VALUE CHAIN ANALYSIS OF *TEFF (Eragrostistef (Zucc):* THE CASE OF JIMMA ARJO DISTRICT EAST WOLLEGA ZONE OF OROMIA REGION, ETHIOPIA

MSc. THESIS

BY

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Value Chain Analysis of *Teff(Eragrostistef(Zucc)*: The Case of Jimma Arjo District, East Wollega Zone, Oromia Region, Ethiopia

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DEDICATION

This thesis is dedicated for my parents (My Father Ato Kabeta Kidane, My mother W/ro Dayite Nagasa and my beloved wife W/ro Habtame Olika) for their unreserved support for success of this study.

STATEMENT OF THE AUTHOR

First, I hereby declare that this thesis is my own work and that all sources of materials used for this thesis have been exactly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for MSc. degree at Jimma University and to be made available for end users and borrowers at the University's Library under rules and regulation of the Library. I solemnly declare that this thesis should not be submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

The author was born in Jimma Arjo district, East Wollega Zone of Oromiya Regional State in May 1988. He attended his primary education at Tibbe Mole elementary school from (1998-2006). He attended his secondary school education at Arjo Senior Secondary School in East Wollega Zone (2006-2007) and Preparatory School at Dr. Haile Fida Preparatory School (2008-2009).

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LIST OF ACRONYMES AND ABBREVATIONS

BLUE	Best Linear Unbiased Estimates
BoDARD	Bureau of District Agriculture and Rural Development
CLR	Classical Linear Regression
CSA	Central Statistical Agency
DA	Development Agent
EATA	Ethiopian Agricultural Transformation Agency
FAO	International Food Association Organization
GDP	Growth Domestic Product
GTZ	German Technical Corporation
MAFAP	Monitoring African Food and Agricultural Policies
MoFED	Ministry of Finance and Economic Development
MSPA	Mauritius Sugar Producers' Association
MVP	Multivariate Probit Model
NGO	Non-Government Organization
OLS	Ordinal Least Squares
PPS	Proportional Probability Sampling
SCM	Supply Chain Management
SNNP	South Nation Nationality Peoples
TLU	Tropical Livestock Unit
UNIDO	United Nation Industrial Development Organization
VCA	Value Chain Analysis
2SLS	Two Stage Least Squares

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VALUE CHAIN ANALYSIS OF *TEFF (Eragrostistef)*: THE CASE OF JIMMA ARJO DISTRICT, EAST WOLLEGA ZONE, WESTERN ETHIOPIA

ABSTRACT

Teff plays a significant role in increasing food security and income for the poor farmers of Ethiopia. Even though teff is economically and socially important, its value chain have not yet been studied and documented in study area. This study attempted to analyze teff value chain in Jimma Arjo district of Eastern Wollega zone, Western Ethiopia with the specific objectives of identifying the role of actors and their respective function, analyzing determinants of teff supplied to the market and market outlet choice of teff producers. Two stages random sampling technique was employed to draw sample of 122 teff producers and purposively selected about 55 traders and 15 consumers. Both quantitative and qualitative data were collected from primary and secondary sources by using pretested structured questionnaire and checklists. Descriptive statistics, value chain analysis approach and econometric models were used to analyze data. Results showed that the main teff value chain actors in the study area were input suppliers, producers, local collectors, wholesalers, retailer and consumers. In the district there were no proper upgrading practices and governance system in teff value chain. The result of two stages least square indicated that land size, quantity of teff produced, credit service, and market distance influenced amount of teff supplied to market significantly. The Multivariate Probit model result indicated that likelihood to choose wholesalers outlet was significantly influenced by market distance, household size, volume of teff supplied and nonfarm income. The likelihood of choosing local collectors outlet was significantly influenced by volume of teff supplied, land size, nonfarm income and market distance. The likelihood of choosing retailers outlet was significantly influenced by land size, volume of teff supplied, household size and access to market information. The likelihood of choosing consumer outlet was significantly influenced by price of teff and nonfarm income. The predicted probability that teff producers choose local collectors, wholesalers, retailers and consumers outlets are 45%, 69.9%, 20.4%, and 74.6%, respectively. The joint probabilities of success and failure of the four variables also suggest that it would be unlikely for households to choose all market outlet simultaneously, for their likelihood to do so was only 7.7% while joint probability of failure were2.8%.The Kendall's Coefficient of Concordance (W) analysis showed that 68.5% and 46.2% of farmers were in agreement with each other on ranking of constraints hindering teff production and marketing, respectively. Recommendations drawn from the study findings include the need to improve the input supply system, improving the governance and upgrading issues needed in the chain, training farmers, increasing quality of market information, improving productivity and volume sales of teff, constructing infrastructure, providing extension and credit services, strengthening the linkage among teff value chain actors and strengthening supportive institutions.

Key words: Market outlet, Market supply, Multivariate Probit model, 2SLS, Value chain

1. INTRODUCTION

1.1 Background

The majority of Ethiopia's population earns its livelihood primarily from agriculture. The agricultural sector, which is stunned by subsistence smallholder farmers, is the primary source of livelihood for the majority of the population and the basis of the national economy. According to MoFED (2014), in Ethiopia, smallholder agriculture is the main source of food. This sector contributes about 96 percent of total crop production in 2012/13 and also according to CSA (2014); smallholder farmers produced 21.6, 28.6, and 7.11 million quintals of cereals, pulses, and oil crops, respectively. However, the productivity of this sector is very low in quantity. Agriculture continues to dominate the national economy of Ethiopia, accounting for 36.7% of overall GDP and 70% of foreign exchange earnings. The sector provides employment for 72.7% of the population and is a means of generating livelihood for about 83% of the rural population (ATA, 2017; FAO, 2015). In Ethiopia 95% of the total area under agriculture is cultivated by smallholder farmers and contributes to 90% of the total agricultural output indicating the dominant contribution of smallholder farmers to the overall agricultural production (MoARD, 2010). In the agricultural sector, cereals cover about 80% of the total grain crop area (9.97 million hectares) and contribute about 87% (23.1 million tons) of the grain production (CSA, 2016).

Among cereals, *teff* stands first in terms of land area, followed by maize and wheat (CSA, 2016). Ethiopia is the center of both origin and diversity for *teff*. *Teff* is a staple food and one of the most important crops for generating farm income, cultural heritage, national identity and nutritional security. The scientific name of *teff* is *Eragrostistef (Zucc.)* and is believed to have originated in Ethiopia (Vavilov, 1951). *Teff* is a tiny, round, khaki-colored grain closely resembling millet. "*Teffa*", the Amharic word for "lost", is so named because of *teff* small size. It is the smallest grain in the world and often is lost in the harvesting and threshing process because of its size. From *teff* the preferred staple diet made in the Ethiopian and Eritrean is *injera*, a flat sour-like fermented pancake that is used with "*wot*", a stew made with spices, meats and pulses, such as lentils, beans and split peas (Piccinin, 2002).

Even though *teff* production is expanded by 72 percent (CSA, 2012), it is second (to maize) in terms of quantity of production. Similarly, with only 1.3 tons per hectare, *teff* yield is the lowest among cereal crops. Supplementary to this, *teff* is grown entirely by smallholders, and has been actively marketed for many years. Until recently, its market was almost wholly domestic, within Ethiopia (and formerly Eritrea): however, a promising niche export market is now developing in Europe and America (Samuel and Sharp, 2008).*Teff* production has increased by 24.5 percent. This growth was achieved mainly due to 37 percent expansion in area under cultivation and 64 percent increase in yield levels per hectare (CSA, 2015).

It was estimated that *teff* made up 20 percent of all the cultivated area in Ethiopia, covering about 2.7 million hectares and grown by 6.3 million farmers (CSA, 2012). Compared to other cereals, *teff* is considered a lower risk crop as it can withstand adverse weather conditions and it can be stored for longer period without major impacts (Bekabil *et al*. 2011). *Teff* is also valued for its fine straw, which is used for animal feed as well as mixed with mud for building purposes. According to a study conducted by Reardon *et al.* (2012), major changes are happening in agricultural and food markets worldwide and especially so in developing countries; supermarkets revolution, share of high-value crops have increased, quality demands rise, food safety requirements for export countries, vertical integration, up-scaling, disintermediation, and branding.

Minten and Reardon (2008) indicated that modernization of agricultural value chain systems by which food flows from the farm gate to the consumer is both a consequence and cause of economic development. Commercial demand increases due to income and population growth, urbanization, and trade liberalization. Marketed supply simultaneously rises due to productivity improvements in production, post-harvest processing, and distribution systems. The combination of increased commercial demand and supply induces the emergence of modern marketing channels employing sophisticated management methods, such as costly grades and standards or vertical coordination or integration of activities that profitably add value to raw commodities through transport, storage and/or processing. Farmers whose comparative advantage allows them to tap the latent demand of better-off or more distant markets made accessible by emergent agricultural value chains typically improve their productivity and profitability, thereby further stimulating commercial demand and supply

through reinforcing feedback. The emergence and modernization of agricultural value chains thus result from and contribute to economic development (Reardon and Timmer, 2007).

Value chain is important in the enforcement of standards, with each player ensuring that the product originating from the previous stage adheres to the standards (UNECA, 2009). According to Bekabil *et al.* (2011) *teff* value chain program supports the doubling of *teff* production and ensures farmers to access sufficient markets to capture the highest value from their production, increase incomes and reducing the price to consumers within five years.

In Ethiopia, land used for *teff* production during 2017 production year were estimated 3.02 million hectares and 50.2 million quintals was produced with productivity of 16.64 quintals per hectare of land. In Oromia regional state 441,029.78 hectares of land was allocated for *teff* production and 24.74 million quintals of *teff* was produced with productivity of 17.17 quintals per hectares of land. And also in Eastern Wollega Zone 77,455.03 hectares of land used for *teff* production and 1.4 million quintals of *teff* was produced with productivity of 18.02 quintals per hectare of land (CSA, 2017).In Jimma Arjo district, there are 11,995 farm households and among those 7,512 households (6,783 and 729 male and female household heads) are *teff* producer. Land allocated for *teff* production during the year (2017) was 4630 hectares (16.54 percent of total land holdings) from a total of 27,991 hectares of land. In the district 56,717 quintals of *teff* was produced during current production year and productivity of *teff* was 12.25 quintals per hectar of land which was below national standard (BoDARD, 2017). In light of the above information, this study focused to identify actors and their respective functions, determinants of volume of *teff* supplied to the market and determinants of *teff* market outlet choice of farmer in study area.

1.2 Statement of the problem

Agriculture is central to Africa's agenda, and efforts have made to link production with agribusiness for better growth in the sector. Now days, it earns an average of 24 per cent of its annual growth from its farmers and their crops value chains reveal common and well known constraints, such as poor infrastructure; fragmented and risky markets; poorly functioning input markets; difficulties accessing land, water, and finance; and inadequate skills and

technology. More revealing, however, is the big differences across value chains (World Bank, 2013).

According to Wolday (1994), agricultural marketing is a very important factor in economic development and lack of a well-functioning agricultural market and marketing system severely hinders the increase of social welfare, income distribution, and food security of developing countries. Moreover, markets and marketing system and value chains do not develop simultaneously with economic growth. Development policy of Ethiopia has placed emphasis on increasing agricultural production to serve as a base for rural development. Even though there has been an increase in agricultural production, there were drawbacks with regards to many households limited participation in the markets. According to Best *et al*. (2005), the limited market participation of many agricultural households face is considered to be a major constraint to eradicate poverty. This shows that an efficient, integrated and responsive market that is marked with good performance is of crucial importance for optimal allocation of scarce resources and stimulating households to increase produce (FAO, 2003).

Bezabih (2010) indicated that, agriculture continues to face a number of constraints and obstacles in Ethiopia. The major ones are adverse climatic conditions; lack of appropriate land use system resulting in soil and other natural resources degradation; limited use of improved agricultural technologies; the predominance of subsistence agriculture and lack and/or absence of business oriented agricultural production system; limited or no access to market facilities resulting in low participation of the smallholder farmers in value chain. In comparison to this, the study by Jifara and Amsalu (2017) indicates that, agricultural marketing is a very important factor in economic development and lack of a well market and marketing system severely hinders developing countries.

Teff value chain upgrading activity performed by *teff* farmers includes use of improved seed and differentiates the product by color to meet the consumer demand. Price and standard of *teff* entirely determined by *teff* traders. *Teff* farmers' production and marketing constraints were shortage of fertilizer and seed supply, price setting and access to credit whereas that of *teff* traders were double taxation, absence of infrastructure, capital shortage, inadequate credit

service, farmers reluctance to sell *teff*, lack of demand, absence of storage facility and absence of government support(Efa, 2016).

The study area is known by production of *teff* mainly for market and family consumption and supply of *teff* in the study area is subjected to seasonal variation where surplus supply at harvest is the main feature. However, value chain aspects of *teff* were not undertaken in this district and undertaken in other areas by different authors such as Mohammad (2011), Tadele *et al.* (2016);Endalew (2017);Efa (2016);Azeb *et al* .(2017);Yadeta and Temesgen (2018) and Addisu (2018), did not address value chain aspects of *teff* in study area.

Most of the previous researchers on the same topic and at different study area has used multinomial logit model to examine factors affecting market outlet choice of the crop which is inefficient i.e. Multivariate Probit model is appropriate because farmers have more than one outlet options. To examine factors affecting market supply previous researchers used OLS without testing the possible endogeneity problem and missed to use 2SLS method. Yet there is no such study which tries to look into the whole spectrum of value chain of *teff* in the district and encouraged the researcher undertaking of value chain analysis of *teff* in the district is essential. Since *teff* is economically and socially crucial crop in the study area this study is designed to address the prevailing information gap on proper understanding of demographic, socioeconomic and institutional determinants of *teff* market supply and market outlet choice as well as identifying actors involved in the chain and their respective role including upgrading and governances as well as constraints of its production and marketing.

Therefore this study identifies actors and their respective functions as well as governance and upgrading issues, analyzes factors affecting *teff* market supply and market outlet choices of smallholder farmers and readdress the knowledge gap in the study area.

1.3 Research Questions

This study tries to answer the following questions;

1. Who are actors and what are their respective functions in *teff* value chain in study area?
2. What are key factors affecting *teff* market supply in study area?
3. What are key factors affecting farmer's *teff* market outlet choice in study area?

1.4 Objectives of the Study

1.4.1 General objectives

The general objective of the study is to analyze *teff* value chain in Jimma Arjo district of Eastern Wollega zone, Oromia regional state of Ethiopia.

1.4.2 Specific objectives

1. To identify actors and their respective functions along *teff* value chain in study area,
2. To identify determinants of volume of *teff* supplied to the market in study area and
3. To analyze factors affecting *teff* market outlet choice of producers in study area.

1.5 Significance of the Study

The study provides information on the existing constraints, opportunities and entry points in the *teff* value chain. In addition, the study provides information on the determinants of *teff* supply to the market, the determinants of market outlet choice decisions, identifies opportunities and constraints of *teff* value chain, possible upgrading strategies of actors and governance in the study area. The information generated in this study could help a number of stakeholders: national and international research institutions, regional, zonal, district and *kebele* administration bodies and other development organizations, traders, producers, policy makers, extension service providers, government and non-governmental organizations to assess their activities and redesign their mode of operations and to find leverage points or point of policy interventions which is suitable for the development of *teff* value chain in study area.

1.6 Scope and Limitations of the Study

This study was focused on the entire *teff* value chain from input supplier to the consumer within the district and role of actors and respective functions, supply of *teff* to the market and

market channel selection. The study was conducted in one district and important information was collected from sample households and value chain actors involved in *teff* value chain in the study area. However, there are spatial as well as temporal limitations to make the study more representatives in terms of wider range of area coverage, limited budget and time horizon. Furthermore, since Ethiopia has a broad diversified agro ecologies, institutional capacities, organizations and environmental conditions, the result of the study have limitations to make generalizations and make them applicable to the country as a whole. These limitations are mainly due to limited time, budgets and facilities.

1.7. Organization of the Thesis

This thesis has been organized under five chapters. Chapter one presents introduction (background, statement of the problem, and research questions, objectives, significance of the study, scope and limitation of the study). Chapter two presents review of literature on theoretical and empirical evidences that support the study and conceptual framework. Chapter three presents research methodology (description of the study area, data types, sources and methods of data collection, sampling procedure and sample size determination, methods of data analysis, model specifications, and hypothesis and variable definitions). Chapter four presents result and discussions and Chapter five presents the major findings of the study and draws conclusion and recommendations. Finally it includes references and appendices.

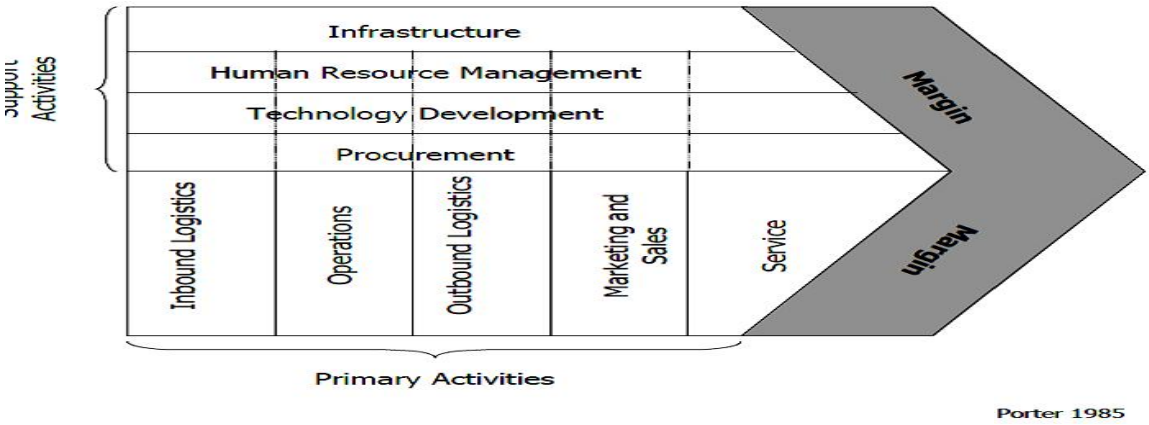
2. REVIEW OF LITERATURE

In this chapter, an attempt has been made to explain basic concepts used in this study. In addition, this part is intended to critically review the literature of the past research work in relevance to present study objective, so that theoretical and empirical reviews enables better understanding of the subject.

2.1 Theoretical Reviews

2.1.1 Concepts of Value Chain

The term 'Value Chain' was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining superior Performance" (1985). The value chain analysis describes the activities the organization performs and links them to the organizations competitive position. The value chain is a concept which can be simply described as the entire range of activities required to bring a product from the initial input-supply stage, through various phases of production, to its final market destination In reality, value chains tend to be more complex, to involve numerous interlinked activities and industries with multiple types of firms operating in different regions of one country or in different countries around the globe.



Source: Porter (1985)
Figure 1: Porter value chain

The Value Chain Approach: It is a means for examining the development of competitive advantage which is achieved when an organization links its activities in its value chain more cheaply or more expertly than its competitors. The chain consists of a series of activities that create and build value.

2.1.2 Value Chain Marketing Systems

In a value chain marketing system, farmers are linked to the needs of consumers, working closely with suppliers and processors to produce the specific goods required by consumers. Similarly, through flows of information and products, consumers are linked to the needs of farmers. Using this approach, and through continuous innovation and feedback between different stages along the value chain, the farmer's market power and profitability can be enhanced. Rather than focusing profits on one or two links, players at all levels of the value chain will benefit. Well-functioning value chains are said to be more efficient in bringing products to consumers and therefore all actors, including small-scale producers and poor consumers, should benefit from value chain development. Here the system is market "Pull". This is based on integrated transactions and information. Consumers purchase products that are produced according to their preferences. The farmer becomes the core link in producing the products that the consumers desire.

Supply Chain: Supply Chain Management (SCM) emerged in the 1980s as a new, integrative philosophy to manage the total flow of goods from suppliers to the ultimate user and evolved to consider a broad integration of business processes along the chain of supply (Martha *etal.* 1997). As the name implies, the primary focus in supply chains is on the costs and efficiencies of supply, and the flow of materials from their various sources to their final destinations.

Value Chain Actors: A value chain is made up of a series of actors (or stakeholders) from input (e.g. seed) suppliers, producers and processors, to exporters and buyers engaged in the activities required to bring product from its conception to its end use (consumption). Value chain stage defines the various chain actors and their roles for the functioning of the entire chain. Accordingly, the various actors in the value chain can be grouped under three levels or stages based on the roles they play.

Value chain supporters: These are services providing various actors who never directly deal with the product, but whose services add value to the product. Closely related to the concept of value chains is the concept of business development services or value chain supporters. These are services that play supporting role to enhance the operation of the different stages of the value chain and the chain as a whole.

Value chain influencers (enabling environment)

These are the third group of chain actors. These include the regulatory framework, policies, etc. Specific policy and regulatory service elements influencing value chain performance include land tenure security, market and trade regulations, investment incentives, legal services, and taxation. The value chain concept entails the addition of value as the product progresses from input suppliers to producers to consumers. A value chain, therefore, incorporates productive Transformation and value addition at each stage of the value chain. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally, some form of value is added. Value addition results from diverse activities including bulking, cleaning, grading, and packaging, transporting, storing and processing (Anandaja yasekeram and Berhanu, 2009).

Value chains can be classified into two based on the governance structures: buyer-driven value chains, and producer-driven value chains (Kaplinsky and Morris 2001). Buyer-driven chains are usually labor intensive industries, and so more important in international development and agriculture, which is our focus in this paper. In such industries, buyers undertake the lead coordination activities and influence product specifications.

Stage of Production

In agricultural value chain analysis, a stage of production can be referred to as any operating stage capable of producing a saleable product serving as an input to the next stage in the chain or for final consumption or use. Typical value chain linkages include input supply, production, assembly, transport, storage, processing, wholesaling, retailing, and utilization, with exportation included as a major stage for products destined for international markets. A stage of production in a value chain performs a function that makes significant contribution to the effective operation of the value chain and in the process adds value (Anandajayasekeram and Berhanu, 2009).

