in Chano mille Kebele supported by regional bureau of agriculture, which is responsible in producing different types of grafted mango varieties and supplied to the woreda and SNNPR woredas. The supply is very limited and the study revealed that majority of sample producers used their own seedling, which is local variety, poor productivity and quality. Vita, an Irish non-governmental organization, is also participated in input supply activities (improved seedling supply, packaging materials and improved harvesting tools) in the study woreda. Additionally, Arbaminch agricultural research center involved in providing root stock and scion for the nurseries. Regarding pesticides, Arbaminch plant health clinic participated in

supplying pesticides to control fruit fly. Farmer cooperatives and Gamo Gofa mango and fruit marketing producers' cooperative union distributed weighing balances and plastic box (Crate) to members for the purpose of packaging and weighing. Still the supply of inputs is dominated by government and cooperatives and the involvement of private input supplier are very limited. Therefore, it is very important to enhance farmer's knowledge in improved seedling production, grafting techniques and encouraging private input suppliers through training, business development service, and create financial and market linkage.

**Producers:** Mango producers are the major actors who perform most of the value chain functions right from farm inputs preparation on their farms or procurement of the inputs from other sources to post harvest handling and marketing. The major value chain functions that mango producers perform includes agronomic practices, planting, grafting, irrigating, tree management, pruning, pest and disease controlling, harvesting and post-harvest handling. The study woreda is highly suitable for mango production. Unfortunately, these opportunities have not been exploited by the producers due to the lower price they receive for their produce in the markets, as well as bearing the cost of post-harvest losses. The survey has revealed that sample producers were grown mango for the purpose of cash revenue, shed and consumption. They have planted mango at their farm, and around home. They used either local or improved mango varieties to produce mango fruit. The study result shows that mango provides immediate cash as source of income opportunities for the producers. Unfortunately, these opportunities have not yet been exploited by the producers due to the lower price they receive for their produce in the markets; as well as bearing the cost of post-harvest losses during harvesting, transporting and marketing due to lack of proper harvesting materials, packaging and transportation materials.

**Collectors/Aggregators:** The range of collectors/aggregators includes small collectors and larger traders, Initial contact with producers was made at the farm or market, where a farmer brings a product, or at the farm gate, where a collector travels to arrange a sale before harvest, based on existing community relationships. Some

opportunistic collectors wait for producers to come directly to them with an offer of a sale. They then offer a price based on quality inspection, and once agreed upon, they send transportation to harvest or pick up the mango. Then these collectors deliver and sold the mango to wholesalers. Collectors are traders in assembly markets who collect mango from producers in village markets and from farms for the purpose of reselling it to wholesalers and retailers. They use their financial resources and their local knowledge to bulk mango from the surrounding area. They play important role and they do know areas of surplus well. Collectors are the key actors in the mango value chain. The trading activities of collectors include buying and assembling, repacking, sorting, transporting and selling to wholesale markets.

They used donkey cart and human back to transport their product from farm gate to market. After they aggregate the unripe mango they resell it to wholesalers at the nearest market assembly place. They often receive cash from wholesalers after or before sell. The survey has further indicated that all mango collectors in the study area have limited knowledge in harvesting and post-harvest handling so that they begin collecting of mango prior to peak maturity period. This result is in line with Takele (2015) study conducted in Boloso Bombe woreda, Wolaita zone who indicated that due to lack of knowledge and skill collectors involved in collecting of mango prior to peak maturity period eventually leads to decrease in producers' utility because producers were obliged to sell unripe mango with a low price after it has been harvested.

**Wholesalers:** Wholesalers buy mango directly from producers and farmer traders in larger quantity than any other actors and supply it to exporters and retailers. They were relatively well equipped with the necessary capital, facilities and knowledge as compared to other traders. These wholesalers were traders' sold their product to Hawassa, Addis ababa, Dessies, Mekelle, Adama, Shamemen etc.

They collect and assemble unripe mango in farm gate for 3-5 days and after ripened it they sell to either at the assembly point to the wholesalers coming from Addis Ababa, Shashemene, Guraghe, Mekele, Dessie and Wolaita or transport it to other

regional cities, where they sold it to another wholesalers or retailers. The assembly point they use newspaper and dry grass either to ripe mango or to protect mango from being contacted with the surface of the earth. They also store product, usually for a maximum of three days. Survey result indicates that wholesale markets are the main assembly centers for mango in their respective surrounding areas. They have better transport and communication access than other traders.

**Cooperatives:** Cooperatives are association of producers that collects producers produces and resold it to the union, wholesalers, and retailers. They played both collection and wholesaling roles to their members and non-members. In the study worda 10 primary fruit and vegetable marketing cooperative were found which provides marketing services to their members and non-members. These cooperatives were the member of Gamo Gofa zone fruit and vegetable marketing union. Cooperatives bought mango produce from the members and deliver to the union. They accessed finance from the union. The union provides finance to those cooperatives that are lacking finance to purchase product from their members.

**Retailers:** Retailer involvement in the chain includes buying of mango, transport to retail shops, grading, displaying and selling to consumers. Retailers are key actors in mango value chain in the Woreda. They are the last link between producers and consumers. They mostly buy from wholesalers, collectors, cooperatives, and producers and sell to rural and urban consumers. Sometimes they could also directly buy from the producers. Consumers usually buy the product from retailers as they offer according to requirement and purchasing power of the buyers. Retailers can be divided in to urban and rural. Rural retailers are based in village market and road side market and mainly purchase mango from producers, and sell to consumers. Whereas urban retailers are based in Arbaminch town purchased mango from producers, cooperatives, collectors, wholesalers and rural retailers in village market, at farm gate and sale to urban consumers.

**Consumers:** Consumers are those purchasing the products for consumption and they are the final user of mango. The final product that consumer used either in the

form of fresh mango or in the form of juice. They ate by slicing, juicing or processing using juicer. They are individual households; they bought mango for their own consumption only either in processed or fresh form. They buy mango either in fresh or processed form from producers, retailers and processors. Consumers prefer good quality which is physically undamaged, not bruised, less fibrous, not affected by disease and red mango for their immediate consumption. In general consumers have their own quality criteria to purchase mango.

#### **4.2.2. Support service providers/Enabling Environment**

**Ministry of Agriculture and Rural Development:** There are a variety of government agencies and ministries which impact the mango sector. The key player for all agricultural related activities is the Ministry of Agriculture and Rural Development (MoARD) which holds the responsibility for production and technical support offered to Ethiopian producers. While the MoARD is at the federal level, there are regional level offices known as the Bureau of Agriculture and Rural Development (BoARD). The BoARD focuses on the following key areas: crop production (rain fed), livestock production, irrigation (and horticulture), inputs and distribution, extension, and natural resource management and water harvesting.

The BoARDs of each region oversee zonal level agricultural offices who then oversee woredas level offices, who oversee kebele level agricultural offices; the higher offices provide backstopping and technical support to the lower level offices on an as needed basis. Within all of these offices agricultural extension officers (or Development Agents (DA) are employed. Agricultural Extension Centre is the governmental institution which provides extension service for small scale producers in agricultural sector in the study area. Each kebele (smallest administrative unit, or neighborhood/ward) has a designated "Farmer Training Centre" (FTC) which has land and is mandated to run demonstration plots. Most of these are underutilized and local government often decries the tendency by development organizations to run separate farmer field schools. Mango has not been a strong focus of DAs in Arbaminch zuriya woreda who are not very knowledgeable about the crop. It has

facilitated extension services and provide seedling through development agents on mango production. This organization provides various extension services specifically in mango sector in the study area. The major services which this organization is providing in the mango sector are training on agronomic practices, mango grafting, provision of improved mango variety, compost application, harvesting and post-harvest handling, and provision of improved harvesting material. The assessment has also revealed that that despite development agents is providing technical advice in mango sector, provision of extension service is not covered the whole farming families in the study area.

**Woreda Marketing and Cooperative Office:** It is a governmental organization which provides organization of producers, trainings for leaders and members, licensing, auditing, and technical support on marketing and promotional services for primary cooperatives and producer producers in the study area. It can also impact the mango sector through regulations and programming.

**Woreda trade and industry office:** It is a government organization that provides services like quality control, licensing, and market place for wholesalers, collectors and retailers. The organization provides license to wholesalers emerging from the near area and certifies licensed mango traders to secure their freely involvement in mango transactions. At the same time, the organization prohibits direct entry of unlicensed mango traders in order to uphold the rights of traders who have been licensed. In terms of quality control, the organization prohibits traders who collect immature and unripe mango in rural village. Provision of market place to mango retailers is also through this organization. By performing all this responsibilities, the organization enables mango marketing environment for the traders and sets rules and regulations guiding traders in the study area. But, the study has further indicated that some mango traders like collectors act illegally by collecting immature mango and enter into the business without receiving trade license from the woreda marketing and cooperative office.

**Vita-Ethiopia:** This is also the non-governmental organization which is working in the

mango sector in the study area in collaboration with the Bureau of Agriculture (BoA), and bureau of cooperative. The organization objectives are improving productivity, reducing wastage and improving income of mango producers through mango value chain development. The project name is climate smart agriculture funded by Irish aid and its working area is Arbaminch zuriya woreda. Major activities have been conducted by this organization to list; it has provided trainings, introduced improved harvesting tools, created market linkage with processing industries, provided transportation, supplied packaging materials to producers, cooperatives and union.

**Arbaminch agricultural research center:** Arbaminch Agricultural Research center (AARC) collaborates on providing research and community services on mango seedling, pest and diseases managements, harvesting and post-harvest handling.

**Arbaminch plant health clinic:** It is a government organization working on pest and disease identification and research and provides technical support to producers, trains development agents, and provides chemicals.





### 4.2.3. Constraints of mango production and marketing

During focus group discussion the majority of the respondent answered that input supply includes improved seed and fertilizer, skill gap, limited financial access, poor linkage among actors, poor ripening/storage facility, incidence of diseases and pest that damage their mangoes, climatic variations, problem of market for their harvested mango and lack of all-weather road are the major constraints of mango production.

**Pest and disease:** In the study woreda, the incidence of pest (fruit fly) and disease (Anthracnose) was found significantly affects the production and marketing mango. As indicated in Table 11, 81.4% of respondents replied that the severity of pest and disease was highly affected the production of mango. The study made by Muchiri (2012) in Embu district, Kenya indicated that Fruit fly is the most serious mango pest to all producers followed by mango seed weevil and aphids. Powdery mildew is the most damaging disease followed by anthracnose and bacterial black spot.

**Table 11.** Pest and disease problem on mango production

Severity of pest and disease problem	Frequency	Percent (%)
Low	34	16.7
Medium	4	2.0
High	166	81.4
<b>Total</b>	<b>204</b>	<b>100.0</b>

Source: Own survey result, 2016

**Input supply:** Shortage of improved and quality seedling, chemicals (Pesticide), which is more serious in area revealed by the focus group discussion.

