TOMATO VALUE CHAIN ANALYSIS IN OMO NADA DISTRICT OF JIMMA ZONE, OROMIA REGION, ETHIOPIA

MSc. THESIS

BY

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DEDICATION

I dedicate this thesis to my beloved my mother Workine Fayisa and my father Abdisa Hinsarmu, my brother Magarsa Abdisa and my uncle Tamiru Hinsarmu for their patience and sacrifice starting from an elementary class up to the completion of MSc thesis.

STATEMENT OF THE AUTHOR

First, I declare that this thesis is my own work and that all sources of materials used for this thesis have been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree Agribusiness and value chain management at Jimma University and is deposited at the University Library to be available to borrowers under the rules of the library. I declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate. Brief quotations from this Thesis are allowable without special permission provided that accurate acknowledgment of the source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or part may be granted by the head of Agricultural Economics and Agribusiness or the Coordinator of the School of Graduate Studies when in his/her judgment the proposed use of the material is in the interest of scholarship. In all other instances, however, permission must be obtained from the author.

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BIOGRAPHICAL SKETCH

Sorome was born in Kello kebele Ebantu district, East Wollega Zone of Oromia Regional State, Ethiopia in August 1993. She attended her primary education at Lalisa School (2001-2009). She attended her secondary education at Ebantu secondary School in East Wollega zone (2010-2011) and a Preparatory school at ASK College in Nekemte town (2012-2013). After she completed her preparatory education, she joined Wollega University College of Agriculture and Natural Resource, in the Department of Agricultural Economics and Agribusiness Management in October 2014 and graduated in June 2016 with a BS.c. Degree in Agribusiness and Value Chain Management. Upon her graduation, the author was employed Graduate Assistant I (GA I) in that University in 2016 and served the institution for one year. The author joined the School of Jimma University in October 2017 to pursue her MSc degree in Agribusiness and Value Chain Management program.

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ACRONYMS AND ABBREVIATIONS

AAFC	Agriculture and Agri-Food Canada
CITA	International Center for Tropical Agriculture
CSA	Central Statics Agency
DA	Development Agents
EEA	Ethiopia Economic Association
EHDA	Ethiopian Horticultural Development Agency
EHPEA	Ethiopian Horticulture Producers and Export Association
EIA	Ethiopian Investment Agency
EU	European Union
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GMMc	Gross Marketing Margins of Collectors
GMMp	Gross Marketing Margins of Producers
GMMr	Gross Marketing Margins of Retailers
GMMw	Gross Marketing Margins of Wholesalers
GOE	Government of Ethiopian
GVC	Global Value Chain
HGVC	Horticulture Global Value Chain
ILO	International Labor Organization of the United Nations
MOA	Ministry of Agriculture
MOFED	Ministry of Finance and Economic Development
MVP	Multivariate Probit Model
NGO	Non- Government Organization
SNNPR	Southern Nation Nationality and Peoples Region
SPSS	Statically Package for Social Science
TGMM	Total Gross Marketing Margin
UNIDO	United Nation Industrial Development Organization

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ABSTRACT

Lower production, marketing inefficiencies and low coordination of tomato value chain are the main problems though Omo Nada district is potential in tomato production.This study is tomato value chain analyzes with the specific objective to identify tomato value chain actors and their respective roles, to assess market performance factor across the channel in the tomato value chain*, to identify factors affecting producer's tomato market outlet choice for selling tomato and constraints and opportunity of tomato production and marketing along value chain actors in Omo Nada district. Data for this study were collected from both primary and secondary sources. Primary data were collected through a survey using a pre-tested, structured questionnaire administered to randomly sampled 190 producers, 25 traders, and 15 consumers. Qualitative data were collected through key informant interviews using checklists. Secondary data were collected from the district of agricultural office, Omo Nada irrigation development of Authorities, Central Statics Agency, and review of unpublished and published document. Descriptive statistics, value chain analysis and econometric models were used to analyze the data. A multivariate probit model was used to analyze factors affecting market outlet choice of tomato producers in the study area. The major actors of the tomato value chain were; input suppliers, producers, collectors, wholesalers, retailers, and consumers. Four market channels of tomato were identified in the study area. The producers' highest gross marketing margin was77.5% in channel III (producers-wholesaler-consumers) whereas the lowest gross marketing margin was76.8% in channel II (producers-collector-wholesaler-retailer-consumers) and the highest total gross margins was 44.5% in channel II%, whereas the lowest total gross margin was 22.4% in channel III. The results of multivariate probit model indicated that the households market outlet (sex of household and distance to nereast market was positively and significantly affected collector outlet. Also, family size and market information was negatively and significantly affected collector outlet). Family size, educational level, quantity produced, motor pump, transeport facilities, land size, was positively and significantly affected wholesaler outlet.Whereas distance to neraest market was negatively affected the wholesaleroutlet.(Quantity produced was positively and significantly affected with retailer outlet. Also family size was negatively affected with retailer outlet. Sex of household head and non farm income activities was positively and significantly affected with consumer outlet while distance to nereast market was negativiley and significantly affected with consumers outlet). The findings suggest the need to improve the input supply system, encouraging adult education, increasing the quality of market information, improving productivity and quantity of tomato produced, strengthening the linkage/interaction among tomato value chain actors, training producers how to select appropriate market outlet and strengthening supportive institutions.*

Keywords: Ethiopia, Oromia, Marketing Margin, Multivariate Probit, Tomato, and Value Chain

1. INTRODUCTION

1.1. Background of the Study

Agriculture is the main economic pillar of the Ethiopian economy and the overall economic growth of the country is highly dependent on the success of the agriculture sector. This is because the share of the sector to the national gross domestic product (GDP) agriculture accounted for 36.3% (UNDP, 2018), crop production accounts for 27.4 % (NPC, 2016), and provides employment for 72.7percent of the total population (UNDP, 2015). Moreover, Ethiopian agriculture is dominated by smallholder farming which accounts for 96% of the total area cultivated and 97% of agricultural output produced (MoARD, 2010).

The sector is a means of livelihood for the overwhelming majority of Ethiopians. It is the source of food and cash for those who are engaged in the sector and others. Most agricultural holders acquire the food they consume and the cash they need to cover other expenses only from farming activities. Since farming in Ethiopia is often precarious and usually, at the mercy of nature, it is invariably an arduous struggle for the holders to make ends meet. This, it often transpires, is true to the frequent shortfalls in the volume of production that occur in the country (CSA, 2013).

Value chain analysis is used to analyze, coordinate and optimize linkages between activities in the value chain, by focusing on the interdependence between these activities (Abele *et al.*, 2011). Value-added agriculture has a key role to stabilize farm incomes and to revive primary agriculture and the rural economy. Market-drivers are the fundamental cause of moving agriculture to add value. Value-added activities are born from the necessity to adapt to the wide-ranging changes affecting the agriculture and Agri-food industry (AAFC, 2004).

Vegetable production plays an important role in poverty alleviation through employment generation, improving the feeding behavior of the people, and creating new opportunities for poor farmers. The vegetable products are bulky, perishable, and it has continuous demand in the market, its production and marketing allow high productive employment. Increasing horticultural production and marketing thus contribute to the commercialization

of the rural economy and create many off-farm jobs (Lumpkin, 2005). The vegetable production is becoming an increasingly important activity in the agricultural sector of the country following the development of irrigation and increased emphases given by the government to small scale commercial farmers (Dawit 2015).

Ethiopia's diversified agro-climatic condition makes it suitable for the production of a broad range of fruits, vegetables, and herbs. The wide range of altitudes, ranging from below sea level to over 3000m above sea level, gives it a wide range of agro-ecological diversity ranging from humid tropics to alpine climates, where most types of vegetable crops can be successfully grown. Different types of vegetables are grown in Ethiopia with different intensities in terms of land and other input allocation, the purpose of production, and marketability is to increase economic growth. Holders living near to urban centers largely practice vegetable farming. Most vegetables are not commonly practiced by the rural private peasant holders, hence the small volume of production recorded as well evidenced by the survey results (CSA, 2015).

Ethiopia has a comparative advantage in a number of horticultural commodities due to its favorable climate, proximity to European and Middle Eastern markets and cheap labor. However, the production of horticultural crops is much less developed than the production of food grains in the country. On average more than 2,399,566 tons of vegetables and fruits are produced by public and private commercial farms (less than 2% of the total crop production) (EIA, 2012).

The tomato is an important vegetable with ranges of reported nutritional and health benefits. In Ethiopia tomato is one of the most important and widely grown vegetable crops, both during the rainy and dry seasons for its fruit by smallholder farmers, commercial state and private farms (Gemechis *et al*., 2012). The importance of tomato is increasing these days in Ethiopia. It is widely accepted and commonly used in a variety of dishes as raw, cooked or processed products more than any other vegetable (Lemma, 2002). According to (CSA, 2012), in Ethiopia land allocated for tomato was 7,237.4 ha with a total production of 55,514.3 tons and yield per hectare of 7.7 tons/hectares. Also, the area covered by tomato in Ethiopia was 4, 953 ha and production were 40,426 tons with the productivity of 8.2ton per ha (Desaleng *et al.*, 2016). Tomato ranks 1st with respect to production in Ethiopia: far

below the average productions observed in some other countries and the fruits are poor quality; because Adopting technologies like a greenhouse, on the other hand, promotes year-round tomato production and improve fruit quality (Yebirzef, 2016).

Tomato production is a widely practiced activity in Jimma zone and other zones of Oromia regions. Omo Nada district has potential tomato production and it is more produced undertaken by smallholder farmers. As a result, a large number of tomato producers are supplied to different markets in the area and to different parts of the country as a whole (Feyera, 2013). Omo Nada district has allocated 1,083 hectares from a total of 41,660 hectares of land for tomato production during the year 2018. In the district, 44,403 quintals of tomato were produced during the current production year with the productivity of 41 quintals per hectare of which below the national standard (ONDoAO, 2018). The sector faces different problems in the study area. Market prices are volatile, no value addition and/or value chain is developed, and farmers are not benefiting. In light of the above information, this study analyses the tomato value chain in the Omo Nada district.

1.2. Statement of the Problem

In Ethiopia, the performance of the agricultural market system has been recognized in various studies as a major impediment to growth in the agricultural sector, and the overall economy due to many factors such as poor quality of agricultural produce, lack of market facilities, weak extension services which ignored marketing development, and absence of marketing, (Eleni *et al*., 2004, cited in Dawit, 2005). A review of literature on value chain indicates that the agricultural sector faces many challenges including limited seed supply, market outlets decision, limited efforts in market linkage activities (institutionalization) and poor market information among actors (Dereje, 2007; Kaleb, 2008; Dendena *et al.*, 2009). This implies that markets could be physically available but not accessible to some of the farm households. In this context, value chain analysis is essential to explain the connection between all the actors in a particular chain of production, distribution and it shows who adds value to the product along the chain.

Mebrat (2014), analyzed tomato value chain in Dugda woreda by using multinomial logit, to examine factors affecting market outlet choice of the crop which is inefficient i.e. Multivariate Probit model is appropriate because of farmers have more than one outlet options.

Getachew *et al.* (2014) revealed that wholesalers are making the highest net margin as they have short channels between producers and consumers, and as they relatively charge a higher price using their market power. According to Dawit (2015), the net margin for the smallholder farmers is the highest only when tomatoes are supplied to individual consumers through unions via consumer cooperatives thereby reducing the number of middlemen across the market channel. Therefore, they end up earning little margins while giant chain actors along the chain have the power to determine prices paid by the final consumer and thus extract huge marketing margins. The nature of the product in terms of perishability on one hand and lack of organized marketing system on the other resulted in low producers' prices. The involvement of market intermediaries, lack of proper coordination among the value chain actors, and low marketing margins are shared among the actors as share to producer's quality and post-harvest losses are the major problems (ONDAO, 2018).

The findings from this study are believed to be helpful in reducing the information gap on tomato and contributing to a better understanding of improved strategies for reorienting the marketing system for the benefit of smallholder farmers, traders, and other market participants. Analyzing the constraint of tomato marketing would indicate the gaps to improve tomato production and marketing, benefit policymakers and implementers in the area to fill the gaps. In addition to this, it will also help to make appropriate marketing outlet decisions by the producers, traders, consumers, and others. So, to investigate tomato value chains and analyze market margin in different market channel adding value on tomato in the study area, which were narrow the knowledge gap on the subject and contribute of better understand to improve the strategies of reorienting marketing system for the benefit of small householder producers, traders, conduct to analysis tomato value chain and lack of market linkage between value chain actors.

Even though some related studies were carried out in different regions of the country, such study that provides empirical evidence for improving the production and marketing of

tomato has not been undertaken in the study area (Omo Nada). Therefore, the aim of this study is strong need to make value chain analysis to identify the major tomato value chain actors and their respective roles, to estimate marketing costs and margins at different market channel and to identify factors affecting producer's market outlets choice in Omo Nada District, Jimma zone Oromia National Regional State, Ethiopia.

1.3. Research Question

The study attempted to answer research questions of the following:

1. Who are the major actors and what are their respective roles along the tomato value chain in the study area?
2. Who incurs the highest cost and who gets the highest profit, in the tomato value chain in the study area?
3. What are the major factors affecting farmers' market outlet choice decisions for the tomato in the study area?
4. What are the key constraints and opportunities along with tomato value chain actors?

1.3. Objectives of the Study

1.3.1. General objective of the study

The general objective of this study is to analyze the tomato value chain in the Omo Nada district of Jimma zone, Oromia Region State, Ethiopia.

1.4.2. The specific objective of the study

1. To identify tomato value chain actors' and their respective roles in the study area
2. To analyze market performance factor across the channel in the tomato value chain
3. To analyze the factors affecting tomato producers market outlet choice decisions and
4. To identify constraints and opportunities for tomato production and marketing along the value chain

1.4. Significance of the Study

This study resulted in detail and valuable information on the tomato value chain in the study area (Omo Nada district) by identifying tomato value chain actors, and their respective roles. Similarly, it provides essential information on the determinants of tomato marketed margin and across the market channel. Similarly, it provided essential information on the determinants of households' market channel choices and identified constraints and opportunity tomato in the study area. The result of the study would assist the concerned bodies (government, NGOs, individuals, and cooperatives) to make an appropriate decision by providing inputs, extension services advise, market information, the market for producers and traders which can easily lead tomato value chain to be developed in the study area. The result of the study would also be supportive of producers, traders, and consumers which could enable them to make an appropriate decision on tomato production, marketing, and consumption. In the same way, the findings of this study would be used as a reference for other students or researchers who want to conduct a study on a tomato value chain.

1.5. Scope and Limitation of the Study

This study was focused on the entire tomato value chain analysis in the study area in four kebeles (Nada cala, Nada sokote, Doyo yaya, and Biso gombo) from input suppliers, producers, traders and consumers within the district and the role of actors and respective functions, analyzed marketing margin across the channel, determinants of farmers' market outlet choice and constraints and opportunity tomato value chain. The study was conducted in one district and important information was collected from sample households and done with one year using a cross-sectional research design and value chain actors involved in the functioning of the tomato value chain in the study area. However, there are spatial as well as temporal limitations to make the study. This study is limited to cross-sectional data. Also, due to financial, time and other resource limitations, the study is limited to only one district.

1.6. Organization of the Thesis

The Thesis is divided into five chapters. The remaining part is organized as follows: Chapter two presents a review of theoretical, analytical, empirical evidence and conceptual framework of the study. Chapter three discusses research methodology (description of the study area, data types and sources, sampling techniques, method of data collection and methods of data analysis) of the study. Chapter four presents results and discussions (descriptive, value chain analysis and econometric results). Chapter five summarizes the main findings of the study and draws the conclusion and appropriate recommendations.

2. LITERATURE REVIEW

In this part of the thesis, the basic concepts of value chain, concepts guiding agricultural value chain, benefit of value chain in agricultural markets and marketing, market outlet, market margins, developing value chain towards the benefit of the poor, market deriving development in tomato value chain, empirical reviews, and conceptual framework were reviewed and presented.

2.1. Basic Concepts and Definitions

Industry chains are classified as either supply or value chains. The following definitions within the general term 'industry chain' are used.

Value chain: The term value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2001). The value chain is a socio-economic system that is formed from a number of interdependent actors who carry out certain activities that add value to the product along the production-consumption chain (ILO, 2009).

The concept of the value chain was made popular by Harvard University's Professor Michael Porter. The Porter value chain has been widely accepted by the business community as a mechanism to understand and comprehend complexity in business environments, with the ultimate goal of structuring the business to maximize its competitive advantage (Van Rensburg, 2006). In the case of tomato, for example, the value chain begins with the preparation of land and then progresses along to planting, harvesting, cleaning, domestic marketing and selling (Kaplinsky and Morris 2001).