Vertical Coordination

The performance of an agricultural value chain depends on how well the actors in the value chain are organized and coordinated, and on how well the chain is supported by business development services (BDS). Verticality in value chains implies that conditions at one stage

in the value chain are likely to be strongly influenced by conditions in other stages in the vertical chain, in direct and indirect ways, and in expected and unexpected ways. It should be noted that intra-chain linkages are mostly of a two-way nature. (Anandajayasekeram and Berhanu, 2009).

Value chain mapping: It is the process of developing a visual depiction of the basic structure of the value chain. A value chain map illustrates the way the product flows from raw material to end markets and presents how the industry functions. It is a compressed visual diagram of the data collected at different stages of the value chain analysis and supports the narrative description of the chain. Value chain mapping is an attempt to assess or estimate how competitive a selected commodity or product is likely to be in a target market, even before it gets there. In this mapping, all the structures that deal with consumer demand for a particular product are identified and critically examined, particularly those that will either foster or impede its competitiveness. Attention should also be paid to production, processing and marketing activities of the commodity.

Purpose of Value chain analysis

According to UNIDO (2009), 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. 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.

Value Chain Strategy: The set of statements and guidelines at chain level with the purpose to guide the future development of the chain and its links, and based on the shared ultimate goal of the chain. Chain strategies cover domains as market coverage, coordinated investments,

and extension of the chain with new participants, innovation. Besides chain (oriented) strategies every link in the chain has its own (supplementary) strategies. There are three possibilities of chain strategy.

Chain Formation: Are all the activities and conditions necessary to design as well as implement collaborative relations between chain links with the purpose to support the productive functioning of the chain efficiently.

Chain behavior: It refers to interaction of a chain with its environment at a cognitive, an evaluative and an active level, as well as the interaction between the constituting links of the chain.

Value chain finance: It is considered as financial products and services flowing to and/or through a value chain to address the needs of those involved in that chain, be it a need for finance, a need to secure sales, procure products, reduce risk and/or improve efficiency within the chain.

Value chain integration: It is the process in which multiple enterprises within a shared market cooperatively plan, implement, and manage (electronically and physically) the flow of goods, services, and information from point of origin to point of consumption in a manner that increases customer-perceived value and optimizes the efficiency of the chain, creating competitive advantage for all stakeholders involved.

2.1.3 Marketing and Agricultural marketing system

Kotler's (2003) definition of marketing is widely known as "the 21 century definition of marketing" which runs as follows a social and managerial process by which individuals and groups obtain what they need and want through creating and exchanging products and values with others. Marketing is the process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual and organizational goals. According to definition by American Marketing Association, marketing is the management of process involved in identifying, anticipating and satisfying consumer requirements profitably.

Marketable and marketed surplus: According to Thakur *et al*. (1997) marketable surplus is the quantity of the produce left out after meeting farmer's consumption and utilization requirements for kind payments and other obligations such as gifts, donation, charity, etc. So, marketable surplus shows the quantity left out for sale in the market. The marketed surplus shows the quantity actually sold after accounting for losses and retention by farmers, if any and adding the previous stock left out for sale. Thus, marketed surplus may be equal to marketable surplus, it may be less if the entire marketable surplus is not sold out and the farmers retain some stock and if losses are incurred at the farm or during transit.

Agricultural marketing: It is defined as *"*The performance of all business activities involved in the flow of food products and services from the point of initial agricultural production until they are in the hands of consumers."Agricultural marketing is also the study of all the activities; agencies & policies involved in the procurement of farm inputs by the farmers & the movement of farm products from the farms to the consumers and a link between the farm & on- farm sectors. Thus, the agricultural marketing includes product marketing as well as input marketing. In the context of agricultural marketing, product marketing is largely the food marketing which is a connecting link-the bridge between food producers and consumers. It is both a physical distribution and an economic bridge designed to facilitate the movement of commodities from the farm to the fork.

Vertical Chain: It is the process that begins with the acquisition of raw materials and ends with the distribution and sale of finished goods.

Market channel: It is a trade or distribution network and it is defined by Stern *et al.* (1996) as sets of interdependent organizations involved in the process of making the product or service available for consumption. The channel follows a vertical structure where products flow from producer to the ultimate consumer and in which actors meet at each market. Different marketers exist in channel arrangements to perform marketing functions that contribute to the product flow. Actors acting between producers and final users are known as intermediaries.

2.1.4 Agricultural Value Chain Analysis

According to Anandajayasekeram *et al.* (2009), there are four major key concepts guiding agricultural value chain analysis. These are effective demand, production, value chain governance and upgrading.

Effective demand: According to MSPA (2010), agricultural value chain analysis views effective demand as the force that pulls goods and services through the vertical system. Hence, value chain analysis need to understand the dynamics of how demand is changing at both domestic and international markets, and the implications for value chain organization and performance. Value chain analysis also needs to examine barriers to the transmission of information in the changing nature of demand and incentives back to producers at various levels of the value chain.

Production: According to study by Anandajayasekeram and Berhanu (2009), in agricultural value chain analysis, a stage of production can be referred to as any operating stage capable of producing a saleable product serving as an input to the next stage in the chain or for final consumption or use. Typical value chain linkages include input supply, production, assembly, transport, storage, processing, wholesaling, retailing, and utilization, with exportation included as a major stage for products destined for international markets. A stage of production in a value chain performs a function that makes significant contribution to the effective operation of the value chain and in the process adds value. Producing the required amount effectively is a necessary condition for responsible and sustainable relationships among chain actors. Thus, one of the aims of agricultural value chain analysis is to increase the quantity of agricultural production.

Value chain governance: Governance refers to the role of coordination and associated roles of identifying dynamic profitable opportunities and apportioning roles to key players (Kaplinsky and Morris, 2000). Value chains imply repetitiveness of linkage interactions. Governance ensures that interactions between actors along a value chain reflect organization, rather than randomness. The governance of value chains emanate from the requirement to set product, process, and logistic standards, which then influence upstream or downstream chain actors and results in activities, roles and functions. Value chains can be classified into two

based on the governance structures: buyer-driven value chains, and producer-driven value chains. Buyer-driven chains are usually labor intensive industries, and so more important in international development and agriculture.

Value chain upgrading: Upgrading refers to the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into higher-value activities (Kaplinsky and Morris, 2000). Upgrading in firms can take place in the form of process upgrading, product upgrading, functional upgrading and chain upgrading. Upgrading entails not only improvements in products, but also investments in people, knowhow, processes, equipment and favorable work conditions.

2.1.5 *Teff* Value Chain in Ethiopia

The idea of value chains is quite intuitive. It exists when all of the actors in the chain operate in a way that maximizes the generation of value along the chain. Value chain can be in a narrow or in a broad sense. In the narrow sense, a value chain includes the range of activities performed within a firm to produce a certain output. In other words, all activities constitute the chain which links producers to consumers and each activity adds value to the final product. The broad approach does not only look at the activities implemented by a single enterprise. Rather, it includes all its backward and forward linkages, until the level in which the raw material is produced will be linked to the final consumers (Kaplinsky and Morris, 2002).

Minten *et al.* (2013) studied *teff* value chain by selecting major *teff* producing zone in Ethiopia. The study showed that the adoption of modern farm inputs by farmer's increases, increasing willingness to pay for convenience in urban areas, improvement of foodservice industry, improved marketing efficiency, quality demands rise and shifts from the cheap red varieties to the more expensive white ones. According to this study, transformation happened in the last decade in the staple food value chain in Ethiopia, which contrasts the pervasive view that agricultural value chains in Africa are static and change slowly. Developing country food value chains are changing rapidly, fueled by the expansion of modern food retailers, wholesalers and manufacturers, which coexist and interact with firms in traditional food value chains. As a result, the structure of food value chains is being shaped in ways that have no

precedent in developed countries, where the transition from traditional to primarily modern system occurred (Gomez and Ricketts, 2013).

Despite *teff*, trade is highly profitable; little is known about the farm level competitiveness of *teff* production and the distribution of the costs and value-added between the chain participants, which include farmers, traders and processors. Although past studies in Ethiopia (Minten *et al.,* 2013; Fufa *et al.,* 2011) have looked at value chain analysis of *teff*, literature on quantitative value chain analysis that captures the cost build-ups along the chain is scarce. According to Minten *et.al* (2013) *teff* value chain had divided in to upstream and downstream. The use of modern input such as herbicide, pesticide, improved seed varieties, chemical fertilizer increased productivity in upstream of teff value chain, however, broadcasting is common method used for *teff* sowing. The share of red *teff* in production declined from 36 percent of total production to 20 percent. The reasons for the decline of red *teff* produce over time. First, the prices for red *teff* are significantly low. Second, red *teff* traditionally used to have higher productivity than white *teff* this is now changing as high-performing white varieties have recently become available. Thirdly, only very few improved red varieties are currently available.

The study by Efa *et al*. (2016) on *teff* value chain analysis the case of Bacho and Dawo districts indicated that chain actors are differing from chain supporters in terms of ownership status they have to the product. Chain actors own the product. Ownership is transferred from one actor to the next actor in the chain. Chain supporters supporting actors in the value chain in finance and providing other services but not own the product. The actors in *teff* value chain are input suppliers, farmers/producers, rural and urban retailers, rural/urban wholesalers, processors (flour sellers and injera sellers), NGO (*Birmadu Folle*), cooperatives/union, *injera* sellers and consumers. The *teff* value chain begins with input suppliers who supply production inputs to producers.

2.2 Empirical Review

2.2.1 Determinants of *teff* market supply

Different articles were reviewed in relation to determinants of market supply for agricultural commodities in general and *teff* in particular. The main purpose of this section is to identify the factors that affect market supply of agricultural products and the method they used to quantify the cause and effect relationship between variables. Efa *(*2016) analyzed determinants of market participation and intensity of marketed surplus of *teff* producers in Bacho and Dawo districts of Oromia region, Ethiopia using double hurdle econometric model. His result indicated that family size, credit access, farm size, lagged market price, agro-ecology and transport equipment affect the market participation of *teff* producers; on the other hand, proxy to nearest market, perception of farm gate price, family size, farm size, on/off farm income, agro-ecology and livestock ownership were found to be statistically significant factors of intensity of marketed surplus of *teff* producers.

The study conducted by Mohammed (2011) applied multiple linear regressions model to identify determinants of market supply of *teff* and wheat in Halaba Special Woreda, Southern Ethiopia. The author runs separate regression analysis for the *teff* and wheat. Among 11 explanatory variables, sex of the household head, *teff* production, access to market information and extension service were statistically significant factors affecting *teff* market supply; on the other hand, price of other crops, wheat production and credit access affect market supply of positively and significantly. In addition to the above study, Azeb *et al.* (2016) analyzed factors affecting *teff* and wheat market supply in dendi district, West Shoa Zone, Ethiopia using multiple linear regressions. Similar to Mohammed (2011), he incorporated 11 explanatory variables and examined separate analysis for *teff* and wheat market supply. He got the same result with Azeb *et al.* (2011) who analyzed the determinants of quantity of *teff* market supply; whereas, price of *teff* in 2013/14, wheat quantity produce and credit access significantly and positively affected market supply of wheat.

By using multiple linear regression model a study by Sultan (2016) indicates that, livestock ownership affects quantity of wheat supplied to market positively and significantly. As farmer's livestock ownership increased by one unit the amount of wheat supplied to market is

increased by0.37 quintal. This is because livestock ownership in highlands of Bale is an important input for wheat production. Family size affects supply of wheat to market negatively and significantly. The negative effect of the variable shows that as the number of household members increased more part of wheat produce is allocated for household consumption. As the member of household is increased by one, volume of wheat supplied to market is decreased by 0.05 quintal. It is assumed that the larger the total area of the farm land the farmer owns, the larger land is allocated for wheat and the higher would be the output that influences large quantity of wheat supplied to market. And also quantity of wheat produced affects market supply positively and significantly at 1% probability level.

By using multiple linear regression model a study by Azeb *et al*. (2017) indicated that, income of non-farming which shows a positive relation to the quantity of *teff* sold or supplied to the market. Producers checked the income of non-farming for their best benefit and this directs to the determinant to be significance at 5% level. The price of *teff* also affected market supply of *teff* significantly and positively at 10% level. Quantity of *teff* produced affected volume of *teff* supplied to the market significantly and positively at 1% level due to unit increase in the quantity of *teff* produced will increase the marketable supply of farmers. Labour affected the quantity of *teff* sold or supplied to the market. Producers checked the labour for their best benefit and this directs to the determinant to be significance at 5% level. The positive and significant relationship between the variables indicates that as the labour rises, the quantity of *teff* sold at the market also rises, which in turn increases the quantity of *teff* sold per household per year. The coefficient of the variable also confirms that a unit labour increase in the *teff* market directs to the household to increase yearly *teff* sales by 1.20 quintal.

The other result with Ashenafi *et al.* (2010) who studied about analysis of grain marketing in Southern zone of Tigray region, Ethiopia. Yield positively affected quantity supplied and is statistically at 1% significant level. As hypothesized when the quantity of grain produced increases, the market supplies also increase too. Other result with Berhanu and Hoekstra (2007) who studied about cereal marketing and household market participation in Ethiopia in the case of *teff* and wheat and rice. The study on the determinant of *teff* market participation indicated that about 60% of *teff* produce is sold, although there were significant variations among the districts. The proportion of *teff* produce sold ranged from 42–80%. Results also

indicated that in areas, where the proportion of cultivated area covered with *teff* was lower, significantly higher proportion of *teff* produce was sold, indicating the relative role of staple food crops in market participation for a particular crop.

A Study conducted by Efa (2016) conducted on the determinants of market participation and intensity of marketed surplus of *teff* producers in Bacho and Dawo districts, of Oromia region by using double hurdle model indicated that, Land allocated for *teff* production positively and significantly affects the probability of market participation at 10% probability level. A farmer who has a large farm size would have high probability to allocate more land for production of teff. Access to credit positively and significantly influences the likelihood of farmers in market participation at 1% significance level. Having ownership of transport equipment is positively and significantly influences the market participation at 5% probability level. Household size is negatively associated with the intensity of *teff* sold at 5% probability level. An increase in the household size by one person decreases sale of *teff* by 6%. Distance to the nearest market negatively and significantly influences the intensity of marketed surplus at 10% significant level. Farm size allocated for *teff* production is positively and significantly affects the extent of marketed surplus at 1% significance level. Similar to the study done by Masoku *et al.* (2001) which showed that positive and significant relationship between land size and market participation in the maize market.

2.2.2 Factors affecting market outlet choice of producers

Producers choose their marketing plans and assess outside options that are available before participating in any marketing outlet. Multivariate probit estimation has been used in many studies to identify determinants of adoption of agricultural technologies. Gillespie *et al*. (2010) and Jenkins *et al.* (2004) used this approach to identify factors that affect cotton producers' adoption pattern of different information sources i.e. private, extension and media and to estimate factors that affect adoption of four breeding technologies.

Corsi *et al*. (2009) was used multivariate probit model to analyze the diversification of the marketing chains and channel choices among oil seed producers. The results suggest that farmers' personal characteristics influence their choice, and that more educated and skilled farmers are less likely to choose traditional marketing chains and more likely to engage in the

new marketing chains. Padmanand *et al.* (2015) also used 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 positive effect whereas household size was negatively associated with supper marketing channel choices.

Shewaye (2016) was employed multivariate probit model to identify factors determining haricot bean market outlet choices in Misrak Badawacho district. The result revealed that distance to all weather roads and distance to the nearest district market positively affect the probability to choose rural assemblers market outlet whereas number of equine owned and use of credit has a negative effect. Number of equine owned positively affects the probability to choose direct consumers outlet. Number of equine owned, use of credit, membership in cooperative and price information positively affect the probability to choose urban traders outlet, whereas distance to the nearest district market negatively affect the probability to choose the urban traders outlet.

Oliyad *et al*. (2017) used multivariate probit model to analyze determinants of market outlet choice of Groundnut producers in Digga district of Oromia region. The multivariate probit model results revealed that variables like educational level, distance to the nearest market, access to extension service, size of land allocated for groundnut, quantity of groundnut produced, transport facilities, buyers' trust and access to off/nonfarm income affected the choice of appropriate market outlets of producers. Study by Addisu (2016) by using multivariate probit model to identify factors affecting potato market outlet choices in Ejere district and his result indicated that quantity of potato sold, education level, sex of household head, family size, farming experience, distance to nearest market, off/non-farm income, trust in traders, ownership of 15 motor pump, selling price of potato and area of land allocated for potato significantly influence potato producers choosing of market outlets for their produce.

Takele *et al.* (2017) used multivariate probit model to identify determinants of market outlet choice of mango producers in Boloso Bombe district, Southern Ethiopia. The results from multivariate probit model indicated that variables such as family size, distance to the market, quantity of mango produced, price offered, access to market information and access to non-farm income determined the decision of choice of wholesaler, collector, retailer and consumer

market outlets. The study by Yadeta and Temesgen (2018) by using multivariate probit model also revealed that, sex, land size and quantity of *teff* produced were significantly affected the farm gate outlet choice of the smallholders while retailer outlet choice of farmers were significantly determined by quantity of *teff* produced. On the other hand, the wholesale market outlet choice of farmers was significantly determined by education level of the farmers.

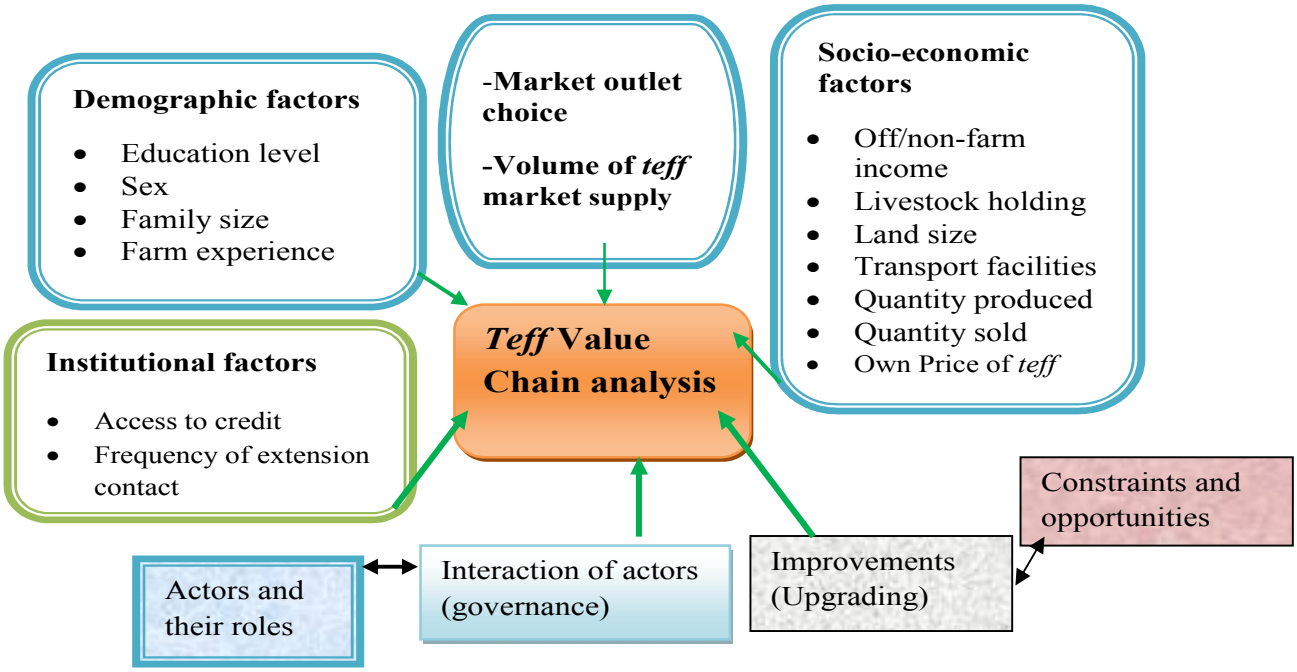
Addisu (2018) used multivariate probit model to identify determinants of *teff* market outlet choice of producers. His result indicated that educational level of household head, household size (adult equivalent), livestock owned, equines owned, size of land under *teff* production, distance from the nearest market, and current market price of *teff* were found to significantly affect the market outlet choice behavior of *teff* producers. The likelihood of choosing collector outlet is relatively low (39.1%) as compared to the probability of choosing consumer outlet (41 .6%), cooperative outlet (51.1 %) and wholesalers outlet (64.4). This is indicates that wholesaler is the most likely chosen market outlet by farmers and the low capacity of collector outlet to purchase more *teff* produce at a time and the limited capacity of collector outlet.

2.3 Conceptual Framework

In order to analyze value chain of *teff*, this conceptual framework was developed. The conceptual framework consists of different actors; their role, linkage and interaction; attitude, practices and habits of the different actors, enabling environment including policies, institutional arrangements and incentives that affect the capacity and efficiency of actors to innovate across the value chain. According to Hellin and Meijer (2006), the Market Map is made up of three inter-linked components: Value chain actors, enabling environment (infrastructure and policies, institutions and processes that shape the market environment such as R&D, BoDARD, NGO etc) and Service providers (the business or extension services that support the value chains' operations).

Value chains include process actors such as input suppliers, producers, traders and consumers. At one end are the producers the farmers who grow the crops and raise the animals. At the other end are consumers who consume it. In the middle may be many individuals and firms, each performing one small step in the chain: transporting, processing, storing, selling, buying,

packaging, checking, monitoring and making decisions. Different demographic factors affecting *teff* market supply and outlet choice were education, household size, socioeconomic factors are land size, livestock holding, total *teff* produced, quantity sold, access to credit, access to market information, distance to the nearest market, farming experience, having transport facility and frequency of extension contacts.



Source: Own design by reviewing related literature (2018)

Figure 2: Conceptual framework of *teff* value chain

3. RESEARCH METHODOLOGY

This chapter summarizes description of the study areas, data types, source of data, and method of data collection, sampling procedure and sample size, method of data analysis (descriptive statistics and specification of econometric models), hypothesis and variable definition.

