



**VALUE CHAIN ANALYSIS OF TEFF: THE CASE OF SHEBEL BERENTA
DISTRICT, EAST GOJJAM ZONE, AMHARA REGION, ETHIOPIA**

MSc THESIS

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MAY, 2024

WOLKITE, ETHIOPIA

**VALUE CHAIN ANALYSIS OF TEFF: THE CASE OF SHEBEL BERENTA
DISTRICT, EAST GOJJAM ZONE, AMHARA REGION, ETHIOPIA**

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

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**A Thesis Submitted to College of Agriculture and Natural Resource
Department of Agri Business and Value chain Management, postgraduate
program**

May 2024

Wolkite, Ethiopia

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As thesis research advisors, we hereby certify that we have read and evaluated this thesis prepared, under our guidance, by Yewegnesh Habtamu entitled “Value chain Analysis of Teff: In Shebel Berenta District, East Gojjam Zone, and Amhara Region, Ethiopia”. We recommend that it be submitted as fulfilling the thesis requirement.

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Final approval and acceptance of the thesis is contingent upon the submission of its final copy to the Council of Graduate Studies (CGS) through the candidate’s department or School graduate committee (DGC or SGC).

DEDICATION

This thesis is dedicated for my parents who have always given me moral support for success of this study.

DECLARATION

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every serious effort has been made to avoid any plagiarism in the preparation of this thesis.

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BIOGRAPHICAL SKETCH

The author was born on January 20, 2001 in Shebel Berenta district, East Gojjam Zone of Amhara region of Ethiopia from her father Habtamu Meku and her mother Yalga Kebede. She attended his Primary Education at Mergech Primary School from 2007-2014 (grade 1-8) in Shebel Berenta district. Then after, she attended her Secondary and Preparatory education at yedwuha Higher Secondary and Preparatory School, 2015-2018.

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ACKNOWLEDGMENT

First, I would like to gratitude God and his mother sent Marry for his mercy, care, strength and guidance throughout my work. Then I convey my deepest thank to my advisor Yonnas Addis (Asst.prof) and my co-advisor Bizualem Assefa (Asst.prof) for giving me constructive pieces of advice and guidance starting from proposal development to the completion of this work.

I am indebted to my family for assisting me in moral, my thanks extends to my classmate and friends for their encouragement.

Finally, I would like to thank Shebel Berenta district's agricultural office for giving me information during data collection for my post graduate study.

LIST OF ACRONOMY AND ABBRIVIATIONS

CS	Commercial surplus
CSA	Central Statistical Authority
DA	Development Agent
DAP	Diammonium Phosphate
DOA	District Office of Agriculture
GMM	Gross Marketing Margin
GMMp	Gross Marketing Margin of Producer
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
OSBWARD	Office of Shebel Berenta District Agriculture and Rural Development
PEI	Potential Environmental Impact
TGMM	Total Gross Marketing Margin
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
USD	United States Dollar
VIF	Variance Inflation Factor
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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ABSTRACT

Teff is a largely precious crop for Ethiopian people in generating income and achieving food security. Indeed still teff is economically and socially important, its value chain and gender gap in productivity haven't yet been studied and proved in the study area. This research was conducted to analyze teff value chain in Shebel Berenta district of East Gojjam zone, Amhara region, Ethiopia with the specific objectives of mapping the value chains of teff, analyzing performance (value added share) of teff market participant and to assess impact of gender gap in teff productivity. Two stage sampling procedure was applied to select 120 sample teff producer households. Also, 30 traders, 6 processor, and 14 consumers were purposively selected for identifying performance of teff market in the study area. The data were obtained from primary and secondary data sources. The data were analyzed by descriptive statistics and econometric model. Result from functional and institutional approach of value chain analysis showed that input supplier, producer, rural collector, processor, wholesaler, and retailer were set up to be the major teff value chain actors. Analysis of marketing margins indicated that from total gross marketing margin wholesalers received the highest (39.46%) marketing margin and rural collectors received the least marketing margins (6.06%) in teff value chain. teff market is also characterized by relatively good producers' share when they sale to consumers, retailers and wholesalers. Marketing margin and cost analysis showed unreasonable cost and profit share among teff market chain actors. Therefor teff market in the study area is inefficient. Likewise, the analysis utilizes the Oaxaca- Blinder decomposition model. The result of this model indicated that men headed households 27.28% further productive than women headed households in the study area. Policy implications drawn from the study findings include, strengthening the relation/ commerce among teff value chain actors are recommended to strengthen teff value chain development and programs need to take into account. Differences in morals, markets, and institutions more extensively in order to increase the productivity of women growers in the study area.

Key words; Teff, value chain analysis, Oaxaca-blinder decomposition model

1 INTRODUCTION

1.1. Background of the Study

Ethiopia is the largest teff producer in the world. In 2017, Teff accounts for 24% of the grain area, followed by maize 17% and sorghum 15%. Particularly, teff is grown mainly in Amhara and Oromia, which together described up to 84% of the total cultivated area and production. East and West Gojjam of Amhara and East and West Shoa of Oromia are mainly known potential teff producing areas in the country and a smaller proportion of teff is also produced in Tigray and SNNP regions (Abeje, 2018). Amhara and Oromia are the two major regions, and collectively, the two regions account for 85.5% of the teff area and 87.8% of the teff production (Hyejin, 2018).