The value chain concepts provide a significant means to recognize business-to-business relationships that connect the chain, devices for enhancing efficiency, and ways to enable businesses to increase productivity and add value. In addition, it provides a reference point for enhancements in supporting services and the business environment (Webber *et al.,* 2009). Generally, the value chain is the system of link steps necessary to transform raw materials

into a disposal finished product or service for an end consumer, somewhere each step along the way adds to a product's value. It is much like a supply chain, except it focuses on how value is added rather than how raw materials get from one topic to the other (Kanji *et al.*, 2005).

Value chain management: Is about creating the added value at each link in the chain and sustainable competitive advantage for the businesses in the chain. How value is actually created is a major concern for most businesses. Porter (1985) indicates that value can be created by differentiation along every step of the value chain, through activities resulting in products and services that lower buyers' costs or raise buyers' performance. In much of the food production and distribution value chain, the value creation process has focused on commodities with relatively generic characteristics, creating relatively small profit margins.

Supply chain: It is taken to mean the physical flow of goods that are required for raw materials to be transformed into finished products. Supply chain management is about making the chain as efficient as possible through better flow scheduling and resource use, improving quality control throughout the chain, reducing the risk associated with food safety and contamination, and decreasing the agricultural industry's response to changes in consumer demand for food attributes (Dunne, 2001). Kotler (2003) also defined the supply chain as a longer channel stretching from raw materials to final products that are carried to final buyers. He shortly put a value-delivery network. He also separated the supply chain from the demand chain in that the later starts from thinking first the target market and move backward from that point, as a backward orientation. According to Andrew *et al*. (2006), 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. Both the value chain and supply chain have common grounds. In a sense, supply chain and a value chain are complementary views of an extended enterprise with integrated business processes.

Both chain enabling the flows of products and services in one direction, and of value as represented by demand and cash flow in the other. Both are made up of companies that interact to provide goods and services. On the other hand, the primary difference between a

supply chain and a value chain is a fundamental shift in focus from the supply base to the customer. Supply chains focus upstream on integrating supplier and producer processes, improving efficiency and reducing waste, while value chains focus downstream, on creating value in the eyes of the customer. This distinction is often lost in the language used in the business and research literature, (Andrew, 2006).

2.1.1. Value addition

Value addition refers to the act of adding value(s) to a product to create form, place, and time utility which increases the customer value offered by a product or service. It is an innovation that enhances or improves an existing product or introduces new products or new product uses (Fleming, 2005). The size of value added is decided by the end customer's willingness to pay. For producers, value addition has particular importance in that it offers a strategy for transforming an unprofitable enterprise into a profitable one. Values adding activities based on their simplicity and difficulties. The simplest are washing, cleaning, grading, bulking and storage; these activities are conducted by the control of producers. And the complicated are ginning, roasting, refrigerating, milling, cutting, mixing, dehydration, cooking, and packaging.

These activities are generally undertaken by specialist market chain actors or service providers, (Muluken, 2014). The aim of value-adding is to increase marginal profit on the product when it is processed. Value-added is used to characterize food products that are converted from a raw state through processing that gives the resulting products an incremental value in the market place. Incremental value is realized from either a higher price or an expanded market. Value-added product is also used to characterize by again in incremental value in the marketplace through differentiation from similar products based on attributes such as geographical location, environmental stewardship, food safety or functionality studies (AAFC, 2004).

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. Agricultural value chain analysis is a dynamic approach that

examines how markets and industries respond to changes in the domestic and international demand and supply for a commodity, technological change in production and marketing, and developments in organizational models, institutional arrangements or management techniques (Hoffer and Maingi, 2006). The analysis should look at the value chain as a set of institutions and rules; as a set of activities involved in producing, processing, and distributing commodities; and as a set of actors involved in performing the value-adding activities. Value chain analysis focuses on changes over time in the structure, conduct, and performance of value chains, particularly in response to changes in market conditions, technologies and policies (Anandajayasekeram and Berhanu, 2009).

An agricultural value chain can 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). Agricultural value chains link urban consumption with rural production. Changing demand, as a consequence of urbanization, the emergence of modern consumption patterns or new trends in international trade, impacts on rural areas along value chains and spills over to marketing and production systems.

These rural-urban linkages bear challenges but mutual benefits for producers and consumers and can be promising entry points for development interventions (Hoffer and Maingi, 2006). Agricultural value chains can include three or more of the following; producers, processors, distributors, brokers, wholesalers, retailers and consumers. The partners within the value chain will work together to identify objectives and are willing to share risks and benefits and will invest time, energy and resources to make the relationship work. Bammann (2007) has identified three important levels of the value chain.

- **Value chain actors:** The chain of actors who directly deal with the products, i.e. produce, process, trade and own them.
- **Value chain supporters:** The services provided by various actors who never directly deal with the product, but whose services add value to the product.
- **Value chain influencers**: The regulatory framework, policies, infrastructures, etc.

2.1.2. Purpose of value chain analysis

Value chain analysis is a useful analytical tool that helps understand overall trends of industrial reorganization and identify change agents and leverage points for policy and technical interventions. Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships; determining the chain governance, or leadership, to facilitate chain formation and strengthening, and identifying value-adding activities in the chain and assigning costs and added value to each of those activities; (UNIDO, 2011).

Also, it is one of the main methods of channel mapping and a high-level model of how businesses receive raw materials as input, add value to the raw materials through various processes and sell finished products to customers. The process of tracing a product flow through an entire channel from the point of product concept to the point of consumption highlights the pattern of inputs, constraints, value-adding or non-value adding activities, associated costs, and competitive advantage (Yohannes, 2005).

2.1.3. Value chain Vs market chain

Value chain works aligned with consumers (demand-driven), and its objective is delivering a quality product desired by the final consumer. It focuses on pie-growing, coordination, and innovation whereas the marketing chain is supply-driven and large farmers are isolated from the consumers. It focuses on pie-sharing, capacity and profit optimization and maintaining the status quo. In demand-driven products are supplied to the market and the marketing system is product- push. However, previously the terms supply chain, market chain, and value chain often used interchangeably, but in fact, there are some important differences.

The value chain is understood as a strategic network between a number of independent business organizations. According to Hobbs *et al*. (2000), a value chain is differentiated from a market/supply chain because participants in the value chain have a long-term strategic vision, disposed to work together, oriented by demand and not by supply, shared

commitment to control product quality and have a high level of confidence in one another that allows greater security in business and facilitates the development of common goals and objectives. The market chain is referring to several links connect all actors and transferee involve movement agricultural goods from the seller to the consumer; (CIAT, 2004).

2.1.4. Market and marketing

The market can be defined as an area in which one or more sellers of given products/services and their close substitutes exchange with and compete for the patronage of a group of buyers. Originally, the term market stood for the place where buyers and sellers are gathered to exchange their goods, such as the village square. A market is a point or a place or sphere within which price making force operates and in which exchanges of title tend to be accompanied by the actual movement of the goods affected (Backman and Davidson, 1962). The concept of exchange and relationships leads to the concept of the market. It is the set of the actual and potential buyers of the product (Kotler and Armstong, 2003). Conceptually, a market can be visualized as a process in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries. Therefore, markets involve sales locations, sellers, buyers, and transactions. Marketing is essentially a process like farming, manufacturing, mining or construction (Backman and Davidson, 1962).

As such basically functional in character and may therefore, be defined as the performance of all activities necessary ability, effecting the transfer of ownership of products, providing for their physical distribution, and facilitating the entire marketing process. In addition to those definitions, defined the marketing concept, as the philosophy of business, which states that customers want satisfaction, is the economic and social justification for a firm's existence. Consequently, all the firms' activities must be devoted to finding out what the customers want and then satisfying those wants while still making a profit over the long run (Lee and Jain 2012).

Market performance: can be evaluated by analyzing the costs and margins of marketing agents in different channels. A commonly used measure of system performance is the

marketing margin or price spread. Margin or spread can be useful descriptive statistics if it used to show how the consumer's price is divided among participants at different levels of the marketing system (Mendoza, 1995).

Market channel: Formally, a marketing channel is a business structure of interdependent organizations that reach from the point of product or origin to the consumer with the purpose of moving products to their final consumption or destination (Kotler and Armstrong, 2003). This channel may be short or long depending on the kind and quality of the product marketed, available marketing services, and prevailing social and physical environment (Islam *et al.,* 2001).

Marketing costs: Marketing costs are the embodiment of barriers to access to market participation by resource-poor smallholders. It refers to those costs, which are incurred to perform various marketing activities in the transportation of goods from producer to consumer. Marketing costs include handling cost (labor, loading, and unloading, costs of damage, transportation and etc) to reach an agreement, transferring the product, monitoring the agreement to see that its conditions are fulfilled, and enforcing the exchange agreement (Holloway *et al*., 2002).

Marketing margin: Is defined as the difference between the price paid by consumers and that obtained by producers. Margins can be calculated all along the market chain and each margin reflects the value added at that level of the market chain (Bonnard and Sheehan, 2009). Marketing margin has commonly used the measure of the performance of a marketing system (Abbott and Makeham, 1981). It is defined as the difference between the price the consumer pays and the information flow, low product quality, lack of support from concerned forms, high controlling power of wholesalers, high portable distance of export to Somalia, lack of processing and long-chain condition of the market price that is obtained by producers, or as the price of a collection of marketing services, which is the outcome of the demand for and supply of such services (William *et.al*, 1990).

The size of market margins is largely dependent upon a combination of the quality and quantity of marketing services provided the cost of providing such services and the efficiency with which they are undertaken and priced. For instance, a big margin may result

in little or no profit or even a loss for the seller involved depending upon the marketing costs as well as on the selling and buying prices (Mendoza, 1995). According to Tomek and Robinson (1990), marketing margin is defined as a difference between the price paid by consumers and that obtained by producers or the price of a collection of marketing services. Mendoza (1995) also, explained that the marketing margin measures the share of the final selling price that is capturing by a particular agent in the marketing chain. It includes costs and typically, though not necessarily, some additional income.

2.1.5. Vegetable production constraints facing smallholder farmers in Ethiopia

Smallholders have grown vegetables for a long time for their livelihood needs since the start of its commercialization. Yet, the average yield of tomato in Ethiopia is low, ranging from 6.5-24.0 Mg ha-1 compared with average yields of 51, 41, 36 and 34 Mg ha-1 in America, Europe, Asia, and the entire world, respectively (FAO, 2005). Moreover, growers have been challenged by inconsistent production and low yields. Improving smallholders' vegetable production would contribute to enhancing food security and alleviating poverty. The few surveys carried out so far on tomato production were broad and covered all horticultural crops. Such surveys were crude and did not identify production status and constraints at the level of the individual crop. Moreover, the limited information available at the crop level is site-specific and no attempts have been made to assess for each vegetable growing Eco region conditions that may limit or reduce the yield of crops (Lemma, 2002).

2.1.5.1. Characteristics of vegetable marketing

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

Perishability: The vegetable is highly perishable, they start to lose their quality right after harvest and continued throughout the process until it is consumed. For this purpose elaborated and extensive marketing channels, facilities and equipment are vital. Perishability behavior of vegetables exposed the commodity not to be held for long periods and fresh produce from one area is often sent to distant markets without a firm buyer or

price. Prices may be negotiated while the commodities are in route, and they are frequently diverted from their original destination of a better price can be found. Sellers might have little market power in determining a price

Seasonality: Vegetable has seasonal production that directly influencing their marketing. Normally they have a limited period of harvest and more or less a year-round demand. In fact, in some cases the cultural and religious set up of the society also, renders demand to be seasonal. This seasonality also worsened by a lack of facilities to store. Improving vegetable marketing in developing countries is vital for a number of reasons; rapid increase in demand from growing domestic urban populations, opportunities to earn foreign exchange by exporting high value-off-season produce, the income raising opportunities it offers to small farmers and the contribution to employment made by its labor-intensive production, handling and sales requirement are some to mention (Abay, 2007).

Product bulkiness: Since water is the major component of the product, it makes them bulky and low value per unit that is expensive to transport in fresh form every time. Therefore, exposed farmers to lose a large number of products on the farm unsold. These listed characteristics of the product require a special complex system of supportive inputs. It demands a regular marketing preparation process like washing, cooling, proper management from the time of harvest until the product is put on display. It is frequently believed a vegetable not only remains attractive to the consumer it must have a shelf life of a few days after having purchased by the consumer (Nonnecke, 1989).

2.2. The Framework of Value Chain Analysis

2.2.1. Theoretical framework

Global value chain approach was born out of a recognition that there was a clear shift away from the vertically integrated, producer-driven variant in a range of industries, and the buyer-driven/ producer-driven types could not characterize all of the network types being observed in the field. Global commodity chain (GCC) approach as consisting of sets of inter organizational networks clustered around one commodity or product, linking households to one another within the world economy. The global value chain approach mainly focuses on

power relations (in the coordination of dispersed but linked production system) which are embedded in value chain analysis (Gereffi and Korzeniewiz, 1994).

Filiere approach describes the flow of physical inputs and services in the production of a final product. The scholars analyzed the vertical integration and contract manufacturing in French agriculture with the filiere concept during the 1960s. As the filiere concept is a static model with non-changing actors and national boundaries it is less functional to analyze the global world economy. A filiere tended to be viewed as having a static character, reflecting relations at a certain point in time. It does not indicate growing or shrinking flows either of commodity or knowledge nor the rise and fall of actors. In general, a filiere analysis has been applied to the domestic value chain, thus stopping at national boundaries (Kaplinsky and Morris, 2001).

The value chain approach was developed by Michael Porter in the 1980s, and described in his book competitive advantage creating and sustaining superior performance (Porter, 1985). The concept of value-added in the form of a value chain has been used to build up an industry's sustainable competitive advantage in the business field. The entire industry is formed of activities that link together to develop the value of the business, and together these activities form the industry's value chain. Such activities included product manufacturing, and activities of purchasing, distribution, and marketing of the company's products. Since the value chain framework is used as a powerful analytical tool for the strategic planning of an organization, it aims to maximize value creation while minimizing costs.

The concept of the value chain (VC) was first defined by Porter (1985) as "a collection of activities that are performed to design, produce, market deliver, and support products." Porter's concept of the value chain was at the level of the individual firm, which seeks to gain competitive advantage by using its primary and support activities to add value in the given competitive structure of its industry. Primary activities are all activities directly associated with the product or service, inbound logistics, operations, outbound logistics, marketing and sales, and service, while support activities include the company's infrastructure, technology, human resources, and procurement.

Porter contends that each activity's contribution to the firm's success as well as its linkages with other activities needs to be thoroughly understood in order to optimize the firm's value chain. Porter's five forces model highlights the competitive structure of the industry as shaped by the ability of new competitors to enter the market, the threat of substitute products, the relative bargaining power of buyers and suppliers, and the degree of rivalry among existing competitors (Miller, 1998).

The moving beyond individual firm conceptualizes value systems, which represent sequences of a firm's value chains from raw material to the final consumer, which are aligned to deliver value to the end consumers. In the international development literature (Gereffi & Fernandez-Stark, 2016). Value chains have a similar definition to the value system used by Porter. A commonly used definition from (Kaplinsky and Morris 2000) defines the value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.

Value chain analysis (VCA) used by development practitioners expands upon Porter by establishing a diagnostic tool for studying the interactions of chain actors among others in developing country markets (Trienekens, *et al*., 2011) where systemic competitiveness induced by globalization is becoming an important aspect to be considered (Kaplinsky & Morris, 2001). Issues of adding value to value chains are combined with an identification of key chain actors (mapping), the assessment of institutional arrangements in the chain (governance), addressing the means of value addition (chain upgrading), and assessing the benefits of chain participation (Kaplinsky and Morris 2000). These four components are also discussed in the six dimension framework for global value chain (GVC) analysis introduced by (Gereffi and Fernandez-Stark 2016). One of the crucial determinants of competitiveness and VC performance is the concept of governance (Kaplinsky & Morris, 2001). Governance refers to institutional arrangements or coordination mechanisms used by trading parties' (producers and buyers) (Gereffi *et al.*, 2005).

Global value chain analysis basically takes up the notion of markets, hybrids, and hierarchies (vertical integration) and further distinguishes three hybrid forms: modular,

relational, and captive (Dolan *et al*., 2004; Gereffi *et al.*, 2005). Related to the power relationships between smallholders and other actors in value chains, developed four trajectories of value chain governance: buyer-driven chains, producer-driven chains, bilateral, and traditional markets. Buyer-driven chains refer to relationships in which private quality and safety standards are imposed by retailers (Gereffi, *et al.*, 2012).