**Production and marketing:** According to the focus group discussion and key

informant interview of the study woreda, low yield was caused due to inadequate agronomic practices and untimely supply of agricultural inputs such as improved mango seedling supplies; chemicals (Pesticide). Marketing problems cited by producers include traders suppressing of mango price, lack of all-weather road in most of the peasant associations, the largest proportion of the producer's stress that low price of mango is a major problem followed by price fluctuation. Lack of grading and standards for mango created opportunity for the traders to determine weight and prices of the product. Producers are generally price takers

**Ripening/Storage facilities:** Mango is highly perishable agricultural product. In the study areas lack of ripening/storage facilities for mango was raised by all producers during group discussion and other actors as a priority problem. In few places where there is ripening center producers started to benefit a lot. It was also reported that in some places ripening center was designed and constructed by some NGO like Vita Ethiopia (NGOs) and the government department which eventually was not utilized by producers. Therefore, it is recommended to expand ripening center in high mango producing areas as per standard ripening center design and construction. Through technical support to the producers, cost effective mechanism of expanding storage should be considered. In addition, building capacity of the primary cooperatives and government staff especially DAs to control the quality of the ripening center constructed at primary cooperative/kebele level. Training and experience sharing for local business persons may stimulate construction of ripening center (Storage system) to making earning out of it. Individual producers can invest in storage facilities if they are well aware of the benefits and could increase their productivity. This requires capacitating producers' entrepreneurship.

**Transportation:** Mango producers and traders transported mango to the local market in Ethiopia is done in human back, animal back, cart (Pulled by animals), non-refrigerated trucks and cars. Temperatures during the mango production season are high, and thus non-refrigerated transport increases the deterioration of quality and causes major losses of fruit, especially when it is done inadequately. Land non-refrigerated transport to local markets may be feasible if the distance is short, and

the weather is not very warm. In warm weather transport should be done at night when the temperature is much lower. Non-refrigerated cars and trucks should be covered adequately to protect fruit from wind and high temperature. (Yahia, 1999).

In the case of Arbaminch zuriya mango product transportation took different forms, head load to vehicles. Mango was transported from field to market places with head load, animal back, equine and Isuzu. Isuzu was the prominent transporter of both. Isuzu and FSR took mango from many places with limited transport of cart and donkey load minibuses and large buses participated in product transport per each day at peak production seasons. The problem is some peasant associations are having capacity problems to do the business actively at pick season, they have poor collection system and not on the position to sale their product with fair price.

#### **4.2.4. Opportunities of Mango production in the Woreda**

Based on the survey conducted on the status of the Arbaminch zuriya woreda mango production, it was inspected that it has lots of opportunities and constraints. The opportunities refer to the external favorable conditions that are in favor of mango production and marketing in the Woreda. This includes favorable weather conditions and good strategic location for production of mango.

### **4.3. Mango Marketing Channels, Costs and Margins of Actors**

#### **4.3.1. Marketing Channels**

As depicted in Figure 4, mango marketing channels was carried out to provide a systematic knowledge on flow of goods and services from producers to the final consumers. In this study producers supplied mango to different channels within the same production year. Mango marketing channels were grouped into 12 categories based on the mango flow. In addition to this, channel comparison was made based on quantity that passed through each channel. Accordingly, channel XII (Producers---->collectors---->wholesalers---->wholesaler's outside) carry out the largest quantity of mango supply which was 51.5% of the total mango supplied to the market. On the contrary, channel III (Producers-----> Wholesalers----->rural retailers---

→consumers) carry out the lowest quantity of mango supplied to the market which was 0.2%.

### Marketing channels

- I. Producers----→Cooperatives----→ Rural retailers----→Consumers (87.12Qt.) (0.7%)
- II. Producers-----→ rural retailers ----→ consumers(287Qt.) (2.4%)
- III. Producers--→Wholesalers---→ Rural retailers--→ Consumers(20.3Qt.) (0.2%)
- IV. Producers---→Wholesaler-----→ Arbaminch retailers---→Consumers(71.1Qt.) (0.6%)
- V. Producer-----→Collector----→Arbaminch Retailers--→Consumers(746Qt.) (6.3%)
- VI. Producers →Collectors→Wholesalers→Arbaminch retailers→Consumers (470Qt.) (4%)
- VII. Producers----→Collectors-→Rural retailers--→Consumers(134.3Qt.) (1.2%)
- VIII. Producers ---→Consumers (203 Qt.) (1.7%)
- IX. Producers--→Cooperatives-----→Union-----→Processors outside (929.6 Qt.) (7.8%)
- X. Producers-----→Cooperatives---→Union---→Wholesaler's outside(1887.4Qt.) (16%)
- XI. Producers---→Wholesalers-----→Wholesalers outside(923.65Qt.) (7.8%)
- XII. Producers-----→Collectors-----→Wholesalers-----→Wholesaler's outside(6109Qt.) (51.5%)



production costs. On the other hand, cooperatives were incurred the highest total cost (78 birr per quintal) than other actors. They bought semi and fully ripened mango from member producers and non-members and resold it to Gamo Gofa union. All the costs are spending to undertake marketing activities costs like transportation, labor, loss, sorting and grading, and ripening. They travelled long distance to collect and buy mango so that they were exposed to high donkey cart transportation cost. The study also revealed that the wastage amount was high for retailers as compared to others due to poor transportation, absence of storage and limited knowledge on post-harvest handling. This result is in line with Takele (2015) who depicted that the major costs incurred by all market actors except processors was loss.

**Table 12.** Analysis of distribution of margin along mango value chain

<b>Mango Marketing costs and benefit shares of actors</b>						
<b>Item Birr/Qt</b>	<b>Produce r</b>	<b>Collecto r</b>	<b>Wholesale r</b>	<b>Cooperativ e</b>	<b>Retailer s</b>	<b>Horizontal sum</b>
Purchase price	0	150	160	210	250	770
Production cost	10	0	0	0	0	10
Marketing cost						0
• Labor	10	2.5	6	4	3	25.5
• transport	8.27	6.5	6.5	6.5	6	33.77
• loss	36.48	11	26.4	35	30	138.88
• sorting and grading	3.46	1.5	3	2.5	1	11.46
• packaging						0
• ripening			3.5	5	2	10.5
Total marketing cost	58.21	21.5	45.4	53	42	220.11
Overhead cost			10	25	5	40
Total cost	68.21	21.5	55.4	78	47	270.11
Selling price	150	253.85	381.81	450	500	1735.66
<b>Marketing margin</b>	<b>140</b>	<b>103.85</b>	<b>221.81</b>	<b>240</b>	<b>250</b>	<b>955.66</b>
% share of margin	14.65	10.87	23.21	25.11	26.16	100
<b>Profit margin</b>	<b>71.79</b>	<b>82.35</b>	<b>166.41</b>	<b>162</b>	<b>203</b>	<b>685.55</b>
%share of profit	10.47	12.01	24.27	23.63	29.61	100

Source: Own computation from survey result, 2016

#### ***4.3.2.2. Market margin analysis***

Market margins of mango value chain actors were analyzed in five marketing channels as shown in Table 13 below. GMMp, GMMcol, GMMwh, GMMcop, GMMrret and GMMaret are represents gross marketing margins of producers, collectors, wholesalers, cooperatives rural retailers and Arbaminch retailers, respectively. NMMcol, NMMwh, NMMcop NMMrret and NMMaret, are net marketing margins of collectors, wholesalers, cooperatives, rural retailers and Arbaminch retailers, respectively. The total gross marketing margin of traders (TGMM) was in channel IV, V, VI, VII, VIII, and II which were 71%, 70%,70%,70%,68%,58 % and 50%, respectively. Wholesalers have got the highest gross marketing margin in channel III and IV which is 58 % since they were sold without transportation cost at collection center. In the contrary, rural retailers have got the lowest marketing margin in channel I which is 10 % because they purchase and sell mainly at the rural market with minimum difference in price, in which they faced high competition with wholesalers and collectors.

In channel VIII producer's share is highest where they sold their product directly to consumers. Without considering that channel GMMp was better in channel II and I which were 50% and 42%, respectively. But, it was lowest in channel IV which was 29% for the reason that there were a number of actors involved in the market channels. As a result, the shares of producers diminished.



**Table 13.** Marketing margins for actors along different market channels

Actors	Prices and Margins (ETB)	Marketing Channels							
		I	II	III	IV	V	VI	VII	VIII
Producers	Selling price	210	250	160	160	150	150	150	150
	Production cost/Qt	10	10	10	10	10	10	10	10
	Marketing cost/Qt	58.21	58.21	1	58.21	1	1	1	1
				68.2		68.2	68.2	68.2	68.2
	Total Cost/Qt	68.21	68.21	1	68.21	1	1	1	1
			181.7	91.7		81.7	81.7	81.7	81.7
	Net profit	141.79	9	9	91.79	9	9	9	9
Collectors	Price/quintal	-	-	-	-	254	254	254	-
	GM/quintal	-	-	-	-	104	104	104	-
	%GMMcol	-	-	-	-	41	41	41	-
	Marketing cost/Qt.	-	-	-	-	21.5	21.5	21.5	-
	NMMcol	-	-	-	-	82.5	82.5	82.5	-
	% NMMcol	-	-	-	-	16.5	16.5	16.5	-
	Wholesaler	Price/quintal	-	-	382	382	-	382	-
GM/quintal		-	-	222	222	-	128	-	-
%GMMwh		-	-	58	58	-	34	-	-
Marketing cost/Qt.		-	-	55.4	55.4	-	55.4	-	-
				166.					
NMMwh		-	-	6	166.6	-	72.6	-	-
%NMMwh		-	-	2	30.3	-	2	-	-
Cooperatives	Price/quintal	450	-	-	-	-	-	-	-

	GM/quintal	240	-	-	-	-	-	-	-
	%GMMcop	53	-	-	-	-	-	-	-
	Marketing								
	cost/Qt.	78	-	-	-	-	-	-	-
	NMMcop	162	-	-	-	-	-	-	-
	%NMMcop	32.4	-	-	-	-	-	-	-
<hr/>									
Rural									
retailers	Price/quintal	500	500	500	-	-	-	500	-
	GM/quintal	50	250	118	-	-	-	246	-
	%GMMrret	10	50	24	-	-	-	49	-
	Marketing								
	cost/Qt.	47	47	47	-	-	-	47	-
	NMMrret	3	203	71	-	-	-	199	-
	%NMMrret	0.6	40.6	14.2	-	-	-	39.8	-
<hr/>									
Arbaminch									
Retailers	Price/quintal	-	-	-	550	500	500	-	-
	GM/quintal	-	-	-	168	246	118	-	-
	%GMMaret	-	-	-	31	49	24	-	-
	Marketing								
	cost/Qt.	-	-	-	47	47	47	-	-
	NMMaret	-	-	-	121	199	71	-	-
	%NMMaret	-	-	-	22	39.8	14.2	-	-
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%TGMM		58	50	68	71	70	70	70	0
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%GMMp		42	50	32	29	30	30	30	100
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Source: Own computation from survey result, 2016

#### 4.4. Factors Affecting Mango Market Supply

According to the result of this study, all sample producer households are good suppliers of the mango to the market. Analysis of factors affecting farm level marketable supply of mango was found to be important to identify factors constraining mango supply to market. The numbers of sample mango producers

were 204. Multiple linear regression model was employed to identify the factors that determines the supply of mango to the market. Of the total mango supplied by sample producers 62.8%, 24.5%, 8.5%, 2.4% 1.7% were sold to collectors, cooperatives, wholesalers, retailers and consumers, respectively.