3.1 Description of the Study Area

3.1.1 Overview of Jimma Arjo District

Jimma Arjo is found in East Wollega zone of Oromia region and is 379 Km to West of Finfinne/Addis Ababa. It is bordered on the southwest by the Didessa river which separate it from the Bunno Beddele zone, on the North West by Diga lake, on the north east by Guto Wayu, and on the south east by Nunu Kumba district. The major part of the study area can be described as rolling and undulating topography with dendrite drainage pattern. The elevation of the study area ranges from 1500-2600m a.s.l. The common physiographic features are mountains ridges plateaus and basins. The total study area is highly vegetated and type of vegetation cover depends on the physiographic and climatic condition. It is mainly covered by large trees, grass and bushes.

According to the agro-climatic classification of Ethiopia, the relief/land form of the study area can be grouped into three major physiographic units based on their elevation. The lowlands with <1500m a.s.l which is suitable for maize, sorghum, sesame, nouge and Daguja production, mid altitude with 1500-2300m a.s.l which is suitable for all types of crop production, and highlands with >2300m a.s.l which is strongly suitable for *teff*, wheat, bean, pea, with 30%,58% and 12% coverage respectively. According to the annual rainfall mapping the study area gets annual rainfall up to 2800mm. Types of crops produced in the study area are *teff*, wheat, maize, sorghum, nouge, sesame, pea, bean, lettuce, sugarcane, potato, tomato, faba bean, barley, onion, Garlic, and others horticultural products. Not only crops and also livestock's are produced includes sheep, horse around highland and mule, donkey, goat and cows are produced around lowland areas of the district. *Teff* is produced once a year because of agricultural activities of the district is rainfall based, that means no

irrigation activities employed for *teff* production. In the district *teff* is only produced on high land and midlands areas.

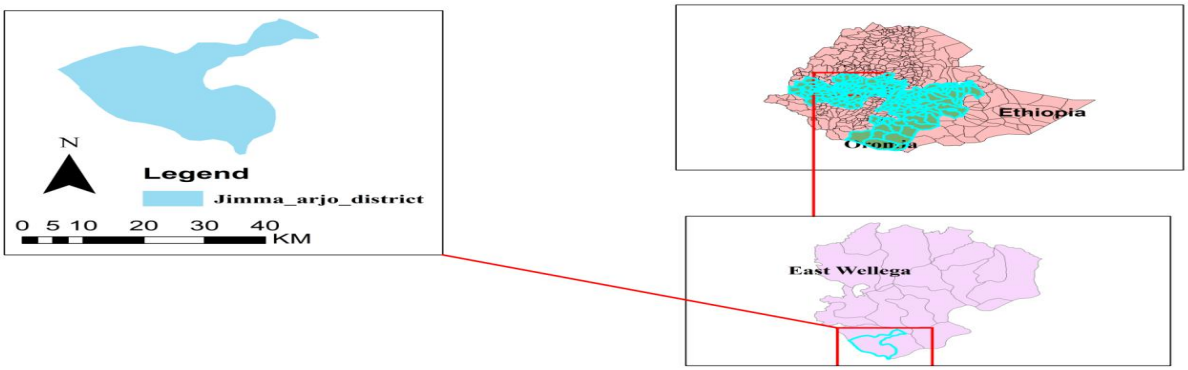


Figure 3: GIS map of study area

3.2. Data Types, Sources and Methods of data collection

3.2.1 Data types and sources

For this study both qualitative and quantitative data were collected from primary and secondary sources. Primary data sources were smallholder *teff* producer farmers randomly interviewed and from purposively selected traders and consumers. Secondary data sources were from district agriculture and rural development offices, primary cooperatives, district trade and industry offices, data taken from CSA, published and unpublished materials either from internet and bulletins.

3.2.2 Methods of data collection

Primary data: The data were collected formally by the method of individual interview using pre tested structured questionnaire, while data from focus group discussion and key informant interview were collected by using checklists. Before distributing the pre tested questionnaire for enumerators, the author was trained enumerators on how to collect relevant data from concerned respondents.

Secondary Data: By using checklists data were gathered from published and unpublished materials, district agriculture and rural development offices, farmers' organizations, input suppliers, marketing agencies, primary cooperatives, districts industry and trade office.

3.3. Sampling Procedure and Sample Size

Farmers sampling

Two stages random sampling technique was used to select sampled kebeles and respondents because of all sampled kebeles and respondents are *teff* producers and sellers (Homogeneous). There are 20 rural and 2 urban kebele administrations in the district. From 20 rural kebele administrations only 12 rural *kebeles* are *teff* producers. In the first stage from 12*teff* producing *kebeles* 3 *kebeles* were selected randomly and in the second stage 122 farmers from *3* sample *kebeles* were randomly selected based on Probability Proportional to Size (PPS) using Yemane (1967) formula.

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

Where, n = sample size, N= Number of household heads of 12*teff* producer *kebeles* (7512) and e = level of precision assumed 9%. Sultan (2016) and Addisu (2016) also used this level of precision. Accordingly, the required sample size at 91% confidence level with level of precision equal to 9% was used to obtain a sample size required which represent a true population.

$$\text{n} = \frac{7512}{1 + 7512(0.09)^2} = 122$$

Table 1: Sample distribution of producer *kebeles* (PPS)

Selected Kebeles	Total Households	Proportion	Sample(n)
Hindhe	880	0.44	53
Tibe Caffe	506	0.25	31
Hara	626	0.31	38
Total	2012	1.00	122

Source: Own design (2018)

Wholesalers, Assemblers, Retailers and Consumers sampling

Data from traders and consumers were also collected. The sites for the trader surveys were market towns and villages in which a good sample of *teff* traders existed. On the basis of flow of *teff*, three markets (Gaba Sanbata, Arjo and Jimate) were selected as the main *teff* marketing sites for the study areas. It is obvious that taking sample from unknown number of population randomly is impossible due to absence of recorded list of trader's population

except wholesalers in the study area. Therefore, a purposive sampling technique was used to select 15 local collectors, 20 wholesalers, 20 retailers and 15 consumers.

3.4. Methods of Data Analysis

Descriptive statistics and econometric analysis were employed to analyze the data collected from all actors involved in *teff* value chain and marketing of the crop in the study area.

3.4.1. Descriptive statistics

Descriptive statistics such as mean, maximum, minimum, standard deviation, frequencies and percentages were used in process of examining and describing socioeconomic and demographic characteristics of farmers and traders. And also Kendall's Coefficient of Concordance (W) was used to rank constraints hindering *teff* production, marketing and agreement among farmers on those constraints.

3.4.2 Value chain analysis

The analysis of *teff* value chain discusses the need for enterprise development, achievement of product quality, and promotion of coordinated linkages among producers and improvement of the competitive position of individual enterprises in the market place and this study included the followings:

Mapping the value chain: Value chain map is a standard tool of a value chain research and analysis (ILO, 2009). This helps to understand characteristics of the chain actors and the relationships among them, including all actors in the chain, the flow of *teff* through the chain, employment features, and the destination.

Defining upgrading needed within the chain: These include interventions to improve product design and quality, reorganize the production system or invest in new technology to upgrade the process and enhance chain efficiencies, introduce new functions in the chain to increase the overall skill content of activities; and adapt the knowledge gained in particular chain functions in order to redeploy it.

Emphasizing the governance role: By focusing on governance, an actor that may require support to improve capabilities in the value chain and correct distributional distortions was

identified. Thus, governance constituted a key factor in defining how the upgrading objectives could be achieved. Following the above procedure, the main aspects of *teff* value chain analysis was conducted by applying some qualitative analysis.

3.4.2 Econometric models

Econometric models were employed to analyze factors affecting supply of *teff* to the market and market outlet choice of *teff* producers.

Factors affecting *teff* market supply

Multiple linear regressions employed to analyze the determinants of *teff* market supply since all *teff* producer farmers are *teff* market participants. However, when some of the assumptions of the Classical Linear Regression (CLR) model are violated, the parameter estimates of the above model may not be Best Linear Unbiased Estimator (BLUE). Thus, it is important to check the presence of hetrocedasticity, multicollinearity and endogeneity problem before fitting important variables into the regression models for analysis.

The problem of endogeneity occurs when an explanatory variable is correlated with the error term in the population data generating process which causes, the ordinary least squares estimators of the relevant model parameters to be biased and inconsistent. The source of endogeneity could be omitted variables, measurement error and simultaneity (Maddala, 2001). Both Hausman test and Durbin-Wu-Hausman (DWH) test were applied to check the presence of endogeneity. In this study, there was a potentially endogenous variable, which was quantity of *teff* produced, included in the explanatory variables that could cause endogeneity bias if OLS is applied. Therefore, in identifying the determinants of *teff* supplied, a two-stage least square (2SLS) model was used. Two-stage least square is similar to OLS except that uses two completely separate stages during the analysis phase in order to avoid problems of endogeneity (Wooldridge, 2010).Econometric model specification of supply function in matrix notation is as follows:

$$Y = \beta o + X_k^{'\beta_1} + \delta Y_1 + U \qquad (2)$$

Where Y is vector of quantity of *teff* supplied to market, $X^{'}$ is exogenous variable that is assumed to affect market supply of *teff,* Y_1 is vector of endogenous variables which is

quantity produced of *teff*, while β_0, β_1 and δ are a vector of parameters to be estimated and U a vector of disturbance term. As the name suggests 2SLS involves using OLS regression in two stages, in the first stage a reduced form of the structural equations is estimated where the endogenous variable productivity of *teff* regressed on all the exogenous variables. Reduced form is here below:

$$Y1i = \Omega 0 + \Omega 1Xi + \Omega 2Zi + v \quad (3)$$

Where Y_{1i} is endogenous variable (quantity of *teff* produced) , X_i vector of explanatory variables, Z_i is a vector of excluded instrumental variables Ω is coefficients to be estimated and v is error terms and systematically surrounded around zero.

Multicollinearity problem arises due to a linear relationship among explanatory variables; and becomes difficult to identify the separate effect of independent variables on the dependent variable because there exists strong relationship among them (Gujarati, 2003). Two ways to check multicollinearity, Variance Inflation Factors (VIF) is used to check for continuous variables and Contingent Coefficient for discrete variables. When value of VIF is greater than 10 (R^2>0.90), there is strong multicollinearity between continuous explanatory variables and specified as:

$$VIF(X_j)X = \frac{1}{1 - {R_j}^2} \quad (4)$$

Contingency coefficient (CC) was used to investigate multicollinearity problem among discrete variables and specified as;

$$CC = \sqrt{\frac{x^2}{N+x^2}} \quad (5)$$

CC= Contingent Coefficient and when its value exceeds 75 percent variables are collinear. In order to check the existence of hetrocedasticity problem in the data set, the parameter estimates of the coefficients of the independent variables cannot be BLUE. We check problem of hetrocedasticity by using STATA13 software using Breusch Pagan test.

Factors affecting market outlet choice of *teff* producers

Econometric models such as multivariate Probit /logit, multinomial Probit/logit, conditional or mixed, or nested logit are useful models for analysis of categorical choice dependent

variables. A number of studies have been done that have revealed factors influencing marketing channel choice decisions. 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 outlet choice are not mutually exclusive, considering the possibility of simultaneous choices of outlets and the potential correlations among these market outlet choice decisions. Therefore, by reviewing previous empirical studies, multivariate Probit model was employed for this study to estimate several correlated binary outcomes jointly because it simultaneously capture the influence of the set of explanatory variables on each of the different outlet choices, while allowing for the potential correlations between unobserved disturbances, as well as the relationships between the choices of different market outlets (Greene, 2012).

The Multivariate Probit model takes into account the potential interdependence in market outlet choices and the possible correlation in the choice of alternative outlets. The probability of preferring of any particular market outlet is estimated conditional on the choice of any other related outlet. The Multivariate Probit model assumes that each subject has distinct binary responses, and a matrix of covariates that can be any mixture of discrete and continuous variables. Generally speaking, the Multivariate Probit model assumes that given a set of explanatory variables the multivariate response is an indicator of the event that some unobserved latent variable falls within a certain interval.

The *teff* producers were mapped into four marketing outlets: sales to collectors, wholesalers, retailers, and consumers. The *teff* producing farmer i will able to choose from a set of alternatives $(j = 1, 2, 3, \text{and } 4)$ which provided a certain level of utility Uij from each alternative. This model was based on the principle that the farmer will choose the outlets that will maximize his/her utility. The farmer will make a comparison on marginal benefit and cost based on the utility that will be gained by selling to a combination of market outlets which will maximize its utility). However, it is not possible to directly observe the utilities but the choice made by the farmer revealed which marketing outlet provides the greater utility (Djalalou *et al*., 2015). Hence, the utility was decomposed into deterministic (Vij) and random (εij) part:

$$Uij = Vij + \varepsilon ij \quad (6)$$

Since it was not possible to observe εij and predict exactly the choice of marketing outlet, the probability of any particular outlet choice was used in which a farmer selected a marketing outlet j=1 if:

$$Uik > ui \forall j \neq k \quad (7)$$

Where Uik represents a random utility associated with the market channel$j = k$, Vij represents an index function denoting the decision makers' average utility associated with this alternative, and εij represents the random error. As *teff* producers more likely choose two or more than two types of outlets simultaneously in the study area, assuming the selection of different marketing outlets, as well as their simultaneous use, depends on producers' willingness to maximize their profit and is conditional to socioeconomic, institutional, production, and market-related factors.

According to study by Djalalou *et al*. (2015) and Shewaye *et al.* (2016) the household decision of whether or not to choose is considered under the general frame work of utility or profit maximization .It is assumed that given producer i in making a decision considering not exclusive alternatives that constituted the choice set Kth of *teff* marketing outlets, the choice sets may differ according to the decision maker. Consider the ith farm household ($i = 1, 2 \ldots\ldots N$) facing a decision problem on whether or not to choose available market outlets. Let Uk represent the benefit of farmer to choose the Kth market outlet: where K denotes the choice of Local collectors($Y1$), Wholesalers ($Y2$), retailers ($Y3$), and consumers ($Y4$) .The farmer decides to choose the Kth market outlets if$Y * ik = U * k - U0 > 0$. The net benefitY^*ik) that the farmer derives from choosing a market outlet is a latent variable determined by observed explanatory variable (Xi) and the error term (εi):

$$Y^*ik = X'\beta_k + \varepsilon_i (k = Y1, Y2, Y3\ and Y4\ ) \quad (8)$$

The econometric approach for the study is by using the indicator function; the unobserved preferences in above equation translate into the observed binary outcome equation for each choice as follows:

$$\mathrm{Y_{ik}} = \begin{cases} 1 \text{ if } \mathrm{Y^*\ ik} > 0 \\ 0 \text{ otherwise} \end{cases} \ (\mathrm{k = Y1, Y2, Y3 \text{ and } Y4}\ ) \quad (9)$$

In case of multivariate probit model, where the choice of many 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 $(\mu_{x1}, \mu_{x2}\mu_{x3,}\mu_{x4,})MVN\sim(0,\Omega)$ and the covariance matrix Ω is given by:

$$\Omega = \begin{cases} 1 & \rho x1x2 & \rho x1x3 & \rho x1x4 \\ \rho x2x1 & 1 & \rho x2x3 & \rho x2x4 \\ \rho x3x1 & \rho x3x2 & 1 & \rho x3x4 \\ \rho x4x1 & \rho x4x2 & \rho x4x3 & 1 \end{cases} \quad (10)$$

Of particular interest are the 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 the above equation generates a multivariate probit model that jointly represents decision to choose 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 formula used by Cappellarri and Jenkins (2003), the log-likelihood function associated with a sample outcome is then given by:

$$lnL = \sum_{i=1}^{N} \omega_i \, ln\emptyset(\mu i, \Omega) \quad (11)$$

Where ω is an optional weight for observation i and Φi is the multivariate standard normal distribution with arguments μi andΩ, where μi can be denoted as:$\mu_i = (k_{i1}\beta_1 X_{1i}, k_{i2}\beta_{2i}X_{2i}, k_{i3}\beta_{3i}x_{3i}$while Ωik = 1for j = k and

$$\Omega jk = k_{ij}k_{ik}\rho_{jk} for j \neq k, k = 1,2,3,4 \ldots . with k_{ik} = 2y_{ik} - 1 \quad (12)$$

3.5 Hypothesis and variable definition

Dependent Variables

Quantity of *teff* supplied to the market: It is a continuous dependent variable measured in Kilograms of *teff* supplied to the market during 2017/18 year.

Market outlet choice: A categorical option dependent variable measured by a choice of outlets defined and measured as binary outcome. The multivariate probit has a set of binary dependent variables Yi, such that:(1=Local collector or 0 if not and represented by

Y1),(1=Wholesaler or 0 if not and represented by Y2), (1= retailer or 0 if not and represented by Y3) and (1=consumer or 0 if not and represented by Y4).

Explanatory Variables

Non-farm income (NONFIN): Is continuous variable measured by birr earned from non-farm/off farm activities of the household. The study by Azeb *et al.* (2017), the coefficient of income of non-farming which shows a positive relation to the quantity of *teff* sold or supplied to the market. Producers checked the income from non-farming for their best benefit and this directs to the determinant to be significance at 5% level. Again, farmers who gain more income from non/off farm activities want to supply their vegetable to any nearest market outlet with low price than to go far (Addisu,2016). Farmers who gain more non- /off-farm income may sale their products to the nearest market outlet (Shewaye *et al*., 2016).So this variable is hypothesized to negatively affect quantity of *teff* supplied to market. Also it is hypothesized to affect the likelihood of choosing local collectors and wholesalers positively, retailers and consumers negatively because of those farmers participating in non-farm activities more prefer the nearest market.

Distance from nearest market center (DISMKT): It is a continuous variable which is measured in kilometers. The more household is nearest to the market the smaller the marketing cost that farmer pays. Berhanu and Moti (2010) found out negative relationship between market participation and distance to the nearest urban market center. So if farmer is nearest to the market and better access to market information and faces less post harvest loss caused by spoilage and deterioration of the product. So this study expects distance from market center negatively affects *teff* market supply. It also hypothesized to affect likelihood of choosing local collectors positively while negatively affects wholesalers, retailers and consumers because of farmers far from market center more prefers to sell their product for local collectors to minimize their marketing cost.

Household size (HHSIZE): It is a continuous variable measured in Adult equivalent. However, household size in the study area might negatively affect on market participation and marketable surplus of *teff*. A study conducted by Wolday (1994) identified that family size has a significant positive effect on quantity of *teff* marketed and negative effect on quantity of

maize marketed. Lapar *et al.* (2003), Edmeades (2006) and Berhanu and Moti (2010) found out negative relationship between household size and market supply. So it is hypothesized to affect volume of market supply negatively. Takele *et al.* (2017) found that having large family size was good for delivering output to the final market outlet. This variable also hypothesized to affect the likelihood of choosing local collectors negatively, wholesalers, retailers while consumers positively because of farmers with large number of household were expected to sell their product for final outlets to earn higher price.

Access to market information (**ACMKTIN**): It is a dummy variable and assigned as 1 for those households who access to marketing information and 0, otherwise. Farmers marketing decisions are based on market price, supply and demand information, and poorly integrated markets may convey inaccurate and inadequate information on price, volume demanded and supplied as well as quality. Sultan (2016) indicated access to market information positively affected volume of wheat supply for the market. So it is hypothesized to affect volume of *teff* supply positively. It also hypothesized to influence likelihood of choosing local collectors and retailers negatively because of it charges low price and positively affects wholesalers and consumers outlets because of these outlet charges higher prices than retailer and local collectors, respectively.

Using credit (USCRED): It is a dummy variable taking the value 1 if farmer uses credit for production and/or marketing activities related to *teff* and 0 otherwise. Credit is a key financial instrument to break low level of production and then marketing problem. According to Mohammed (2011) and Sultan (2016) access to credit had positive and significant influence on volume of wheat supply. So it is hypothesized to affect volume of *teff* supplied to the market positively. It also hypothesized to affect likelihood of choosing local collectors and retailers negatively while wholesalers and consumers positively because of farmers were being credit user can produce many quintals of *teff* which is sold in large quantity since local collectors and retailers buys it in small amount due to their limited capacity.

Quantity produced (QPRD): It is a Continuous variable which is measured in *quintal* (Q), which directly contributes to quantity supplied to the market. It means those who produces large amount supplies in large volume and produces small amount supplies in small amount.

The study by Mohammad (2011), Sultan (2016), Kindie (2007), Bosena (2008), and Assefa (2009), which found that the amount of *teff*, wheat, grain, rice, red pepper, sesame, cotton and honey, respectively, produced by household affected marketable supply of each of the commodities positively. For this study it is hypothesized to affect volume of *teff* supply positively.

Farming experience (FAREX): It is a continuous variable and measured in years of starting production of *teff*. Abraham (2013) also proved that farmers who have more experience provide more of their potato product to market. According to study by Tadese *et al*.(2016) indicated that, the increase of *teff* farming experience by one year affects household to select market outlet 1% statistical significance level and positively. So for this study it is hypothesized to affect volume of *teff* market supply positively. Addisu (2016) reported that farmers who growing onion for many years were found to sell onion by choosing outlet than those with less years of experience. Also it is hypothesized to influence the likelihood of selling for local collectors and retailers negatively because of these outlet charges lower prices while it is expected to affect wholesalers and consumers positively because of these outlet charges better prices than others.

Education years attended (EDUHH): It is continuous and measured in years of formal schooling. Sultan (2016) has indicated that the household head level of education affects market supply of wheat positively. It is believed that if a farmer attained formal education of any level there is a possibility that the farmer would choose appropriate channels. This is supported by Girma and Abebaw (2012).So it is hypothesized to affect *teff* market supply positively. Chala and Chalchissa (2017) found that by making informed decisions educated farmers choose the best market outlets to sale their farm produce. This variable also hypothesized to influence the likelihood of choosing local collectors and retailers negatively while expected to influence wholesalers and consumers positively.