This is usually to be found in the large-scale export chains of the large supermarket chains which use contracts with plantations or large-scale farmers also, smallholder-based production. Producer-driven chains, at the other extreme, have middle actors acting as processors processing products and coordinating the products from producers to consumers, and these processors are responsible for quality and safety issues. The result of this stage is a calculation of total profit throughout the chain and disaggregating the share of this profit to different actors of the value chain. However, such information does not fully capture or quantify the dynamics of the way VCs evolve and change based on new upgrading strategies, investments, or public policies, and limits the ability of value chain analysis to priorities among different options (Rich *et al*. 2011).

Therefore, a key condition for producers to be included in successful value chains is that they have access to market information and possess the ability to translate it to market intelligence. Actors networking value chain theory suggests that the value chain map should be simple, easy and clear. But the real world can be much more complex than mapped because of the involvement of different actors and channels. In order to simply understand the ground situation, the map should simply describe the flow of inputs, products, and information among the actors (Kaplinsky and Moris, 2000).

2.2.2. Analytical framework

The value chain framework is used as a powerful analytical tool for the tomato value chain analysis since it aims to maximize value addition while minimizing costs. In this study, value chain analysis is used to understand the relationships among actors from input suppliers to final consumers. The value chain analysis, the coordination, and role of actors, the supporting services, market performances and vertical and horizontal linkages in the contribution of each actor in the overall value added to the tomato value chain used.

Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships, identifying value-adding activities in the chain and assigning costs and added value to each of those activities. The flows of goods, information, and finance through the various stages of the chain are evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain (UNIDO, 2009).

Models, which include a "yes" or "no" type-dependent variable, are called dichotomous. Such models approximate the mathematical relationships between explanatory variables and the dependent variable that is always assigned qualitative response variables. We assume that a farmer's decision to sell in a given market derives from the maximization of expected utility (profit) he or she expects to gain from this market (Djalalou *et al.*, 2015).

A farmer's decision to select a given market or not is made by evaluating the return in expected utility, taking into account the related investment and transaction costs (Urquieta, 2009). Farmers will select the market channel that shows the most positive utility. Econometric models such as multivariate probit/logit, multinomial probit/logit, conditional or mixed or nested logit are useful models for the analysis of categorical choice dependent variables. A multivariate probit model is preferred over the multinomial logit model because of the independence of irrelevant alternatives (IIA) assumption in multinomial logit model which states that the ratio of the probabilities of choosing any two alternatives is independent of the attributes of any other alternative in the choice set (Greene, 2003). The choice decision over the given groups of market outlets can be modeled in two ways: either by multinomial or multivariate regression analysis. However, the multivariate probit model is among the market outlet are not mutually exclusive as farmers are selling tomato products at more than one market at the same time and therefore the random error components of the market outlet may be correlated.

Therefore, we consider using a multivariate probit model which allows for the possible contemporaneous correlation in the choice to access the four different market outlets simultaneously. Multivariate probit approach simultaneously models the influence of the set of explanatory variables on choice of markets outlets, while allowing for the potential

correlations between unobserved disturbances, as well as the relationships between the choices of different market outlets (Belderbos *et al*., 2004). The market outlets for the producers have been categorized into four groups: collector, wholesaler, retailer, and consumer market outlets. Each producer can use one or more marketing outlets or several combinations of different outlets that maximize the expected utility and due to this there are some overlapping and many farmers sell on more than one market outlet. But multinomial models are appropriate when individuals can choose only one outcome from among the set of mutually exclusive, collectively exhaustive alternatives. However, in this study producers' market channel choice not mutually exclusive; considering the possibility of simultaneous choices of the channel and the potential correlations among these market channel choice decisions.

The observed outcome of market outlet choice can be modeled following random utility formulation. Consider the i^{th} farm household (i=1, 2, 3….. N), facing a decision problem on whether or not to choose available market outlets. Let U_0 represent the benefits to the farmer who chooses wholesalers, and let the U_K represent the benefit of the farmer to the K^{th} market outlet: where K denotes the choice of the rural collector (Y1), wholesaler (Y2), retailer (Y3) and consumers (Y4). The farmer decides to choose the K^{th} market outlet if $Y_{ik}^{*} = U_k^{*} - U_0 > 0$.

The multivariate probit model takes into account the potential interdependence in market ou tlet choices and the possible correlation in the choice of alternative outlets. The probability of preferring any particular market outlet is estimated conditional on the choice of any other related outlet. Multivariate probit model (mv probit) is applied for household variation in the choice of a market outlet and to approximation several correlated binary outcomes jointly.The use of multivariate probit as a micro- econometric model to investigate farmers' decisions between potential joint alternatives is a consolidated technique within the agricultural economics literature in the field of information and knowledge transfer, in/off farm investment and planning decisions (Velandia *et al*., 2009). Moreover, Corsi *et al*. (2009) recently applied this approach to model organic farmers' decisions to diversify their marketing chains in a regional case study in Italy.

2.2.3. Review of empirical studies

2.2.3.1 Marketing margin

According to Djalalou *et al*. (2015); the profits farmers expect from selling the products enable them to make appropriate decisions to sell their products in the market. By taking investment and transaction costs into account farmers make the decision on channel choice by evaluating the return of expected profit (Urquieta, 2009).

According to Addisu (2016); marketing margin determination should be conducted by taking into consideration the price received or selling price. The marketing margin is a sequence of production and marketing operations that define the value chain. Calculating production costs in value chains involves an aggregating cost of enterprises in a particular segment to arrive at an average of the value chain or of the sector at large relating the data to the functions in the value chain. In order to achieve this, the functional sequence of the value chain is to be broken down into small steps. Unit cost in each operation is measured the procedure comes close to activity-based costing analysis in which costs are assigned to business activities. Marketing costs are estimated to compute the share of profit captured by key actors in the marketing.

As to Gizachew (2018); the study on vegetable (red pepper) value chain, six marketing channels of red pepper were identified. He found out that; the gross marketing margin of producers (GMMp) was highest in the channel of Producers - Collectors - Wholesalers - Urban retailers - Consumers, and the total gross marketing margin (TGMM) was highest in the channel of Producers - Wholesalers - processors - Consumers.

Adisu (2016); studied on vegetable (onion) value chain by identifying six marketing channels of onion. The results of, his study show that; the gross marketing margin of producers (GMMp) was highest in the channel of Producer-Wholesaler-Processor-Consumer which accounts forn72.84%. This implies that district retailers and wholesalers were received the highest remuneration from onion marketed in the study area. While central retailers and rural collectors took the smallest profits shares from the onion value chain. Also, the total gross marketing margin (TGMM) was highest in the channel of Producer-Collector-Wholesaler-Central retailer-Consumer and in the channel of Producer-

Wholesaler-Central retailer-Consumer which accounts for 32.75% and 32.05, respectively. This implies, the share of market intermediaries in the consumers' price was substantial and there was a need to reduce market intermediaries to minimize the marketing margins and thereby enhance the producers' income.

According to Bekele (2017); five marketing channels of the potato were exhibited. His result indicated that producers' share (GMMp) was the highest in the channel of Producers - Retailers - Consumer which accounts for 77.78% from the total consumers' price, and lowest in the channel of Producers -collectors-Wholesalers- Consumers which was 42.86%. However, (TGMM) was the highest in the channel of Producers-Collectors-Wholesalers - Consumers which accounts for 57.14%. High TGMM reduces the producers' share (GMMp), which is the percentage share of producers from the total consumers' price.

2.2.3.2. Factors affecting market outlet choice

Regarding factors affecting channel choices of the households, different researchers used a multivariate probit model and logit for categorical marketing systems for different agricultural commodities.

Addis (2016); used multivariate probit models to analyze factors influencing potato and onion farmers' choice of marketing outlets. The study showed that the potato farmers in the study area decide on market outlets for their products based on the quantity of potato sold. Other factors that determined the market choice include; education level of households, sex of households, family size, farmers' experience, distance to the nearest market, access to off/non-farm income, trust in traders, and ownership of motor pump and area of land allocated for potato. The study also showed that from variables hypothesized to influence onion producers choice of market outlets, the quantity of onion supplied, extension contact, farmers experience, distance to the nearest market, access of off/non-farm income, current farm gate price of onion, trust in traders, ownership of motor pump and land size allocated for onion were among determinants which affect significantly onion producers to choose the alternatives market outlets.

Gizachew (2018); used multivariate probit regression analysis to investigate a factor that influences market outlet choice of red pepper producers. The result has indicated that variables such as family size, distance to the market, the quantity of red pepper produced and price offered are significant determinants of the choice of wholesale market outlet. Farmers' choice of collector market outlet is determined by the family size, distance to the nearest market, the quantity of red pepper produced, the price offered and access to non-farm income. The choice of retailer market outlet is determined by the variables such as the quantity of red pepper produced and the price offered. Consumer market outlet choice was negatively and significantly determined by the variables such as the quantity of red pepper produced, the price offered and access to market information.

A study by Mukiama *et al*. (2014); pointed out that three key marketing channels for tomatoes were collectors, direct retailing, and farmers' cooperatives. Factors such as gender, income, experience, group membership, vegetable land size, soil conservation practice, and type of pesticide used were found to significantly affect the farmers' choices of marketing channels.

Abraham (2013); used a multinomial logit model to identify factors determining farmers' vegetable market outlet choice decision. The model results indicated that the probability to choose the collector outlet was significantly affected by access to extension service, owning transport facility, membership to any cooperatives and post-harvest value addition compared to the wholesaler outlet. Similarly, the probability of choosing a retailer marketing outlet was affected by woreda dummy, educational status of household heads, access to extension services and owning transport facilities compared to the wholesaler outlet.

Nyaupane and Gillespie (2010); farmers choose a market outlet considering its convenience and economic profitability. Farmers will choose the channel that is most convenient and that offers the highest returns. The survey results of the factors influencing producers' marketing decisions in the Louisiana Crawfish Industry showed that most farmers choose wholesale markets compared to selling directly to consumers, retailers, and producers. Farmers have a choice of whether to sell through direct or indirect marketing channels. Demographics farm

characteristics (farm size and diversification) and premarket characteristics had significant influences on market outlet choice.

Bai *et al*. (2006); conducted a study on consumer choice of retail food store formats in Qingdao, China. The study used a multivariate probit model with four categories of retail food store formats (wet market, small grocery stores, supermarkets, and hypermarkets) in Qingdao and the study indicates that the new hypermarkets are substitutes for the supermarket. This study pointed out that quantity of tomato sold, land allocated tomato, agricultural market distance, sex, education level, households size, market information, transport facilitate, buyer trust, own to motor pump in agro-pastoralism, and off-farm income are the main factors that influence the choice of marketing outlet by the agro-pastoral. From the aforementioned result on the factor which determines the market outlet choice on different agricultural commodities, one can come up with most of the factor that affects the market outlet choices differ from commodities to commodities. Hence the existing market outlet, location of the study area and type of the commodity might result in a difference in factor affecting market outlet choices. Therefore it is pertinent to conduct a study on analyzing factors determining the market outlet choices.

Padmanand *et al.* (2015); used a multivariate probit model and confirmed that income, education, employment status, household size, and distance influence shopping frequency in all five outlet types selected. Income had a positive effect, whereas household size was negatively associated with supper marketing channel choices. Therefore, the goal of the modeling market outlets choice decision is to explain the effects of the independent variables on the probability of choosing between different market outlets in the tomato value chain.

2. 4. Conceptual Framework of the Study

A value chain consists of all stages of a technical production process as well as of the interaction between these stages. Value chains include process actors such as input suppliers, producers, traders, and consumers. And the other part of a value chain, the interaction between the actors at each stage, is the relationships and contractual linkages of

the producing, processing, packaging, transportations, storage, for the overall character chain (Schipmann, 2006).

Different demographic factors that affect tomato value chains are age, family size, and sex of household head farming experience, educational level of household head and farm characteristic are lands allocated for tomato production And mean livelhood also affect market outlet choice such as; quantity tomato produced, non-farm income and institutional characteristic are; access to market information, ownership of motor pump, distance to the nearest market, having transport facility, extension service, and buyer trust affect tomato market outlet choice in the study area.

Besides all these major actors involved and their interaction at each stage, there are other service providers that have an indirect role and the linkage between these actors thereby creating the governance structure (Kaplinksy and Morris, 2001). In order to improve the marketing of tomato, there is a need to identify tomato value chain actors, their respective roles, draw up value chain map of tomato in the study area, and assess tomato value chain actor, market performance, factors affecting market outlet choice decision of smallholder tomato producers and constraint and opportunity tomato value chain in Omo Nada. Generally, farmers' income and welfare can be enhanced through increased volume of sale and choices of appropriate market outlets in the study area. Based on theoretical concepts and empirical studies, a conceptual framework of the tomato value chain was constructed as follows

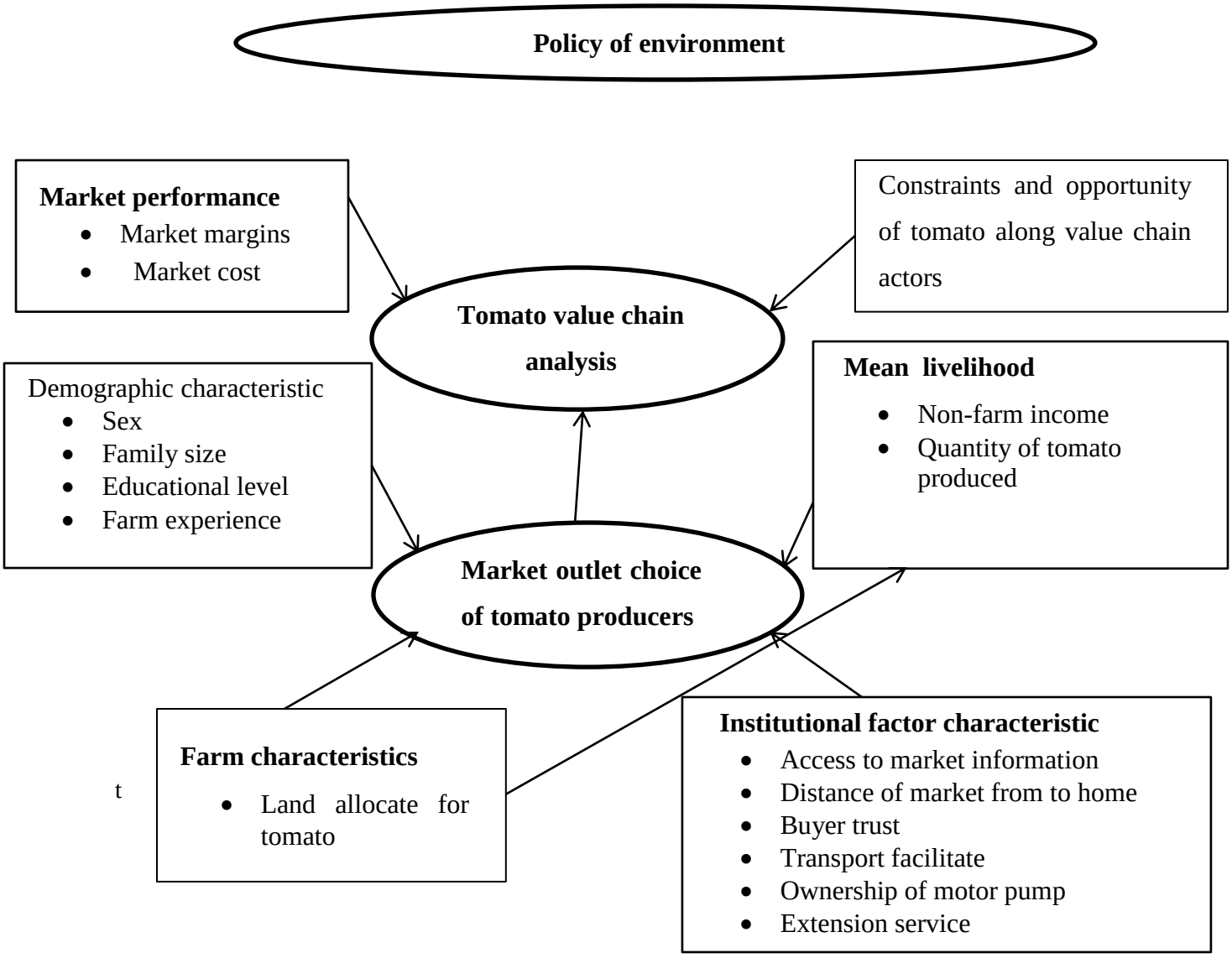

Figure 1: Conceptual framework

Source: Own Construction 2019

3. METHODOLOGY

3.1. Description of the Study Area

The study was conducted in the Omo Nada district of Jimma zone Oromia National Regional State, Ethiopia, and located at approximately 290 kilometers southwest of Addis Ababa and 70 kilometers from Jimma town. It is bordered in the south by the Gojeb river which separates it from the Southern Nation Nationality People Region (SNNPR), in the west by the Dedo, in the northwest by the Kersa, in the north by the Tiro Afeta, in the northeast by Sokoru, and in the east by Omo River. Nada is the capital city of the Omo Nada district. The district has a total of 28 kebeles of which 24 are rural-based kebele administration areas and 4 are town kebele. According to Population and Housing Census of Ethiopian Central Statistic agency projection, the total population of Omo Nada district was 198,618 in which the total male population comprises 99,508 and remaining 99,110 are females (CSA, 2018).