Twelve explanatory variables were hypothesized to determine the household level marketable supply of mango. Out of the 12 explanatory variables used for the analysis seven of them were found to significantly affect mango supply at different significant levels. These are distance to the nearest market, number of mango trees, experience in mango production, marketing experience, ownership of transport, extension contact, and market information access.

For the parameter estimates to be efficient, unbiased and consistent the assumptions of Classical Linear Regression (CLR) model should hold true. Hence, multicollinearity, heteroscedasticity and omitted variable detection tests were performed using appropriate test statistics of variance inflation factor, Breusch-Pagan test and Ramsey test applied, respectively.

**Multicollinearity test:** Variance inflation factor (VIF) and Contingency coefficient (CC) were employed to test the existence of multicollinearity problem among continuous explanatory variables and dummy variables respectively. As a rule of thumb, if the VIF of an explanatory variable exceeds 10 it is said to be highly collinear. But, in this case the value of VIF for all variables was in the ranges of 1.09 to 1.53 As a result, multicollinearity was not a problem among the hypothesized continuous and dummy variables (See appendix table 2). The result of the contingency coefficient indicates the absence of multicollinearity problem among the explanatory dummy variables (See appendix table 3).

**Heteroscedasticity test:** Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was used to detect heteroscedasticity. Since Prob> chi2=0.0000 is significant which indicated that, there is no constant variance of error terms. As a result, it was possible to conclude that there was a problem of heteroscedasticity in the data (See appendix table 4). Therefore, robust command in STATA was applied to correct the

heteroscedasticity problem. Robust the standard error was used to obtain the estimates with smallest possible standard errors since heteroscedasticity causes standard errors to be biased.

As described in Table 14, the results of the multiple linear regression model showed seven explanatory variables found significantly in affecting mango market supply of farm households. Six explanatory variables; experience in mango production, marketing experience, ownership of transport, extension contact, number of mango trees and market information access were positively and significantly affected market supply of mango whereas distance to the nearest market affected negatively and significantly. In addition, the Prob. > F = 0.000 means that the entire model is fit and the  $R^2 = 0.774$  means 77.4% of the variation in the supply of mango to market is explained by the independent variables.

**Table 14.** Model output of multiple linear regression for factor affecting market supply

Variable	Coef.	Robust Std. Err.	t	P>t
SEX	4.180	4.024	1.04	0.300
FAMSIZE	-0.279	0.534	-0.52	0.602
EDUCATN	-0.596	0.827	-0.72	0.472
DISTNMKT	-3.497**	1.445	-2.42	0.016
EXPRMPRD	0.949**	0.407	2.33	0.021
MRKTEXP	1.742***	0.587	2.97	0.003
NMTREES	1.149***	0.327	3.52	0.001
OWNTRANS	27.309***	8.132	3.36	0.001
COOPMEM	-3.858	3.443	-1.12	0.264
ACCSCRDT	6.972	5.402	1.29	0.198
EXTENSION	3.990**	2.013	1.98	0.049
MKTINFO	14.763**	6.534	2.26	0.025
CONSTANT	-25.709	11.701	-2.20	0.029
R <sup>2</sup>	77.40			
F	49.89***			
Prob> F	0.0000			
N	204			

Note: Dependent variable is quantity of mango supplied to the market in quintal. \*\*\*, \*\* and \* are statistically significant at 1%, 5% and 10%, respectively.

Source: Own computation from survey result, 2016

**Distance to the nearest market (DISTNMKT):** It affected mango market supply negatively and significantly at less than 5% significance level. The result shows that as distance to the district market increases by one hour the amount of mango supplied to the market decreased by 3.49 quintals, *other things remaining constant*. This is due to the reason that as the distance to the market center increases, cost of transportation increases, and other marketing expenses also increased as a result

quantity of mango supplied to the market decreased. This result is in line with findings of Ayelech (2011) who depicted that as the distance to the market center increases transportation and other marketing costs also increased as a result the avocado market supply decreased.

**Experience of mango production (EXPRMPRD):** As hypothesized, the regression result shows that experience of mango production positively and significantly affected mango quantity supplied to the market at less than 5% significance level. The result also implied that other variable remained the same, experience of mango production increased by one year the quantity of mango supplied to market increased by 0.95 quintals. Producers experience in mango production plays a vital role in producing quality mango. Those farmers who are more experienced were better in doing good agronomic practice, good harvesting and post-harvest handling, controlling pest and disease, and their loss is low so that they supplied more to the market. This agrees with the findings of Derib *et al.* (2014) who illustrated an increase of farmer's experience in avocado production by one year, the quantity supplied to market increased by 0.24 quintals. Similarly, the findings of Ayelech (2011) indicated that when experience increased by one year the amount of avocado supply increased by 5.98 quintals.

**Marketing experience (MRKTEXP):** It is positively associated with the value of marketed supply of mango and statistically significant at less than 1%. The positive sign of marketing experience implied that, when mango producer marketing experience increased by one year the amount of mango supplied to the market increased by 1.74 quintals, *ceteris paribus*. This result is in line with the findings of Geoffrey *et al.* (2014) who indicated that marketing experience statistically influencing positively and significantly the extent of market participation which is an increase in a farmers marketing experience by one year increase the proportion of pineapple sale by 0.0098.

**Number of bearing mango trees (NMTREES):** This variable affected the supply of mango to market positively and significantly at less 1%. The result revealed that

those producers who owned large number of bearing mango trees their mango supply to the market increased by 1.15 quintals. This result is in line with the findings of Davis (2015) who indicated that producers with large number of mango trees were more likely supply 0.159 quintal to the market since the product is perishable.

**Ownership of transport (OWNTRANS):** It affected supply of mango positively and significantly at less than 1% of significance level. The result indicated that those households who owned transport their mango market supply increased by 27.30 quintals, keeping other variables constant. This is due to the fact that transport ownership plays vital role in reducing transportation costs as well as farmers who have transport can go distant market and choose more than one market to sell their produce, supply more and so be able to achieve higher price. This is in line with the findings of Takele *et al.* (2017) who indicated that owning transport significantly and positively affected at less than 1% and increased the probability of producer's participation by 0.637% and quantity of mango supply conditional on decision to participate increased by 118.1%.

**Extension contact (EXTENSION):** It affected mango market supply positively and significantly at less than 5 % significance level. If producer's extension contact increased by a unit producer's quantity supply to the market increased by 3.99 quintals, *ceteris paribus*. This is due to the fact that the more producers obtained extension service frequently in agronomic practice, harvesting, post-harvest management, and marketing their production improved and post-harvest loss reduced and so that they supplied more quantity of mango to the market. This result is in line with the findings of Nega *et al.* (2015) and Ayelech (2011) who indicated that if a mango producer gets extension contact the amount of mango supplied to the market increased by 0.522 and 9.595 quintals, respectively.

**Market information access (MKTINFO):** It is positively associated with the value of marketed supply of mango and statistically significant at less than 5%. The positive sign of market information access implied that, if mango producer gets market information the amount of mango supplied to the market increased by 14.76 quintals,

*ceteris paribus*. This result is in line with the findings of Nega *et al.* (2015) who indicated that farmers who have market information can supply 0.125 quintal than those who do not have market information access, other things remaining constant. Similarly, Derib *et al.* (2014) who indicated that the better information farmers have about the products marketing, the higher would be their participation level and avocado supply level increased by 3.21 quintals.

### **3.1. Factors affecting mango producers Market Outlet Choices**

The model results in Table 15 showed the choice set in the MVP model includes five outlet choices; which were wholesales, collectors, cooperatives, retailers and consumer outlets. The samples were drawn 5 times because, maximum likelihood (ML) estimators was computed from the parameters estimated as of the samples drawn. The matrix rho21, rho31, rho41, rho51, rho32, rho42, rho52, rho43, rho53, rho54 were represented the correlation coefficient matrix between collectors and wholesalers, cooperatives and wholesalers, retailers and wholesalers, consumers and wholesalers, cooperatives and collectors, retailers and collectors, consumers and collectors, retailers and cooperatives, consumers and cooperatives, consumers and retailers, respectively. The likelihood ratio test result indicated that, the correlation coefficients are statistically different from zero in 1 of the 10 cases, confirming the appropriateness of the multivariate probit specification and outlet choices are mutually interdependent. The Wald  $\chi^2$  test value of 152.25 which is significant at 1% significance level indicated that separate estimation of choice of these outlets is biased and the decisions to choose the five outlets were interdependent.

The log likelihood ratio tests are jointly zero and the five outlet choice decisions are independent was rejected at the 1% level. The ML estimation results suggested that there was a negative and significant interdependence between household decisions to choose wholesalers and collectors at less than 5 % significance level, and collectors and cooperatives; and cooperatives and retailers outlet choice were also negatively and significantly interdependent at less than 1% significance level; whereas collectors and retailers and wholesalers were positively and significantly



interdependent at less than 1% and 5%, respectively but not between wholesalers and cooperatives ;collectors and consumers; wholesalers and retailers; cooperatives and consumers; and retailers and consumers.

The choice of collector's outlet was significantly decrease the choice of wholesalers' and cooperatives outlets; and the choice of cooperatives as significantly decrease the choice of retailers since the households' decision to choose one type of outlet reduces choice of the other outlets. On the other hand, the choice of wholesalers and collectors positively and significantly affects the choice of retailers and consumer's outlets, respectively.

The outlet choice of wholesalers was influenced by family size of the household head, quantity of mango produce, marketing experience, membership in cooperative, selling price and extension contact. The predicted probabilities of household's wholesaler outlet was 14 %. This result was relatively lower than the probability of choosing collectors, cooperatives, retailers and consumers outlet choices. This was due to the fact that wholesalers were purchase high amount from collectors in the woreda and kebele market than from producers. Hence, they face constraints to sell mango immediately to wholesalers. This result is in line with Takele *et al.* (2017) who indicated that the probability of choosing wholesalers outlet is influenced by household family size, distance to nearest market, price and quantity of mango produced.

Age of the household head, credit access, selling price and market information access were significant determinants of the collectors' outlet choice. The predicted probability of choosing collectors outlet was 69% relatively highest outlet choice. This was due to fact that collectors were available near to producers, bought at premium price and in large quantity than others. This is in line with the findings of Takele *et al.* (2017) who illustrated that probability of choosing collector market outlet was determined by the family size, distance to the nearest market, quantity of mango produced, price and access to non-farm income.

Cooperatives outlet choice was influenced by education of the household head,

cooperative members and selling price. The predicted probability of choosing cooperatives outlet was 32%. This result is in line with Charity *et al.* (2015) who indicated that the education level of the household, trust level and transport cost affects choosing of mango produce market group.