Land holding size (LSIZE): It is a continuous variable measured in hectares of land household owned. That means those who have large land size or many hectares of land can allocate large hectars of land to raise their *teff* production which in turn to marketable surplus. The study by Alemayehu (2012) also indicated that a unit increase in land allocated for

ginger, would give rise to 11.1qt increase in the amount of ginger supplied to market. Oliyad *et al.* (2017) found an increase in land allocated to groundnut increases farmers' likelihood of choosing wholesaler outlet than consumer's outlet. It is hypothesized to influence volume of *teff* market supply positively and hypothesized to influence like lihood of choosing local collectors, wholesalers, retailers and consumers positively because of farmers uses all outlet to earn average market price.

Having transport Facilities (TRANFAC): It is a dummy variable which takes value 1 if household owns transport facilities and 0 other wise. According to Jagwe (2007) the availability of transportation facilities helps to reduce long market distance constraint, offering greater depth in marketing choices. Ownership of means of transport has a positive impact on market participation by reducing the cost of transporting inputs from the market to the farm and output from the farm to the market (Efa *et al.,* 2016).This variable is hypothesized to influence the likelihood of choosing local collectors negatively while wholesalers, retailers and consumers positively.

Livestock holding (LIVHH): It is a continuous variable which is measured in Tropical livestock unit (TLU) which plays major role to increase *teff* production which is directly involved to raise the ability of farmer to supply *teff* for the market in large amount. Ownership of livestock has positive influence in increasing the volume of *teff sold* due to its significant role on *teff* production (Mebrahatom, 2014).So for this study it is hypothesized to influence volume of *teff* supplied to market positively.

Number of extension contact (EXTCON): It is continuous variable measured by number of days that household gets extension contact monthly. Extension services provide different support for all stakeholders' of *teff* production and marketing. Study by Tadese *et al*. (2016) indicated that access to extension services influenced *teff* market supply positively. If producers have frequent 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 best 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 and also Oliyad *et al.* (2017) found that farmers' use of extension service had significant negative effect on the likelihood of choosing consumer outlets. It is

hypothesized to influence the volume of *teff* supplied to the market positively. And also, extension contact is hypothesized to influence the likelihood of choosing wholesalers and consumers outlet positively while retailers and local collectors negatively because of retailer and local collectors' charges lower price than others.

Quantity of *teff* sold (VTS): It is a continuous variable measured in Kilograms. The more quantity of *teff* sold, the higher would be the chances of using different market alternatives. The study of Chalwe (2011) also indicated the positive relationship between quantities sold and channel choice. So this variable hypothesized to influence the likelihood of choosing local collector, wholesaler, retailer and consumer positively because of farmers sells large quantity of *teff* prefers to sell for all market outlets to earn an average market price.

Price of *teff* (PRT): It is a Continuous variable which is a price per kilogram given for the commodity at different market outlets and measured by ETB. Each market outlet average price will be asked. Berhanu *et al.* (2013) has found that price offered by milk market outlet per liter of milk significantly and negatively affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. And also study by Addisu (2018) indicated that current price of *teff* is negatively and significantly associated with the likelihood of choosing consumer and collector outlets. But in this study it is hypothesized to influence the likelihood of choosing wholesalers and consumers outlet positively while retailers and local collectors negatively.

Table 2: Description of explanatory variables used in two stage least square

Independent Variables	Definition	Type	Measurement	Expected Sign
NONFARIN	Non-farm income	Continuous	In birr	-
HHSIZE	Household size	Continuous	In adult equivalent	-
ACMKT-INF	Access to Market information	Dummy	1, if household is access to market information, 0 otherwise	+
USCRED	Using credit	Dummy	1,if household is credit user and 0 If not	+
QPRD	Quantity of *teff* produced	Continuous	In quintal	+
FAREX	Farm experience	Continuous	In years of start *teff* production	+
EDUHH	Educational level of household	Continuous	In years of schooling	+
LSIZE	Land Size	Continuous	In hectars	+
LIVH	Livestock holding	Continuous	Tropical livestock Unit	+
EXCONT	Frequency of extension Contact	Continuous	Number of contact per month	+
DISMKT	Distance to the market	Continuous	Measured in kilometers	-

Table 3: Description of explanatory variables used in Multivariate

Variables	Measurements	Expected effect on Market outlet choice			
		Assembler	Wholesaler	Retailer	Consumer
Non-farm income	In Birr	+	+	-	-
Household Size	In adult equivalent	-	+	+	+
Access to market information	1, if household is access to market information, 0 if not	-	+	-	+
Farm experience	In years of starting *teff* production	-	+	-	+
Credit using	1 if user, 0 if not user	-	+	-	+
Year of Education	In formal years of schooling	-	+	-	+
Land size	In hectars	+	+	+	+
Transport facility	1 if household owns it and 0 if not	-	+	+	+
Frequency of extension contact	In numbers that household is contacted extension agent	-	+	-	+
Price of *teff*	In Birr	-	+	-	+
Distance from the nearest market	In Kilometers	+	+	+	-
Quantity sold	In Kilogram	+	+	+	+

Source: Own design of survey (2018)

4. RESULTS AND DISCUSSION

This chapter presents the major findings of the study and discusses it in comparison to results of similar studies. It is divided in to four sections. The first section presents descriptive statistics results. Section two presents value chain analysis. Section three presents' econometric model results and finally constraints and opportunities in the *teff* value chain are presented.

4.1 Descriptive statistics

4.1.1 Demographic characteristics of farmers

Analyzes variables used to describe mean, maximum, minimum, frequency and percentages of sampled households in study area to discuss their demographic characteristics.

As shown in Table 4, out of total households head interviewed 72.1% were male headed households while 29.9% were female headed households. In study area those female headed household not equally participating in supplying *teff* for the market with male headed households due to there are different social factors limiting women's to participate in supplying *teff* for the market in large amount and lack of empowering women on cash crop. Age is one of the important characteristics of the community. It reflects on the productivity of the farmer as it has a bearing on the overall health situation within the community. It has a bearing on the employment pattern, spatial mobility and quality of work done. Age plays a crucial role in any kind of business activities particularly in agriculture, because the use of child labor on the farms is quite high. Accordingly, the minimum and maximum age of the sample farmers were 18 and 65 years respectively with mean age of 38.3 years (Table 4).

Education (EDUC)

Educational status of the household head can influence how household head accepts new idea of production and searches for efficient markets for their products. It can affect attitudes of farmers towards adoption of new technologies and ways of thinking toward the advantage of using new technology for their economic improvements. Education can also contribute to decision-making processes that alter the paths people take in life. Educational status of the

sample household heads in the study area ranges from illiteracy (0 grades) to grade 12 completed (Table 4).

Table 4: Demographic Characteristics of sample households

Demographic Variables	Minimum	Maximum	Mean	Std. Deviation
Age of household head in years	18.00	65.00	38.305	11.87
Education of household in years of schooling	.00	12.00	3.426	3.44
Household Size in adult equivalent	1.75	12.01	5.80	2.13
Farming experience in years of starting *teff* production	3.00	45.00	22.89	10.64

Sex of household	Frequency	Percent
Male	88	72.1
Female	34	27.9

Source: Own survey computation (2018)

Household size (HHSIZE)

The mean household size of the total sample respondents was 5.83 adult equivalent ranging from 1.75 to 12.01 and this might limit them for a better participation of households in supplying large volume of *teff* to the market because of in the study area those respondents having large number of family uses more of their *teff* products for family consumption and searches to earn non-farm income for covering their expenses (Table 4).

Experience in *teff* production (FAREX)

The sampled respondents have an average of 23 years of farming experience in *teff* production with a standard deviation of 10.64 (Table 4). In study area those farmers having more experience are more knowledgeable on efficient market outlet selection and producing large quintals of *teff* per acre of land which helps them to increase volume of *teff* supplied for market than those less experienced farmers.

Land size owned and allocated for *teff* production (LSIZE)

Land is the most essential fixed factor of production and measure of wealth in the study area. It is the main source of income and increases the status of people in the society. Total and mean size of land owned by respondents were 267.3 and 2.19 hectars

respectively, as well as total land allocated for *teff* production during 2017 was 94.65(34.4% of total holdings) hectars. From the mean land size owned by individual respondent 0.76(34.7%) hectars of land is used for *teff* production by each respondent during the year (Table 5). The mean productivity of *teff* during the year was 9.49 quintals which is highly below district, zone, region and national standard.

Table 5: Land holdings and area of land allocated for *teff* production during 2017

Land and productivity of *teff*	Sum	Mean	Std. Dev.	Min.	Max.
Land size in hectares	267.31	2.19	2.36	0.00	18
Land allocated for *teff* production in hectares	94.65	0.76	0.67	0.13	4
Productivity of *teff (*Quintals/hectare)		9.49	3.71		

Source: Own survey computation (2018)

Besides of *teff* production farmers in study area were uses part of their land(65.3%) for production of other major crops such as maize, sorghum, wheat, Daguja, bean, pea ,fruits, vegetables, tuber and root crops, nouge, spice crops are produced simultaneously and as grass land.

4.1.3 Institutional services

Credit Services (USCRED)

The availability of adequate financial sources for credit is crucial for farmers. Farmer's uses money they gets from credit to buy inputs such as improved seed, fertilizers, weed killers and livestock which directly contributes in increasing of *teff* products per hectars and enables farmers to raise quantity of *teff* supplied to the market. The most important services that are expected to promote production and marketing of *teff* in study area includes provision of credit services, extension service, and market information. In study area the major source of credit service is Oromia Credit and Saving Institution and others sources such as cooperatives, local money lenders and microfinance are less contributors of credit provision for farmers in study area. Among sampled household heads 41.8% of respondents are non-users and 58.2% are users of credit service from the available sources (Table 6). However, the credit provision is based on group collateral but farmers are not much interested in this way in order not to pay for defaulters in their group.

Provision of market information (ACMKTIN)

Marketing information are essential factors in promoting competitive markets and improving agricultural sector development. A well-organized market intelligence information system helps all the producers and traders freely interact with one another in arriving at prices. Existence of reliable market information help farmers sell their surpluses of *teff* and choose modes of transaction, each of which yields a different benefit. It has been postulated that farmers can choose a profitable mode of transaction if they can receive reliable market information on the prevailing market conditions. Among sampled households 24.6% of household heads are not access to market information while 75.4% has access to market information from neighbors, radios, and traders on prices, quality, and market demands for *teff* products(Table:6). Most of farmers were raised problem of lack of market information regarding price of *teff,* which means there is information asymmetry problem between traders and farmers. Always traders are price informed and farmers are not informed, this means according to response of focus group discussion *teff* is not market driven which leads price fluctuations and provides unfair price for farmers.

Number of extension contact (NEXCON)

Currently in Ethiopia the government has been attempted to fill the required knowledge and achieve food self-sufficiency in the country by placing in each Kebele administration three development agents and built a farmer training center to increase the volume of *teff* production and market surplus. Development agents are assigned as better source of extension services for farmers at kebele level that strengthens intensive method of extension work. The focus group discussions pointed out that some development agent misses to deliver technical advice to farmers at wanted time. From the sampled households the minimum and maximum number of farmers contact with extension agents is 1 and 12 times respectively with a mean contact of 3 times monthly (Table 6).

Ownership of transport facility (TRANFAC)

To create place utilities of product, availability of well-functioning transporting facility plays major role. In study area those farmers having transport facility are selling their *teff* product at market which they earns better price without paying any transport cost. According to the survey result, about 51.6% of households have their own transport facility and about 48.4%

have no transport facility (Table 6). According to the survey result because of productivity of *teff* is lower than other crop in study area all farmers are using animal and cart as transport facility rather than using vehicles. Moreover, the results revealed that the main means of transport were transport animals and cart.

Non-Farm income (NONFIN)

Non-farm income generating activities of farmers in the study area were daily labor, petty trade, brokers, were found to be some of the off/non-farm income generating activities in which sampled farmers were participating. Sampled households earns about means of non-farm income of 3206.23 birr by participating on off/non-farm income activities with standard deviation of 4517.49 (Table 6). Those farmers earns non-farm income by participating in non-farm activities supplies less amount of *teff* products i.e. they prefers to store, expects its future price increases, and uses more of it for family consumption and prefers for efficient markets.

Livestock holdings (TLU)

Livestock is the main source of household farm income in study area, that means those household owned large number of animals were earned income by selling livestock and their products which directly contributes for purchasing agricultural input and family expenses and leads farmers to produce *teff* in large amount and supply for the market in large quantity. Having large number of livestock in study area is seen as a dignity or store of value and easy for those households to prepare their own organic fertilizer from dung's of livestock which contributes to increase *teff* productivity and increases the amount of *teff* supplied to the market. From sampled households the maximum and mean of livestock owned were 21.64 and 4.91 TLU respectively and refer (Table 6).

Distance from nearest market center (DISMKT)

The study result indicated that sample producers in the study area travels average kilo meters of with ranging from 1 to 16.5 to the market center (district market) with mean distance from district market of 8.56 Kilometers shown in (Table 6). Distance from producer's house to district market was also the factor which determines producer's *teff* supply to the market and outlet choice. The study result showed that the more the farmer is nearest to the district

market the more farmer is able to select better channel outlet, they gets price and quality information and earns better price. District market is taken as market center because of almost all of sampled farmers sold their *teff* product at district market due to price difference with other market center existing in the district.

Quantity of *Teff* produced (QPRD)

The survey result shows that quantity of *teff* produced affects quantity of *teff* supplied to the market. From sampled households those who produces many quintals of *teff* searches for better market outlet and gathers information on price charged for their products and quality expected by traders. In the study area quantity of *teff* produced during 2017 by sample household were 578.65 with average of 4.74 quintals and ranges from 0.25 to 32 quintals. And also the study shows that the productivity of *teff* per hectar of land in the study area was 9.49 quintals which is below national, regional, zone and district standard because of farmers are still using local seed repetitively and need huge modification to equalize with the set standard. From total quantity produced 345.45(59.9%) quintals of *teff* was sold with mean 285.82kilogram (Table 6).

Quantity of *teff* supplied (VTS)

Quantity of *teff* sold determines the farmer to which market outlet he/she must sell *teff* products. The study result indicates that those farmers who produce large quantity of *teff* sold their *teff* product in large quantity (the more producer is the more supplier of *teff* to the market) and has a possibility of selling *teff* at more than one market outlet. In the case of this survey those farmers who produces *teff* in large amount prefers to sell for wholesalers than consumers, retailers and for local collectors and has the possibility to sell for all market outlets (four outlets) within the district. The quantity of *teff* sold by sampled households to different actors (LC, WS, RT, and CS) were 34,545 kilograms and mean quantity sold for local collectors, wholesalers, retailers and consumers were 30.61, 159.55, 14.51 and 81.15 kilograms, respectively (Table 6).

Price of *teff* (PRT)

Price *teff* is a money value of *teff* products that the sample household earns from the sale of their *teff* at different market outlets. So the study result shows that the price of *teff*in study area was very low when it is compared with price of *teff* with other districts because of its low quality and not supplied to central markets. Also the average price of *teff* farmers earned was 14.86 birr per kilogram at the district market and farmer selects the outlet sets fair price to earn better income from sale of their produce (Table 6).

Table 6: Institutional and socio-economic factors

Variables	Mean	Std. Dev.	Min.	Max.
Quantity of *teff* produced in quintal	4.74	4.17	0.25	32
Quantity of *teff* sold in kilogram(Total)	285.82	312.5	0	2500
Quantity of *teff* sold for local collectors in kilogram	30.61	52.92	0	300
Quantity of *teff* sold for wholesalers in kilogram	159.55	282.77	0	2500
Quantity of *teff* sold for retailer in kilogram	14.51	37.97	0	200
Quantity of *teff* sold for consumers in kilogram	81.15	68.44	0	400
Price of *teff* per kilogram	14.86	13.5	15	17
Total livestock holdings	4.91	4.58	0	21.64
Number of extension contact monthly	3.14	2.5	1	12
Non- farm income	3206.23	4519.49	0	21000
Distance from the nearest market	8.56	3.31	1	16.5
Variables	Frequency	Percent		
Not credit users	51	41.8		
Credit users	71	58.2		
Not access to market information	30	24.6		
Access to market information	92	75.4		
Haven't transport facility	59	48.4		
Have transport facility	63	51.6		

Source: Own survey computation (2018)

4.1.4 Input utilization

Inputs used by farmers of the study area are fertilizer both DAP and UREA, herbicides for t*eff* production. These inputs are supplied to farmers either by cooperative/unions and private traders. Cooperatives are major suppliers of fertilizer for producers in the study area. Government (National Input Supply Enterprise) supplies to the unions such as DAP and Urea fertilizers and then the unions can either sell to primary cooperatives and cooperatives distribute for farmers and other private input suppliers. Moreover, proper application of the recommended fertilizer rate is important to obtain the required production and marketable

supply. However, farmers in the study area apply varying fertilizer rate, which is below the recommendation rate given by Agricultural experts to recover their entire farm lands with little quantity of fertilizer due to their financial constraints and this leads them to obtain small amount of *teff* product per hectar/ acre of land.

The amount of fertilizer applied per hectar by farmers in study area was below recommended amount. So 94.96 quintals of DAP fertilizer and 82.77 quintals of UREA fertilizer were used for *teff* production with mean of 0.78 and 0.68 quintals used by each respondent farmers during 2017 production years, respectively(Table 7).

Table 7: Input used for *teff* production and amount applied during 2017 year of production

Input used and its amount	Sum	Mean	Std.dev	Minimum	Maximum
Quantity of DAP used for *teff* production in quintals	94.96	0.78	0.64	0.13	4
Quantity of UREA used for *teff* production in quintals	82.77	0.69	2.26	0	3
Amount (liters) of herbicides used for *teff* during 2017	93.15	0.76	0.89	0.13	8

Source: Own survey computation (2018)

Amount of herbicide used by farmers during the year for *teff* weeding were 93.15 liters with average 0.76 liters were used by each sample household as shown in (Table 7). The other point is a farmer purchases those inputs from both cooperatives and private traders. But rather than buying from private traders farmers prefers to buy input from cooperatives due to price difference and those farmers producing small amount of *teff* uses little amount of inputs prefers to purchase agricultural inputs from traders because of cooperatives sells in large amount at the price above the level of farmers and purchasing less than half quintal is impossible.

Table 8: Suppliers of input for farmers

Suppliers of input	Frequency	Percent
Cooperatives	90	73.8
Private	32	26.2
Total	122	100.0

Source: Own Survey computation (2018)

From sampled *teff* producer households 73.8% of them purchases agricultural inputs from Primary cooperatives /unions while 26.2% purchases from private traders as shown in (Table 8). In this case primary cooperatives/union was the major supplier of input for *teff* production because of their price is fairer than private traders and less participant in *teff* output market.

4.1.5 Description of market outlets

This part explains the frequency and percentage of farmer's market outlet choice in the study area. It is obvious that any producers selects the outlet which maximizes their profit since firm is a profit maximizer and cost minimizer. So study result indicated that 45 producers (45.08%) were selected local collector outlet and 77 producers (54.92%) were not selected local market outlet due to different factors. This outlet was selected by producers because of it exists near to farmers village and also not selected because of its price is lower than other actors. Most of the time this outlet likely selected by farmers who are far from nearest market center (district market), household with minimum family members, earns non-farm income and not owned transport facility. And also this outlet were not selected by farmers near to market center, produces in large amount, owns transport facility, has no non-farm income, with large family members, has business ideology, needs to store it for future sale and capital efficient (Table 9).

According to survey result, 87 (69.9 %) of farmers were selected wholesale market outlet and 35 (30.1%) were not selected this outlet. This outlet was selected by farmers because of the average price charged by this outlet was higher than local collector outlet. This outlet is selected by farmers who owns their own transport facility, produces *teff* in large quantity in relation to others, near to market center, with large number of family members, large land size, and sells *teff* in large quantity. And also farmers not selected this outlet were those with low production, not near to market centre, not owned transport facility and refer (Table 9).

Table 9: Description of *teff* market outlets

Response of household	Local collectors		Wholesalers		Retailers		Consumers	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Yes	45	45.08	87	69.9	24	20.5	93	74.6
No	67	54.92	35	30.1	98	79.5	29	25.4
Total supplied to each outlet		3,735		19,465		1,770		9,900

Source: Own survey computation (2018)

The other is 98 (79.5 %) of farmers were not selected retailer market outlet because of this outlet charges low average price next to local collector and less than wholesaler and consumer outlet. This outlet is selected by farmers with no market information and study result indicated that 24 (20.5%) of farmers were selected this outlet and refer (Table 9).The other outlet chosen by farmers were consumer outlet and this outlet is mostly preferred outlet by 93 (74.6%) of farmers because of it provides higher price than all possible outlets and price setting nature is somewhat through negotiation of both farmers and consumers. This outlet was selected by farmers with market information and low producers of *teff*. And also 29(25.4%) of farmers were not selected this outlet because of it is much far from farmers and end outlet and refer (Table 9).

4.1.6 Demographic and socio economic characteristics of traders

Demographic characteristics of traders in terms of age, household size, experience, sex and education were summarized in (Table 10). The average family size of the traders is 5.27 persons and ranges from 2 to 11. The average age of traders was 39 years and ranges from 19 to 60 years. The traders have an average of 16.42 years of experience in *teff* trading (ranging from 1 to 36 years trade experience). The survey further indicates that 58.2% of the sample traders were males while 41.8% of them were females. This implies that both females and male's participation in *teff* trading was high. The age composition of traders was between the age group 18 to 65 which is the productive age group. With regard to the level of education of traders, the survey results showed that about 27.3% of the respondents are illiterate (0 grade) while 72.7% were literate (Table 10).

Table 10: Demographic characteristics of sampled traders

Variables	Minimum	Maximum	Mean	Std. Deviation
Age of traders in years	19	60	38.55	11.19
Household size	2	11	5.27	2.06
Education status of traders	0	12	4.13	4.01
Experience in *teff* trading	1	36	16.42	10.5
Sex of traders	Frequency		Percent	
Female	23		41.8	
Male	32		58.2	
Total	55		100.0	

Source: Own survey computation (2018)

Socio-economic characteristics of traders include financial assets such as initial capital, working capital, source of capital and source of loan. As depicted in Table 11, the average initial capital of sampled *teff* traders were birr 91,400.09 with ranges from 125 to 550,000 birr. With, regard to current working capital, the survey result shows in 2017 average working capital of sampled *teff* traders was birr 166162.36 birr ranges from 320 to 2500,000 birr (Table 11).