The rainfall of the area is bimodal, with unpredictable short rains from March to April and the main season ranging from June to September. The minimum and maximum annual rainfall range from 1066 to 1200mm with a mean annual temperature ranging from 18 to 25°C (BFED, 2018). The district's land is diverse, flat and undulating topography with the altitude ranging from 1650–2200 meters above sea level (masl). Omo Nada district lies at 7°17'to 7°49'N 37°00' to 37°28'E.

Now, the district had the potential for producing crops and livestock. Crop production takes the lion's share of consumption and income generation of the household. Cereal crops widely produced in the area include maize, wheat, barley, from pulse crops like; soya bean, chickpea, haricot bean, and faba beans are the major crops grown. Moreover, vegetables and root crops produced in the area include onions, potato, tomato, red pepper, cabbage respectively. Annual crops are predominant and rain-fed agriculture is mainly practiced using animal power. Livestock production is also another source of income and food source next to crop production. In addition, it is the source of traction power and used as a means of transpiration. Farmers keep livestock (cattle, sheep, poultry, fish, and horse) for various purposes in the study area (ONDAO, 2018).

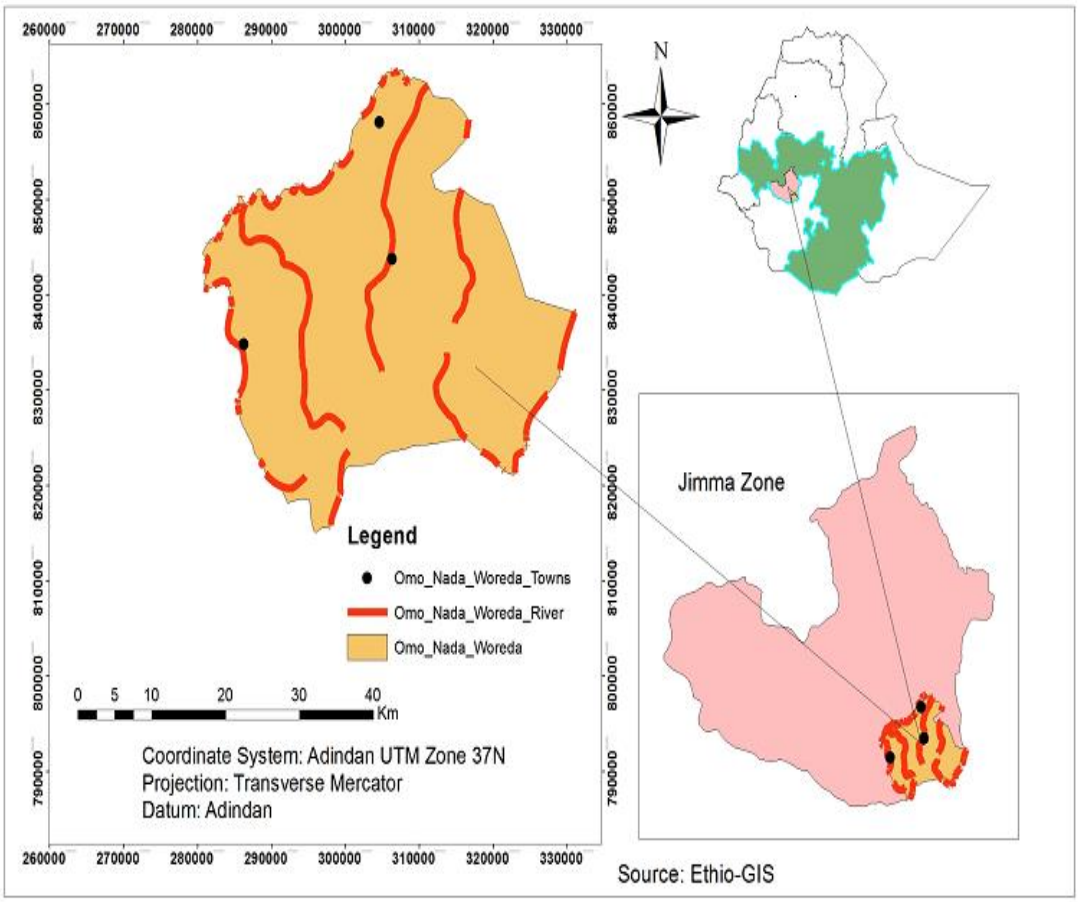

Figure 2: Map of the study area

3.2. Data Types and Sources

The quantitative and qualitative data were collected from both primary and secondary sources. Primary data was collected from randomly sampled 190 producers, 25 traders, and 15 consumers by using a structured questionnaire through the interview method and assess the constraint and opportunities of farmers in small-scale irrigation practices. Before embarking into data collection, the questionnaire was pre-tested to check its appropriateness for gathering the required information. The main important data collected variables were transported mode, the market distance from their home, the volume of tomato produced, and access to market information, farm experience, and off/non-farm-income activities. Qualitative data was about business practices and transactions, the patterns and socio-economic activities of the producers in the study area were gathered informally through direct observation of the study area and informal discussions Key informant interviews were

made with development agents and experts in district agricultural development office, ethnic leaders using checklists. Also, the quantitative data were collected about the population size, physical characteristics, and the volume of tomato supplied through each outlet.

Secondary data: Relevant data needed for this study were collected, from the district of agriculture office and Rural Development, District Trade and Market Development Office and its associated primary cooperatives and Central Statistical Agency, bulletins, annual reports, and websites. Both published and unpublished documents were comprehensively reviewed to support the interpretation of the primary data. Both qualitative and quantitative data types were collected, depending on tomato production and marketing, constraints and opportunities of the value chain in the study area.

3.3. Sample Size and Sampling Technique

Selection of sample tomato producer household

For this study, two-stage sampling procedures were followed to select sample tomato producers. In the first stage, out of 15 kebeles in the district four kebeles namely; Nada Cala, Doyo Yaya, Nada Sokote and Biso gombo were selected randomly. In the second stage, from 2705 tomato producers' in four kebeles,190 tomato producer households were randomly selected using probability proportionality size following a simplified formula provided by (Yamane, 1967). Accordingly, the required sample size at a 95% confidence level with a 5% degree of variability and level of precision at 7% is used to obtain a sample size required which represents a true population (Table 1).

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

Where: n = is the desired sample size, N = is the total population of tomato producer households in the four kebeles (2705), and e = is the level of precision.

$$n = \frac{2705}{1+2705(0.07)2} = 190$$

Table 1: Sample procedures of tomato producer select in kebele

Selectedkebele	Tomato producers	Proportion	Sample size
Nada Cala	850	0.31	59
Doyo Yaya	725	0.27	51
Nada Sokote	650	0.24	46
Biso Gombo	480	0.18	34
Total	2705	1	190

Source: Own competition survey results in 2019

3.3.1. A sampling of other value chain actor

The sample of traders and consumers were obtained from available actors who perform trading and consumption of tomato in the study area. Accordingly, 25 traders (11collectors, 6 wholesalers, and 8 retailers) and 15 consumers were purposively selected because of the number of collectors, retailers, and consumers were not registered. So the interviewed selected from the towns of Omo Nada district to fill the questionnaire required from traders and consumers.

3.4. Method of Data Collection

The primary data was collected through a field survey from randomly selected respondents such as producers, traders, and consumers. Before data collection, the questionnaire was pre-tested on eight farmers and three traders to evaluate the appropriateness of the design, clarity and interpretation of the questions, relevance of the questions and time taken for an interview. Hence, appropriate modifications were made on the questionnaires prior to conducting the survey. Data was collected under continuous supervision of the researcher.The questionnaires was covered with the order to capture relevant information related to the study of the objectives.

Key informant interviews and focus group discussions: Focus group discussion is the main data collection method in this research. This approach was conducted with specific tomato farmers to collect data required for the value chain analysis. With consultation with local authorities, Farmers and experts (i.e. extension agents and district experts) the researcher scheduled meetings for collecting data, and farmers indicated by key informants

were invited to participate in the focus group meeting. Two focus group discussions were prepared for each kebeles and that each group contains 10 members.

Secondary data were collected from the office of agriculture, marketing agencies, survey report, bulletins, annual reports, and websites. Both published and unpublished documents were comprehensively reviewed to support the interpretation of the primary data. Information on different variables such as data on, land allocate for tomato production, quantity of tomato produced, distance of market from their home, farm experience, age of household head, sex of household head, extension service, educational level of household head, family size, access to market information, buyer trust, ownership of motor pump, non-farm income activities, constraints and opportunities in the value chain and type of sellers and buyers were collected by using the structured questionnaires.

3.5. Method of Data Analysis

Three types of data analysis namely; descriptive statics, value chain analysis and econometric analysis are undertaken to address the research questions and objectives of this study

3.5.1. Descriptive statistics analysis

Descriptive analysis of the data mainly uses minimum, maximum, mean, frequency, percentage and the standard deviation was used. It was employed in the process of examining farm household characteristics,institutional characteristics producers, traders, and consumers. Also, the variables which are analyzed by descriptive were; sex of household head, age of household head, family size, farm experience, land size, credit user, extension service, and off/non-farm income.

3.5.2. Value chain analysis

Value chain analysis was used to identify and analyze roles and linkages among input suppliers, producers, traders, consumers, and supporters. It is also used to map tomato value chain, figure out marketing channels, constraints hindering tomato value chain development and opportunities. Analyzing the performance of the market is necessary for agricultural

value chain analysis. Market concentration and barriers to entry and exit were used to analyze the structure of the market. The conduct of the market was also analyzed by using traders' pricing strategies, traders' purchasing, and selling strategies. Finally, the performance of the tomato market was evaluated by calculating marketing costs, margins and profit shares of the major actors under various marketing channels and constraints and opportunities of the tomato value chain in the study area.

3.6. Analysis of Tomato Market Performance

According to Ghorbani (2008), the marketing margin is important indices in the evaluation of value chain performance. It is the difference in the price payable by consumers and that are received by the producers. Marketing margins are also calculated at different points along the value chain and then compared with a consumer price. Once the basic structure of a marketing channel is established, it is relatively easy to collect information on the price at which the product is bought and sold at each stage in the production process (Smith, 1992).

Estimates of marketing margin are the best tools to analyze the performance of market margins. A marketing margin is similar to a profit margin in that it shows the relationship between the amounts a farmer pays for a product and the amount its customers pay. Also, the marketing margin is most commonly used to refer to the difference between a producer and consumer prices of an equivalent quantity and quality of a commodity. 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.

$$\text{TGMM} = \frac{\text{Final consumer price} - \text{final producer price}}{\text{Final consumer price}} * 100 \qquad (2)$$

Gross marketing margin (GMM): is the portion of the price paid by the end consumer that belongs to the farmer as a consumer. It should be emphasized that growers that as middlemen also receive an additional marketing margin. The producer's margin or share in the consumer price (GMMp) is calculated as:

$$\text{GMMp} = \frac{\text{Consumer price} - \text{Market gross margin}}{\text{Consumer price}} * 100 \qquad (3)$$

Net Marketing Margin (NMM): It is the percentage over the final price earned by the intermediary as his/her net income once his/her 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 producers and marketing agents.

$$\text{NMM} = \frac{\text{Gross marketing margin} - \text{Marketing cost}}{\text{Consumer price}} * 100 \qquad (4)$$

The consumer price share of market intermediaries is calculated as:

$$\text{MM} = \frac{\text{SP} - \text{BP}}{\text{EBP}} * 100 \qquad (5)$$

Where: MM = Marketing margin (%) SP = Selling price at each level, BP = Buying price EBP = End buyer price. The above equation tells us that a higher marketing margin diminishes producers to share and vice versa. It also provides an indication of welfare distribution among production and marketing agents. In the case of perishable products, estimating the margin depends largely on primary data collection in the form of surveys carried out over time intervals relevant market cycle occurs. Recording prices at different levels of the marketing chain during a two-to-three-week period is sufficient to calculate quite accurately the relevant marketing margin (Mendoza, 1995).

3.6.1. Econometric model specification

3.6.2. Market outlet choice modeling

Econometric analysis is used to estimate the causal relationship between the dependent variable and the explanatory variables. It is essential to understand the effects of different factors on tomato market channel choice. Determinants of the market outlet choices have identified this study using the multivariate probit model. Some recent empirical studies of market outlet choices assume that producers consider a set 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 a multivariate probit model in which other outcomes are possibly chosen. However, in this study, more than one marketing outlet is available in the study area and farmers 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. This is to mean that farmers do not sell tomato permanently to the particular market outlet and use the available market outlets alternatively in the absence or presence of the possible choices.

Since farmers may market their product via multiple outlets, the multinomial logit model would be infeasible due to the resultant very large number of possible choices. The relative risk of selecting one outlet can be affected by the relative risk of selecting the other and violate the Hausman assumption of independence of irrelevant alternatives (IIA) in the multinomial logit model. If simultaneity in decision-making exists, this approach yields biased, inefficient and inconsistent estimates (Maddala, 1983; Greene, 2003). Failure to unobserved factors and inter-relationships among choice decisions regarding different market outlets will lead to bias and inefficient estimates (Menale *et al*., 2012).

Corsi *et al*; (2009), used a multivariate probit model to analyze the diversification of the marketing chain choice among organic producers. A multivariate probit model is preferred over the multinomial logit model because of the independence of irrelevant alternatives (IIA) assumption which states that the ratio of the probabilities of choosing any two alternatives is independent of the attributes of any other alternative in the choice set (Greene, 2003). Multivariate probit approach at the same time models the influence of the set of explanatory variables on choice of markets outlets, whereas allowing for the potential correlations between unobserved disturbances, as well as the relationships between the choices of different market outlets (Hailemariam *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 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 it is used to estimate several correlated binary dependent variables jointly.

$$Y_{ik}^{*} = X_i \beta_k + \varepsilon_i \qquad (k=Y_1, Y_2, Y_3, Y_4) \qquad (6)$$

Using the indicator function, the unobserved preferences in Equation (6) translates into the observed binary outcome equation for each choice as follows:

$$Y_{ik}^{*} = \begin{cases} 1 \text{if } Y_{ik}^{*} > 0 \\ 0 \text{otherwise} \end{cases} \qquad (k= Y_1, Y_2, Y_3, Y_4) \qquad (7)$$

In multivariate model, where the choice of several market outlets is possible, the error terms jointly follow a multivariate normal distribution (MVN) with zero conditional mean and variance normalized to unity (for identification of the parameters) where ($\mu_{y1}, \mu_{y2}, \mu_{y3}, \mu_{y4}$) MVN ~ (0, Ω) and the symmetric covariance matrix Ω is given by multivariate probit model;

$$\Omega = \begin{bmatrix} 1 & \rho_{y1y2} & \rho_{y1y3} & \rho_{y1y4} \\ \rho_{y2y1} & 1 & \rho_{y2y3} & \rho_{y2y4} \\ \rho_{y3y1} & \rho_{y3y2} & 1 & \rho_{y3y4} \\ \rho_{y4y1} & \rho_{y4y2} & \rho_{y4y3} & 1 \end{bmatrix} \qquad (8)$$

The particular interest is off-diagonal elements in the covariance matrix, which represent the unobserved correlation between the stochastic components of the different types of outlets. This assumption means that Equation (8) generates an MVP model that together represents the decision to the choice of a particular market outlet. This specification with non-zero off-diagonal elements allows for correlation across error terms of several latent equations, which represents unobserved characteristics that affect the choice of alternative outlets. Following the form used by Cappellarri and Jenkins (2003), the log-likelihood function associated with a sample outcome is then given by the multivariate probit model;

$$\ln L = \sum_{i=1}^{N} \omega_i \ln \Phi(\mu_i, \Omega) \quad (9)$$

Where Ω is an optional weight for observation I, and $_I$ is the multivariate standard normal distribution with arguments μ_i and Ω, where μ_i can be denoted as;

$$\mu_i = (k_{i1}\beta_1 X_{i1}, k_{i2}\beta_2, k_{i3}\beta_3 X_{i3}), \text{while } \Omega_{ik} = 1 \text{for } j = k \quad (10)$$

$$\Omega_{jk} = \Omega_{kj} = k_{ij}k_{ik}\rho_{jk} \text{ for } j \neq k, k = 1,2,3.... \text{with } k_{ik} = 2y_{ik} - 1 \quad (11)$$

3.7. Definitions of Variables and Hypotheses

3.7.1. Dependent variable

1. **Market** o**utlet choice decision**: In order to identify factors influencing tomato market outlets choice both continuous and discrete variables were hypothesized based on economic theories and the findings of the empirical studies. Accordingly, in order to investigate the determinants of market outlet choice, the following variables were identified. The explanatory variables are expected to influence the dependent variables. The dependent variable was represented in the model as Y1 for those households who choose to sell tomato to collectors, Y2 for producers who choose wholesalers, Y3 for producers who choose retailers and Y4 for producers who choose consumers to sell tomato in the study area. The respective variables assume a value of 1 when the definition is fulfilled and 0 otherwise.