Distance to nearest market, experience of mango production, ownership of transport, credit access and extension contact were the significant factors which influenced the retailer's outlet choice. The predicted probability of choosing retailers outlet was 16%. This is also in line with the findings of Takele *et al.* (2017) who indicated that the retailer's outlet choice is influenced by quantity of mango produced and price. Consumers market outlet was also significantly affected by age, education, sex of the household, and membership in cooperative. The probability of households choosing consumers outlet was 19%.

The joint probability of success or choosing five outlets was only 4.86%. It was unlikely for households to choose all five outlets simultaneously. This was due the fact that all the five outlet choices were not simultaneously accessible in the study district by the mango producers. Besides, the five outlet choices were competitive. However, the joint probability of failure or not to choose all outlets was 0.03%, which means that the households were less likely to fail.

**Table 15.** Model outputs of multivariate probit for determinants of outlet choices

Variable	Wholesalers (1)		Collectors (2)		Cooperatives (3)		Retailers (4)		Consumers (5)	
	Coef.	S.E	Coef.	S.E	Coef.	S.E	Coef.	S.E	Coef.	S.E
AGE	0.012	0.013	-0.018*	0.009	0.008	0.009	0.008	0.009	-0.016*	0.009
EDUCATN	0.141	0.112	-0.082	0.088	0.267***	0.088	0.048	0.085	-0.21***	0.102
FAMSIZE	0.148***	0.053	-0.033	0.038	0.043	0.038	0.011	0.045	-0.002	0.039
SEX	-0.025	0.378	0.201	0.289	-0.400	0.289	0.647	0.413	-0.466*	0.262
DISTNMKT	0.137	0.104	0.078	0.082	-0.030	0.082	0.145*	0.076	-0.041	0.080
QPRODUCT	-0.004**	0.002	0.001	0.001	-0.001	0.001	-0.0007	0.002	-0.001	0.002
EXPRMPRD	0.017	0.031	0.012	0.023	-0.015	0.023	0.069***	0.026	0.020	0.023
MRKTEXP	0.074*	0.039	-0.0005	0.031	-0.003	0.031	0.003	0.031	0.008	0.032
OWNTRANS	-0.170	0.500	0.0204	0.325	-0.305	0.325	0.760***	0.359	-0.678	0.438
COOPMEM	-0.76***	0.302	0.181	0.227	0.649***	0.227	-0.144	0.247	0.559***	0.225
ACCSCRDT	0.182	0.411	-0.703*	0.307	0.245	0.307	-0.63***	0.281	-0.082	0.331
PRICE	-0.015**	0.007	-0.02***	0.006	0.028***	0.006	0.001	0.006	0.001	0.005
EXTENSION	-0.306*	0.163	0.179	0.128	-0.114	0.128	0.278***	0.133	0.094	0.128
MKTINFO	-0.388	0.342	-0.691*	0.270	0.254	0.270	0.236	0.419	0.212	0.347
_CONS	-0.724	1.837	6.036	1.633	-6.751	1.633	-4.030	1.649	0.096	1.418
rho21	-0.278									
rho31	-0.042									
rho41	.0157									
rho51	0.417									
rho32	-0.872									
rho42	0.706									
rho52	0.098									
rho43	-0.603									
rho53	-0.118									
rho54	0.039									
Predicted probabilities	0.14		0.69		0.32		0.16		0.19	
Joint probability (success)	0.04861									
Joint	0.00033									

probability  
(failure)  
N = 204  
Number of simulation (draws) = 5  
Log likelihood = -370.98389 of fitted model  
Wald chi2(70) = 152.25  
Likelihood ratio test of rho21=rho31=rho41 =rho51=rho32=rho42=rho52=rho43=rho53=rho54=0; Chi2(10) =  
127.717  
Prob> chi2 = 0.0000

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\*\*\*, \*\* and \* are statistically significant at 1%, 5% and 10%, respectively.

Source: Own computation from survey result, 2016.

## 4. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 4.1. Summary and Conclusions

Mango (*Mangifera indica* L.) is a fleshy stone fruit belonging to the genus *Mangifera*, consisting of numerous tropical fruiting trees in the flowering plant family *Anacardiaceae*. It is grown throughout the tropics, and subtropics of the world and also considered to be the king of fruits due to wide ecological range, delicious taste, excellent flavor, very high nutritive and medicinal value as well as great religio-historical significance (Yigzaw *et al.*, 2014). The specific objectives of this study were identifying the major mango value chain actors and their roles in the study area; quantifying costs and margins for key mango value chain actors; identifying factors affecting market supply, and identifying producers' outlet choices and its determinants.

The data were collected from both primary and secondary sources. The primary data were collected from 204 sample producers, 24 traders, and 30 consumers and analyzed by descriptive statistics, value chain mapping, marketing margin, multiple linear regression and multivariate probit model with the application of appropriate statistical procedures.

The result indicates, of the total 204 interviewed mango producing households, 85.3% were male headed and the remaining 14.7% were female-headed households. The mean age of sample household heads was 53.5 years. The average family size of sample households was 7.7. From the total sample 27.5% of household heads were illiterate while the remaining 72.5 % of the sampled households had different level of education which ranges from read and write up to 12 completions. The average number of mango tree per household was 26.92 trees. The total mango produced by sampled households and its mean was 18,243.72 quintals and 89.43 quintals respectively. Out of the total quantity produced 11,785 quintals (64.5%) was supplied to the market, 5,720 quintals (31.2%) was wasted and the rest 784 quintals (4.3%) was consumed at home.

The main value chain actors were seedling suppliers, mango producers, collectors,

wholesalers, cooperatives, retailers, and consumers. Collectors engaged in purchasing mango from producers and sell to wholesalers at similar district market. Wholesalers purchase mango from producers and collectors and sell to retailers and other wholesalers outside the study woreda. Cooperatives purchase mango from producers and sell it to processors, union and retailers. Retailers purchase mango from producers, collectors, cooperatives, and wholesalers and sell to consumers. The main identified support services were Agriculture and Rural Development Office of Arbaminch zuriya woreda, cooperative promotion office, trade and industry office, Arbaminch plant health clinic and Arbaminch agricultural research center.

Mango producers incurred a total cost of 68.21 birr per quintal of which 14.66% were costs of production and the remained 85.34% were marketing costs. Cooperatives were incurred the highest total cost (78 birr per quintal) than other actors. The total gross marketing margin of traders (TGMM) was in channel IV, V, VI, VII, III I, and II which were 71 %, 70 %, 70%, 70%, 68%, 58 % and 50%, respectively. Wholesalers have got the highest gross marketing margin in channel III and IV which is 58% since they were sold without transportation cost at collection center. In the contrary, rural retailers have got the lowest marketing margin in channel I which is 10% because they purchase and sell mainly at the rural market with minimum difference in price, in which they faced high competition with wholesalers and collectors. Without considering that channel GMMp was better in channel II and I which were 50% and 42%, respectively. But, it was lowest in channel IV which was 29% for the reason that there were a number of actors involved in the market channel. As a result, the shares of producers diminished.

The result of multiple linear regression model indicated that, market supply of mango was significantly and positively affected by experience in mango production, marketing experience, number of mango trees, ownership of transport, extension contact, and market information access. Whereas distance to nearest market affected supply negatively. About 77.4% of the variation in the dependent variable is explained by the independent variable. Therefore, these variables require special

attention if marketable supply is to be increased.

Multivariate probit model was used to identify determinants of producers' market outlet choice decisions since, outlet decisions were interdependent. The outlet choice of wholesalers was influenced by family size of the household head, quantity of mango produce, marketing experience, membership in cooperative, average selling price and extension contact. The predicted probabilities of household's wholesaler outlet was 14%. This result was relatively lower than the probability of choosing collectors, cooperatives, retailers and consumers outlet choices. Age of the household head, credit access, average selling price and market information access were significant determinants of the collectors' outlet choice. The predicted probability of choosing collectors outlet was 69% relatively highest outlet choice. Cooperatives outlet choice was influenced by education of the household head, cooperative members and average selling price. The predicted probability of choosing cooperatives outlet was 32%. Distance to nearest market, experience in mango production, ownership of transport, credit access and extension contact significantly influenced the retailer's outlet choice. The predicted probability of choosing retailers outlet was 16%. Consumers market outlet was also significantly affected by age, education, sex of the household, and membership in cooperative. The probabilities of households choosing consumers outlet was 19%.

The joint probability of success or choosing five outlets was only 4.86%. It was unlikely for households to choose all five outlets simultaneously. This was due to the fact that all the five outlet choices were not simultaneously accessible in the study district by the producer producers. Besides, the five outlet choices were competitive. However, the joint probability of failure or not to choose all outlets was 0.03%, mean that the households were less likely to fail.

#### **4.2. Recommendations**

Based on the findings of the study, the following recommendations are suggested to be considered by Governmental and Non-Governmental Organizations, producers and other stakeholders in their future intervention strategies aimed at providing the

development of mango value chain in the study area in particular and other areas with similar setting.

The study indicated that there is a high difference between producers' price and retail price in mango marketing resulting in to low gross margin of producers. But, producers are doing all works of mango production bearing other associated risks. Therefore, more effort should require by governmental institutions to reinforce market intelligence in all actors by collecting market information and disseminate the daily prices at all levels of the marketing chains and locations.

The result of multiple linear regression analysis indicated that mango supply to the market was positively and significantly affected by experience in mango production, marketing experience, number of mango trees, ownership of transport, extension contact and market information access. Therefore, these factors should be promoted in order to increase the amount of mango marketable supply. Improving mango seedling supply system, capacitating farmer's knowledge and skill on mango production and management, post-harvest handling practices, introducing improved harvesting tools and technologies, renewing old mango trees by top working, and controlling disease and pest by promoting integrated pest and disease management practices should be promoted to increase mango marketable supply. In addition, improving transportation system, creating awareness on credit and saving, and linking producers with microfinance institutional and banks. Furthermore, assisting and strengthening cooperatives, capacitating cooperatives leaders through trainings and close monitoring, linking cooperatives with union and financial institutions would increase mango marketable supply.

On the other hand, mango marketable supply was significantly and negatively affected by distance to nearest market. Therefore, these factors should be promoted to increase the marketable supply of mango. Enhancing knowledge and skill of producer family members by giving training and awareness creation on production and marketing, and reducing wastage by promoting better harvesting and post-harvest handling. In addition to that, improving road infrastructure, establishing



collection center and cold storage, cold transport and market centers near to the producer's area increases marketable supply of mango to the market.

Regarding to the market channel choices, the collector's outlet choice was highly chosen by producers so that intervention is needed to strengthen the linkage between producers and collectors, assist collectors to add value on the product, legalizing illegal collectors, there is a need to strengthening and promoting producers' adequate extension services, creating access to logistics and cold transportation system, and creating strong market linkage with agro processing industries. In addition, based on the findings of this study, some relevant implications can be drawn that can assist to design appropriate intervention mechanisms to improve market outlets choice of mango producers in the study area. Interventions intended at reducing transaction costs through rural infrastructure investment in the form of establishing all weather road, improving producers skill on production, harvesting and post-harvest handling of mango, encouraging producers to add value on the product, introducing new innovative technologies, improving market information delivery system in order to avoid information asymmetry, improving smallholder farmers access to credit through strengthening rural micro finance and encouraging membership in cooperatives are vital area of intervention that would assist farmers to choose the more rewarding market outlets.