Table 11: Financial Capital of sampled traders

Variable	Minimum	Maximum	Mean	Std. Deviation
Working capital in 2017	320	2500,000	166162.36	374713.76
Initial capital	125	550000	91400.09	140077.74

Source: Own survey computation (2018)

Source of working capital for sampled traders were from loan and own. The study result indicated that about 29.1% of sampled traders were using their own capital while about 41.8% through loan and 29.1% were from both (Table 12).

Table 12: Source of working capital for sampled traders

Source	Frequency	Percent
Loan	23	41.8
Own	16	29.1
Both	16	29.1
Total	55	100.0

Source: Own survey computation (2018)

Table 13 below summarizes that source of loan for sampled households in study area and indicated that 29.1% of traders were not loan user, 29.1% were took loan from Oromia credit and saving institution, 25.5% from banks, 7.3% from private lenders and 9.1% took from relatives/ family.

Table 13: Source of loan for sampled traders

Source	Frequency	Percent
Not user of loan	16	29.1
Oromia credit and saving institution	16	29.1
Bank	14	25.5
Private	4	7.3
Relatives	5	9.1
Total	55	100.0

Source: Own survey computation (2018)

4.1.7 Demographic and socio economic characteristics of consumers

The survey results as it is indicated in (Table 14), 7 (46.7%) sampled consumers were females and the remaining 8(53.3%) were males. The respondent's age ranges from 28 to 47 years with an average of 37.33 year. The average family size of the consumers is 5.13 persons and ranges from 3 to 8. The educational level of consumers result shows that 26.7% were illiterate, 73.3% were literate. Socio economic characteristics of consumer as indicated in (Table 14), shows that an average monthly income of consumer was 5870 ranging from 800 to 25000 birr.

Table 14: Demographic Characteristics of consumers

Variables	Minimum	Maximum	Mean	Std. Deviation
Education status	0	12	4.1	4.23
Household size	3	8	5.13	1.81
Age of consumer in years	28	47	37.33	5.49
Sex	Frequency		Percent	
Female	7		46.7	
Male	8		53.3	
Total	15		100.0	

Source: Own survey computation (2018)

Also an average monthly income spent on *teff* consumption by consumers was 585.33 ranging from 200 to 1200. So the study result indicated that the proportion of consumer income spent on *teff* consumption by consumer was 9.97% of their monthly income.

Table 15: Socio economic characteristics of consumers

Income		Minimum	Maximum	Mean	Std. Deviation
Monthly income of consumers		800	25000	5870	7441.43
Income spent on *teff* consumption		200	1200	585.33	301.75
Source of income	Response		Frequency	Percent	
	Government work		4	26.7	
	Private employment		2	13.3	
	Trade		5	33.3	
	Agriculture		1	6.7	
	Daily work		3	20.0	
	Total		15	100.0	

Source: own survey computation (2018)

The source of income for consumer in study area was from Government work, private employment, trade, agriculture and daily work by 26.7%, 13.3%, 33.3%, 6.7% and 20% respectively (Table 15).

4.2 Value Chain Analysis

Cereal production and marketing are the means of livelihood for millions of households in Ethiopia. It is the largest sub-sector within Ethiopia's agriculture, far exceeding all other crops in terms of its share in rural employment, agricultural land use, calorie intake, and contribution to national income. In the same manner, Jimma Arjo District is known for her cereal crop production and the sector contributes more in terms of food self-sufficiency and income generation. *Teff* is one of cereal crops that contribute more for the livelihood of community in the study area.

4.2.1 *Teff* Value Chain actors and their functions

The actors involved in the *teff* value chain of the study area are the following:

Input suppliers: The existence of quality input supply at the right time and place plays a major role for farmers to improve production and productivity. At this stage of value chain, there are many actors who are involved directly or indirectly in agricultural input supply in the study area. Currently primary cooperatives/ union and private input suppliers are the main source of input supply (Table 8). The above mentioned actors are responsible for providing seed of improved varieties, fertilizer, and farm implements for the farmers in the study area. Mostly herbicides are supplied by private traders and cooperatives to farmers. Those primary cooperatives bought from importers in Addis Ababa and resell for farmers in the district. The purchased chemicals are then transported by hired vehicles; public transport while other outlets do not use vehicles. The major buyers of herbicides were individual farmers, primary cooperatives. Suppliers set price plus commission to determine the selling price in the market but prices are largely guided by traders not by market forces or interaction between supply and demands.

Farmers/producers: These are smallholder *teff* producer households in the district and there were no commercial *teff* farming or state farm works on *teff* production due to *teff* production

is costly, small output per hectare when we compare its productivity with other cereal crops, force effective, because of it has less quality in comparison to other area, less priced because of its not pure white and only depends on natural rain fall that means no irrigation applied for its production as other crops. So smallholder farmers are major actor involved in production and marketing of surpluses they produce. Mainly they start from input preparation, produce, and store and provide surplus to market. *Teff* producers in the district supply their product only for within district market. The study result indicated that all farmers sold within district for different actors (Local collectors, wholesalers, retailers and consumers) because of they are smallholder and average of productivity is small and below national standard of *teff* productivity.

Local collectors: Assemblers play an important role in collecting produce from smallholder farmers at the village market and delivering to consumers at district market. They are the first actor that links farmers to other actors involved in *teff* market. Local collector's purchases *teff* from farmers at village market such as Gaba Sanbata, Jimate and Gombo and resell to district market for consumers by earning profits through adding value by transporting, storing, and cleaning *teff*. A local collector prefers to sell for consumers than other actors because of consumers buys from them at high price than traders. This actor owns lower capital than other traders because they use profit earned from reselling *teff* products for family expenses. When local collectors resell for consumers, price set by market interaction while when reselling for wholesalers there was problem of scale cheating as well as retailers provides less prices than consumers. Local collectors resell it only within district market.

Wholesalers: These were those participants of the marketing system who used to buy *teff* at district market with a larger volume than other actors. Wholesalers buy *teff* mainly from individual farmers, some collectors/small traders and a few other wholesalers within a district. They purchase this product only from actors within the district and resell within and outside the district market. Within a district they resell to consumers such as government workers, retailers, wholesalers, hotels and injera sellers. They adds value by cleaning, loading/unloading, transporting by vehicles, reselling to outside zone markets such as for Jimma, Agaro, Mettu, Mizan and Tepi town retailers and wholesalers by including commission, transport costs and their profit. These actors plays major role to move the

product from one district or zone to others by using vehicles as a means of transport and they are more capital efficient and access to credit service than other actors. Each of Wholesaler in the district were playing crucial role in creating job opportunity at least for 5 peoples under a single wholesaler and generating income for government through paying tax which directly contributes for society welfare and they supply from surplus area to shortage areas.

Retailers: These are market actors operating at the last stage of the marketing channels selling to consumers. They buy from wholesalers and farmers in their surroundings and directly resell *teff* 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 larger trade. They always prefer to buy from farmers than other actors and not resell for other actors except for consumers.

Consumers: Are individual groups involved in buying *teff* products from farmers and traders for consumption not for reselling. Consumers most of the time prefers to buy from farmers than traders due to price difference and quality. They pays part of their income for buying *teff* and those consumers in the district are traders themselves, government workers and prison houses in the district and consumers outside the district. Consumer outlet was preferred by farmers and all traders because of consumer price were higher than others price and make fair decision on price setting than any actors. The above actors are actors directly involving in owning the resource and earning profit/income from this marketing exchange by adding value at each possible channels by producing, transporting, loading /unloading, cleaning, packaging, reselling, generating income, earning profit buying and consuming the *teff* products.

***Teff* value chain supporters and their functions in the district**

Primary Cooperatives: Cooperatives in the study area play crucial role in supplying inputs to the farmers. However, they are not efficient enough in terms of timely provisions of agricultural input, buying of harvested products and financial management. In the study area cooperatives are not efficiently participating on *teff* marketing. It is both direct and indirect actors in *teff* value chain.

Bureau of District Agriculture and Natural resources: This actor plays an important role in *teff* production and increasing marketed surplus of *teff* to feed rapidly increasing population. This sector contributes for *teff* production by structuring, providing and coordinating extension or development agents for each kebele households under their supervision. This organization provides training, adoption of new technologies of production, input in collaboration with cooperatives/unions such as fertilizer, herbicides, and improved seeds and how to apply on field to increase productivity of this essential crop to raise farm income.

Oromia Credit and Saving Institution (OCSI): It is a part of microfinance institution which provides credit services for smallholder *teff* producers in the study area. It is a major source of financial service for farmers and urban peoples including assemblers and retailers, but not for wholesalers because of they are efficient to get credit from banks and it stands to finance smallholders and financially inefficient actors. And also this institution helps its users by holding saving money which is given to them when they leave out their service. All farmers are not benefited from this institution because of farmers has less awareness about how to use money obtained from this institution for production rather than for family consumption.

Banks: It is the most financial source for Wholesalers and primary cooperatives by providing credit services in a long term or short term. Most of wholesalers in the district are getting credit service from this institution and from each other. It is the only source of credit for larger traders in the district because of the prefers huge capital for trading activities than retailers, local collectors. Also it is source of credit for cooperatives (input suppliers). But this sector is not providing credit service for smallholder farmers especially for *teff* production and marketing related issues because they lack collateral assets and the sector was not working in rural areas to finance this important crop for both national economy and consumption.

Bureau of District Trade and Industry: It plays a major role in coordinating all private and cooperative/union traders by providing licenses, training, collecting legal payments from traders to increase government revenue for public welfare. This organization coordinates and manages each and every each of *teff* traders in the district and works to create competent firms who create job opportunity for next generation in a sustainable manner.

4.2.2 Value chain map of *teff*

Functional and institutional analysis approach of a value chain mapping was used to identify the different actors involved in the *teff* value chain, and to understand their roles and linkages. For this study identified actors, their functions, supporters, financial flow between actors, information, input service flow and product flow was included .The current value chain map of *teff* in Jimma Arjo district is depicted according to 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 as a credit for each other and while product flows to one way from one actor to others.

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 flows from suppliers to farmer for production rather than more exchange activities and also service flows on one direction especially from district bureau of agriculture and natural resources and primary. And also product flows on one direction on each channel from producer up to consumers. The below map of *teff* value chain in study area also shows respective functions of actors along the value chain. That means input suppliers supplies input, farmers produces and sells for market, traders purchases *teff* from producers and resells or distributes for next actors while consumers purchases and consume it at the given price with his/her income.

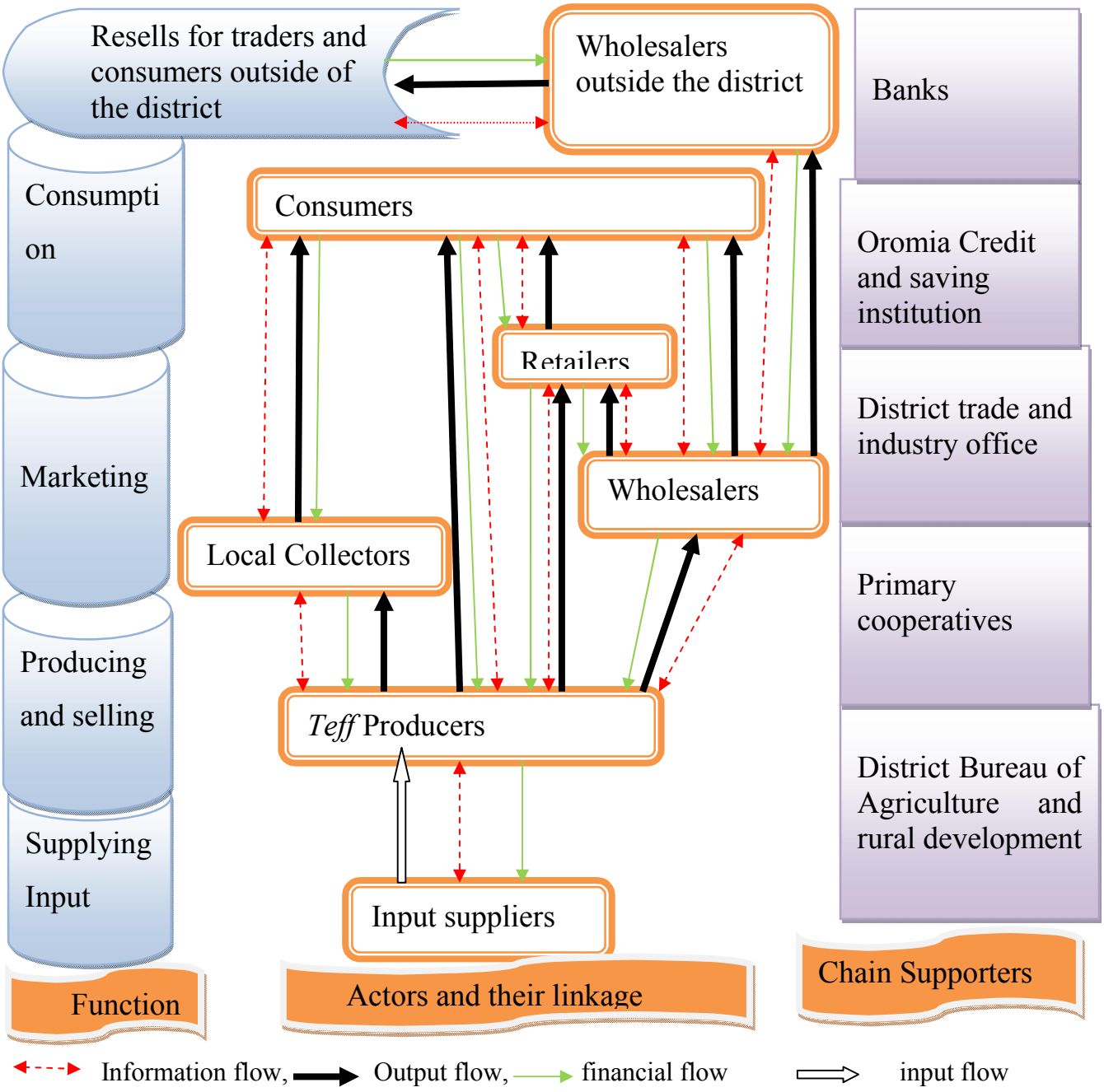


Figure 4: *Teff* value chain map of the study area
Source: Own Survey Design (2018)

4.2.3 Governance of *teff* value chain

According to GTZ (2007) report indicates that forms of a chain governance range from spot market to vertical integration of the entire value chain. Analyzing the existing business linkages includes judging the intensity and sustainability of cooperation, the existence of lead

firms and their attitude and commitment. A related point is the analysis of conflicts arising from differences in negotiation power, asymmetric information and competition for resources between value chain actors. Business linkage studies also include the degree of sector organization, especially the capacity of commercial business associations.

Table 16: Firm's price determination

Variables	Responses	Frequency	Percent
Level of quality of market information	Adequate information(Yes)	0.00	0.00
	Medium information (Yes)	57	46.0
	Low information (Yes)	39	31.5
	No information(Yes)	12	9.7
Decision of farmers when *teff* price falls at the market	Take back to home	26	21.0
	Sold at low price	53	42.7
	Sold at another market	16	12.9
	Put at relatives house	27	21.8
Farmers level of buyer trust	Very trusted	17	13.7
	Moderately trusted	41	33.1
	Little trusted	64	53.2
Do you have linkage with buyers	No	85	68.5
	Yes	37	29.8
Difficulty of getting buyers	No	93	75.0
	Yes	29	23.4
Setting price	Buyers	85	68.5
	Farmers	5	4.0
	Negotiations	32	25.8

Source: Own survey design (2018)

Chains are characterized by a dominant party, known as the lead firm, which coordinates the interaction between the links in the chain and becomes responsible for upgrading activities in the individual links. The role of 'governance' can undertake either by buyer-driven chains or by producer-driven chains (Gereffi, 1995). In the district about 68.5% of the producers accepted the price and product specification determined by the buyer, even though the price was lower than the average market price. In the case of the district about 25.8% of producers had to accept the price determined in negotiations with traders and the rest has sold at price set by them (farmers) and refer (Table 16). Those who sold their *teff* produce at price they set are those always sold for consumers and not for any of traders. It appears that the producers in the study areas have almost no bargaining power. This is due to existence of asymmetric information between all actors and *teff* production in study area is not demand or buyer-driven production system, it is totally producer driven production system which leads *teff* product in

study area becomes cheap and has low price as well as low quality, highly scattered production structure, lack of producers' organizations, smallholders' farmers are highly dependent on intermediaries to take their produce to the markets and forced to accept the price set by buyers. There is buying and selling (transaction) but little exchange of information and learning from one another (interaction) in *teff* value chain in the districts. This type of value chain governance is market-based relationships, because the conditions of exchanging goods and services are based on the market price. This means that buyers (traders) govern *teff* value chain while farmers are leaded by them in study area also raised by focus group discussion.

The survey result indicates that at the market center when price of *teff* falls due to presence of asymmetric information between farmer (sellers) and buyers (traders) which leads farmers earn low price for their *teff* products. During that in study area 21%, 42.7%, 12.9%, and 21.8% of farmer as shown in (Table 16) has faced problem of taking back to home, sold at low price, sold at another market and put at relative's house respectively.

Improving flow of information between farmers and potential buyers is crucial in reducing transaction costs within the value chain because it lowers the cost of searching for information. Monitoring costs is reduced if information regarding buyers, sellers, and other market conditions such as price transmission and product quality is effectively relayed between various chain participants. Information asymmetry affects the coordination of the value chain actors (Efa, 2016).Based on the quality of information transmitted from buyers/other sources about the price of *teff* to supplier there was a problem in which there is no farmers obtained adequate information on the price of *teff* in the districts and only 46%, 31.5% and 9.7% of farmers got medium, low level of information and no any information respectively concerning to price of *teff* and this shows there is problem of asymmetric information as indicated in (Table 16).

The survey result also indicated that the farmers took the *teff* product to market based on information obtained from different sources such as neighbor, traders, radio, and other means. About 23.4% of sampled respondents faced difficulty of getting *teff* product buyers and forced to sell their product to low price otherwise put relative house and transfer the product to other market in which the farmers incur additional transportation cost (Table 16).When the

transaction takes place between actors at different stages of the value chain it is called vertical linkages. The farmers' linkages with buyers of his *teff* product are vertical linkages. However, the survey result showed that only 29.8% of the farmers had linkages with their *teff* product buyers from the district. Horizontal business linkages refer to the transactions between actors of value chain (enterprise) operating in the same functional segment of the value chain. In study area because of all farmers are smallholders they are not linked that much horizontally, and their integration is not powerful. This implies that there are weak linkages among the *teff* producers in the study areas.

To say one commodities market is competitive there should be a better flow of information between actors involved in that market and good trust. Information was found to flow from buyers, through their agents and/or brokers, to the farmers. Out of the total sample from the district 13.7%, 33.1% and 53.2% of the farmer level of their buyers trust were highly trusted, moderate and little trusted respectively because of most of the time traders cheats weight scaling and hides the exact price of *teff* per kilogram as shown in (Table 16).This indicates that on average majority of the farmer didn't have the trust on their buyers and prefers to set price through negotiation and check the exact weight of their crop.

The *teff* value chains in the study areas are characterized by a highly disintegrated. Generally there were weak integration between *teff* traders and producers in study area because of farmers were less trusted with price set by traders for *teff* produce. There were also information gap about the end price of *teff* between producer and farmers which causes negative vertical integration between all actors of *teff* value chain which leads farmers to earn less profit share in relation to other actors. According to focus group and key informant respondents, traders earned more benefit from *teff* than producer due to farmer pays cost of production which are counted in monetary terms and uncounted while traders occurs only transportation costs, brokers, storage, taxation, loading/unloading which covered in short period of time.

4.2.4 Value Chain Upgrading

In the district some of the sampled producers engaged in product upgrading activities. The below table summarizes some of the changes or improvements made to the product. These

changes use of fertilizer to increase production, diversification, and types of seed used herbicides and differentiation. All producers were used local seed for production of *teff* that means no farmer used improved *teff* seed because of no supply. The use of improved seed and fertilizer by smallholder producers may be considered as product and process upgrading which introduces new products and increasing efficiency of internal process for production.

In the study area all sampled respondents used fertilizer and herbicides to increase productivity of *teff* because their land is much degraded and highly infertile; it is case for weed planting (Table 17). When we compare current productivity of *teff* with previous productivity it is significantly decreasing and which needs immediate solution or policy intervention. Because of price of *teff* depends on colors they produces red, mixed and white *teff* simultaneously. In the district 94.26% of *teff* producer farmers were diversified *teff* production while 5.74% is not, by color (59.2%), by purifying sand materials (21.5%) while by types of seed (13.1%). Most of farmers used white *teff* for marketing because of its price is higher than mixed and red color *teff* while farmers used red and mixed color *teff* for both family consumption and marketing. In the district *teff* product has less quality which has no market demand at Finfinne (Capital City of Oromiya, Ethiopia) but supplied to Mettu, Jimma, Agaro, Tepi, Beddele, and Mizan wholesaler and retailer markets by district traders. Upgrading entails not only improvements in products, but also investments in people, knowledge, processes, equipment and favorable work conditions.

Farmers in the district still now upgrading *teff* production was less efficient because of shortage of input supply, inadequate extension service which is leading the producer is not competent and producing less than national standard of *teff* productivity and below the district office of agriculture plan. In the district because of lower level of upgrading activities are functioning *teff* produce in the district were less priced and has low demand in comparison to others. Concerning to quality many stakeholders of *teff* production in the district were raised problem low quality of *teff* which leads low level of trust between *teff* value chain actors. Generally in the district no upgrading is done on marketing, functions, interaction between actors, improving win-win strategies, and improvement of poor participation and the way *teff* market is functioning is not competent.