3.7.2. Independent variables for market outlet choice

There are thirteen independent variables hypothesize to affect farmers' choice of market channel for their producers, and the explanatory variables expected to influence the dependent variables were the following:

Sex of the Household Head (Sex): It is a dummy variable (takes a value of 1 if the household head is male and 0 for female). The variable is expected to have either a positive or negative relationship with the volume of tomato with collector and consumer market outlets. Both men and women participate in selling tomato products using different market outlets to generate income. Male household heads have been reported to have a better

tendency in searching market alternatives for the sale of tomato than female household heads. Bebe *et al*., (2012) noted that the majority of the female are resource-constrained given that they do not own critical resources in vegetable marketing to obtain additional income. As a result, male household heads have more chance to choose appropriate market outlets than female household heads.

Family Size (FAMS): It is a continuous variable measured in adult equivalent. Storck *et al.*, (1991) indicates the availability of active labor force in the household, which affects farmers' decision to market participation. Production is a function of labor, and the availability of labor is assumed to have a positive relationship with the quantity of tomato produce. Berhanu and Moti (2010) found out the negative relationship between family size and market participation. However in this context, the family size was hypothesized to have a positive relationship with wholesaler and retailer market outlet choice.

The education level of the household head (EDUHH): It is a continuous and measured in years of formal schooling. This indicated that the household head level of education affects the market supply of vegetables significantly. It is believed that if a producer's attained formal education of any level there is the possibility that farmers would choose appropriate channels. Gizachew (2018) identified that educated households sell their red pepper products positively and significantly affect probabilities choose wholesaler outlets. Moreover, better-educated household tends to be more innovative and more likely to adopt the modern market and choose appropriate market channels.

Land size (LSA): It refers to the size of land allocated for the tomato production of the producer. It is a continuous variable and measured in a hectare. If the producer allocates more land to tomato production, he/she could be benefited from the scale of tomato production. This finding is in line with Adisu (2016) found that the total area of land allocated onion in terms of hectares positively and significantly affected probabilities choosing wholesaler outlets. Therefore, land size allocated is hypothesized to affect the wholesaler market outlet positively.

Farming experience of the household heads (EXP): It is a continuous variable measured in the number of years. Farmers with longer farming experience are supposed to have better

competence in assessing the characteristics and potential benefits of a new marketing opportunity than farmers with shorter farming experience. Mebrat (2014) found a positive relationship of experience in tomato farming and the choice of probabilities appropriate market outlets. Therefore, it is expected that farm experience affects market outlet choice decisions.

Quantity of tomato produced (QTPR): It is a continuous variable measured in quintals. The more the quantity of tomato produced the higher would be the chances of using different market outlets. Households producing small quantities of tomato are likely to sell their products within a village rather than selling to other market channels. This is in line with finding Addisu (2016) identified that educated households sell their onion products positively and significantly affect probabilities choose wholesaler and retailer outlets.

Ownership motor pump (OWN UP): It is a dummy variable that takes a value if the farmers had their own motor pump for irrigation was 1 otherwise 0; this is one of the most important inputs for tomato production in the study area. The household with an owned motor pump for irrigation in tomato production is assumed to produce more amounts of tomato and, hence have hypothesized to influence in tomato production and thereby the volume of tomato supply positively. The study of Moti (2007) showed that area allocation to onion and kale production around Ziway as well as beetroot and leek production around Haro-Maya are positively and significantly affected by motor pump ownership. Motor pump ownership helps to produce more quantity and aids to choose a profitable market outlet choice by producing a quality product. Therefore, motor pump ownership is hypothesized to have a relation with wholesaler outlet choice to sell their product.

Extension contacts (EXTCONT): It is a continuous variable measured by frequency of contact. If producers have contact with DAs, there is an opportunity of obtaining important market information as well as other related agricultural information which helps to increase the farmer's ability to choose the better market outlets for his/her product. The study made by Girma and Abebaw (2012) also indicated the relationship between extension contact and choice of channels. Therefore, extension contact is hypothesized to have positively and significantly related to channel choice to sell their product. Abraham (2013) found that for

the households having extension service, the probabilities likelihood of choosing collector outlet decreases.

Distance from the nearest market (DSTMKT): It is a continuous variable measured in walking hours from home to market. In addition, those households that are close to the market are assumed to have more probability of choosing a better market channel than those households far from the market to sell their products. The study conducted by Bongiwe and Micah (2013) identified that the probability of households to choose wholesalers is negatively related to distance to market. Djalalou *et al*. (2015) also found that distance has a relationship for market outlet choice. Hence, this variable is expected to influence the market channel choice of the household. Mekonin (2015) found that the choice of cooperative outlet is positively and significantly affected by distance to the market compared to a private trader outlet.

Non/off-farm income (INCOM): It is a continuous variable measured in birr. Again, farmers who gain more income from non-farm activities want to supply their vegetables to any nearest market outlet with low price than to go far (Addisu, 2016). So this variable is hypothesized to positively and significantly affect the quantity of tomato produced to the consumer outlet.

Ownership transport facilities (TRANFAC): It is a dummy variable that takes value 1 if the household owns transport facilities and 0 otherwise. According to Jagwe (2007), the availability of transportation facilities helps to reduce long market distance constraints, offering greater depth in marketing choices. In this study, it is expected that the variable influences the likelihood of wholesaler outlet choice positively and significantly because those who own transport facilities can supply their products in large amounts without fearing of transport costs and searches for an appropriate market outlet. The findings of Nuri (2016) indicated that transport facilities ownership by households increased the likelihood of choosing wholesalers outlet. Therefore, this variable is assumed to affect the probability of households to choose wholesaler market outlets.

Access to market information (ACMKTIN): It is a dummy variable. Market information is the information on price, demand, quality, buyers and other relevant information that can

contribute to good decision making for sellers. Therefore, it is hypothesized that market information is negative and positive related to the market supply of tomato. Producers who have access to market information have more probabilities to choose wholesaler outlet (Abraham, 2013).

Trust in buyers (TRUST): It is a dummy variable that takes a value of 1 if the outlet is trusted and 0 otherwise. Farmers having high trust in clients are supposed to spend less time to find their transacting partners or monitoring on payments and deliver their product to this outlet. Trust in traders is hypothesized to have a positive relationship with producer decision to choose market outlets. Trust in traders is hypothesized to have a positive/negative relationship with producers' decision to choose market outlets. Producers' measured to buyers trust depend on to give a fair price, scaling fair (weighing) to sell their product a trader. Therefore, the buyer trust was hypothesized to have a relation with the probability of the market channel. The finding of Addisu (2016) identified that households who trust in buyers are more likely to deliver to collector outlet. Trust in traders is hypothesized to have positive relationships with producer decisions to choose market outlets.

Table 2: Summary of independent variables used in the Multivariate probit model

Variable	Measurement	The expected effect on market outlet choice				
		Collector	Wholesaler	Retailer	Consumer	Autors
Sex of household head	1 male 0 female	+/-	-	+/-	-/+	Bebe *et al.,* (2012)
Family size	Adult equivalent	-	+	-	-	Moti (2007)
The educational level	Formal schooling	-	+	-	-	Gizachew (2018)
Land size	Hectare	-	+	-/+	-	Adisu (2016)
Farm experience of HH	Year	-	+	-	+	Mebrat(2014)
Quantity produced	Quintals	-	+	+	-	Adisu (2016)
Extension contact	Frequency contact	-	+	-	-	Abebe(2012)
Distance to the nearest market	Hours	+	-	-	-/+	Bongiwu& Michah, (2013)
Non-farm income	Birr	-	+	-	-	Adisu (2016)
Motor pump	Yes=1, No=0	+/-	+	-	-	Moti (2007)
Transport facilities	Yes=1 No = 0	-	+	-	-/+	Jadwe(2007)
Market information	Yes =1No= 0	-/+	+	-/+	-	Abraham (2014)
Buyer trust	Yes= 1 otherwise	-	+	-	-/+	Adisu(2016)

4. RESULTS AND DISCUSSIONS

This chapter presents the results of the study. Descriptive analysis is employed to describe the socio-economic characteristics of sampled farmers households, traders and consumers. Value chain analysis of tomato which includes value chain map, actors and their roles, challenges and opportunities along the value chain, marketing costs, and margins, and benefits shares of actors in the value chain discussed.

4.1 Descriptive Statistics

4.1.1. Demographic characteristics of the sampled household head

The demographic characteristics of households explain the profile of sampled household heads which is essential for the study.

4.1.1.1. Household characteristics

Household characteristics include (sex, age, family size, farming experience, and educational level of household headed). As shown in Table 3, out of the total households interviewed, 77.4% were male-headed households and 22.6% were female-headed households. Age plays a significant role in any kind of business, particularly in agriculture, because the use of child labor on the farms is quite high. Accordingly, the maximum and minimum age of the respondent was 22 and 70 years with a mean of age was 43.2 years.

The mean of the educational level of household heads was 2.96 with ranging from 0 to 9 grade. Educational backgrounds of the sampled households are believed to be important features that determine the readiness of household heads to accept new innovations and improve their market participation and choice of better market outlets. The mean family size of the sample households were 4.2 persons. The mean farming experience of the total sample respondents was found to be 16 years. In the Omo Nada district which implied that sampled households had good experience of the tomato production with ranging from 2 to 42 years.

Table 3: Demographic characteristics of sampled producers' (continues and dummy variable)

Dummy variable		**Frequency**	**Percent**
Sex HH size	Female	43	22.6
	Male	147	77.4

Continues variable	**N**	**Min**	**Max**	**Mean**	**SD**
Educational of household	190	0.00	9	2.96	2.72
Family size	190	1	8	4.17	1.80
Farm experience of household	190	2	42	16	8.98
Age of house hold size	190	22	70	43.2	12.10

Source: Own computations survey results, 2019

4.1.1.2. Farm Characteristics

Land: Land is one of the important factors of production and measure of wealth in the study area. The survey results show that the mean of land size was 3.49 hectares with ranging from 1 hectare to 6 hectares (Table 4). The result also indicates that the mean land allocated for tomato production per household was 0.45 hectares with ranging from 0.13 hectares to 1 hectare.

Table 4: The land size of household respondents and allocated for tomato(hactare)

Variable	**N**	**Min**	**Max**	**Mean**	**SD**
Land allocate for tomato	190	0.13	1	0.45	0 .19
Total land owned	190	1	6	3.49	1.60

Source: Own computation survey results, 2019

4.1.1.3. Institutional characteristics

Development agents are an important factor in making information available and help farmers to be accessed with different services which could encourage them to produce, sell and choose appropriate market outlets. As depicted in Table 5, the mean frequency of extension contact of sample households was 23.70 times in a year with ranging from 1 to 48 times in a year. Among the sampled household heads, 41.6% of respondents are non-access credit service and 58.4% got credit service from the available sources.

Market information is an essential factor in promoting competitive markets and improving agricultural sector development. It enables farmers to negotiate with traders on prices, quality and quantity required. Access to reliable market information on the prevailing market condition would help farmers to sell their surplus of tomato and choose lucrative market outlets. The survey result reveals that 54.2% of the sampled households had access to market information from different sources and about 45.8% of sampled households had no access to market information (Table 5).

Owning transport facilities was very important for households who produce different crops. Farmers use different transport types to move their products from the place of production to the place of the market. The survey result showed that the major means of transport were head caring, own pack animals, animal cart and public transport (vehicles). Accordingly, the survey result, about 57.9% had access to own transport facility and 42.1% had no access transport facility (Table 5). Head caring was the major means of transporting facilities for those respondent's lack of pack animals, cart and vehicles in the study area.

In the study area, motor renting, daily labor, petty trade, and brokers was founded to be some of the non-farm income-generating activities in which sampled producers were participating. The average of earn from non-farm income was 7984.2 birr by participating in non-farm income activities and ranging from 00 to 15000birr (Table 5). Households who are nearest to the market obtain enough information about price, demand, supply and incur a minimum market cost as compared to the households who are far away from the market. As depicted in Table 5, the average walking hour from the home to the market was 1.30 with ranging from 10 minutes to 6 hours.

Table 5: Institutional and socio-economic factors descriptive

Continues variable	**N**	**Min**	**Max**	**Mean**	**SD**
Extension service	190	1	48	23.70	17.09
Distance to market from their home	190	.10	6	1.30	1.06
Non farm income activities	190	.00	15,000	7,984.23	4571.0
Dummy variable	**Frequency**			**Percent**	
Not credit user	79			41.6	
Credit user	111			58.4	
Haven't owned a transport facilities	80			42.1	
Have own transport facilities	110			57.9	
Haven't access to market information	87			45.8	
Have access to market information	103			54.2	

Source: Own computations survey results, 2019

4.1.2. Demographic characteristics of sampled traders

As depicted in Table 6, the demographic characteristics of traders in terms of sex, age, family size, trade experience, and educational level status in the study area. The average family size of traders was 3.18 persons with ranging from 0 to 6. The average of educational level traders was 5.00 with ranging from 0 to 12 grade. The mean of age traders was 39.8 years with ranging from 20 to 53 years. The traders have an average of 9.24 years of experience in tomato trading and ranging from 3 to 15 years of trade experiences. The survey result indicates that about 64% of the sample traders were males while about 36% of them were females. This implies that both women's and male's participation in tomato trading was high. Regarding the marital status of traders, 60% were married, 32%, were single, 4% were widowed and 4% were divorced respectively.

Table 6: Demographic characteristics of sampled traders (continues and dummy variable)

Continues variable	**N**	**Min**	**Max**	**Mean**	**SD**
Age of HH	25	20	53	39.8	10.49
Education of household head	25	.00	12	5	3.25
Family size	25	.00	6	3.18	1.80
Experience trading	25	3	15	9.24	3.41

Dummy variable		**Frequency**	**Percent**
Sex	Female	9	36
	Male	16	64
Marital status	Single	8	32
	Married	15	60
	Widowed	1	4
	Divorced	1	4

Source: Own computations survey results, 2019

4.1.2.1. Socio-economic characteristics of sampled traders

Socio-economic characteristics include financial assets such as initial capital traders, working capital traders, source of capital and source of loan. The initial capital and working capital could be one of the indicators of the financial position of a given through it does not necessarily show the financial progress of the firm. As depicted in Table 7, the average initial capital of sampled tomato traders was 8,580 birr with ranging from 500 to 12000birr. With, regard to current working capital, the survey result shows in the 2018 average working capital of sampled tomato traders was 39,160 birr with ranging from10, 000 to 250,000 birr.

Table 7: The initial and working capital for tomato traders'

Variable	**N**	**Min**	**Max**	**Mean**	**SD**
Initial capital	25	500.00	12000.00	8,580	2737.4
Working capital	25	10,000	250,000	39,160	67493.012

Source: Own computations survey results, 2019

As indicated in Table 8, most of the traders' working capital originated from the internal source than external sources. About 36% of sampled traders were using their own capital

while about 36% through loan and 20% were functioned by share. The smallest proportions of about 8% source of traders' working capital were through gifts and combinations of own and loan, respectively. Further, the survey results revealed that about 16 % of traders borrowed working capital from relatives/family while about 24 % borrowed from Microfinance Institution's, 24% were from privates money lenders, 12% of traders borrowed from friends, 4% were traders borrowed from other traders, 8% were traders borrowed from NGO and 12% were traders borrowed from Bank.

Table 8: Traders' source of capital

Source capital	Frequency	Percent
Relative/family	4	16
Private money lender	6	24
Friend	3	12
Micro finance	6	24
Bank	3	12
Other traders	1	4
NGO	2	8

Source: Own computations survey results, 2019

4.1.3. Demographic characteristic of consumer

The survey results as depicted in Table 9, about 66.3% of the consumers were male and 33.3 % were female which entails that both men and women purchase and consume tomato in the Omo Nada district. The respondents are adults of ages ranging from 20 to 60 years with an average of 38.6 years. The average family size of consumers were 3.74 persons with ranging from 2 to 6. The educational level of consumers' results shows an average of 3.25 with ranging from 0 to have a certificate. Regarding marital status consumers, 53.3% were married, 20% were single, and 6.7% were widowed and 20% were divorced.