Teff is a significant part of Ethiopia's cultural heritage and national identity and contributes to both their food security and income (Hassen *et al.*, 2018; Tadele and Hibistu, 2021). It's profoundly nutritional and it contains 11% proteins, 80% complex carbohydrates and 3% fats. It's the alternate most important cash crop (after coffee), generating nearly 464 million USD income per year for original growers. Either, teff is an extremely important income- generating crop especially for smallholder growers (CSA, 2015).

The performance agricultural production including teff is mostly characterized as inefficient due to high market concentration, high barriers to entry in terms of capital and credit, evidence of collusion in the rural market, low market actors integration, high marketing margin, and high seasonal price variation (Mengistu and Tinsae, 2021). In this respect, *teff* value chain program that supports to double teff production and ensures farmers access sufficient markets to capture the highest value from their production, increase incomes, and reducing the price to consumers (Tadele and Hibistu, 2021)

Teff production creates employment openings for smallholder growers, and its civilization contributes to soil fertility and water conservation. Teff is an important marketable crop in the development of the agricultural sector. It's one of the cash crops substantially cultivated by smallholder growers. For case, in terms of area content, Teff takes the lion share but in terms of product and productivity, it's below the other cereal crops. Teff market demand is adding through time but it isn't completely capitalized due to smallholders' product dominance and their

subsistence husbandry systems (Adugnaw and Birara, 2023). Teff marketing is ineffective in Ethiopia because of poor planter links that make it insolvable to meet market conditions, low product volume, a dispersed producer base, the actuality of brokers, and perceived low prices in informal markets (Zena *et al.*, 2021).

The crop is critical for income and food and nutrition security across the country and is grown by 6.5 million resource-poor smallholder growers (FAO 2018). This implies that 43% of all Ethiopian growers grow teff. Thus, this sector is the most important in Ethiopia's agricultural frugality which accounts for 72% of all cultivated land.

According to Temesgen *et al.*, (2021) inputs used by growers included fertilizers, DAP, UREA, and herbicides for teff product. These inputs are supplied to growers both by cooperative/ unions and by private traders. Cooperatives are significant fertilizer suppliers for producers. The government (National Input Supply Enterprise) supplies the unions with similar fertilizers as DAP and Urea. The unions can send it to primary cooperatives, and the cooperatives distribute it to growers and other private input suppliers.

Teff merchandising in Ethiopia is substantially done by manufactories they regard for 70 percent of all the teff sold in Addis Ababa, while cereal shops and consumer cooperatives make up the remaining 18 percent and 9 percent respectively (Woldu, 2013). Some retailers procure teff directly from rural areas and, thereby, cut out urban wholesale markets. Using un-weighted averages of the panel retail shops, it is estimated that 83 percent of the teff supplies are obtained on urban wholesale markets. The larger retailers, are estimated that 27 percent of the teff sold in Addis Ababa does not go through the urban wholesale markets are especially doing direct rural procurement (Minten *et al.*, 2016).

Most teff is processed into flour for the bakery industry, food manufacturing or retail. Teff finds its way to the consumer market through specialized bakeries, restaurants, health shops or retailers with ethnic or gluten-free products. Currently, little value is added to teff in Ethiopia, probably except for injera (the flat fermented bread) (Zhu, 2018), while a variety of products are being developed and marketed by other countries (Hyejin, 2018). Teff milling, processing of injera (the staple food of the majority of Ethiopians, a fermented, pancake-like, soft, spongy, sour, circular flatbread), and other food products are made from teff (Geremew, 2019).

Additionally, teff residues could be used as fodder for livestock and often incorporated as construction materials (Cheng, 2017).

Ethiopia has yet to develop an efficient teff marketing and value chain scheme. Its value chain is often described as unsophisticated or untraceable (Minten *et al.*, 2016; Amentea *et al.*, 2016). Currently, little evidence exists for modernized teff trading and retailing practices. For instance, the role of credit is minor, most of the transactions are on a cash basis, and standardization of Teff grading is virtually absent (Minten *et al.*, 2016). As Minten *et al.* (2016) examined the share of teff price structure in detail; one notable result is that teff growers obtained on average 79.4% of the final retail price of the raw product. While the assemblers, wholesalers, and retailers shared the rest of the price. 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. According to Temesgen *et al.* (2021) low bargaining power, low teff price, teff quality, weak links between farmers and traders, lack of market information, and buyers' mistrust of farmers are the major marketing problem.

Agricultural commercialization may involve changes in the gender relations and norms of agricultural production as well as control over income flows from crop revenues (Quisumbing, 2021). Commercialization of agriculture in Ethiopia is still poor (Leta, 2018). Teff is an important commercial crop in the development of the agricultural sector. According to Cochrane and Bekele (2018) the productivity of teff is increasing through time while teff market is characterized by small scale operations with limited scale of economies which leads to low level of teff commercialization (Orr *et al.*, 2021). Study by Osmani and Elias (2015) indicated that several demographic, socio-economic and institutional factors hinder the development of teff commercialization. Agricultural commercialization among poor smallholder farmers is an important mechanism to reduce poverty, improve household food security and foster sustainable development goals of the country (Carletto *et al.*, 2017).