Table 17: Upgrading activity performed by producers of *teff*

Variables	Responses	Frequency	Percent
Types of seed used	Local seed	122	100
Apply fertilizer	Yes	122	100
Using weed killer	Yes	122	100
Differentiate production	Yes	115	94.26
	No	7	5.74
Ways of differentiate	By color	77	59.2
	By Purity of product from sand materials	28	21.5
	Types of seed (Improved, Local)	17	13.1

Source: Own survey computation (2018)

4.3 Econometric results

4.3.1 Factors affecting volumes of *teff* supplied to the market

Factors that affects supply of *teff* to the market was estimated by using 2SLS model since all respondents used for this study supplied their *teff* to the market. Eleven explanatory variables (nine independent variables and two instrumental variables those which are not correlated with both endogenous and exogenous variables) were analyzed to know their effects on quantity of *teff* supplied to the market in study area. Those hypothesized variables were: Access to market information, Frequency of extension contact, Use credit, land holding size, livestock holdings in Tropical Livestock Unit (TLU), farming experience in years of *teff* production, quantity of *teff* produced in quintals, educational level of household head in years of formal schooling, household size in adult equivalent, distance from the nearest market centre in kilometer and quantity of *teff* produced in quintals.

Breusch Pagan test showed that there was problem of hetrocedasticity because of (chi2 (1) = 17.85, Prob>chi2 = 0.000). Robust regression option was used in STATA13 software to correct hetrocedasticity problem. Multicollinearity problem was also tested using VIF (Variance Inflation Factors) and the result showed that there was no serious multicollinearity problem since VIF value 1.66 is less than 10(Appendix). Coefficient of multiple determinations (R^2) was used to check goodness of fit for the regression model. Hence, R^2 indicates that 85.66 % of the variation in the quantity of *teff* supplied to the market was explained by the variables included in the model as shown in (Table 18). Test of endogeneity indicated that the quantity of *teff* produced was endogenous to the model.

To overcome the problem of endogeneity we have to apply two stages least squares (2SLS) estimations method because instrumental variables are used to cut correlations between the error term and independent variables. The method involves two successive applications. The first stage is made by regressing the suspected endogenous variables over the pre-determined or pure exogenous variables to get their predicted values. Then the predicted values of the endogenous variables in the first stage are used to estimate the supply equation. Here non-farm income and education year of household head were used as instrument to quantity of *teff* produced. The instrumental variable should fulfill two requirements to be used as instrument. One of the requirements were instruments must be uncorrelated with error term and second requires the linear projection of endogenous variable onto all the exogenous variables. So for this study both instrumental variables were checked and not correlated with both endogenous and exogenous variables. Secondly there were linear projection between endogenous variable (Quantity of *teff* produced) and exogenous variables was checked for this study.

Post estimation after indicated that Wu-Hausman Robust regression (F1, 11) = 3.146(P=0.07892) and Robust Score chi2 (1) = 3.301 (P=0.0692), First Stage Summary statistics checked shows that F (2,111)= 14.04 and P=0.000, significant at 1% significance level which shows there was no endogeneity problem of the model. The other issue tested under post estimation endogeneity was test of over identifying restriction and the result showed that the schore chi2 (1) = 0.296 ($p = 0.5681$) is insignificant and fits the model accordingly and showed no endogeneity problem (Table 18). From eleven explanatory variables including two instrumental variables four variables such as quantity of *teff* produced, land holding size, using credit and distance from the nearest market were affected volume of *teff* supplied to the market significantly.

Quantity of *teff* produced (QPRD): It is the total amount of *teff* produced in quintals in 2017 production year in the study area. Also the study result indicated that quantity of *teff* produced affected quantity supplied to the market positively at 1% significance level. Positive sign of the coefficient indicates that as quantity produced increases by 1 quintal the quantity of *teff* supplied to the market increases by 66.57 kilogram. This result indicates that farmers who produces large quantity of *teff* supplies large quantity of produce for the market. This result is in line with study by Sultan (2016) which indicates that quantity of wheat produced affects

market supply positively and significantly at 1% significance level. The same study by (Azeb *et al.*, 2017) indicated that quantity of *teff* produced was significantly affected *teff* quantity sold at 1% level.

Land holding size (LSIZE): It is a continuous variable refers to the total hectar of land owned by farmers in the study area. So the study result showed that size of land holding affected volume of *teff* supplied to the market positively at 5% significance level during current year of 2017/2018. Positive coefficient shows that, the larger the total area of the land that farmer owns, the larger land is allocated for *teff* and the higher would be the output that influences large quantity of *teff* supplied to the market in study area. According to the study as land holding of the farmer household increases by 1 hectar, the quantity of *teff* supplied to the market increases by 39.64 kilograms. The study result is consistent to study by Efa (2016) which indicated that land is a scarce resource in the study area and it is more likely that those with more hectars of land can allocate to cultivation of more *teff* which lead to high *teff* production and hence supply in large volume of *teff* to market.

Table 18: Determinants of *teff* market supply (2SLS estimates)

Variables	Coefficients	Robust Std. Err.	P-value
Quantity of *teff* produced	66.574***	9.191	0.000
Household size	-5.739	5.201	0.270
Landholding size	39.638**	16.574	0.017
Farm experience in *teff* production	-1.852	1.285	0.149
Number of extension contact	-1.400	4.295	0.744
Using credit	45.571*	26.604	0.087
Livestock holding	3.655	4.539	0.421
Access to market information	18.811	21.405	0.380
Distance from nearest market	-9.869**	4.462	0.027
Constant	25.656	65.359	0.695
Number of observation	122	Wald chi^2	375.44
Prob>chi^2	0.000	R- Squared	0.857

While ***, **, and * are significant at 1%, 5% and 10%, respectively

Source: Own survey result (2018)

Using credit (USCRED): It is a dummy variable which concerned with the influence of using credit on volume of *teff* supplied to the market. So the study result showed that using credit for *teff* production were affected volume of *teff* supplied to the market positively at 10% significance level. This indicates that those farmers who are credit users were solve their

financial problem of purchasing input such as fertilizer, herbicides, and seeds which directly contributed for increasing volume of *teff* supply to the market. The coefficient showed that as farmers were being credit users, the volume of *teff* supplied to the market increase by 45.57 kilogram. This study is in line with study by Efa (2016) which indicated that access to credit positively and significantly influences farmer's participation in supplying *teff* to the market at 1% significance level. Also Muhammad (2011) has indicated in his study of market chain analysis of *teff* and wheat the case of Halaba district has found that Access to credit was influenced volume of wheat supplied to the market positively and significantly at 5% level.

Distance from the nearest market center (DISMKT): It is continuous variable hypothesized to affect volume of *teff* supplied to the market negatively and the study result showed that distance from the nearest market center affected volume of *teff* supplied to the market negatively at 5% significance level. Negative coefficient shows that as the distance from the nearest market center increases by one kilometer, the volume of *teff* supplied to the market decreases by 9.87 Kilogram. The same study by Efa (2016) indicated that, distance from the nearest market were negatively and significantly influences the intensity of marketed surplus at 10% significant level. When the household is located one Kilometer away from the market, the quantity of *teff* sold decreases by 2%. And also consistent with study by Zamasiya *et al*. (2014) which indicated that, soybean market participation by smallholder farmers in Zimbabwe in which distance to the market negatively affected smallholder farmers' extent of market participation and quantity sold.

4.3.2 Factors affecting market outlet choice of *teff* producers

Multivariate Probit was employed to analyze factors affecting *teff* market outlet choice decision of producer in the study area. Twelve explanatory variables hypothesized to affect *teff* market outlet choice of *teff* producer were land size, education level of household, farming experience of farmer in *teff* production, volume of *teff* sold, price of *teff*, non-farm income, credit using, number of extension contact, access to market information, distance from the nearest market center, household size and having transport facility was analyzed by multivariate Probit model and from those variables education influenced consumer outlet, Land size affected likelihood of choosing local collector and retailer market outlet, volume of *teff* supplied affected likelihood of choosing local collector, wholesaler and retailer outlet,

household size affected likelihood of choosing wholesaler and retailer outlet, price of *teff* affected likelihood of choosing consumer outlet, non-farm income affected the likelihood of choosing local collector, wholesaler and consumer outlet choice of household simultaneously. Access to market information affected likelihood of choosing retailer outlet, and distance from the nearest market center affected likelihood of local collector and wholesaler outlet choice of producers in the study area.

The model fits the data reasonably because of Wald test (Wald chi2 (48) = 88.92, p=0.0003) is significant at 1% 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. The other is likelihood ratio test of the model is (Chi^2 (6) = 18.68, Prob > chi^2 = 0.0047) is statistically significant at 1% level. Indicating that the independence of the error terms (independence of market outlets choice) is rejected and there are significant joint correlations for two estimated coefficients across the equations in the model. The likelihood ratio test of the null hypothesis of independence between market outlet choice decisions of producers$\rho = \rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$, where $\rho_{21}, \rho_{31}, \rho_{41}\, \rho_{32}, \rho_{42} and\ \rho_{43}$ represents the correlation between wholesalers and local collector, retailer and local collector, consumer and local collector, retailer and wholesaler, consumer and wholesaler and consumer and retailers respectively. And also ρ (*rho*) values (Likelihood ratio test of rho21 = rho31 = rho41= rho32= rho42 = rho43 = 0) are jointly equal to 0 is rejected and it indicates the goodness-of-fit of the model. Since there are differences in market outlet selection behavior among farmers, which are reflected in the likelihood ratio statistics.

According to the study result the likelihood that *teff* producers choose local collector, wholesaler, retailer and consumer market outlet were 45%, 69.9%, 20.4%, and 74.6%, respectively as shown in (Table 19). The joint probabilities of success and failure of the four variables also suggest that it would be unlikely for households to choose all market outlet simultaneously, for their likelihood to do so was only 7.7% while joint probability of failure were 2.8%. Estimated Covariance matrix were $\rho 21$ (the correlation between the choice of local collector and wholesaler outlet was negative at 10% significance level and indicates substitution relationship between both outlets. ρ_{43}(the correlation between consumer and

retailer outlet) was positive at 1% significance level which indicates complementary relationship between consumer and retailer outlets.

Land Size (LSIZE): The study result reveals that land size influenced the likelihood of choosing local collector and retailer market outlet negatively at 5% and 10% significant level, respectively. The negative coefficient further implies that farmers those who own large hectars of land were less likely associated with local collector and retailer outlets because price charged by both local collector and retailer outlet was very unfair and lower than wholesale and consumer outlet. Also it indicates that producers who owned large size of land more likely allocates large area of land for *teff* cultivation and able to produce large quintals of *teff* which leads them to prefer wholesale market who purchase in large quintals rather than selling for retailer and local collector because of it purchases in small amount due to their capital constraints.

Price of *teff* (PRT): It is continuous variable, which was price given for the commodity per kilograms at different outlet. The result reveals that price of *teff* influenced the likelihood of choosing consumer outlet positively at 5% significance level. This positive coefficient further implies that because of consumer pays fair price than other outlets, farmer was positively associated with consumer outlets than other outlets. This finding also implies that farmer prefers directly selling for consumer outlet because of farmer has bargaining power in this case and no cheating in the process of determining price, scaling weight because of price set through negotiation by depending on quality and color of *teff*. But findings of Addisu (2016) indicated that average price of onion was associated negatively and significantly at 10% level of significance with selling onion to consumers.

Non-farm income(NONFIN): The survey finding implies that, those farmers who earn nonfarm income were positively and significantly associated with the likelihood of choosing rural collector and wholesaler market outlet at 1% and 10% significance level, respectively, while negatively and significantly associated with the likelihood of choosing consumer outlet at 5%, significance level. This positive and negative result showed that farmers who earns nonfarm income more likely chooses local collector to sell *teff* within their village and wholesaler to sell on weight rather than selling for consumers because, farmers earning non-

farm income were less likely searching consumer outlet since selling for consumer takes time of the producers in order not to participate in nonfarm activities. In opposite of this findings, study by Addisu (2016) showed that availability of off/nonfarm income has negative and significant relation with the likelihood of choosing collector outlet at 5% significance level.

Access to market information: This variable negatively influenced the likelihood of choosing retailer market outlet at 10% significance level. This negative coefficient indicates that negative association between farmers and retailer outlet because of retailer outlet charges lower price than other outlets in study area. All farmers having market information of price, quality, color, quantity and place of market didn't choose retailer outlet since it charges lower price for *teff*.

Quantity of *teff* supplied (VTS): This finding reveals that, quantity of *teff* sold positively influenced the likelihood of choosing local collector, wholesaler and retailer market outlet at 10%, 1% and 1% significance level, respectively. This implies that the larger *teff* quantity sold the more a farmer was likely to sell more than one outlet simultaneously. The positive coefficient implies that producer tend to increase association with all local collector, wholesaler and retailer to sell their *teff* product. The other point with this finding reveals that farmer those supplies large quantity of *teff* uses selling for more than one actor as a technique to earn an average price from different outlet channels and to recover their production costs and family expenses. This finding is consistent to Addisu (2016) which indicated that the likelihood of choosing wholesaler positively and significantly affected by volume supply to market at 1% levels of significance.

Household size (HHSIZE): This variable positively influenced the likelihood of choosing wholesaler and retailer outlet of producers at 10% significance level. Positive sign shows that household was positively associated with choosing both wholesalers and retailers market outlet due to producers with large household size more likely participates at more than one outlet by using the available of family labor in transporting, cleaning, packaging, producing, storing and selling. This finding is consistent with the finding of Takele *et al.* (2017) who found that having large family size was a better for delivering output to the final outlet.

Table 19: Multivariate Probit result of determinants of *teff* market outlet choice

Variables	Local Collector Coef.(SE)	Wholesaler Coef.(SE)	Retailer Coef.(SE)	Consumer Coef.(SE)
Cons.	3.289***	-0.418	-1.578	-2.447
	(1.392)	(1.270)	(1.500)	(1.577)
Education year	0.049	0.035	-0.011	-0.120
	(0.040)	(-0.052)	(0.046)	(0.042)
Household size	0.007	0.147*	0.147*	-0.035
	(0.007)	(0.084)	(0.079)	(0.072)
Farming experience	0.013	-0.003	-0.007	-0.003
	(0.040)	(0.018)	(0.017)	(0.013)
Volume of *teff* supplied	0.001*	0.001***	0.002*	-0.007
	(0.001)	(0.000)	(0.001)	(0.066)
Land holding size	-0.207**	0.124	-0.210*	-0.097
	(0.09)	(0.139)	(0.112)	(0.101)
Price of *teff* at each outlet	0.001	0.001	.0001	0.003**
	(0.001)	(0.0001)	(.001)	(0.001)
Nonfarm income	0.0001***	0.0001*	-.0003	-0.0004***
	(0.000)	(0.000)	(.000)	(0.000)
Using credit	0.177	0.291	-.405	-0.085
	(0.271)	(0.317)	(.313)	(0.299)
Number of extension contact	0.011	-0.047	.094	0.003
	(0.056)	(0.069)	(.066)	(0.057)
Access to market information	-0.467	0.063	-.656*	0.343
	(0.307)	(0.355)	(.343)	(0.350)
Distance from nearest market	0.121***	-0.208*	-.008	0.063
	(0.047)	(0.061)	(.053)	(0.054)
Having transport facility	-0.200	0.388	-.149	-0.218
	(0.295)	(-0.360)	(.329)	(0.312)
Predicted probability	0.450	0.699	0.204	0.746
Joint probability of Success = 0.077, Joint Probability of failure = 0.028				
Chi^2 (6) = 18.678, Prob > chi^2 = 0.0047, Draws =5				
Number of obs=122, Log likelihood = -208.327,				
Wald chi2 (48) = 88.92, Prob > chi2 =0.0003,				
Likelihood ratio test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0:				
Correlation Matrix				
/atrho21 -.477* .246			/atrho42 -.105 .185	
/atrho31 .290 .192			/atrho43 .813** .275	
/atrho41 .044 .164				
/atrho32 -.116 .203				

Where ***, **and * are statistically significant at 1, 5, and 10 %

Source: Own data computation (2018)

Distance from the nearest market center (DISMKT): This variable positively influenced likelihood of choosing local collector outlet positively and wholesaler outlet negatively at 1% and 10% significant level, respectively. This implies that as producers found far from the nearest market centre the producers chooses local collector market outlet to sell their product and unlikely to sell for wholesale market since local collector and wholesaler has substitution relationship. So it indicated distance from the nearest market centre were positively associated with choosing local collector and negatively associated with wholesaler market outlet. It isin line with the study by Chalwe (2010), indicated that, distance to nearest market was significantly and negatively related to wholesale outlet. Also consistent to finding of Addisu (2018) which indicated distance from the nearest market is negatively and significantly associated with likelihood of farmers selling to wholesalers and cooperatives outlet at 5% and 10% level of significance, respectively; and positively associated with likelihood of selling to consumer and collectors at 5% level of significance.

4.4 Constraints and Opportunities of *teff* production and marketing

4.4.1 Constraints and opportunities of *teff* production

There are a number of factors that affect agricultural productivity in general and *teff* production in particular in the district. High rain fall during harvesting yield, shortage of rainfall during production, rust of *teff* during yield, high price of input, inadequate extension services, inadequate credit provision, shortage of cultivable land, low soil fertility, lack of capital, shortage of improved seed supply and low yield of *teff* per hectar. The Kendall's Coefficient of Concordance (W) analysis showed that 68.5% of the farmers were in agreement with each other on ranking of these constraints to *teff* production (Table 20). The main constraints of *teff* production were explained as follows:

High rainfall during yield harvesting was found to be the most important constraint of *teff* production in the district. *Teff* producers were raised this problem as a major problems they faced during harvesting yield and they loss huge quintals *teff* produce because of during harvesting time high rainfall damages *teff* yield and leads farmers to get below the expected amount of yield for long period of time.

Table 20: Ranking of agreements of respondents on constraints of *teff* production

Constraints listed	Mean Rank	Over all rank
High rain fall during yield harvesting	4.96	1st
Rust of *teff* during yield	5.05	2nd
low yield per acre of land	5.09	3rd
Shortage of rain fall during production	5.52	4th
High price of input	5.59	5th
Inadequate extension service	5.61	6th
Inadequacy of credit provision	5.61	6th
Low fertility of soil	6.55	7th
Shortage of cultivable land	6.65	8th
Lack of capital	7.78	9th
Lack of improved seed	7.58	10th

N=122, Kendall's=0.685, Chi-square (X^2) =459.82, DF=10, Asymp.sig. =0.000

Source: Own survey computation (2018)

The study result indicated that rust of *teff* during harvesting, low yield of *teff* per acre of land, shortage of rain fall during production, high price of input, inadequate extension services, inadequate credit provision were raised by producers and ranked as second, third, fourth, fifth, sixth and seventh next to high rain fall. Rust of *teff* was found to be the major constraints hindering *teff* production in the district by destroying yield which directly reduces productivity of this important crop. And also this problem was limiting farmers' to enhance their food security and supplying *teff* produce for the market. Low yield of *teff* per acre of land also found to be the major constraints hindering farmers next to rust of *teff* during yield because of different factors such as, high rainfall during harvesting and inappropriate harvesting technique.

Shortage of rain fall during production also not found to be the minor problem of *teff* production in study area. This constraint reduces productivity of *teff* and guiding farmers to earn less than national, regional, zonal and district standard. Next to this constraint high price of input also raised by farmers as major problems and needs serious corrections to enhance productivity of *teff.* In the study area high price of input is leading farmers to produces small amount of *teff* because of the price of fertilizer, herbicides, wages, land rent and seed were increasing from year to year. Inadequate extension service was also limiting farmers to produce *teff* in large quantity for both family consumption and supplying for the market and ranked sixth next to high price of input. It is obvious that provision of extension service has a

significant role in increasing productivity of this important crop to sustain food security and increase amount of *teff* supplied to market. But in study area the concerned offices were not functioning well as expected and there were problem of good governance in the study area which is leading in limiting *teff* production in the district.

Inadequate credit service was also found to be a major problem of *teff* production in study area and ranked next to inadequate extension service. So farmers were raised problem of credit provision because of concerned organization were not providing enough credit services for farmers and the way they provides also needs serious correction because of farmer were limited from using credit by different collateral problem and fear of repaying the credited money with interest rates. Low fertility of soil were also not seen as a minor problem because of it is highly reducing productivity of *teff* from year to year and asking farmers to incur much expense for production. This problem was occurred due to degradation of land because of farmers were ploughing there land continuously without shifting cultivation.

Shortage of cultivable land found to be a major problem of *teff* production in study and ranked next to low fertility of soil. Especially youth aged farmers were raised this problem than old aged farmers and shortage of cultivable land is a serious problem which needs a great attention from concerned organization. Next to this constraint capital constraint was hindering *teff* productivity because of capital is an economic resource which is highly required to combine economic resources of farmers such as land, family labor, and managerial skills of farmers. In study area there were no supply of improved seed and farmers were using local seed repetitively and it is leading productivity of *teff* decrease from previous to current year.

The interest of farmers in improved seed varieties, the availability of market for the *teff* produce, strong commitment of governmental and non-governmental organizations in the crop improvement; the importance of the crop in food self-sufficiency as strategic crop at regional and national levels; the diverse use value of the crop; expansion of urbanization; and availability of human resource and knowledge in the improvement and development of the crop are some of the major opportunities available for the crop improvement and expansion of its production in the study area.

4.4.2 Constraints and opportunities of *teff* marketing

There were a number of factors that affect marketing of *teff* in the district. Price fluctuations, low bargaining power of producers, low piece of *teff*, weak linkage between farmers and traders, low quality of *teff*, lack of market information, and mistrust of farmers with *teff* traders. The Kendall's Coefficient of Concordance (W) analysis showed that 46.2% of farmers were in agreement with each other on the ranking of the constraints to *teff* marketing (Table 21). The main constraints of *teff* production were explained as follows:

Price fluctuation was found to be a major constraint hindering *teff* marketing and ranked first in study area. In study area price of *teff* were fluctuated at different season and leading farmers to earn minimum income from sale of their *teff* product.