Table 9: Demographic characteristics of consumers (continues and dummy variables)

Item	N	Min	Max	Mean	SD.

Age of household head		15	20	60	38.60	9.55
Family size		15	2	6	3.74	1.07
Educational of the household head		15	.00	Certificate	3.25	4.11
Item				**Frequency**	**Percent**	
Sex	Female			5	33.3	
	Male			10	66.7	
Marital status	Single			3	20.0	
	Married			8	53.3	
	Widowed			1	6.7	
	Divorced			3	20.0	

Source: Own computations survey results, 2019

4.1.3.1. Means of livelihood of the consumers

Consumers earn their income from different sources. About 40% and 26.7% of consumers' were earned their income from trading and employment, respectively. About 13.3% of the sampled consumers were earned their income from hotels and renting the house and 20% earned from daily laborer works.

Table 10: Consumer's source of income

Variable name		**Frequency**	**Percent**
Source in come	Laborer	3	20.0
	Trader	6	40.0
	Employment	4	26.7
	Working hotel and renting	2	13.3

Source: Own computations survey results, 2019

4.2. Major Value Chain Actors and their Major Functions

Value chain actors are individuals or institutions who take ownership of a product through the exchange of money or equivalent goods or services during the transaction process of moving the product from conception to the ultimate consumers. Those individuals or firms providing a service without taking ownership of the product are considered to be service

providers. Figure 3, show different actors involved directly or indirectly between producers and final consumers in the tomato value chain.

Main actors: Those actors who directly deal with the products. Activities of main actors in the tomato value chain include producing, trading, marketing, and consuming. Main actors in tomato the value chain included: Input suppliers, producers, collectors, wholesalers, retailers, and consumers.

Input suppliers: Any activity requires an input to be transformed into a given product. Agricultural value chain analysis begins at the input supply level. Input such as seed is mostly supplied from fellow producers and according to the result, there were no many cooperatives, agricultural research institutes that provide improved tomato seed for producers. Instead of pesticides for weeds, producers use manual weeding which wastes time and requires labors; and farm implements are rarely supplied by cooperatives, Omo Nada agricultural center and Demonstration Station, traders, and informal producers. But most of the producers of the selected sample use seed from other producers.

Producers: producers are the primary and most valued actors in the tomato value chain. Producers decide, what input to use, when to seed and harvest, how much to consume, and how much to sell, considering the available resource. They perform most of the value chain functions right from farm inputs preparation on their farms to post-harvest handling and marketing. The major value chain functions that tomato producers perform include land preparation, growing/planting, fertilization, irrigating, protecting from weed, disease, harvesting, and post-harvest handling and marketing. In the Omo Nada district, tomato is produced using irrigation and the small number of producers indicated that they had used the rain-fed system. From sampled producers, about 80% are engaged in tomato production using irrigation and the remaining 20% produced tomato under rain-fed. Major value chain function that sampled households perform includes cultivation, fertilizer application, weeding, pest/disease control, seed preparation, harvesting, cleaning, post-harvest handling, and marketing.

From the sampled farmers about 51.7% of them have owned motors pump and the rest about 48.3% have rented or farmed in partnership apart from those who have motors pumps.

Collector: Collectors are traders that assemble a small lot of tomato from farmers in village markets for the purpose of reselling it to wholesalers, transporting it by using a donkey, cart and small truck. Collectors have a financial problem to collect and transport to another place to get high profit. Their chance is to only sell the collected product to wholesalers. The local traders play the key role as in the tomato value chain in the area. Their trading activities include; buying and assembling, repacking, sorting, and selling to wholesalers typically transport on donkeys or cart to the nearest town. Their major sales outlets are relatively wholesalers. And most of these outlets own or rent storage but usually do not store for more than two or three days because of perishability. These local traders collect tomato for wholesalers and wholesalers purchase from rural collectors by covering all costs and also an additional fee for their services.

Wholesalers: There are very few wholesalers, who have the license to do wholesale in the study area. Wholesalers are mainly involved in buying a tomato from collectors and producers in larger volumes than any other actors and areas for resale in deficit to larger market centers and retailers with better financial and information capacity. Wholesalers are the major buyers of tomato as they buy at least a truckload of tomato at a time from producers. They mostly purchase from producers and collectors. The majority of wholesalers are located outside the districts mainly in Jimma town and other districts. Wholesalers mostly purchase in bulk from the kebeles, transport and sell the product to the major towns like Omo Nada, Omo Beyam and Jimma zone, and others. Wholesalers buy a tomato from producers through brokers who represent them in tomato buying activities. They have better storage, transport and communication access than other traders.

Retailers: They are one of the last links between producers and consumers. They buy from collectors, wholesalers, and producers in their surroundings and directly resell tomato to consumers. They perform several value addition activities such as buying, transporting, storing and selling to end-users. The problem raised by retailers during the survey was limited financial capacity that hinders them from being involved in a larger trade. They always prefer to buy from producers than other actors and not resell for other actors except for consumers and most of the retailers of the study area are unlicensed.

Consumers: Consumers are final purchasers of tomato products mostly from retailers, producers, another trader for consumption purposes and not reselling. Tomato consumers are individual households (rural and urban dwellers) hotels and institutions. The majority of sampled consumers preferred smooth red, medium-size and undamaged tomato and followed by large size and clean tomato. Almost all sampled consumers 86.5% preferred fresh tomato products while a small proportion of 13.5% of consumers preferred packed tomato products. Consumers think that if the chain becomes shorter and shorter the price of tomato will be reduced.

4.2.1. Value chain supporters

In a value chain, a supporter includes all chain-specific actors providing regular support services or representing the common interest of the value chain actors. The supporting function players for the tomato value chain are those who are not directly related to the tomato value chain but provide different supports to the value chain actors. According to Martin *et al*., (2007), access to market information or knowledge, technology, and finance determines the state of success of value chain actors. The support functions include different services (e.g. credit), research and development, infrastructure, and information. Support service providers are essential for value chain development and include sector-specific input and equipment providers, financial services, extension service, and access to market information and dissemination, technology suppliers, advisory service, etc. In the study areas, there are many institutions supporting the tomato value chain in one way or another.

The most common support providers are the District Agriculture office, District Irrigation and Development Authority, District trade and Market Development office, Cooperatives, Oromia Micro Finance Institutions, and Private transporters. The office provides advisory services, facilitates access to inputs and provides technical support in seedbed preparation, fertilizer application, crop protection, and post-harvest handling. The key informant interview points out that the producers get extension service on general agriculture and it is not sufficient to improve the technical skill of the producers. The most common sources of loans are Oromia Microfinance, Institutions and relatives/friends since they do not require collateral. Moreover, it was found that NGOs and Banks are operating in providing technical service and offers credit support to the producers. But the producers are not

receiving sufficient service regarding finance related issues in the study area. In the study areas, cooperatives do not support producers in the value chain of tomato as expected, they supply only fertilizer for producers. This is due to the lack of adequate capital to supply inputs and a lack of emphasis on district administrations to organized cooperatives in each peasants' association and functions efficiently.

4.2.2. Chain influencers (Enabling environment)

These are the value chain environment and systems for tomato value chain performance in the study area. These include; regulatory framework, land tenure security right, legal service and security for actors. Regulatory framework provides knowledge and information about rules and regulation for producers and traders, land tenure security provides the right to land for producers, market and trade regulation provides market place development, transportation, and communications, marketing and business support services include market information services, market intelligence, facilitation of linkages of producers with buyers, organization and support for collective marketing system.

4.2.3. Value chain map of tomato in the study area

Mapping a value chain facilitates a clear understanding of the sequence of activities and the key actors and relationships involved in the value chain. The mapping of value chain functions is considered to show the relationships and integrations of the processes and activities performed along the value chain. Major functions include input supply, production, trading, processing, and consumption. The current value chain map of tomato in the Omo Nada district is depicted as the below Figure. Finance, service, product, input, and information flows between each actor through buying and selling as well as giving credit and selling the product like credit for each other and while product flows to one way from one actor to another.

But the flow of information between actors for the study area was mapped by using dash arrows because of the flow of information between actors was not efficient. Input and service flow was mapped by one arrow (one direction) which indicates inputs flow from suppliers to the producer for production rather than more exchange activities and also

service flows in one direction especially from the district bureau of agriculture and natural resources and unions. Also, the product flows in one direction on each channel from producer to consumer. The below map of the tomato value chain in the study area also, shows the respective functions of actors along the value chain. That means input suppliers supply input, producers produces and sell for the market, traders purchases tomato from producers and resells or distributes for next actors while consumers purchases and consume it at the given price with his/her income.

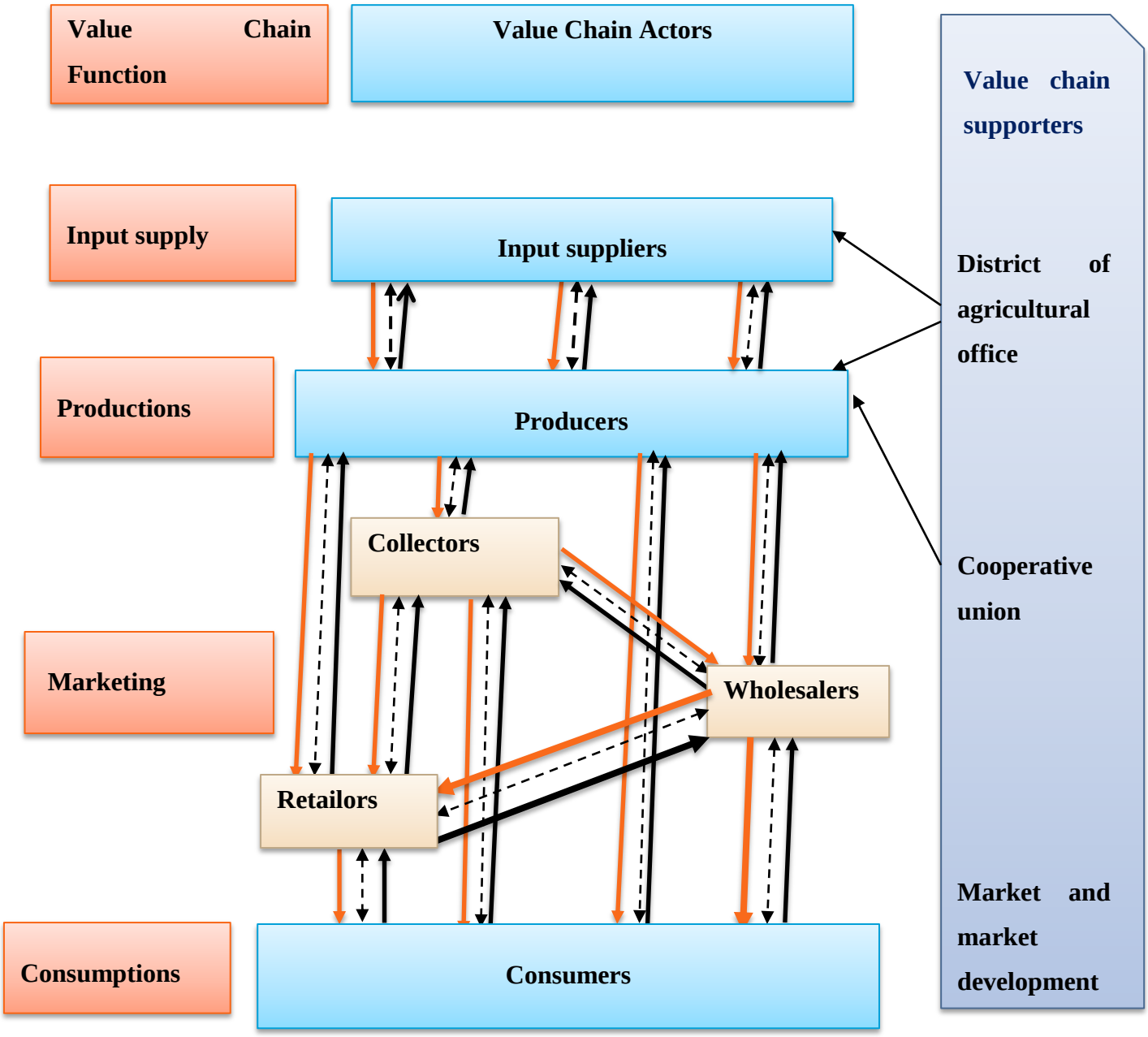

Figure 3: Tomato value chain map

Source: Own computations survey result, 2019

4.3. Tomato Market Performance

4.3.1. Tomato market channel

Marketing channels and marketing margins were used in the analysis of supply chain performance. These are quantity handled, producer's share, total marketing margin, and rate of return. Out of these volumes handled, producer's share and marketing margin were considered for the tomato in this study. Consequently, effectiveness is defined as the ability of the marketing channels to result in (offer) proper service outputs or the right services in relation to consumer preferences. In essence, therefore, identification of the marketing chain precedes its analysis.

Marketing channels are defined as alternative routes of product flows from producers to consumers, (Kohls and Uhl, 1985). According to Adugna (2009), a marketing channel involves a series of intermediaries through which vegetables pass from producers to consumers. Producers sell tomato through different channels. Four marketing channels of tomato are exhibited in the study areas. It was estimated that 7,350 quintals of tomato were supplied to the market by sampled producers. Wholesalers and consumers were the main receivers of tomato with percentage shares of 37.4% and 27.9% (Figure 4). The market channels identified during the survey were:

Channel I: Producer-Consumer: This channel is the shortest channel where producers directly sell to consumers on the market day. It represented 27.9% of the total tomato marketed which amounted to 2,050.65 quintals through this channel of tomato during the survey period. The channel was found to be the second most important marketing channel in terms of volume.

Channel II: Producer- collector-Wholesaler- retailer - Consumer: Rural collectors are buying a tomato from producers in the study area and they sell to the wholesaler. It accounted for 18.4% of the total tomato marketed 1,352.4 quintals during the survey period.

Channel III: Producer-Wholesaler-Consumer: This is the largest and most important channel, accounting for approximately 37.4% of the total marketed volume of tomato 2,748.9 quintals during the survey period. Wholesalers buy a tomato at the farm gate or at

the local market through brokers or directly from producers and sell it to retailers and consumers in Jimma zone and another town.

Channel IV: Producer- retailer-Consumer: District retailers in the production area buy with or without the involvement of brokers depending on the volume of the product and resale to the consumer. It represented 16.3% of the total tomato marketed 1,198.05 quintals during the survey period.