Finally, there is a need to further research on mango value addition, processing and market integration by research institutions, universities, NGOs and other stakeholders. Additionally, promoting private-public partnerships and bringing various stakeholders together through different forums (Value chain actor's consultative workshops) would strengthen the linkages and improve information flow along the chain.

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## 7. APPENDICES

## I. Appendix Tables

**Appendix Table 1.** Statistical results of one sample t-tests for continuous variables

<b>Total(N=204)</b>			
<b>Variables</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>t-value</b>
Age(Years)	53.5	13.6	56.3***
Family size(Number)	7.7	2.8	39.4***
Education of the HH (Years of schooling)	2.7	1.7	22.7***
Distance to nearest market (Hours)	2.3	1.4	24.2***
Mango production(Quintal)	89.4	71.9	17.7***
Number of trees(Number)	24.2	21.8	15.8***
Mango production experience(Years)	13	4.5	41.0***
Marketing experience(Years)	12	4.5	37.7***
Price(Birr)	176	21.4	117.9***
Extension contact (Number of contact)	1.8	0.9	28.2***

Note: \*\*\* is statistically significant at 1% significance level.

Source: Own computation from survey result, 2016

**Appendix Table 2.** VIF for continuous variables included in the MLR model

<b>Variables</b>	<b>VIF</b>	<b>1/VIF</b>
Family size	1.09	0.91
Education of the household	1.20	0.83
Distance to nearest market	1.28	0.78
Number of mango trees	1.46	0.68
Mango production experience	1.16	0.86
Marketing experience	1.53	0.65
Extension contact	1.20	0.83
Mean VIF	1.27	

Source: Own computation from survey result, 2016

**Appendix Table 3.** Contingency Coefficient test for dummy variables included in the MLR model

	Sex	Membership in cooperative	Credit access	Market information	Transport ownership
Sex	1.0000				
Membership in cooperative	0.0542	1.0000			
Credit access	0.1491	0.0223	1.0000		
Market information	-0.0757	0.0743	0.2711	1.0000	
Transport ownership	0.1909	0.1242	0.1242	0.1007	1.0000

Source: Own computation from survey result, 2016

**Appendix Table 4.** Breusch-Pagan/ Cook-Weinsberg Test for Heteroscedasticity test of MLR model

Ho: Constant Variance
Variable: fitted values of MKT supply
Chi2(1) =132.36
Prob>chi2=0.0000

Source: Own computation from survey result, 2016

**Appendix Table 5.** Ramsey RESET test for Omitted variable test of MLR model

Ho: model has no omitted variables
F(3,187)=9.31
Prob>F=0.0000

Source: Own computation from survey result, 2016



**Appendix Table 6:** Error covariance matrix and correlations of the MVP model

Correlation	Coef.	Std. Err.	z	P>z
/atrho21	-.2856347	.1425875	-2.00	0.045**
/atrho31	-.0427563	.135758	-0.31	0.753
/atrho41	.1587899	.1578564	1.01	0.314
/atrho51	.4441061	.1601249	2.77	0.006***
/atrho32	-1.342271	.1919767	-6.99	0.000***
/atrho42	.8794051	.1917753	4.59	0.000***
/atrho52	.0983946	.1151377	0.85	0.393
/atrho43	-.6985975	.2090045	-3.34	0.001***
/atrho53	-.1188556	.1339289	-0.89	0.375
/atrho54	.0397001	.1391298	0.29	0.775
rho21	-.2781121	.1315589	-2.11	0.035**
rho31	-.0427303	.1355101	-0.32	0.753
rho41	.1574686	.1539421	1.02	0.306
rho51	.4170422	.1322753	3.15	0.002***
rho32	-.8722166	.0459282	-18.99	0.000***
rho42	.7061212	.0961548	7.34	0.000***
rho52	.0980783	.1140301	0.86	0.390
rho43	-.6034768	.1328884	-4.54	0.000***
rho53	-.1182991	.1320546	-0.90	0.370
rho54	.0396793	.1389108	0.29	0.775

Likelihood ratio test of  $\rho_{21} = \rho_{31} = \rho_{41} = \rho_{51} = \rho_{32} = \rho_{42} = \rho_{52} = \rho_{43} = \rho_{53} = \rho_{54} = 0$ :  $\chi^2(10) = 127.717$  Prob>  $\chi^2 = 0.0000$ , \*\*\* and \*\* are statistically significant at 1%, and 5%, respectively. Source: Own computation from survey result, 2016

**Appendix Table 7:** Joint probability of success or failure (outlet choosing decision) in MVP model

<b>Variables</b>	<b>Obs</b>	<b>Mean</b>	<b>Std.Dev.</b>
Variance0s	204	0.0486142	0.059418
Variance1s	204	0.0003395	0.0013701

Source: Own computation from survey result, 2016

**Appendix Table 8:** Predicted probabilities of choosing the outlet choice

<b>Variables</b>	<b>Obs</b>	<b>Mean</b>	<b>Std.Dev.</b>
Variance1	204	0.148	0.148
Variance2	204	0.69	0.21
Variance3	204	0.32	0.22
Variance4	204	0.16	0.12
Variance5	204	0.19	0.12

Source: Own computation from survey result, 2016

## **II. Appendix Interview schedules**

### **A. Producers' Interview Schedule**

#### **General instruction to Enumerators**

- ✓ Make brief introduction before starting any question, introduce yourself to the farmers and make clear the objective of the study
- ✓ Avoid arrogance and over action
- ✓ Name of the respondent is kept confidential
- ✓ Please fill the interview schedule according to the farmer's reply (do not put your own feeling).
- ✓ Please ask each question clearly and patiently until the farmer gets your points.
- ✓ Please do not use jargon and ambiguous words and do not forget local units.
- ✓ During the process write answers on the space provided (for close ended questions use "✓" to pick up the answer)
- ✓ Prove that all the questions are asked and the interview schedule format is

properly completed

- ✓ Do not forget to thank the interviewee when you finish

**Objectives of the study**

- To identify mango value chain actors, their functions and to analyze benefit distribution among actors in mango value chain;
- To analyze the determinants of mango supply to the market in the study areas ;
- To identify factors affecting outlet choice decisions of mango producers.

Questionnaire serial No. \_\_\_\_\_

**I. Demographic information**

1. Name of Zone:.....Woreda: .....Kebele: -----Gote:-----

2. Age of the respondent : [ \_\_\_\_\_ ] years

3. Family size:[ \_\_\_\_\_ ]

4. Sex of the respondent (✓): 1. [    ] male                    2. [    ] female

5. Educational status(✓):

No formal education (1)	1-4 grade (2)	5-8 grade (3)	9-12 grade(4)	Certificate(5)	Diploma(6)	Degree (7)

6. Marital status:

Single (1)	Married(2)	Widowed (3)	Divorced (4)

7. Occupation:

Farmer (1)	Trader (2)	Employed (3)	Others, specify (4)

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## II. Area Information

8. Distance of your residence from the nearest market center \_\_\_\_\_ Km or \_\_\_\_\_ walking time (minutes/hrs).
9. Distance of your residence from the extension center \_\_\_\_\_ Km or \_\_\_\_\_ walking time (minutes/hrs).
10. Distance to all weather road \_\_\_\_\_ Km or \_\_\_\_\_ hours walk.

## III. Production Aspects

11. What is your livelihood system?

Farming(1)	Trading(2)	Government worker(3)	Non-government worker (4)	Others, specify (5)

12. If your answer for question number 11 is farming, what kind of farming system do you use? Tick the appropriate one!

Crop-livestock production (1)	Only crop(2)	Only livestock(3)	Others, specify(4)

13. Mention livestock animals under your production system?

Livestock animals	Types/description(Number)	Estimated Annual income (in birr)	Rank (from greater to lowest)
Cattle (1)			
Small ruminant(2)			
Poultry (3)			
Others, specify (4)			



**14. Mention all types of crops produced in your production system**

Crops	Types/description(number)	Yield in quintals	Annual income (in birr)	Rank (from greater to lowest)
Cereals(1)				
Fruits (2)				
Vegetables (3)				
Legumes (4)				
Others, specify(5)				

15.

Which fruits are your major means of income (put in rank)?

	Banana	Mango	Papaya	Avocado	Orange	Others, specify
Rank						

16. If you produce mango, what production system do you use to produce mango?

Sole planting (1)	Intercropping (2)	Backyard garden(3)	Others, specify(4)

17. Number of mango trees owned?.....

18. How many quintals of mango produced per year and for what purpose do you produce mango?

Production in quintal (1)	Purpose of production		
	Sold in quintal(2)	Consumed in quintal(3)	Post-harvest loss in quintal (4)

19. How long have you practiced production of mango? \_\_\_\_\_years

#### IV. Inputs and Source of Inputs

20. What kind of variety you used to produce mango? (Type of Mango variety used)(please tick(✓)in the box)			21. From where do you get mango variety for your production?(Source of the variety)(please tick(✓) in a box and multiple response is possible)					
Local variety (1)	Improved variety(2)	Both (3)	Own(1)	Gov.(2)	Private (3)	NGOs (4)	Research centers(5)	Other (6)

22. What kind of inputs do you use to produce mango (Please circle the response;

multiple response is possible)?

1. Fertilizer 2. Compost 3. Farm yard manure 4. Others, specify

23. From where do you get these inputs for mango production) (Please tick in a box (✓); multiple responses are possible)?

Extension center(1)	Market(2)	Agricultural research center(3)	Own stock(4)	Other farmers(5)	Private input suppliers(6)	Others, specify(7)

24. What type of planting material do you use to produce mango?

1. Local material 2. Improved material 3. Both

25. What local materials do you use to produce mango?

\_\_\_\_\_

26. What improved materials do you use to produce mango?

\_\_\_\_\_

27. What is your source of labor for production, and harvesting?(Please tick in a box (✓); multiple responses are possible)?

Family labor(1)	Hired labor(2)	Labor exchange(3)	Cooperation(4)	Others, specify(5)

28. What is the number of bearing and non-bearing mango trees?

Type of mango tree	Quantity in number	Average production per tree(Kg/quintals)
Bearing (1)		
Non-bearing (2)		

## V. Access to Services

29. Do you have access to extension service regarding mango production and

value chain? (✓)

1. [ ] Yes                      2. [ ] No

30. If yes, how often the extension agent contacted you specifically for mango production and marketing purpose in the year 2015?