Table 21: Ranking constraints hindering *teff* market in the district

Constraints listed	Mean Rank	Over all rank
Price fluctuation	3.16	1st
Low bargaining power of producers	3.25	2nd
Low price of *teff*	3.82	3rd
Weak linkage between farmers and traders	4.06	4th
Low quality of *teff*	4.07	5th
Lack of market information	4.80	6th
Mistrust of farmers by buyers	4.84	7th

Kendall's W[a]=.426, Chi-square=328.24, df =6, and Asymp.sig. =0.000

Source: Own survey computation result (2018)

Low bargaining power, low price of *teff*, low quality of *teff*, weak linkage between farmers and traders, low quality of *teff*, lack of market information, and mistrust of farmers by buyers were constraints of market and ranked second, third, fourth, fifth, sixth and seventh respectively. Low bargaining power also found to be the second constraints of *teff* marketing in the district and hindering farmers to earn minimum income from sale of their produce and small contribution of enhancing food security and reducing the amount of *teff* supplied to the market in study area.

Despite the considerable constraints listed above, there are many opportunities for the *teff* market in the district. The potential marketing opportunities of the area were urbanization and industry or factory existences in the district were shifting up the demand for *teff* in the district. Obviously the increased demand would be followed by better farm price for producers. As a

result farmers will have an incentive to expand their output. Furthermore, the rising population number around Arjo town is creating additional demand for agricultural commodities like *teff*. Consequently, this contributes for commercialization of rural economy and creates many off-farm jobs opportunities. Furthermore, provision of infrastructure facilities like telecommunication, power supply and financial institutions (Banks, Micro-Finance) supports the marketing activities in the study area were creating good opportunity for *teff* marketing.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary

This study focused on analyzing value chain of *teff* in Jimma Arjo District, East Wollega Zone of Oromia region. The specific objectives of the study include identifying *teff* value chain actors and their respective functions, examining factor affecting volume of *teff* supplied to market and analyzing the factors affecting market outlet choice of producers in study area.

The data were collected from both primary and secondary sources. The primary data were collected from individual interview using semi-structured interview, focus group discussion, and key informants. Primary data for this study were collected from 122 randomly selected *teff* producers and 55 traders and 10 consumers from the district through an interview. Data collected were analyzed by both descriptive statistics and econometric model usingSTATA13 software. In identifying the determinants of market supply of *teff* 2SLS model was employed while multivariate probit model was employed to identify determinants of market outlet choice of producer's. The findings of the study were summarized below:

Teff value chain analysis of the study areas revealed that the main direct value chain actors involved were input suppliers, *teff* Producer, local collectors, wholesalers, retailers and consumers. There are also governmental supportive actors who support *teff* value chain directly or indirectly. The main supporters of the *teff* value chain in the study areas are Bureau of District Agricultural and Rural Development (BoDARD), OCSI, Primary Cooperatives, informal credit suppliers and banks.

The *teff* value chains in the study areas are characterized by a highly disintegrated. Generally there were weak integration between *teff* traders and producers in study area because of farmers were less trusted with price set by traders for *teff* produce. There were also information gap about the end price of *teff* between producer and farmers which causes negative vertical integration between all actors of *teff* value chain which leads farmers to earn less profit share in relation to other actors. In the district no upgrading is done on marketing, functions, interaction between actors, improving win-win strategies, and improvement of poor

participation and the way *teff* market is functioning is not competent but only product upgrading is practiced by providing inputs and technical support on production.

The result of the 2SLS model indicated that quantity produced, landholding size, using credit service and distance from the nearest market centre were significantly affected volume of *teff* supplied to the market. And also the result of multivariate Probit model showed that landholding size, household size, volume of *teff* supplied to the market, price of *teff*, nonfarm income, access to market information and distance from the nearest market centre were significantly influenced likelihood of producer market outlet choice decision. Therefore all these variables should get considerations to improve or increase volume of *teff* supplied to the market and to help producer chooses appropriate market outlet for their products.

The Kendall's Coefficient of Concordance (W) analysis showed that 68.5% and 46.2% of farmers were in agreement with each other on the ranking of the constraints hindering *teff* production and marketing in study area, respectively.

5.2 Conclusion

Generally diversifying land uses, using inputs, getting training, making extension contact with agents, using credit, improved seed and herbicides were used to increase productivity of *teff* which contributes for surplus increment and leads farmers to choose appropriate channel. The financial sector can fund the production of *teff* products whilst the government can provide subsidized inputs to the small holder farmer. This multispectral approach will definitely yield the required result of increasing income for the smallholder farmer. The government also incorporates technology in the curriculum of institutions of higher learning and research institutes. The private sector can also contract the smallholder farmer by equipping them with the inputs and credit and thus later buy the products to distribute it for the area where this product has shortage.

There is need to reduce over reliance in the importing of key production inputs such as fertilizer and herbicide. Imported inputs have meant that the domestic farmer inputs costs has risen and remained higher. The question that now arises and needs to be addressed in order for the productive farmers to become profitable is do they have the business idea, access to

finance, infrastructural support and access to transport and market. One of the most practical solutions to this dilemma is the division of responsibilities between the private sector, Non-government Organizations and government institutions. NGOs can aware farmers through capacity building activities such as farmer group strengthening and business training activities. One aspect of value chain implementation might be enhancing access to mechanization or other means of enhancing the resource that smallholders have to manage their land and create competitive market.

5.3 Recommendation

The findings of this study enabled us to make the following recommendations for policy makers and all other stakeholders participating in increasing *teff* productivity, improving competitive market and *teff* value chain in study area:

- The interaction between farmers and other actors were strongly weak. So the district trade and industry office should have to strengthen the interaction (governance system) between traders and farmers. In the district there was no proper upgrading of *teff* value chain. Only product upgrading was functioned in little amount by distributing fertilizer, weed killer, training on how to protect soil degradation and other natural resources to raise *teff* productivity. But no marketing, functional upgrading and innovation of new product issues are applied. So such problems must get considerations by integration of NGO, BoDARD, primary cooperatives, private institutions and farmer unions, Universities, research institutes and other marketing organizations to realize the benefit of the poor along *teff* value chain.

- The study result indicated that high rainfall during yield harvesting, rust of *teff* during harvesting, low yield of *teff* per acre of land, shortage of rain fall during production, high price of input, inadequate extension services, inadequate credit provision were raised as constraints hindering *teff* production in the district and ranked as second, third, fourth, fifth, sixth and seventh. The Kendall's Coefficient of Concordance (W) analysis showed that 68.5% of the farmers were in agreement with each other on the ranking of the constraints to *teff* production. So the concerned organization such as district agriculture and rural development, credit institutions, banks, NGOs, cooperatives, development

agents, district trade and industry offices and private institutions should have to solve these production constraints.

- Price fluctuations, low bargaining power of producers, low price of *teff*, weak linkage between farmers and traders, low quality of *teff*, lack of market information, and mistrust of farmers with *teff* traders and ranked first, second, third, fourth, fifth, sixth and seventh with the . The Kendall's Coefficient of Concordance (W) analysis showed that 42.6% of the farmers were in agreement with each other on the ranking of the constraints of *teff* marketing. So the district office of agriculture, trade and industry, NGOs, financial institutions, cooperatives, farmers and traders should have to work in a cooperation form to solve *teff* market problems.

- Econometric analysis (2SLS) results of the study also showed that quantity of *teff* produced affected volume of *teff* supplied to the market significantly. So the concerned organization should have to work on increasing quantity of *teff* produced per acre of land by utilizing land because of landholding size has positive effect on volume of*teff* supplied. Providing credit service for farmers to solve financial problem related with buying input for production should have to improve because of since credit is a catalyst for financing agricultural activities. Farmers not closest to the market centre were not probably supply *teff* to the market in a large volume as the closest one. So constructing infrastructure to facilitate transportation can solve problem of reduction of quantity of *teff* supplied to market. The other recommendation for this problem is creating market nearest to those farmers far from the market centre to save farmers from other marketing costs and initiate to sale in large volume.

- The econometric analysis of multivariate probit findings indicated that farmers have been influenced by different factors to choose appropriate marketing outlets to sell their *teff*. The results of this study suggest several ways in which smallholder farmers can actively market their produce. The district trade and industry bureau and agriculture office should have to work cooperatively in line with the study findings to suggest that an adjustment in each one of the significant variables can significantly influence the probability of choice market outlets.

- The findings point to the need for utilizing of land for *teff* production affected choice of appropriate market outlets by improving productivity of *teff*. Policy makers should focus more on enhancing producers‟ marketed surplus of which could be attained through providing the marketing infrastructure, technical and organizational assistance, and access to markets and support to improve the farmers' bargaining power by establishment of farmers' organizations. Distance from farm to the nearest market significantly affect market outlets choice decision, government should ensure developing markets for *teff* within reach this will motivate a lot of farmers to participate in *teff* supply to increase their income and choice of appropriate outlets.

- Price is also an important factor observed to influence choice of appropriate market outlets. Increasing production alone is not enough without getting a reasonable selling price and marketing linkage. Offering reasonable price per kilogram can inspire *teff* producers to sell their produce through the best market outlets. To enhance producers and traders association's farmers should apply better farming practice and produce good quality product. The study results have also policy implications to increase fair market share by building trust between producers and traders by improving price information networks and establish well defined linkages. Nonfarm income has also significant influence on market outlet choice. So the concerned body should trains farmers how to earn income from *teff* selling at appropriate outlet and nonfarm income simultaneously rather than not selecting appropriate outlet and earning major income from non-farming activities.

- Also access to market information believed to play major role in selecting correct market outlet for *teff* producer in study area. So the trade organization must facilitate farmers in order to obtain market information about quality and quantity requirement by buyers, price per kilogram, place of buyers, and which actors provide fair price. Household size also influenced the likelihood of choosing appropriate outlet and bureau of district agriculture and industry bureaus should have to train farmers how to use their family labors in production and marketing of *teff* efficiently.

- Volume of *teff* sold also influenced the likelihood of choosing market outlet significantly and district office of agriculture and rural development, unions, district bureau of industry and private traders should have to motivate farmers in order to increase productivity of *teff* by providing training, input, creating competitive market, paying fair price for farmers, providing incentives, training on how to use their land and providing correct information about *teff* market.

- Finally further studies on *teff* value chain and marketing related topic should have to undertake to improve margins, benefit share, market chain, market integration and value addition activities related issues by well-organized institutions to improve livelihood of smallholders from *teff* producing and marketing.

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APPENDICES

Appendix 1: Conversion factors for Tropical Livestock Unit (TLU)

Animal Category	**TLU**
Oxen	1.1
Cow	1
Heifer	0.5
Bull	0.6
Calves	0.2
Sheep	0.01
Goat	0.09
Donkey	0.5
Horse	0.8
Mule	0.7
Poultry	0.01

Appendix 2: Conversion factors used to calculate Adult Equivalent

Age Category in years	**Male**	**Female**
<10	0.6	0.6
10-13	0.9	0.8
14-16	1.00	0.75
17-50	1.00	0.75
>50	1.00	0.75

Appendix 3: Determinants of volume of *teff* market supply(2SLS estimation)

VTS	Coef.	Robust Std. Err.	Z
QTPR	66.57387***	9.190871	7.24
HHSIZE	-5.738832	5.200953	-1.10
LSIZE	39.63802**	16.57412	2.39
FAREX	-1.851698	1.284616	-1.44
LIVH	3.655114	4.538802	0.81
USCRED	45.57113*	26.60444	1.71
NEXCON	-1.399789	4.294613	-0.33
ACMKTIN	18.811	21.40499	0.88
DISMKT	-9.868991**	4.461964	-2.21
_cons	25.65609	65.35911	0.39

Breusch Pagan test showed that there was problem of hetrocedasticity because of (chi2 (1) = 17.85, Prob>chi2 = 0.000).

Appendix 4: Test of endogeneity

Tests of endogeneity: Ho: variables are exogenous, Robust score chi2 (1) =3.30117,(p=0.0692)

Robust regression F (1,111) =3.14588(p=0.0789)

estat first stage, force non robust

First-stage regression summary statistics

Variable	Adjusted R-sq.	Partial R-sq.	Robust R-sq.F (2,111)	Prob> F
QTPR	0.7114	0.6854	0.2293	14.0365	0.0000

Minimum eigenvalue statistic = 16.5104

Critical Values # of endogenous regressor: 1

Ho: Instruments are weak # of excluded instruments: 2

	5%	10%	20%	30%
2SLS relative bias			(not available)	

	10%	15%	20%	25%
2SLS Size of nominal 5% Wald test	19.93	11.59	8.75	7.25
LIML Size of nominal 5% Wald test	8.68	5.33	4.42	3.92

estat overid

Test of over identifying restrictions: Score chi2 (1) = .296406 (p=0.5861)

Appendix 5: Test of multicollinearity (VIF and CC)

Variable	VIF	1/VIF
QTPR	3.47	0.288568
LSIZE	2.60	0.385296
EDHH	1.95	0.514067
LIVH	1.59	0.630544
DISMKT	1.44	0.692465
FAREX	1.36	0.734815
NONFIN	1.28	0.780094
NEXCON	1.18	0.844810
HHSIZE	1.15	0.868090
ACMKTIN	1.15	0.869388
USCRED	1.11	0.903006
Mean VIF	1.66	

. Correlate USCRED ACMKTIN

(Obs=122)

	USCRED	ACMKTIN
USCRED	1.000	
ACMKTIN	0.0949	1.000

Appendix 6: Determinants of market outlet choice and correlation covariance

LC	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
HHSIZE	-.0085303	.0648158	-0.13	0.895	-.1355669	.1185063
LSIZE	-.2113754	.0890416	-2.37	0.018	-.3858937	-.036857
FAREX	.0086625	.0133012	0.65	0.515	-.0174074	.0347325
VTS	.0013306	.0006242	2.13	0.033	.0001073	.002554
PRT	.0013268	.0008964	1.48	0.139	-.0004301	.0030837
NONFIN	.0000755	.0000308	2.45	0.014	.0000151	.0001358
USCRED	.1565808	.268806	0.58	0.560	-.3702694	.6834309
NEXCON	.0155416	.0550821	0.28	0.778	-.0924174	.1235005
ACMKTIN	-.398612	.3021453	-1.32	0.187	-.9908058	.1935819

	DISMKT	.1184614	.0471112	2.51	0.012	.0261252	.2107977
	TRANFAC	-.1551661	.2908284	-0.53	0.594	-.7251793	.414847
	_cons	-3.207981	1.426189	-2.25	0.024	-6.00326	-.4127021
WS	EDHH	.0474659	.05168	0.92	0.358	-.053825	.1487568
	HHSIZE	.1470081	.0836591	1.76	0.079	-.0169607	.3109769
	LSIZE	.1259436	.139333	0.90	0.366	-.147144	.3990313
	FAREX	-.0020659	.0176183	-0.12	0.907	-.0365971	.0324653
	VTS	.0049481	.0014647	3.38	0.001	.0020774	.0078189
	PRT	.0001683	.0006546	0.26	0.797	-.0011147	.0014512
	NONFIN	.0000874	.0000493	1.77	0.076	-9.18e-06	.0001841
	USCRED	.294868	.3174984	0.93	0.353	-.3274174	.9171534
	NEXCON	-.0475281	.0692417	-0.69	0.492	-.1832394	.0881832
	ACMKTIN	-.0749715	.3540303	-0.21	0.832	-.7688581	.618915
	DISMKT	-.207421	.0611142	-3.39	0.001	-.3272027	-.0876394
	TRANFAC	.3830145	.3600125	1.06	0.287	-.3225971	1.088626
	_cons	-.4518757	1.268608	-0.36	0.722	-2.938302	2.03455
RT	EDHH	-.0189571	.045219	-0.42	0.675	-.1075847	.0696704
	HHSIZE	.1469916	.0785922	1.87	0.061	-.0070462	.3010294
	LSIZE	-.2111998	.1115185	-1.89	0.058	-.4297721	.0073726
	FAREX	-.0079796	.0167636	-0.48	0.634	-.0408357	.0248766
	VTS	.0021641	.0007767	2.79	0.005	.0006418	.0036865
	PRT	.0003356	.0010239	0.33	0.743	-.0016713	.0023425
	NONFIN	-.0000267	.0000371	-0.72	0.472	-.0000994	.000046
	USCRED	-.4106649	.3119502	-1.32	0.188	-1.022076	.2007462
	NEXCON	.0943893	.0659306	1.43	0.152	-.0348323	.2236109
	ACMKTIN	-.6511894	.3430304	-1.90	0.058	-1.323517	.0211379
	DISMKT	-.0083594	.0525747	-0.16	0.874	-.111404	.0946851
	TRANFAC	-.1445971	.3287242	-0.44	0.660	-.7888846	.4996905
	_cons	-1.561828	1.580188	-0.99	0.323	-4.65894	1.535284
CS	EDHH	-.069773	.041665	-1.67	0.102	-.151435	.011889
	HHSIZE	-.034762	.0722814	-0.48	0.631	-.1764308	.1069069
	LSIZE	-.0973519	.1011993	-0.96	0.336	-.295699	.1009951
	FAREX	-.0155551	.0147803	-1.05	0.293	-.0445239	.0134137
	VTS	.0008174	.0007427	1.10	0.271	-.0006382	.0022731
	PRT	.002539	.0010823	2.35	0.019	.0004178	.0046603
	NONFIN	-.0001343	.0000354	-3.79	0.000	-.0002038	-.0000648
	USCRED	-.0846352	.2988531	-0.28	0.777	-.6703765	.501106
	NEXCON	.0025342	.0566437	0.04	0.964	-.1084854	.1135538
	ACMKTIN	.3453163	.3490808	0.99	0.323	-.3388695	1.029502
	DISMKT	.0625806	.0539243	1.16	0.246	-.0431092	.1682703
	TRANFAC	-.2184472	.3122097	-0.70	0.484	-.830367	.3934725
	_cons	-2.442303	1.576945	-1.55	0.121	-5.533059	.6484526
/atrho21		-.4764462	.2454669	-1.94	0.052	-.9575525	.0046601
/atrho31		.2902637	.1919064	1.51	0.130	-.0858659	.6663933
/atrho41		.0441992	.1639711	0.27	0.788	-.2771782	.3655766
/atrho32		-.1161238	.2026853	-0.57	0.567	-.5133796	.2811321

/atrho42	-.1049723	.1853415	-0.57	0.571	-.4682349	.2582903
/atrho43	.8133513	.2751366	2.96	0.003	.2740934	1.352609
rho21	-.443393	.1972088	-2.25	0.025	-.7431832	.0046601
rho31	.2823775	.1766043	1.60	0.110	-.0856555	.5826024
rho41	.0441705	.1636512	0.27	0.787	-.2702914	.3501166
rho32	-.1156046	.1999765	-0.58	0.563	-.4725742	.2739525
rho42	-.1045884	.1833141	-0.57	0.568	-.4367721	.2526957
rho43	.6714349	.1510982	4.44	0.000	.2674297	.8746677

Appendix 7: Predicted probability

Variable	Obs	Mean	Std. Dev.
outlet1	122	.4501141	.2413883
outlet2	122	.6989814	.2923379
outlet3	122	.2034997	.1677994
outlet4	122	.7464072	.2075631

Appendix 8: Joint probability of success and failure

Variable	Obs	Mean	Std. Dev.
prsf1s	122	.0770369	.107863
prsf0s	122	.028294	.0890503

Appendix 8: Rank of constraints hindering *teff* production in Jimma Arjo district

Constraints of *teff* production	Rank	Score sum	Rank Scores of Constraints										
			1	2	3	4	5	6	7	8	9	10	11
High Rainfall during harvesting	1st	184	65	28	17	3	0	0	0	0	0	0	0
Rust of *teff* during yield	2nd	254	55	25	30	4	5	3	0	0	0	0	0
Low yield per acre of land	3rd	441	33	22	20	9	12	5	3	9	5	4	0
Shortage of rainfall during production	4th	660	41	12	0	0	0	16	0	10	23	8	12
High price of input	5th	719	25	15	5	3	2	2	18	13	16	12	11
Inadequate extension contact	6th	724	20	12	13	0	0	16	5	22	9	14	10
Inadequate credit provision	7th	777	19	13	9	3	2	17	5	6	11	19	19
Low soil fertility	8th	812	12	10	10	7	9	10	10	5	6	20	23
Shortage of cultivable land	9th	851	12	10	11	1	0	14	9	7	19	21	18
Lack of capital	10th	932	14	8	4	3	1	0	6	12	24	31	19
Lack of improved seed supply	11th	998	9	7	2	0	2	4	5	10	16	34	33

Source: Own survey computation result (2018)

Appendix 9: Rank of constraints hindering *teff* market in Jimma Arjo district

List of constraints	Rank	Score Sum	Rank scores of constraints						
			1	2	3	4	5	6	7
Price fluctuation	1st	215	60	40	10	5	5	0	0
Low bargaining power of producer	2nd	304	51	25	1	5	40	0	0
Low price of *teff*	3rd	430	30	40	10	0	40	15	0
Weak linkage between actors	4th	436	25	13	11	20	10	9	24
Low quality of *teff*	5th	502	15	20	10	20	20	22	15
Lack of market information	6th	554	15	10	16	15	15	21	30
Mistrust of farmers by buyers	7th	652	8	2	1	20	25	30	36

Source: Own survey results computation (2018)

Appendix 10: Questionnaire

QUESTIONNAIRE DEVELOPED FOR FARMER'S SURVEY

Name of *Kebele* _____Name of Household head _____

Phone number _____Name of interviewer_____

Signature _____

1. Demographic Characteristics of respondents

Sex of household head(SEXHH)	Male 2. Female
Household head age in years(AGHH)	_____Years
Education level of household in years of schooling (EDHH)	_____Grade

d. Household size

Age category	Male	Female
1-14		
14-35		
36-65		
>65		

2. Resource Ownership of farm household

2.1 Land holdings and Characteristics of farm household

2.1.1 What is the area of your total land in hectar (LSIZE)? _____

2.1.2 What is total area of rented in land (RINL) ?_____ha

2.1.3 What the area is of shared in land (SINL)? _____ ha

2.1.4 Total area of land allocated for *teff* during 2009 (LALLTEF)_____ha

2.1.5 What is your grazing land in hectar?(HGL) _____ha

2.1.6 What is your farming experience in *teff* production (FAREX)? _____

2.1.7 Quantity of *teff* produced during 2009/2010 (fill the below table)

Colors of *teff*	Quantity produced(QTPR)	Quantity Consumed in quintal (QTCON)	Quantity Sold in quintals(VTS)	Price per quintal (PRT)
White *teff*				
Mixed *teff*				
Red *teff*				
Total				