Channel I: Producer's ⟶ Consumer's(2,050.65)

Channel I: Producer's ⟶Collector's ⟶ Wholesaler's ⟶ Retailer's ⟶Consumers(1,352.4)

Channel III: Producer's ⟶ Wholesaler's ⟶ Consumer's(2,748.9)

Channel IV: Producer's ⟶ Retailer's ⟶ Consumer's(1,198.05)

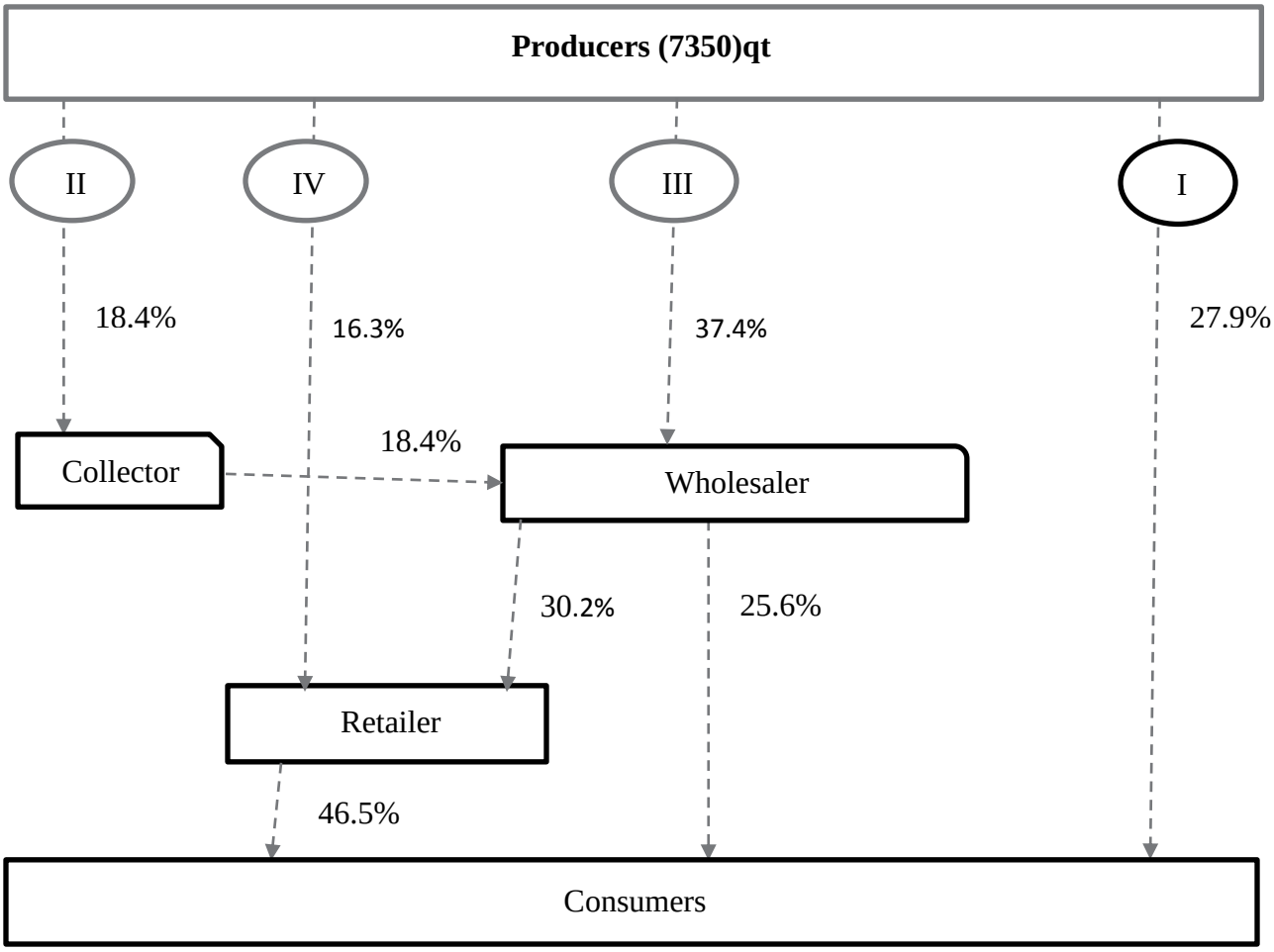

Figure 4: Tomato marketing channel

Source: Own computation survey results, 2019

Cost of tomato production in birr

Identifying the cost and profit of the household is one part of the value chain analysis. The following Table shows the total cost of the households per hectares. The total production cost of the households was 6221.8 with a yield of 41qt/ per hectares. As shown in Table 11, the total production cost per quintal was 151.8 birr.

Table 11: Cost of tomato production in birr

Input cost	**The cost incurred per (birr/ha)**
Seeding	405
Land preparation	556.8
The opportunity cost of land	440
Fertilizer	950
Weeding	870
harvesting,	1,090
Irrigation cost	890
Clean separation cost	1,020
Total production cost (birr/ha)	**6221.8**
Yield (qt/ha)	**41**
Cost (birr/qt)	**151.8**

Source: Own computations survey results, 2019.

4.3.2. Tomato marketing margin and marketing cost analysis

Marketing margin determination surveys should be conducted parallel to channel surveys based on price (payment) received or selling price to calculate the margin. A systematically recording of prices at different levels of marketing chain during a two to three week period is sufficient to calculate quite accurately the relevant marketing margins (Pomeroy and Trinidad, 1995**).** Marketing margin is one of the commonly used measures of the performance of a marketing system. It is defined as the difference between the price of the consumers pay and the price of the producers receive. Computing the total gross marketing margin (TGMM) is always related to the final price or the price paid by the end consumer, expressed in percentage (Mendoza, 1995). Gross marketing margin (GMM) is the gap

between prices at consecutive levels in the marketing channel. The number of intermediates involved in various channels of marketing has a strong effect on the marketing margin. Marketing costs are estimated to compute the share of profit captured by key actors in the marketing chain. Table 12, shows the average marketing costs incurred by every producer during the transaction. The highest marketing cost was incurred by wholesalers 121.5 birr/qt followed by rural collectors' 77.8 birr/qt. This is because wholesalers transport costs are higher to reach the different markets and specialized labor for the packing, storing, cleaning, loading and unloading are relatively expensive in the terminal market. The average marketing cost of producers was 72.2 birr/qt when they sold to consumers when they sold to collector 52.birr/qt, when they sold to the wholesaler 55birr/qt and when they sold to retailer 51biir/qt cost.

Table 12: Tomato Marketing costs (Birr/qt)

Item		**Producers**	**Collectors**	**Wholesalers**	**Retailers**
Marketing cost	Transport	9.1	7.1	10	9
	Storage	-	7.3	9	5.1
	Box	25	25	25	25
	Loading	7.8	5.5	15.5	5.5
	Packaging	10	15	11	10
	Labor expense	6.3	6.6	13.2	5.6
	Telephone	7.5	6.3	15.6	7.9
	Cleaning	3	6.5	11.5	6.7
	Other cost	4	5	10.7	3
Total cost		**72.7**	**84.3**	**121.5**	**77.8**

Source: Own computations survey results, 2019.

Table 13: Tomato marketing margin analysis for different market channels (Birr/qt)

Agent	**Tomato marketing channel**				
		I	**II**	**III**	**IV**
	Production cost	151.8	151.8	151.8	151.8
Producer	Marketing cost	72.2	52	55	51
	Selling price	980	530	690	890
	Profit	756	326.2	483.2	687.2
	GMM P (%)	100	76.8	77.5	77.4
Collector	Purchase price		530		
	Marketing cost		84.3		
	Selling price		690		
	Profit		75.7		
	GMMc (%)		23.2		
Wholesaler	Purchase price		700	690	
	Marketing cost		121.5	121.5	
	Selling price		890	890	
	Profit		68.5	78.5	
	GMMw (%)		21.3	22.4	
	Purchase price				890
Retailer	Marketing cost				77.8
	Selling price				1150
	Profit				182.2
	GMMr (%)				22.6
TGMM (%)		**0**	**44.5**	**22.4**	**22.6**

Source: Own computations survey, result2019

Table 13 clearly depicted differences between the total income from tomato trading and the costs incurred in the process of tomato trading which gives the marketing profit of each actor namely producers, collectors, wholesalers, and retailers. The result shows that tomato producers market profit was the highest when they directly sell to consumers in channel I which accounts for 980 birr/qt, second-highest profit when they sell to retailers in channel

IV which was 890 birr/qt, also they got less profit when they sell to wholesaler in channel III which accounts for 690 birr/qt and at the last producers gets the least profit by selling to collector in channel II which accounts for 530 birr/qt. This implies producers get more profit if they sell tomato products directly to consumers and retailers. As indicated in Table13, the total gross market margin (TGMM) was highest in channel II which accounts for 44.5% and the lowest in channel III which accounts for 22.4%. Producer's share (GMMp) was highest in channel III which accounts for 77.5% of the total consumers' price, and lowest in channel II which accounts for 76.8% respectively.

This difference might support the theory that as the number of marketing agents increases the producers' share decreases. The reason being, the higher the number of middlemen in the commodity market, the more profit they retain for their services whether they add value to the item or not. The results also show that the maximum gross marketing margin from traders was taken by the retailer, which accounts for 22.6% of the retailer price in channel IV and followed by a wholesaler which accounts for 22.4% in channel III. This implies the share of the market intermediaries in the consumers' price was substantial and there was a need to reduce market intermediaries to minimize the marketing margins and thereby enhance the producers' income. The minimum gross margin is taken by the collector which accounts for 21.3% in channel II.

4.4. Factor Affecting of Tomato Market Outlet Choices Decisions

Based on findings of the multivariate probit (MVP) models the difference, similarities, and significance of the determinants influencing producers' decisions in market outlet choice were discussed in this section. Empirical results of the multivariate probit models showed that the correlation coefficients of the error terms in models had positive as well as negative signs, indicating that there is interdependency between the different market outlet choices by the farmers. In other words, these opposite signs of the correlation coefficients revealed that there are complementarities (positive correlation) and competitive (negative correlation) between different markets outlets option being used by the farmers.

The multivariate probit model was estimated jointly for four binary dependent variables namely collectors, wholesalers, retailers, and consumers market outlets. Also, a multivariate probit model that was specified in 6 Equations and 13 explanatory variables was estimated to identify factors affecting the tomato market outlet choice decision of the farmer's households. This result implies that of coefficients are jointly significant and the explanatory power of the factors included in the model is satisfactory thus, the MVP model fits the data reasonably well. The Wald test (52) ($\chi 2 = 119.28$, (ρ=0.0000) p is significant at 1% significance level, which indicates that the subset of coefficients of the model is jointly significant and that the explanatory power of the factors included in the model is satisfactory. Furthermore, the results of the likelihood ratio test in the model (LRx^2 (6) = 17.686, $p>x_2$= 0.0071) is statistically significant at 1% significance level indicating that the independence of the disturbance terms (independence of market outlets choices) is rejected and there are significant joint correlations.

The likelihood ratio test of the null hypothesis of independence between the market outlets decision (p21 = p31= p41= P32 = p42= p43 =0) is significant at 1%. Therefore, the null hypothesis that all the ρ (Rho) (Likelihood ratio test of rho21 = rho31 = rho41= rho32= rho42 = rho43 = 0) values are jointly equal to 0 is rejected, indicating the goodness-of-fit of the model. Hence, there are differences in market outlet selection behavior among producers, which are reflected in the likelihood ratio statistics.

The ρ values (Pij) indicates that the degree of correlation between each pair of dependent variables. The P21 (correlation between the choice for the rural collector and wholesaler outlet), P41 (correlation between the choice for the rural collector and consumer outlet and P43 (correlation between retailer and consumer) are negatively interdependent and significant at 1% and 5% probability level. Whereas P42 (correlation between the choice consumer and wholesaler) positive interdependent and significant at 10% probability levels. This indicating a competitive relationship between wholesaler outlet with collector outlet, consumer outlet with the collector, consumer outlet with retailer outlet and complementary relationship between consumer outlets with the wholesaler outlet (Table 14). This shows that substitution relation between both of them. The simulation results also, indicate that the probability that tomato producers choose collectors, wholesalers, retailers, and consumers

market outlet were 62%, 74%, 61%, and 69%, respectively. With regard to the joint probabilities of success and failure of the market, outlet choice decisions suggest those households are more likely to jointly choose four market outlets. The likelihood of households to jointly choose the four market outlets was 16.5% compared to their failure of 0.44% to choose the four market outlets. As depicted in Table 14, below some of the variables used in the model were significant at more than one market outlet while some others were significant at one market outlet but not in the other market outlet. Out of thirteen explanatory variables included in a multivariate probit model, seven variables significantly affected the wholesaler market outlet; four variable significantly affected rural collector, two variables significantly affected the retailer market outlet and three variables are significant to affect the consumer outlet choices at 1, 5 and 10 percent probability levels.

Sex of household head (SHH): Being a sex household headed was positively and significantly associated with the probabilities of choosing a collector outlet at a 1% significance level. Whereas it is negatively and significantly influences the probabilities to choose consumer outlet at 5%, significance level. Sex of household headed producers are more likely to deliver tomato to collector outlet than consumer outlet. Addisu (2016), found that sex of household head positively and significantly affected the probability of choosing a collector outlet.

Family Size (FAMS): Family size determined the probability of choosing a collector and retailer outlet negatively at a 10% and 1% significance level. Whereas it is positively and significantly associated with the likelihood of choose wholesaler outlet at 1%, significance level. This implies that large family size has plenty of labor force for delivering tomato to the final market and plenty of labor force disfavor selling of tomato to the collector and retailer market which pays the low price at the farm gate. Also, the result shows that those households with large family sizes are more likely to choose wholesaler outlets than other outlets. This is in line with Tewodros (2014) who indicated that large family size implies better labor endowment. So, households are in a position to travel to get wholesalers in the district or nearby town markets.

Table 14: Multivariate probit estimations for determinates of tomato producers outlets choice

Variable	Collectors		Wholesalers		Retailers		Consumers	
	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Constant	0.18763	0.57945	-3.89434***	0.88125	-0.03536	0.59225	-0.54749	0.62322
Sex of household head	0.65664***	0.24103	0.10739	0.33326	-0.13430	0.24311	-0.60287**	0.28422
Family size	-0.11576*	0.05754	0.31372 ***	0.09063	-0.16743 ***	0.05863	-0.04017	0.05931
Education household head	-0.05848	0.03671	0.16720 ***	0.05921	0.19502	0.03811	0.05321	0.04115
Land allocate for tomato	0.17492	0.55338	1.78624 **	0.80051	0.17587	0.54269	0.44385	0.56431
Farm experience	-0.00098	0.01149	0.02515	0.01635	0.00657	0.01114	0.017854	0.01199
Motor pump	0.12939	0.21224	0.53742**	0.28713	-0.10015	0.21588	-0.10514	0.22425
Quantity of tomato produced	0.00399	0.00523	0.02118 **	0.00916	0.01598 ***	0.00545	-0.00050	0.00555
Extension service	-0.000100	0.00607	0.00804	0.00844	-0.00123	0.00616	-0.00151	0.00642
Distance to market	0.19790**	0.10602	-0.29504 **	0.13223	0.02989	0.09634	0.37190***	0.12324
Buyer trust	0.01585	0.20340	0.45359	0.28291	-0.14925	0.20416	-0.34846	0.21520
Transport facilitate	-0.14978	0.21057	0.93639 ***	0.27624	0.31271	0.20982	0.31249	0.219 87
Access to market information	-0.38706*	0.20358	-0.29220	028624	0.09510	0.20619	-0.02868	0.21368
Off farm income	3.00e-0	0.00002	0.00046	0.00002	0.00001	0.00002	0.00005**	0.00002
Predicted probability		0.62			0.74			0.69
0.61								
Joint probability (success)						0.165		
Joint probability (failure)						0.0044		
Number of draws (#)						30		
The number of obs.						190		
Wald chi2(52)						119.28		
Log-likelihood						-377.261		
Prob > chi2						0.0000***		

Likelihoodod ratio test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0: Chi2 (6) = 17.686 Prob > chi2 = 0071

Estimated correlation matrix				
	P_1	**P_2**	**P_3**	**P_4**
P_1	1.00			
P_2	-0.58*** (0.208)	1.00		
P_3	0.028 (0.112)	-0.178 (0.135)	1.00	
P_4	-0.265**(0.127)	0.277* (0.155)	-0.264**(0 .127)	1.00

Where ***, **, and * are statistically significant at 1, 5 and 10 % SE= Standard error **P1**=Local collectors **p2** =Wholesalers **p3**= Retailers and **p4**= Consumers

The educational level of household heads (EDUC): Educational level was positively and significantly affected wholesalers' market outlet choice at a 1% significance level. This result shows that educated producers would more likely sell their tomato to wholesaler's market outlets than other channels. The possible reason might be that the educational level of the producers' increases production and supply to appropriate outlets. If the educational level increases the knowledge of farmers that can be used to collect information, interpret the information received, make products, and marketing decisions.

The positive relationship between education level and selling to wholesaler outlets can be explained by the fact that being educated enhances the capability of farmers in making informed decisions with regard to the choice of marketing outlets to sell their farm produce based on the marketing margin and marketing cost. The study by Gizachew (2018), identified the red pepper value chain revealed that the education level is positively and significantly the effect of choosing a wholesaler market outlet than other market outlets.

Land size (LSA): The size of land allocated for tomato production was positively and significantly associated with choose to wholesaler outlets at a 5% significance level. An increase in the land allocated for tomato production also increased to the likelihood choose to a wholesaler outlet than another outlet. This is due to the area of land covered by the crop increase that can directly increase the market supply of tomato products and farmers supply a large volume of the product to wholesalers for selling. This is in line with Birhanu (2013)

who found that large land allocated for banana and potato positively and significantly affects the proportion supplied through wholesaler traders.

The quantity of tomato produced (QTP): Quantity of tomato produced was positively correlated with the probability of choosing wholesaler and retailer outlet at a 5% and 1% significance level. The positive sign indicates that those households producing a large quantity of tomatoes mostly prefer to use wholesaler and retailer market outlets than other market outlets. This indicates that when the quantity of tomato produced increases, the producers could sell to their produce more than one outlet simeltinuoes market outlet. This result is consistent with Gizachew (2018) indicated that a large quantity of red pepper is positively and significantly affects the likelihood of choose to wholesaler and retailer market outlets.

Ownership of motor pump (OMP): Ownership of motor pump was positively and significantly affected probability to choose to sell to wholesaler outlets at a 5% significance level. The positive sign shows that producers who have own motor pump are more likely to sell tomato to wholesaler outlets. This is in line with finding Addisu (2016) showed that the availability of ownership of the motor pump has positively and significantly affect related to the likelihood of choosing a wholesaler market outlet.