1. Weekly      2. Once in two week   3. Monthly      4. Twice in a year      5. Once in a year  
6. Any time I ask them

31. If your response for question number 29 is yes, what kind of services do they provide to you? (Please tick in a box (✓); multiple responses are possible)

Seed bed preparation	Fertilizer/compost application	Harvesting	Grafting	Transplanting	Marketing of mango	Post-harvest handling	Others, specify

32. Do you have access to credit? (✓)    1. [ ] Yes                      2. [ ] No

33. If your answer for question number 32 is yes, what are the sources of credit? (Please tick in a box (✓); multiple responses are possible)

Relatives	Bank	Micro finance	Friends	Traders	NGOs	Venture capital	Credit and saving coop	Others, specify

34. If your answer for question number 32 is yes, did you receive credit for mango production in 2015 cropping season? (✓)    1. [ ] Yes      2. [ ] No

35. If your answer for question number 34 is Yes, for what purpose did you receive credit? (Please tick in a box (✓); multiple responses are possible)?

To purchase fertilizer for mango	
To rent in land to extend mango production	
To purchase seed/seedling of mango	

To purchase transporting means	
Others, specify	

36. Are there organizations/institutions which provide technical services on mango production? (✓) 1. [ ] Yes 2. [ ] No

37. If your response for question number 36 is yes, what kind of organizations are they?

1. Governmental organizations 2. Non-governmental organizations 3. Both

38. If your response for question number 36 is Yes, what kind of services do you get from these organizations (Please tick in a box (✓); multiple responses are possible)?

1. Training 2. Input supply 3. Supportive supervision/technical support 4. All

39. Have you ever participated in mango production, harvesting, post harvest management and marketing trainings in the last three years? (✓) 1. [ ] Yes 2. [ ] No

40. If your answer for Q.39 is No, why? .....

41. If your answer for Q.39 is Yes, on which aspects, by whom and for how long you have got the training?

No	Training type	By whom 1= Agriculture and natural resource development office 2= NGOs 3=Relative farmers 4=Research centers 5=Cooperative office	How long (days)	Year(1=2014,2=2015,3=2016)
1	Mango production and agronomic practice			
2	Grafting and top working			
3	Pest and disease			

	management			
4	Pre and post harvest handling and management (Sorting and grading, transportation, system, packaging(Value addition))			
5	Mango marketing			

42. Was the training you get easily understandable and practicable? (✓) 1.  Yes 2.  No

43. Could you able to employ the new knowledge you acquired? (✓) 1.  Yes 2.  No

44. If your answer for Q.43is yes, what? \_\_\_\_\_

45. If your answer for Q.43is No, why? .....

## VI. Harvesting of mango

46. At what time/season do you harvest mango?

1] September-November 2] December- February 3] March-May 4] June-August

47. How do you make decision as to when to harvest the mango in 2015?

1. Maturity 2. Market price 3. Fear of theft 4. Others (specify).....

48. At what stage do you harvest your mango produce? (Please tick in a box (✓); multiple responses are possible)

Harvesting fully ripe mango	
Harvesting partially ripen mango	
Harvesting unripe mango	
All type (Mixed)	

49. How do you harvest mango (Please circle the choice; multiple responses are possible)? \_\_\_\_\_

1. Hand picking 2. Cut by scissors 3. Using sticks 4. Shaking branches  
5. All 6. Others

50. How many times do you harvest mango in one year (1=once,2=twice,3=three times) \_\_\_\_\_?

51. How much cost do you incur to produce a one quintal of mango? \_\_\_\_\_ birr

52. What are the major constraints of mango production in the area?

Problems	Severity (Tick the appropriate)				What are the solution (say something)
	1=Low	2=Medium	3=High	4=Very high	
Harvesting and post-harvest handling					
Pests and diseases					
Limited research and development					
Lack of irrigation					
Lack of improved mango varieties					
Birds and predators					
Theft					
De fruiting/aborting					
Others, specify					

### VII. Marketing Aspect

53. Do you sell your mango product? (✓)

1.  Yes                      2.  No

54. If your response for question number 53 is yes, what amount of mango do you supply to the market? \_\_\_\_\_ quintals

55. How long did you participate in mango marketing? \_\_\_\_\_ years

56. Do you have access to roads? (✓) 1.  Yes    2.  No

57. If yes, what kind of road? \_\_\_\_\_?

58. Do you have access to market? (✓) 1.  Yes                      2.  No

59. If your response for question number 58 is Yes, what is place of market for selling mango?

1. Farm gate    2. Local market    3. Town    4. Road side    5. Others,  
specify

60. What is your source of labor for sorting and grading, marketing, etc ?(Please tick in a box (✓); multiple responses are possible)?

Family labor (1)	Hired labor (2)	Labor exchange(3)	Cooperation (4)	Others, specify (5)

61. Do you have your own transportation means? (✓) 1. [ ] Yes    2. [ ] No

62. What kind of transportation means do you use to deliver mango to the market?

1. Donkey    2. Cart    3. Human back    4. Vehicle    5. Others,  
specify

63. What kind of packing material do you use to pack your mango produce?

1.                    Basket    2. Can    3. Plastic box    4. Wooden box  
5. Others, specify

64. Do you have long standing relationship with traders? (✓) 1. [ ] Yes    2. [ ]  
No

65. If your answer to question number 64 yes, with which traders? (Please circle the  
choice; multiple responses are possible)

1. Wholesalers    2. Collectors    3. Retailers    4. Processors    5. Consumers  
6. Cooperatives    7. Others, specify

66. Are you a member of any organization (cooperative)? (✓) 1. [ ] Yes    2. [ ]  
No

67. If your answer for question number 66 is Yes, what is the name of the  
organization? \_\_\_\_\_

68. To whom do you sell your mango product? (Please fill the multiple responses  
are possible)

	Wholesalers (1)	Retailers( 2)	Cooperative s(3)	Collecto rs (4)	Processor s(5)	Consumer s(6)
Quanti ty suppli						



ed in quintal						
Selling price per quintal						

69. What general problem do you experience during transporting your produce? (Please tick in the box ; multiple responses are possible)

Lack of transport(1)	Small size of transport(2)	High transport cost (3)	Excessive post-harvest loss(4)	Others, specify

### VIII. Market information

70. Do you have access to market information? (✓) 1.  Yes 2.  No

71. If your answer for Question 70 is Yes, from whom did you get the market information? (Please tick in the box ; multiple responses are possible)

Development agents(1)	Kebele administration(2)	Woreda experts(3)	Radio(4)	Brokers(5)	From market(6)	Others, specify(7)

72. What type of information did you get? (Please tick in the box ; multiple responses are possible)

Price	Market place	Buyers	Market	Quality	Others,
-------	--------------	--------	--------	---------	---------

information(1)	information(2)	information(3)	opportunities(4)	management(5)	specify(6)

73. Did you know the market prices before you sold your fruits in 2015? (✓) 1.  Yes 2.  No

74. Do you negotiate on price in 2015?(✓) 1.  Yes 2.  No

75. Does your produce have preferred quality by buyers in 2015?(✓) 1.  Yes 2.  No

76. If no, what interventions are needed to attract better price in 2015?.....

77. Who sets your selling price for mango?

Yourself(1)	Buyers (2)	Set by demand and supply(3)	Negotiations(4)	Others, specify(5)

78. How did you sell your produce in 2015?

1. Direct to the purchaser
2. Through brokers
3. Through commission man to the purchaser
4. Others (specify).....

79. On average how long did it take you to sale your mango?

1. On the farm.....hrs/.....days
2. Village market.....hrs/.....days
3. Arbaminch market .....hrs/.....days
4. Hawassa market .....hrs/.....days
5. Addis Ababa market.....hrs/.....days
6. Other(specify).....

80. Did you face difficulty in finding buyers when you wanted to sell mango?(✓) 1.  Yes 2.  No

81. If your answer for question 80 is yes, what is the reason?

1. Inaccessibility of market 2. Lack of information 3. low price offered 4. Others(specify).....

82. What was/were problem/s created by brokers in 2015 on mango trade?

1. Took to limited client 2. Charged high brokerage fee 3. Cheating on scaling (weighing) 4. Wrong price (market) information 5. Others (specify).....

83. What are the problems of marketing in 2015? Rank horizontally

Lack of market	Low price	Lack of storage	Lack of transport	Lack of information	Perishability	Tax	Others, specify

### IX. Value addition and cost of marketing

84. Do you make value addition on your mango products before marketing? (✓)

1. [ ] Yes 2. [ ] No

85. If your answer for Question number 84 is Yes, what are those value adding activities that are doing? (Multiple response is possible)

Value adding activities	Tick the appropriate	Respective cost/kg
Grading and sorting (1=Yes,2=No)		
Ripening(1=Yes,2=No)		
Cleaning (1=Yes,2=No)		
Packaging (1=Yes,2=No)		
Standardizing (1=Yes,2=No)		
Others, specify		
Total cost		

86. At what price do you sale one kilo gram of mango? \_\_\_\_\_birr

87. What type of marketing cost do you incur during marketing your mango?(Please tick in the box ; multiple responses are possible)

Marketing costs	Tick the appropriate	Unit cost per quintal
Collection cost from tree birr/day/all trees		
Transportation cost		
Labor cost (loading and unloading)		
Material cost (packaging...)		
Brokerage fee		
Damage		
Weight loss		
Store rent		
Others, specify (value adding cost		
Total cost		

88. What amount of net income do you earn from one kilo gram of mango? \_\_\_\_  
birr/kg

### X. Post-harvest loss of mango

89. Is there problem of post-harvest loss? (✓) 1. [ ] Yes 2. [ ] No

90. If yes, how much of your mango produce is goes to loss?-----kg

91. At what stage do you face a high loss of mango?(Please tick in the box ; multiple responses are possible) and indicate/estimate if there is loss per 1 quintal along the stages from production to the nearby market

During production( 1)	During harvesting( 2)	During marketing( 3)	During packaging(4)	During transportation( 5)	Others, specify(6 )

92. What are the causes of loss?(Please tick in the box ; multiple responses are possible)

Lack of	Lack of storage	Lack of harvesting	Lack of proper packaging	Lack of transportation	Others, specify(6)

road (1)	(2)	tools(3)	materials (4)	means(5)	)

74. Do you have access to store/pack house? (✓) 1. [ ] Yes 2. [ ] No

**XI. Non-farm and off-farm activities**

93. Do you practice other fruit selling activities than mango selling? (✓)

1. [ ] Yes 2. [ ] No

94. If your answer is yes for Q 93, what type of fruit mainly trading? 1. Banana 2. Avocado 3. Papaya 4. Others (Specify).....

95. How much do you earn from such trading in a year? \_\_\_\_\_birr

96. Do you have access to non-farm income? (✓) 1. [ ] Yes 2. [ ] No

97. If your answer is Yes, what are these sources of income?

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
 98. Did you participate on Productive Safety Net programs (PSNP)? (✓) 1. [ ] Yes  
 2. [ ] No

99. Do you have access to off-farm income? (✓) 1. [ ] Yes 2. [ ] No

100. If your answer is yes, mention the organizations?  
 \_\_\_\_\_,

101. What is the role of government in facilitating mango production and marketing  
 in \_\_\_\_\_ the \_\_\_\_\_ area?  
 \_\_\_\_\_

## End of the interview

**Thank you very much for responding to the questions.**

Name of the Enumerator: \_\_\_\_\_

Date of Interview: \_\_\_\_\_

### **B. Traders' Interview Schedule**

Remark: The personal profile obtained from the respondents with regard to the study will be kept confidential and will not have any consequence on the respondent in any ways. Please give correct answers to the following questions.