2.2 Livestock holdings(LIVH)

Category of animals	1. Number of animal owned from each category	2.Conversion factors	Tropical Livestock unit (TLU)=1*2
Cow		1	
Oxen		1.1	
Heifer		0.5	
Bull		0.6	
Calf		0.2	
Sheep		0.01	
Goat		0.09	
Mule		0.7	
Donkey		0.5	
Horse		0.8	
Hen		0.01	
Total			

2.3 Source of income

2.3.1 Farm income

2.3.1.1 What are major source of your income (FIN)? 1= Sale of livestock and their products, 2= sale of crop, 3=Off/non-farm income, and 4= Others (like pension funds, other family member income etc)

2.3.1.2 Estimate of yearly cash income from different sources

1. Sale of livestock (SLIV) _____Birr/year **2.**Sale of crop (SCR) _____birr/year, 3**.** Sale of livestock product (butter, cheese, milk etc) (SLIVP) _____birr/year

2.3.1.3 Which crops do you sale most of the time? **1**= *teff,***2**= Barley, **3**= Maize, **4**= sorghum, **5**=Daguja, **6**= nouge, **7**=Sesame, **8**= bean, **9**= pea, **10**= wheat and **11**=Others(specify)_____

2.3.2 Off/Non-Farm income

2.3.2.1 What was your annual non-farm income (NONFIN)? _____birr/year.

Non-Farm income source (SNONFIN)	Annual income of household (ANONFIN)
Trade	
Employment	
Daily labour	
Fire wood sale	
Broker	
Other(Specify)	

2.4 Teff production

2.4.1 Input Supply

1. Have you used agricultural input such as (Weed killers, Fertilizers, Improved seeds) for *teff* production? **1**. Yes **2**. No

Types of input	Do you used for *teff* **1.** Yes **2**.No	Price per (Qt/Lit)	Amount used per hectare(Qt)	Source: **1.**Own, **2.**Gov't **3**.Cooperatives **4**. Private traders **5.** NGO(SIN)
Improved seed				
Fertilizer DAP				
Weed killers				

2. Do you differentiate production? 1. Yes 0. No
3. If yes by what ways you differentiate production? [1] By color (1. Yes, 0. No), [2] by purity of product from sand materials (1. Yes, 0. No), [3] by types of seed (1. Yes, 0. No)

3. Credit services

3.1 Are you credit user (USCRED)? Yes=1, No=0

3.2 If Q1 is yes have you got credit last year? Yes=1, No=0

3.3 If Q2 is yes how much it was?_____birr

3.4 If Q2 is yes for what purpose you receive it? 1= to purchase input, 2= for family consumption, 3= to rent land, 4=to purchase livestock, 5= others(specify it)

3.5 From where you got credit services? 1=Government, 2=Microfinance, 3= Private,4= NGO, 5=Neighbor(Friend),6=others(specify it)

3.6 What was the criterion to get credit? 1. Membership 2. Collateral 3. Land holding 4. Personal guarantee 5. Others(specify it)

3.7 If Q2 is No, why? 1=high interest rate,2= lack of collateral, 3=no need, 4=fear of inability to repay 5=No service 6=others

3.8 Do you have any problem to get credit? 1= yes, 0=No

3.9 If Q8 is yes, what is the nature of your credit problem(s)? 1. Inadequacy of credit 2. No diversification 3. Absence of informal sources 4. Unfavorable repayment 5. High interest rates 6. Restrictive procedures 7. Few supply 8. Others

4 **Extension and information services**

4.1 How frequently you contacted extension agents per month (NEXCON)? _____

No	Type of training	By Which Organization?	How many times per month
1	Crop management		
2	Use of input		
3	Use of cooperative		

4	Pre and post harvest mgmt		
5	Marketing of *teff* products		
6	Field days/demonstrations		
7	Seed production		
8	Natural resource conservation		
9	Use of credit		

1=By Bureau of agriculture, 2=NGO, 3= University, 4=Research center, 5=others

5 **Farming activities and associated costs**

5.1 What do you use to plough your land (WPL)? **1**. Own Oxen **2**. Rented oxen

5.2 Do you weed *teff* manually (WTM)? **1**.Yes, **0.**No

5.3 If Q2 is yes from where you get labour for weeding (LWD)? **1**. Family **2**. Daily laborer **3**. Causal labouror

5.4 If Q3 is causal labouror how much do you pay for her or his per month _____birr

5.5 If Q3 daily labouror how much do you pay per man day? _____birr/man day

5.6 If you employ daily labouror for chemical spray how much do you pay him? _____birr/qt

5.7 What are the major *teff* production and marketing constraints (TPMCON)?

No	Constraints	[1]Yes. [0].No	Rank according to importance
1	Rust		
2	Low soil fertility(LSFER)		
3	Short improved seed variety(LIMP)		
4	High rain fall(HRF)		
5	Shortage of rainfall(SRF)		
6	Shortage of improved seed supply(SIMS)		
7	High price of input(HPI)		
8	Low yield of *teff* per ha(LYTEF)		
9	Lack of capital(LAC)		
10	Shortage of cultivable land(SCL)		
11	Double taxation(DTAX)		
12	Others (specify)		

Source of market information

5.8 Did you get market information before you supply *teff* to the market (ACMKTIN)? 1. Yes 2. No

Source Category	List of Sources	Yes 2. No
Personal/Professional networks	Traders(TPI)	
	Friends/Neighbors(NPI)	
	Development agents(DA)	
	Others	
Public Information System	Radio (DHR)	
	Television(DHT)	
	ECX board (ECX)	
	Others(specify)	

5.9 Marketing Constraints

No	Constraints	[1] Yes, [0]. No	Rank according to importance
1	Lack of market information(LMI)		
2	Price fluctuations(PF)		
3	Low bargaining power(LBP)		
4	Dishonesty(DISH)		
5	Weak linkage between actors(WLIN)		
6	Low price(LOP)		
7	Lack of demand(LAD)		
8	Other(specify)		

1. If you store *teff* which type of material you use? [1].Yes, [0]. No

Gumbi (GUM)	
Gotara (GOT)	
Plastic sack (PLAS)	
Others(specify)	

2. What is your motive to store *teff*? 1. Expecting high price (EHP) 2. For saving (FS) 3. Lack of demand (LD) 4. For consumption (FC) 5. Others(specify)
3. Value adding activities of actors (fill the below tables) **1. Cleaning 2. Packaging 3. Storing 4. Transporting 5. Processing 6. Loading/Unloading 7.Others**

Actors(Fill above number)	Value adding activity by each actors	Intermediate cost	Selling Price	Buying Cost	Value added
Producers					
Local collectors					
Wholesalers					
Retailers					
Consumer price					

Cooperatives

10. Distance from the nearest market centre

10.1 How far you from the nearest market center in kilometers (DISMKT) _____

II. Marketing

1. Did you sell *teff* last year 2009/10 (DSTL)? **1.** Yes 2. No
2. If No.1" is no" why didn't you sell? _____
3. If Q1 is yes, which type of teff is sold? **1**. White *teff* **2**. Red *teff* **3**. Mixed *teff*

4.1 Did you sell for Local collectors (LC) 1= Yes, 0=No, If Yes _____Qt/kg

4.2 Did you sell for wholesalers (WS)? 1=Yes, 0= No, If yes _____Qt/kg

4.3 Did you sell for retailers (RT)? 1= Yes, 0=No, if yes _____qt/kg

4.4 Did you sell for consumers (CS)? 1=Yes, 0= No, if yes ____Qt/kg

4. To whom do you usually want to sell (TSMT)? 1. Local collector 2. Wholesaler 3. Retailer 4. Consumer
5. Reason for selling to the selected actor (RFSA)? **1.** Price difference from others **2.** Closeness in distance **3**. Transport availability **4.** Others (specify)_____
6. For how many months you store *teff* for sale (on average months) _____month
7. What was the price of *teff* immediate after harvest in 2009/10? _____birr/100kg
8. Where do you sale/market place? **1**. within village **2**. Outside village **3**. Within district **4.** Outside district **5**. Combination of the above
9. Is there a difference in price due to differences in place of sale and the type of buyer? **[1]**. Yes [2**]**. No
10. If yes, indicate the price when the product is sold to different actors and in different places.

Place of sale	Price when it is sold to those actors in Birr						
	Consumers	Retailer	Wholesaler	Cooperatives	Millers	Assemblers	
On the farm or Farm gate							
Village market							
District market							

Collection point

11. Means of transportation used to take teff to the market (MT)? **1**. Cart **2.** Pack animal **3.** Vehicle **4**. Others (specify)_____
12. Do you own transportation facility to supply to market place (TRANFAC)? [1]. Yes [0]. No
13. If no, how much it costs you to reach market place per 100kg (TRANCOS)? _____birr

14. Average Return of *teff*

Types of *teff*	Selling Price	Total costs per quintal							
		Packing Material	Loading/ Unloading	Transp Ortation	Broker	Weight Loss/qt	Store rent	Revenue	Tax
Red *Teff*									
Mixed *teff*									
White *teff*									

15. Supply Information

a. When did you sell the last year *teff* product (TST)? **1.** Immediate after harvest **2.** One month later **3**. Four month later **4.** More than four month

b. If you sell at immediate after harvest why you did (IAH)? **1**. Better price **2**. Storage problem **3.** Fear of price fall **4**. Bulk of production **5.** Others(specify)

c. What do you consider to supply your *teff* to the market (CST)? **1.** Assess price information **2.** When we need money **3.** Others

16. Market Association

a. What types of market relationships farmers do have with buyers (FRB)? **1.** Friendly **2.** No relation **3.** Relatives **4.**Acquaintance **5.**Others (specify)

b. Do you have constant customer (CONC)? [**1].** Yes, [**0**]. No

c. Do you sell your *teff* produce at credit (STC)? [**1**]. Yes, [**0**]. No

d. What factors determines to whom you sell your product (DBS)? **1.** Price **2.** Quality wanted **3.** Distance **4.** Cost of transporting **5.** Quantity

e. Do you have any linkage with traders? [1] Yes [0] No

f. If your answer for number 1 is yes, why you are made linkage with traders? [10] to negotiate price [2] to determine price [3] transfer information

g. Do you have difficulty of getting buyers? [1] Yes, [0] No

h. What was the level of quality of information? [1] Adequate information (1. Yes 0. No), [20] Medium information (1. Yes, 0.No), [3] Low information (1. Yes, 0. No), [4] No information (1. Yes, 0. No)

i. What is your decision when *teff* price falls at the market? [1]. Do you take to home? (1. Yes, 0. No), [2]. Do you sell at low price? (1. Yes, 0. No), [3] Do you sell at another market? (1. Yes, 0. No), [4] Do you put at relatives house? (1. Yes, 0. No)

j. What was level your buyer trust? [1] Very trusted (1. Yes, 0. No), [2] moderately trusted (1. Yes, 0. No), [3] Little trusted

k. Who sets price? [1] buyers [2] Farmers [3] through negotiations

QUESTIONNAIRE DEVELOPED FOR TRADER

Checklist for traders (Wholesalers, local collectors, retailers, cooperatives)

1. **Demographic Characteristics**

1.1 Name of traders: _____Tel:_____

1.2 Age: _____ 3. Sex: 1. Male 2. Female

1.3 Marital status: 1. Married 2. Single 3. Widowed 4. Divorced

1.4 Country _____Religion_____District_____Kebele_____

1.5 Family Size: Male _____Female _____Total _____

1.6 Type of traders: 1. Wholesaler 2. Retailer 3. Assembler 4. Processor

1.7 Education level of respondent_____

1.8 Position of respondent on the business? 1. Owner 2. Employed manager 3. Relative of business owner 4. Spouse of owner 5. Other

1.9 How long have you been operating the business? _____

1.10 Did you trade alone or in partnership? 1. Partnership 2. Alone 3. In other forms(specify)

1.11 If in partnership how many are you in number? _____

1.12 Total Number of people employed in your business?1. Male_____2. Female____ Total_____

2. **Buying**

2.1 What types of *teff* do you purchase? 1. White 2. Red 3. Mixed

2.2 Who are the major suppliers of *teff* for your purchasing center?1. Farmers 2. Retailers 3. Brokers 4. Assemblers 5. Other wholesalers 6. Others(Specify)_____

2.3 If farmers are the major suppliers where the transaction does takes place 1. Farm gate 2. Village market 3. District market 4. Others(Specify)

2.4 If farmer takes *teff* to your trading center do you help them by paying transportation cost? 1. Yes 2. No

2.5 If yes how do you help them? 1. By sending track to them 2. Sharing transportation cost 3. By covering the whole part of transportation 4. Others(specify)_____

2.6 Is there fluctuation in supply of product to your trading center? 1. Yes 2. No

2.7 If yes Fill the below table

No	**Major Factors(Causes of supply fluctuation)**	**Rank (1. High Priority, 2. Low priority)**
1	Price fluctuations	
2	Variation in production year	
3	Weather fluctuation	
4	Others	

2.8 Average buying prices of *teff* during 2009/2010 production season per 100kg (Average of Bona and Ganna prices) _____

2.9 Quality parameters considered during buying the produce_____

2.10 Do you transfer information on quality considerations for suppliers? [1]. Yes [0]. No

2.11 Is there longstanding r/ship between traders and suppliers (farmers)? [1]. Yes [0]. No

2.12 Do you provide premium price for your permanent suppliers? [1]. Yes [0]. No

2.13 If yes how much (What percent of price)? _____

2.14 If Q12. is yes for what purpose you pay premium price for suppliers?_____

2.15 How many quintals or Kg of teff you buy in average during high supply season and low supply season? 1. in high season_____2. In low season_____

3. **Selling**

3.1 To whom do you resell *teff* product? _____

3.2 Where do you resell *teff* products (place)? _____

3.3 At what average price you resell? _____

3.4 Do you have longstanding customers for reselling *teff* they bought? [1]. Yes [0]. No

3.5 Do you sell on credit? [1]. Yes [0]. No

3.6 If Q5 is Yes for how long time you wait the payment?_____

3.7 Are you supply for flour factory? [1]. Yes [0]. No

3.8 If yes to which area processor you supply? _____

3.9 Do processors have specific criteria for your products? [1]. Yes [0]. No

3.10 What are the requirements of buyers in terms of quality?

3.11 How do you consider the availability of *teff* / volume of marketed of teff in the market you operated? (Increased, Decreased, The same)_____and reason for such trend? _____

3.12 Who is a price maker in the market you resell? _____

3.13 Factors affecting the price of products and services in the area_____

3.14 Do traders (of teff) usually have any legally binding contract agreement with their suppliers and buyers? [1]. Yes [0]. No

3.15 If yes, is there any problem with enforcement of contracts? [1]. Yes [0].No

3.16 Which market regulations affect your business? _____

3.17 Major problems in selling your products? _____

4. **Transportations**

4.1 How do you transport teff? A. By family labor B. By packing animal C.By vehicle

4.2 If traders are transporting using Isuzu trucks, how many quintals can they transport in one load?---------- quintals

4.3 What are the major problems in transporting? _____

5. **Cost**

5.1 Indicate all costs you incur for marketing the product including taxes, transportation, labor, packaging, telecommunication etc

Cost of Marketing	**Cost per unit in birr**	**Remark**
Packing cost		
Loading/unloading cost		

Transportation cost		
Storage cost		
License and tax		
Telephone Cost		

Other costs(specify)

6. **Market Information**

6.1 How do you get market information (source)? ----------

6.2 To whom do they transfer this information?_____

6.3 How often do traders get market information? _____

7. **Credit**

7.1 How often working capital is a problem for traders

7.2 Traders cash sources (own, credit from bank, credit from informal market _____

7.3 Any problem related to credit? _____

8. **Storage**

8.1 Do you own your own storage? 1. Yes 2. No

8.2 If no.1 yes capacity of your storage? _____quintal at a time

8.3 If no.1 is 'no' where do you store? 1. Renting 2. Friends store 3. Others (specify)_____

8.4 If no.3 is renting, rental cost per month? _____ birr/month

8.5 For how many months do you store products you bought? _____months

9. **Value addition**

9.1 Do you add value on teff product? **1**. Yes **2**. No

9.2 If your answer for No1Yes what types of practices you under take? fill the below table

Activities	**Tick it**
Transporting	
Cleaning	
Storing	
Packing	
Loading/unloading	
Milling/processing	
Injera making	

Others(specify)

9.3 If you tore *teff* which type of material you use?

Gumbi	
Togogo	
Plastic sack	
Magazine	

Others(Specify)

9.4 What is your motive to store *teff*? 1. Expecting high price 2. For saving 3. Lack of demand 4. For consumption 5. Others(specify)

9.5 Value adding activities of actors (fill the below tables) **1. Cleaning 2. Packaging 3. Storing 4. Transporting 5. Processing 6. Loading/Unloading 7.Others**

Actors(Fill above number)	Value adding activity by each actors	Intermediate cost	Selling Price	Buying Cost	Value added
Farmer trader					
Local collectors					
Wholesalers					
Retailers					
Consumer price					
Cooperatives					

Consumer check list

1. Name : _____, Sex _____ Age _____
2. Marital status: 1. Single 2. Married 3. Widowed 4. Divorced
3. Education Status in years of formal schooling _____
4. Distance from nearest town in walking hours _____
5. Means of income generation _____
6. Monthly income of consumer_____
7. Experience in *teff* consumption_____
8. Family size_____
9. Source of income 1. Farming 2. Others(Specify)_____
10. Source of *teff* 1. Own produce 2. Purchase
11. Proportion of your income spent on *teff*_____
12. With which types of value chains actors you linked? Multiple responses are possible 1. Farmer 2. Rural collectors 3. Wholesalers 4. Retailers 5. Consumers 6. Others
13. Do you think that *teff* value chain includes many intermediaries (complex)? 1. Yes 2. No
14. Do you think teff traders are efficient and competitive? 1. [ ] Yes 2. [ ]No
15. If your answer for question No 17 is No what are the major problems of traders? 1. Existence of unlicensed traders 2. Supply poor quality 3. Cheat scale weighting 4. Price setting problem

Purchase of *teff*

16. What type of teff products purchased for consumption? Please respond to the following questions. (*Multiple responses are possible):

Type of *teff*	Quantity purchased Per week	Number of market day per week	Low price Paid/kg	No. of months You buy at lower price	High price paid/kg	No. of months you buy at higher price	From whom do you buy?
Red *teff*							
Mixed *teff*							
White *Teff*							

17. As a buyer, do you have difficulty in obtaining sufficient supplies? (√) [1] Yes, [0] No

18. As a buyer, do you have a particular seller? [1] Yes [0] No
19. If the answer to Q. 3 is yes, how many farmers could be your potential sellers with respect to a particular crop? Approximate for *teff*_____
20. Do you consider any quality requirements to purchase *teff*? [1] Yes [0] No
21. If yes for Q.5, what quality requirement do you consider for; _____
22. What are the constraints hindering consumption of *teff*?

Type of crop	Shortage of supply	Income Shortage	Lack of market Information	Poor product handling	High price of product	Others (Specify)
Teff						

23. Do you think that the price of vegetables reduced if the value chain actors" linkage is improved? (√) 1. [ ] Yes 2. [ ] No.
24. If your answer for Q.12 is No, why? _____
25. If your answer for Q.12 is yes, where intervention should is needed_____
26. What should be done to increase teff consumption? _____

Checklist for Key Informant Interview

Key Informants

Kebele: _____ Name of Organization:_____-

Date: _____

Name of Interviewee_____

1. What are threats for *teff* extension service and input supply?
2. Is there infrastructure constraints affecting *teff* production?
3. What are the possible solutions for those problems?
4. What is the role of FTC for *teff* production and how?
5. What outcomes are achieved to achieve *teff* production technologies?
6. What is the rank of *teff* production in comparison to other cereal crops in the district?

Crops	Produced **1.Yes 2. No**	Rank of Dominance	Common Production System 1.**Monocropped 2.Intercropped**	Source of seed(**1.NGO 2. DBoARD) 3. Union 4.R&D 5.own 6. Private 7. Others**	Main purpose for growing **1.Consumption 2. Sale 3. Both**
Teff					
Maize					
Sorghum					
Barley					
Daguja					
Others					

7. What is the role of your organization to support *teff* value chain in the district?
8. What are challenges and opportunities your organization faces to undertake those support?
9. What looks like the interaction/coordination and relationship between value chain actors?
10. Do you think that *teff* value chain actors are competitive and efficient?
11. Where does intervention needed in the *teff* value chain?

Checklists for Focus Group Discussion

Participants: *Teff* producers from selected Kebeles

District: Jimma Arjo Kebele:_____Date: _____

1. Which cereal crops are produced around your areas(rank based on production)

Crops	Produced **1.Yes 2. No**	Rank of Dominance	Common Production System 1.**Monocropped 2.Intercropped**	Source of seed (**1.NGO 2.BoARD) 3. union 4.R&D 5.own 6. Private 7. Others**	Main purpose for growing **1.Consumption 2. Sale 3. Both**
Teff					
Maize					
Sorghu					
Barley					
Daguja					

Others

2. Problems related to inputs suppliers (availability/access, quality, and cost of inputs)?
3. Problems related to *teff* production (post-harvest loss, High rainfall during harvesting and threshing, disease, extension service, credit access, market access)?
4. How these problems will be solved?
5. How do traders influence farmer's participation in *teff* value chain?
6. What are the major problems relating to marketing of *teff*?
7. Linkage /interaction/ partnership/ coordination between value chain actors_____?
8. How all *teff* value chain actors" benefited from this business equally? Your opinion_____