Access to market information (ACMKTIN): Access to market information was negatively and significantly influenced the likelihood of choose to collector outlet at a 10% significance level. This implies that producers get access information they unlikely to choose a rural collector outlet because the rural collector outlet charges a low price for tomato than all other outlets in the district. In the study area, rural collector sets the lowest price than any outlet in the district and most of the farmers were informed about the price set by this outlet.

Distance from the Nearest Market (DNMKT): The result shows that distance from the nearest market has a positive likelihood of farmers selling to collector and consumer outlet at 5%&1% significance level. Whereas, it is negatively and significantly influences the likelihood of choosing the wholesaler outlet at a 5% significance level. This indicates that when the distance to the nearest market increases the likelihood of selling tomato to the

wholesaler and consumer outlet decreases because of the transaction costs related to the delivery of tomato. The positive sign for the collector outlet revealed that as producers are located far away from the wholesaler market face higher transaction costs, may supply for collectors in their villages. This is in line with finding Gizachew (2018) who found that distance from the nearest market was positively and significantly related to the choice of collectors' outlet choice. Similarly, Chalwe (2010), indicated that that distance from the nearest market significantly and negatively related to wholesaler outlet participation.

Ownership transport facilities (TRANSP): Transport facilities was positively and significantly influenced the likelihood of farmers to choose to sell their products wholesaler market outlet at a 1% significance level. Such facilities increase the likelihood that farmers choosing wholesaler outlets is increase. Farmers who have own transport facilities sell their tomato through wholesalers' outlets while those who haven't such transport facilities supplied their products through collectors and other outlets. The availability of transportation facilities helps farmers to reduce long market distance constraints. This concurs with the finding of the study by Nuri (2016) who indicated that transport facilities ownership by farmers increased the likelihood of choosing wholesalers outlet.

Non-farm income (NONFIN): The survey finding implies that those farmers who earn non-farm income were positively and significantly associated with the likelihood of choose to consumers' market outlet at a 5% significance level. Farmers who have to earn non-farm income have more possibilities to choose consumer outlets compared to those who have no earn non-farm income. Income from non-farm income-generating activities enables farmers to purchase different inputs required to produce more tomato. Similarly, income from non-farm strengthens the financial capacity of farmers to improve the production process and hence expand production and enable them to choose an appropriate market channel. This is in line with finding Addisu's (2016) non-farm income was positively and significantly associated with the likelihood to choose consumer market outlets.

4.5. The Constraints and Opportunities of Actors along the Tomato Value Chain

4.5.1. Constraints of tomato production

One of the merits of value chain analysis is that it helps to clearly identify bottlenecks to the development of the chain right from input supply up until the consumption level in an intense way. Accordingly, a number of constraints and opportunities are explained by different actors through focus group discussion, personal observation, and questionnaires. From this results, major constraints that are currently hindering the development of the tomato value chain can be categorized according to the three basic stages: the farm level, the marketing/traders stage and consumer stage (Table 15).

Poor irrigation facility: Even though ample water resource is available in the study area, habit of irrigation and irrigation facility are poor. In study area most of producer use rainfaid this means who use irrigation facilities are only 35% and 65% of producers in study area are used rainfaid. Moreover when the data was collected about 81.6% of the tomato producers reported that poor irrigation facilities as a major problem.

Lack of quality seed: The key informants indicating that there is no package on tomato production and extension agents delivering technology only for food crops. This would finally discourage those producers who have a long plan in the expansion of tomato production. About 75.8% of the tomato producers reported a lack of improved seed quality as a problem.

High-cost input: The finding of the study shows that there are no formal institutions that supply improved tomato seed for the farmers. Farmers purchase seed from other model farmers by selecting good seed by their experience which could negatively affect their return. Households need improved input at the required time to boost their production. The Table below shows that 61.1% of the total household reported that there is the absence of improved seed.

Incidence of tomato disease (root rot): The fact that most farmers are hampered by external factors, such as rainfalls and it was the cause for the incidence of tomato diseases (root rot) which occur due to excessive waterlogging. Sometimes this disease might totally

destroy the whole tomato production. About 58.4% of the tomato producers reported that the incidence of tomato disease as a problem (Table 15).

Table 15: Distribution of HH by the constraints of tomato production

Production constraints	Frequency of respondent	Percent
Irrigation facilitate	155	81.6
Lack of quality seed	144	75.8
Lack of storage	127	66.8
High-cost input	116	61.1
Disease	111	58.4
Lack of extension support	108	56.8

Source: Own computations survey results, 2019.

4.5.2. Marketing constraint of tomato producers

At the trader level poor transport facility, price setting problem, presence of unlicensed traders, limited market research and price fluctuation were the major challenges.

Price fluctuation: The price of tomato has fluctuated from time to time in the study area. In particular season especially in the production season price of tomato becomes low and in summer season price of the tomato is skyrocketed. This cobweb nature of price affects the profit margin of actors along the tomato value chain in the study area.

Brokers: Though brokers play a great role in reducing the cost of the market transaction by searching and connecting sellers and buyers, they are not following business norms in the study areas. Some producers mentioned that the intervention of brokers has also constrained potential income from tomato production in the area.

Lack of market information: This is another important marketing problem faced by tomato producers in the study area. Information on like selling price, market demand, sale place and the like were not properly delivered to the tomato producers and as a result, the selling price of tomato was determined by traders.

Poor transport facilities: Poor transport facilities and road infrastructure, especially for those producers located in remote areas, are challenges faced by sampled households to transact products and input to and from the markets. This problem would lead the consumers to be charged a high price for a quintal of tomato by the traders.

High perishability: In Ethiopia, a considerable quantity of tomato is wasted before it reaches the target markets due to the limited shelf life of the fruit and poor postharvest handling (Bezabih and Hadera, 2007). This perishable nature of the tomato made the transportation of the product very risky to the wholesalers and all traders general in the study area. All respondents show that from the total purchased product 60% was damaged. As it is known, the tomato has high percentages of postharvest losses with a range ofdefects.

Market constraints	Frequency of respondent	Percent
Lack of transport facilitaties	120	80.0
Brokers	120	80.0
Lack of market information	108	72.0
Perishability of product	108	72.0
Price fluctuation	95	60.0

Table 16: Distribution of HH by marketing constraint of tomato

Source: Own computations survey results, 2019

4.5.3. Major constraints faced traders

There are many problems frequently faced by tomato traders along the tomato value chain. The price-setting problem is one of the important constraints which happened due to the absence of a unified and standard price setting in the study area. In order to handle large quantities of tomato, some traders did not follow proper business conduct. Price fluctuation (80.5%), shortage of truck, regulatory framework (tax), unlicensed traders and storage problem are other constraints faced by tomato traders which hinder the development of tomato value chain

4.5.4. The opportunity of the tomato value chain

Numerous production and marketing opportunities at the farm level and trader opportunities are identified during the survey with the key informant, respondents and from the observation of the area. The opportunities were available in the tomato value chain, a continuous demand for the product in the market tomato which would be followed by better farm prices for producers. Another opportunity in the study area, currently, is the availability of district office of agriculture in collaborates with some programs and projects to support tomato production like and as a result, farmers will have an incentive to expand their output. Also, another opportunity in the area includes experiences in tomato production and marketing. On the other hand, the growing number of buyers, high experience in tomato trading and proxy tomato trade and better price were some of the opportunities of tomato trader.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summarys and Conclusions

Tomato production provides an opportunity for market integration for smallholder farmers in the Jimma zone. Omo Nada district is suitable for tomato production due to its favorable agro-ecology and availability of irrigation water. As survey results revealed in 2018 production season total production of tomato in Omo Nada district was estimated to be 4,4403 quintals on 1,083 hectares of land with which that productivety41per/qt.

The purpose of this study was to identify tomato value chain actors and their respective roles; to map the tomato value chain, to identify market margins and market cost across the market channel and to identify factors affecting market channel choice decision by smallholders' tomato market outlet producers and constraints and opportunity tomato production in the study area. To achieve these objectives, both qualitative and quantitative data were used.

The data were collected from primary and secondary sources. A three-stage sampling technique was used to randomly select tomato producers. A face-to-face interview was undertaken with 190 respondents from tomato producers, 25 traders, and 15 consumers for primary data collection. Focus group discussions, key informants interviews, and personal observations were used to collect qualitative data. Similarly, secondary data were collected from different sources like published and unpublished reports, websites and articles, district bureau of agriculture and population statistics. Descriptive statistics, gross margin, and econometric models were used to analyze the collected data. Multivariate probit model (MVP) was used to analyze factors affecting market outlet choice decisions of tomato producers.

The descriptive result shows that from 190 sample tomato producers, out of total household's heads interview, about 77.4% were male-headed while 22.6% were female-headed households. The results revealed that the mean education of sampled households had was 2.96. The survey revealed that the mean land size of sampled households was 3.49 hectares and from the total farm, the mean size of land allocated for tomato was 0.45

hectares and the mean family size of the total sample households was 4.1person and the mean farming experience of the total sample respondents was found to be 16 years. Main actors in the tomato value chain included input suppliers, producers, traders (collectors, wholesalers, retailers,) and consumers were identified. Tomato's value chain map of the study area was also undertaken by taking into consideration all the above-listed actors with different functions and supporters. About four different tomato market channels have been identified with each channels having different marketing margin: channel I (producer-consumer, which accounts for 27.9%), channel II (producer-collector-wholesaler- retailer-consumers, which accounts for 18.4%, channel III (producer-wholesaler-consumers, which accounts for 37.4%) and channel IV (producer-retailer-consumer, which accounts for 16.3%).

Producers largely sell their products to the wholesaler market outlet. On average, households could get ETB 768.4 profit per quintal by incurring ETB 151.8 and 55 for different production and marketing costs per quintal, respectively. They get the highest market profit by directly selling to consumers which were ETB 768.4. They also get ETB 338.4, 495.6 and 699.6 by selling their product to collectors, wholesalers, and retailers, respectively. The households' share (GMMp) is the highest 77.5 % of the total wholesalers' price in channel III and the lowest is in channel II which accounts for 76.8 %. The total gross marketing margin (TGMM) was highest in channel II which accounts for 44.5% and lowest in channels III which accounts for 22.4% respectively.

The multivariate probit model showed that the correlations between the tomato producers' choice of collector and wholesaler outlet were negative and statistically significant, and the correlation between the collector and consumer outlet was also negative and statistically significant and the correlation between wholesaler and consumer was positive and statically significant. Also, the correlation between retailers and consumers was negative and statistically significant. This indicates the competitive relationship of wholesaler market outlets with local collector market outlets and retailer outlets with consumer market outlets. Whereas, wholesaler market outlets and consumers' market outlets had complimentary relationships.

The result obtained from the MVP model revealed that about 10 variables were found to be statistically significant at different significance levels having a different effect on farmers' choice decisions for the collector, wholesaler, retailer, and consumer market outlets. The result has indicated that variables such as sex of households head, family size, education level of households, land allocated for tomato, quantity of tomato produced, ownership of the motor pump, distance to nearest market, having transport facilities, access to market information, and access to off/non-farm income, were among the determinants which affect significantly tomato producers to choose the alternatives market outlet.

Constraints and opportunities of tomato value chain were identified at input supply, production, marketing, and consumption levels. The most important constraints which hinder tomato production were lack of improved seed variety and incidence of disease (root rot), poor irrigation facility, lack of storage, and high-cost input were major constraints faced by the farmer at the production level. Price setting problem, price fluctuation, shortage of truck, storage problem are the major constraints faced by traders along the tomato value chain in the study area. Regarding seed supply, the problem is the lack of improved seed variety due to the absence of seed production in public seed sector and private seed producers. Besides, poor transport facilities and lack of linkage with the research center were the major production and marketing problems.

5.2. Recommendation

Recommendations (policy implications) are relevant to improve the tomato marketing system in the study area which will indicate production and market orientation were set based on the significant variables and raised problems by the value chain actors.

1. Strengthening the linkage/interaction among value chain actors; there is a need to change the outlook of actors, by developing ground rules that will bind the relationship between producers and traders. In particular, positive attitudes toward partnership, interaction, networking and learning need to be developed among main actors in the value chain. So the chain actors should work in an integrated way to improve production and to strengthen sustainable market linkage in the study areas. In addition to this, organizing (voluntarily) traders and producers and establish trustful and strong trade

agreements between the two institutions is crucial to minimize unfair prices created by brokers. With a strong relationship between traders and producers, searching for market information and dissemination will be crucial.

2. The channel with a high total gross marketing margin would reduce the gross profit of tomato producers. Therefore, to attain high gross profit, tomato producers need to engage and supply more tomato in channel III (producer—wholesaler -consumers). In addition, there is a need to enhance value addition activities to improve the quality of the tomato in order to fetch a higher price.
3. The econometric analysis of multivariate probit findings indicated that farmers have been influenced by different factors to choose appropriate marketing outlets to sell their tomato products. The finding of this study pointed that the concerned authority needs to increase the awareness of households about the importance of adult education and about the. The distance of the market was positively and significantly affected by collectors and consumer outlet respectively. Whereas negatively and significantly affecting wholesaler market outlets which hinder the marketing of tomato supplied. The government and private institutions should focus on work to solve the problem of transport and infrastructures. The road condition of the districts is poorly structured so that improving road infrastructures can improve the delivery of tomato producers to select appropriate market outlets.
4. The collector market outlet was positively and significantly affected by the sex household. Whereas, negatively and significantly affected by, family size, and access to market information respectively. So it is better if the district trade office, NGO, and extension agents train farmers on how to choose the better market outlet.
5. The wholesaler market outlet was positively and significantly affected by land allocate for tomato production, family size, quantity tomato produced, ownership of motor pump, transport facilities. So the concerned organization must facilities farmers in order to obtain market information about quality and quantity product requirements by the bureau of district agriculture and industry bureaus should have to train farmers on how to use their family labors in the production and marketing of tomato efficiently.
6. The consumer market outlet was also positively and significantly affect by non-farm income. Whereas it is negatively and significantly affected by the sex of household

head. So the concerned body should train farmers on how to earn income from tomato selling at the appropriate outlet and nonfarm income simultaneously rather than not selecting appropriate outlets and earning major income from non-farming activities. Mostly, expanding equal accessibility of infrastructures such as road and transportation facilities need government intervention to promote the effective marketing of tomato through all outlets.

7. It is highly recommended to improve the input supply system so, that farmers receive the right type of production inputs, quantity, and quality needed at the right time. The improving system will protect farmers from purchasing low-quality inputs by high input cost. The role of research institutes and Universities is crucial in identifying high yielding and disease-resistant varieties to improve the production and productivity of tomatoes. The variable which significant should promoted and get special attention. Established of cooperative and small scale tomato marketing alternative of the farmers, efficient use of the resource and better for the bargaining ability.
8. In order to overcome the irrigation water shortage, the government should give attention to scaled-up underground water and other water sources to expand tomato production and productivity. In the study area, the irrigation practices and water management of the farmers are mostly based on instinctive knowledge, with no scientific support from the extension system. So that improving farmers' skills, knowledge and experience in the use of irrigation water efficiency will minimize the problem of water shortage and create the capacity to expand production and increase the supply during high price seasons. Therefore, concerned bodies should give attention to the introduction of various irrigation water techniques and agronomic practices.
9. Therefore, a further researcher on the tomato value chain is recommended to identify and better advice practices agreed by different chain actors that a well-organized regional and national tomato production and attention should be paid on these issues improvement tomato marketing channel choice in the study area.

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7. APPENDICES

Appendix table 1: Conversion factors used to calculate Adult Equivalent

Age category in year	Male	Female
<10	0.6	0.6
10-13	0.7	0.8
14-16	1.0	0.75
17-50	1.00	0.75
>50	1.00	0.75

Source: Stork, *et al*. (1991)

Appendix table 2: Type of information sampled households provided during the survey period

	Frequency	Present
Price information	28	25.7
Price, Market place information	18	19.9
Buyers information	43	35.6
other(specify)	11	18.8
Total	100	100

Source: own survey results in 2019

Appendix table 3: Means of transport used by sampled producers

	frequency	Present
Manpower	7	10
Back of animal	24	21.6
Animals cart	37	33.5
Vehicle	39	27
Head load and manpower	12	7.9
Total	119	100

Source: Own survey result in 2019

Appendix table 4: Producers' source of credit

	Frequency	Percent
Relative	20	25.3
Bank	19	21.1
Microfinance	29	33.7
Trader	17	19.9
Total	85	100.0

Source: Own survey result in 2019

Appendix table 5: Farmers' extension agent contact frequency

	Frequency	Present
Development agent	81	42.6
Non-government organization	40	21.1
District expert's	33	17.4
Research center	17	8.9
other(specify)	19	10.0
Total	190	100