#### **Instruction to Enumerators**

- ✓ Make brief introduction before starting any question, introduce yourself to the farmers and make clear the objective of the study
- ✓ Avoid arrogance and over action
- ✓ Name of the respondent is kept confidential
- ✓ Please fill the interview schedule according to the farmers reply (do not put your own feeling).
- ✓ Please ask each question clearly and patiently until the farmer gets your points.
- ✓ Please do not use jargon and ambiguous words and do not forget local units.
- ✓ During the process write answers on the space provided (for close ended questions use "✓" to pick up the answer)
- ✓ Prove that all the questions are asked and the interview schedule format is properly completed
- ✓ Do not forget to thank the interviewee when you finish

#### **Objectives of the study**

- To identify mango value chain actors, their functions and to analyze benefit distribution among actors in mango value chain;

- To analyze the determinants of mango supply to the market in the study areas ;
- To identify factors affecting outlet choice decisions of mango producers.

Questionnaire serial No. \_\_\_\_\_

**I. Socio-demographics**

1. Name of Zone:.....Woreda: .....Kebele: -----Gote:-----

2. Age of the respondent : [\_\_\_\_\_] years

3. Family size:[ \_\_\_\_\_]

4. Sex of the respondent (✓): 1. [ ] Male                      2. [ ] Female

5. Educational status(✓):

No formal education (1)	1-4 grade (2)	5-8 grade (3)	9-12 grade(4)	Certificate(5 )	Diploma(6 )	Degree (7)

6. Marital status:

Single (1)	Married(2)	Widowed (3)	Divorced (4)

7. What different languages do you speak? 1. Gamogna      2. Amharic      3. Wolaytigna      4. Others (specify).....

**II. Area information**

8. Region .....Zone.....Woreda..... Name of Market/town .....

1. Village market 2.Arbamicnh market 3. Others (please specify).....

9. Distance from residence to the market.....Km /walking time in minutes

**Multiple answers is possible**

10. What is your main business?

1. Wholesaler 2. Retailer 3. Processor

4. Farmer trader (village collector) 5. Urban assembler 6. Others (specify)

.....

11. What are the functions you perform in the type of business in which you have been engaged as mentioned above?

\_\_\_\_\_

Wholesaling	Retailing	Collecting	Exporting	Processing	Others, specify

12. How do you undertake mango trade activity in 2016?

1. Alone 2. With partner

13. How long have you been in mango trading? ..... years

14. Do you participate in mango trading year round? 1= Yes 0= No

15. If no, at what period of the year do you participate?

1. Year round 2. When purchase price becomes low

3. During high supply 4. Other (specify) .....

16. Do you practice trading other than mango? 1= Yes 0=No

17. If your answer to Question number 16 is Yes, what do you trade other than



mango? \_\_\_\_\_

18. Number of market days in a week? \_\_\_\_\_
19. What percent of the total produce is sold on local market in 2016? \_\_\_\_\_ %.
20. What percent of the produce will go to domestic market (Arbaminch) in 2016? \_\_\_\_\_ %.
21. What percent of the produce will go to domestic market (Hawassa) in 2016? \_\_\_\_\_ %.
22. What percent of the produce will go to domestic market (Addis Ababa) in 2016? \_\_\_\_\_ %.
23. What was the amount of your initial working capital when you start this mango trade business? .....Birr.
24. What is the amount of your current working capital in 2016?  
\_\_\_\_\_Birr.
25. What is your source of working capital? \_\_\_\_\_  
1. Own 2. Loan 3. Gift 4. Share 5. Others (specify).....
26. If it was loan, from whom did you borrow? \_  
1. Relative/family 3. Private money lenders. 5. NGO. 7. Friends.  
2. Other traders 4. Micro finance institutions. 6. Bank. 8. Others  
(specify) .....
27. How much was the rate of interest? \_\_\_\_\_ Birr for formal, .....birr for informal.
28. What was the reason behind the loan? \_  
1. To extend fruit trading. 2. To purchase fruit transporting

vehicles/animals.

3. To purchase mango packaging material 4. Others (specify)

.....

29. How was the repayment schedule? \_

1. Monthly 3. Semi-annually 5. Others (specify) .....

2. Quarterly 4. When you get money

30. Is there change in accessing finance for fruit trade these days?

1. Improved 2. Deteriorated 3. No change

31. Who will buy mango fruits from you in 2016?(multiple choices are possible)

1. Wholesaler 2. Retailers 5.Cooperatives 7. processors

3. Household consumers 4. Brokers6.Processors 8.Others \_\_\_\_\_

32. From where did you purchase mango in 2016?

1. From village, name of village (specify) .....

2. From market, name of market (specify) .....

33. For whom do you purchase mango? 1. For own 2. For others

34. How did you sale your produce in 2016? 1. Direct to the purchaser

2.Through broker 3. Other (specify) .....

35. Who sets the price in 2016? 1. Myself 2. Set by demand and supply 3.

Buyers 4.Other .....

36. How did you set price? 1. Set at time of advance given 2. Negotiated

at delivery 3. At time of delivery 4. Others\_\_\_\_\_

37. If purchasing price was set at the time of advance given, how did you

agree?

1. Orally      2. Written agreement      3. Other (specify)\_\_\_\_\_

38. When did you get the money after sale?

1. As soon as you sold      2. After some hours  
3. On the other day after sale      4. Other (specify) \_\_\_\_\_

39. Do you carry out any physical treatment to maintain product quality? 1.

Yes 0. No

40. What do you do, if the product is not sold on time?

1. Took back home      2. Took to another market  
3. Sold it at lower price      4. Sold on other market

day

41. How do you attract suppliers?

1. Giving better price      2. By visiting them  
3. Fair scaling /weighing      4. Other

42. Who purchase mango from you in 2016?

1. Cooperatives      2. Broker      3. Commission agent  
4. Retailers      5. Friends      6. Consumers 7. Others\_\_\_\_

43. What are the tricks that traders use when selling fruits to intermediaries?

\_\_\_\_\_

44. What transportation means did you use to transport mango?

1. Man power      2. Pack animals      3. Vehicle      4. Cart      5. Others, specify

45. What mode of transport do you use

<b>Stage of movement</b>	<b>Mode of transport</b>
Farm-gate to assembly point	
Assembly point to local market	
Local market-urban/suburban market	

46.

Assets owned in 2016

No.	Asset		No.
1	Store	Separate house	
		Residence	
2	Pack house		
3	Weighing scale/balance		
4	Juicer		
5	Shed for Collection/shop		
6	Isusu car		
7	Motor cycle		
8	Bicycle		
9	Donkey cart		
10	Mobile telephone		
11	Land line telephone		

**III. Purchase practice**

47. From which market and supplier did you buy mango in 2016?

Purchased from Market (location name)	Purchased from	Quantity purchased on market day(KG)	Average price per KG	%age share of fruit purchased from specific source	Term of payment 1=cash 2=credit 3=advance payment
Where _____ _____ _____	<ol style="list-style-type: none"> <li>1. Farmers</li> <li>2. Retailers</li> <li>3. Wholesalers</li> <li>4. Cooperatives</li> <li>5. Collectors</li> <li>6. You don't know</li> </ol>				

48. How do you measure your purchase?



supply		
Poor production	1=[ ]	0=[ ]
Trade regulations	1=[ ]	0=[ ]
Increase in supply of substitutes Other _____	1=[ ]	0=[ ]

#### IV. Selling practices

58. To which market and to whom did you sell mango in 2016

Sold to Market (location name)	Sold to buyer	Quantity sold on market day(KG)	Average price per KG	%age share of buyers	Term of payment 1=cash 2=credit 3=advance payment
Where _____ _____ _____	1. Farmers 2. Retailers 3. Wholesalers 4. Cooperatives 5. Collectors 6. Processors 7. You don't know				

59. How did you sell your produce

1. Direct to the buyer                      2. Through brokers                      3. Others, specify
60. When did you sell? ( give proportion in percentage)

Selling strategy	Tick the appropriate
Store and sell when prices rises	
Sell as soon as the purchase	
Sell in pieces as buyers comes	
Sale before purchase	
Others, specify	

61. How did you attract your buyers?

1. By giving better price relate to others                      3. By visiting them
2. By fair scaling (weighing)                      4. Others (specify)

62. How many regular buyers do you have 2016?

1. Wholesalers \_\_\_\_\_      3. Consumers \_\_\_\_\_      5. Processors \_\_\_\_\_
2. Assembler \_\_\_\_\_      4. Retailers \_\_\_\_\_      6. Others (specify) \_\_\_\_\_

63. What is your packaging material?    1. Sisal sack    2. Plastic sack    3. wooden  
crate

4. Bamboo Basket                      5. Plastic crate                      7. Others \_\_\_\_\_

64. Do you know the market prices in different markets (on farm, village market, Arbaminch market, Hawassa market, Addis ababa market and other areas) before you sold your fruits in 2016? 1=Yes 0= No

65. What is your source of information? \_\_\_\_\_

66. How do you qualify the reliability, timeliness and adequacy of the information you got? regarding the nearby local and Jimma market.

1. It was reliable                      3. It was timely



2. It was adequate

4. Others (specify) .....

67. Are you willing to pay for market information if it is available? 1= Yes 0= No

68. Accessibility to market roads in rainy seasons for vehicles is

1. Difficult

2. Easily accessible

69. If difficult, for how long? \_\_\_\_\_Months

70. Do you have other branch shops/ shades to sell your mango in 2016?

1= Yes 0= No

71. What are the opportunities to expand fruit trading? \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

72. Are there problems on fruit marketing? If yes what are the problems, and your suggestion to overcome each Problem in 2010?

No.	Problem faced	1=yes 2= no	What do you think are the causes of this problem?	What is your suggestion to solve?
1	Credit			
2	Theft			
3	Price setting			
4	Scaling/weighing			
5	Shortage of supply			
6	Pack house/Storage problem			
7	Lack of demand			
8	Information flow			
9	Natural quality problem			

No.	Problem faced	1=yes 2= no	What do you think are the causes of this problem?	What is your suggestion to solve?
10	Government policy			
11	No government support to improve fruit marketing			
12	Poor road access			
13	Others(specify)			

73. Are there restrictions imposed on unlicensed fruit traders? 1= Yes 0=No

74. Indicate your average cost incurred per quintal in the trading process of mango fruits in 2016.

<b>Cost of marketing</b>	<b>Br/qt.</b>
Purchas price per kg.	
Labor employed to fill one qt and stitch/Packaging	
Load/ unload	
Brokerage	
Transportation: Vehicle	
Sorting	
<b>Cost of marketing</b>	<b>Br/qt.</b>
License and Taxes	
Storage cost	
Storage loss	
Manufacture cost/processing cost	
Telephone expense	
Watching and warding	
Personal travel & other expense	
Others (specify)	

Total costs	
Selling price ( per Kg)	
Purchas price per kg.	

75. Who sets selling price?

My self	Set by demand and supply	Buyers	Others, specify

## V. Marketing Services

76. Do you have been issued with license for mango trading? 1. Yes 2. No

77. If your answer to question number 76 is yes, who issues trade license?

\_\_\_\_\_

78. How much do you pay to receive trade license? \_\_\_\_\_birr

79. What is the term of payment for the trade license? 1. Annually 2. Semi-annually 3. Quarterly 4. Monthly 5. Others, specify

80. Mention any organization/institution from which you get marketing services?

Types of services	Organizations	Institutions

81. Is there any organization /institution which influence your overall marketing system? 1. Yes 2. No

82. If your answer to question number 81 is yes, mention those organizations/institutions and how they influence your marketing system?

\_\_\_\_\_

---

83. Did you pay tax for the mango fruit you purchased in 2016? 1=Yes 0=No

84. Did you pay tax for the mango fruit you sold in 2016? 1=Yes 0=No

85. What was the basis of tax for mango fruit you purchase in 2016?

1. Per sack \_\_\_\_\_ birr      3. Per basket \_\_\_\_\_ birr      5. Per kg \_\_\_\_\_  
birr

2. Per quintal \_\_\_\_\_ birr      4. Fixed payment \_\_\_\_\_ birr      6. Others (specify)  
\_\_\_\_\_

86. What was the basis of tax for mango fruit you sell in 2016?

1. Per sack \_\_\_\_\_ birr      3. Per basket \_\_\_\_\_ birr      5. Per kg \_\_\_\_\_  
birr

2. Per quintal \_\_\_\_\_ birr      4. Fixed payment \_\_\_\_\_ birr      6. Other  
(specify) \_\_\_\_\_

87. What is your opinion regarding the marketing fee paid in this market as compared to your transaction?

1. Low      2. High      3. Average      4. You don't Know

88. Is fruit trading in your locality needs a trading license? 1=Yes 0=No

89. If yes, how do you see the procedure to get the license? 1. Complicated      2.  
Easy

90. Did you have fruit trade license? 1=Yes 0= No

91. How much did you pay for fruit trade license for the beginning? \_\_\_\_\_ Birr

92. How much is the yearly renewal payment? \_\_\_\_\_ Birr

93. Did you store mango before you sold in 2016? 1= Yes 0= No

94. If yes in Q 93 for how long did you store mango fruits in the store? Maximum for .....Hrs or/days.

95. Amount of mango fruits lost due to storage ..... k.gs/quts.

96. Are you organized in any of the following organization?

Organization	1=yes	2=no	Options set for benefits
Social association: 'Iqub'			1. <input type="checkbox"/> Access to credit 2. <input type="checkbox"/> Encourage to save 3.. <input type="checkbox"/> Facilitate joint marketing 4. <input type="checkbox"/> No benefit 5. <input type="checkbox"/> Got market information 6. <input type="checkbox"/> Coordinate purchase and sale 7. <input type="checkbox"/> Credibility 8. <input type="checkbox"/> Other (specify)
Trade association			
Marketing cooperative			

**VI. Post-harvest loss**

97. Is there problem of post-harvest loss of mango? 1. Yes 2. No

98. If your answer to question number 97 is yes, please respond the followings?

Causes of loss	Stages of loss	Amount of mango lost in quintal

**End of the interview**

**Thank you very much for responding to the questions.**

Name of the Enumerator: \_\_\_\_\_

Date of Interview: \_\_\_\_\_

### **C. Consumers Interview Schedule**

Remark: The personal profile obtained from the respondents with regard to the theme will be kept confidential and will not have any consequence on the respondent in any ways. Please give correct answers to the following questions.

#### **Instruction to Enumerators**

- ✓ Make brief introduction before starting any question, introduce yourself to the farmers and make clear the objective of the study
- ✓ Avoid arrogance and over action
- ✓ Name of the respondent is kept confidential
- ✓ Please fill the interview schedule according to the farmers reply (do not put your own feeling).
- ✓ Please ask each question clearly and patiently until the farmer gets your points.
- ✓ Please do not use jargon and ambiguous words and do not forget local units.
- ✓ During the process write answers on the space provided (for close ended questions use “✓”to pick up the answer)
- ✓ Prove that all the questions are asked and the interview schedule format is properly completed
- ✓ Do not forget to thank the interviewee when you finish

#### **Objectives of the study**

- To identify mango value chain actors, their functions and to analyze benefit distribution among actors in mango value chain;

- To analyze the determinants of mango supply to the market in the study areas ;
- To identify factors affecting outlet choice decisions of mango producers.

### General information

1. Age of the respondent: \_\_\_\_\_years
2. Sex of the respondent: 1. Male                      2. Female
3. Education level of the respondent (✓): 1. No formal education      2. 1 to 4 grade  
3. 5 to 8 grade      4. 9 to 12 grade    5. Certificate      5. Diploma                      6. Degree
4. Marital status: 1. Single    2. Married    3. Widowed    4. Divorced
5. Distance to nearest town in km: .....km \_\_\_\_\_hours or \_\_\_\_\_ hours walk
6. What is your major means of income? 1. Farming 2. Trade 3. Employment 4. Others
7. How much do you earn per year (estimate based on weekly, monthly income): \_\_\_\_\_Birr
8. Do you consume mango fruit?    1. Yes                      2. No
9.                      If your answer for the question number 8 is yes, how often do you consume/eat mango? 1. Always 2. Occasionally
10. If your answer for the question number 8 is yes, what forms of mango do you consume?  
1. Fresh mango products      2. Processed mango products      3. Both
11. Why do you consume one of the mango forms that you mentioned above?  
\_\_\_\_\_
12. Do you produce and consume or purchase? 1. Purchase              2. Produce      3. Both
13. What amount of mango do you purchase per day? \_\_\_\_\_kg
14. What is the price that you pay for one kg of mango? \_\_\_\_\_birr
15. At what season do you purchase mango at lower and higher prices?

\_\_\_\_\_ and \_\_\_\_\_, respectively.

16. What is the reason for the volatility of mango price from one season to another?

\_\_\_\_\_

17. If you consume processed mango, what kind of processed mango products do you consume? 1. Juice 2. Chutney 3. Puree 4. Jam 5. Nectar 5. Others, specify

18. From where do you get processed mango products?

By processing in own home	Cafeteria and restaurants	Super markets	Mango processing enterprises	Others, specify

19. What is the price that you pay for processed mango? \_\_\_\_\_birr/unit (including Value Added Tax)

20. From which actor do you get fresh mango products?

Actors	Tick with "✓"
From mango producers	
From wholesalers	
From cooperatives	
From retailers	
From rural collectors	
From your produce	
Others, specify	

21. At what time do you consume mango in given day and why?

1. During Morning 2. After lunch 3. Afternoon 4. Evening

22. For what purpose do you consume mango?

1] For feeding purpose 2] for entertainment purpose 3] For medicinal purpose 4. As additional food after meal 5] others, specify

23. What kind of quality standards do you need from mango fruit while purchasing it?

\_\_\_\_\_



24. Is mango that you purchasing meets your quality standards? 1. Yes 2. No

25. Is market for purchasing mango fruit is accessible? 1. Yes 2. No

26. If no what are the problems and who is concerned body for the improvement?

\_\_\_\_\_

27. What are the constraints hindering you from consumption of mango? (Multiple choices are possible)

Problems	Tick the appropriate
Supply shortage	
Income shortage	
Lack of storage at home	
High price of product	
Poor product handling	
Lack of market information	
Perishability of the product	
Pest and disease	
Others, specify	

28. Do you know the benefits of consuming mango product? 1. Yes 2. No

29. If yes, what are those benefits of consuming mango?

\_\_\_\_\_  
\_\_\_\_\_

30. If yes, what are those problems related with the consumption of mango?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

31. Say something about what should be done for further improvement?

\_\_\_\_\_  
\_\_\_\_\_

---

**D. Key Informant Discussion with Hort. Experts of the Woreda**

Woreda \_\_\_\_\_

Kebele \_\_\_\_\_

Date \_\_\_\_\_

Name of interviewee \_\_\_\_\_

Title of the interviewee \_\_\_\_\_

Location and contact information: Region/Zone/Woreda/ Kebele/ P.O. Box/telephone

Type of the organization: Public/Private/NGO

1. Organizational mission, vision and objectives

.....  
.....

2. What is the role of your organization in mango value chain in the study area?

.....  
.....

3. What are the challenges and opportunities you faced in undertaking those roles assigned to your organization?

.....  
.....

4. What are the threats for mango extension service and input supply?

.....  
.....

5. What are the most important constraining infrastructures affecting mango production and marketing?

.....  
.....

6. What are the possible solutions to correct these problems?

.....  
.....  
7. What is the role of FTCs on mango production and marketing? How?

.....  
.....  
8. What outputs are achieved on dissemination of mango technologies?

.....  
.....  
9. Linkage /interaction/ partnership/ coordination between actors

#### **E. Checklist for Farmers' Group Discussion**

1. Group members should:

- Respect others and their views
- Strive to be honest and transparent
- Recognize and acknowledge social reactions

2. The Moderator should

- Act as catalyst between individuals of the group
- Strive to enhance capacity of rural people in analysis of problems and opportunities
- Find ways of integrating dominant and quiet people and makes sure that all group members are able to express their opinions
- Make sure that the group keeps to the topic but flexible in handling additional information
- Take care of time management

- Listen carefully to any group member and does not much

1. Evaluation matrix for SWOT analysis

Woreda .....

Kebele .....

Total number of participants .....

Date .....

<p><b><u>Strengths of production and marketing of mango</u></b></p> <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul>	<p><b><u>Weakness of production and marketing of mango</u></b></p> <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul>
<p><b><u>Opportunities on production &amp; marketing</u></b></p> <ul style="list-style-type: none"> <li>•</li> </ul>	<p><b><u>Threats on production &amp; marketing</u></b></p> <ul style="list-style-type: none"> <li>•</li> <li>•</li> </ul>

2. What is your possible solution to rectify the above problems?

---



---



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**F. Checklist for Traders Focus Group Discussion**

1. Group members should:

- Respect others and their views
- Strive to be honest and transparent
- Recognize and acknowledge social reactions

2. The Moderator should

- Act as catalyst between individuals of the group
- Strive to enhance capacity of rural people in analysis of problems and opportunities
- Find ways of integrating dominant and quiet people and makes sure that all group members are able to express their opinions
- Make sure that the group keeps to the topic but flexible in handling additional information

1. How do traders influence farmers' participation in mango market/value chain?

.....  
.....

2. What are the major problems in marketing of mango?

.....  
.....

3. Who is responsible for the above problem?

.....  
.....

4. What is the quality trend of mango improving or deteriorating? Who is responsible for the problem?

.....  
.....

5. How these problems can be solved?

.....  
.....

6. From whom do you purchase fruits at reasonable price?

.....  
.....

7. What problems do you face in mango marketing? Mention the common problems in mango marketing?

.....  
.....