Commercialization may further marginalize women's agency and control over resources or improve it depending on specific gender norms and evolving social and economic circumstances. Understanding the gendered implications of agricultural commercialization is critical for

policymakers aspiring to achieve agriculture transformation while promoting gender outcomes (Berhane *et al.*, 2023).

Gender and gender relations are important in agricultural production—defining tasks men and women do on the farm, time allocation, and control over production and income (Quisumbing, 2021). Carletto *et al.*, (2017) find female farmers in Malawi, Tanzania, and Uganda sell larger shares of production under their control, although they appear to participate less in market activities. Women represent a tremendous productive resource in the agricultural sector. They are major contributors to the agricultural workforce, either as family members or in their own right as women heading households. However, literatures find that female farmers have lower rates of agricultural productivity than male farmers (UN Women, 2018). This may be due to substantial differences driven by gender-differentiated access to inputs or gender-differentiated returns to those inputs. Such gender difference limits the productivity, production, and the development of value chain of different agricultural commodities, including teff.

Despite teff plays important role for Ethiopians as a staple food, cash income source and a source of livelihood for millions of Ethiopians. Weak value chain actors' integration, low productivity mainly due to gender difference and inefficient market performance hold back its value chain development and multiple contribution of the industry to the economy. For this reason, this study is proposed to map the value chain of teff, evaluating the performance and value added share of market actors, and identifying factors leads to gender productivity gap for teff in Shebel Berenta district of Amhara national regional state.

1.2 Statement of the problem

Value chain development in the agricultural industry, including teff can support pro-poor development through strengthening enterprises, improving productivity, business relationships, improving market performance and the business environment (Shashidhara *et al.*, 2015; Temesgen *et al.*, 2021). The value chain development of the agricultural industry is highly constrained by subsistence farming as a result of shortage of land, traditional methods of production, efficiency of the value chain varies depending on the areas, and the market lacks large-scale processing. Little value addition, a lack of grade and standardization causes uncertainty and additional costs of teff farming (Hyejin, 2018).

In Ethiopia, teff farming is characterized as low productivity, poor access to improved seed and poor agronomic practices, inferior seed quality due to poor threshing practices, inadequate and untimely supply of inputs and absence of collective marketing, fragmented farm plots (Temesgen, 2018). Different studies were conducted to improve the role of teff industry in different part of Ethiopia. A study by Mihretie *et al.* (2022) revealed the possible role of improving crop cultivation practices like residue removal; tillage and soil compaction; and knowledge on how to use inputs and irrigation technologies for improving teff production. Additionally the teff value chain program supports the doubling of teff production and ensures farmers access sufficient markets to capture the highest value from their production, increase incomes, and reducing the price to consumers (Fufa *et al.* 2011).

There are very limited access to agricultural inputs, including high-quality seeds, fertilizer, or agrochemicals (certified seeds and other inputs are currently not available in sufficient quantity), lack of trade relations with the Addis Ababa market, and drought and erratic rainfall are among the most significant natural hazards and cause risks for smallholder's farmers (Weber, 2017). A study by Mengistu and Tinsae, (2021) revealed provision of improved and high yielding varieties, insecticides, fertilizers, and pesticides may favor the farmer in increasing production.

Agricultural production and supply to the market is highly constrained by weak bargaining power of farmers and underdeveloped industrial sectors, inadequate market information system, lack of finance to invest, lack of fertilizer and improved seed, lack of improving production tools, inadequate transport network, very poor harvesting methods, shortage of land, the highest cost of production and low productively (Efa *et al.*, 2016). 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. In addition to this (FAO, 2003) 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.

Gender gaps in agricultural productivity reflect multiple sources of constraint, including women's lower access to agricultural inputs, lower returns on the inputs they use and comparatively less secure land rights as well as gender- predicated distortions in product markets. Bolstering these disadvantages are unsexed morals and practices, reflecting unstable

power relations and fairly rigid gender divisions of labour at the household position (UN Women, 2018). Rural men and women have different access to productive resources, services, information, and employment openings, which may hinder women's productivity and reduce their contributions to husbandry, food security, nutrition, and broader profitable and social development pretensions (Duffy *et al.*, 2017). In general rural women in the developing world and throughout Ethiopia in particular make critical contributions to household agricultural product and productivity consequently to household and public food security.

The study area is known by production of teff mainly for market and family consumption. However, value chain aspects of teff were not undertaken in this district and undertaken in other areas by different authors such as (Temesgen *et al.*, 2021; Efa *et al.*, 2016; Haregitu, 2019; Addisu, 2016; Tekalign *et al.*, 2020) did not address value chain aspects of teff in study area. 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 mapping the chain and their respective role of the actors and analyzing performance of teff market in the study area.

In addition to this it is essential to study the productivity of female-headed households in teff commodity as compared with their male counterparts in the area where gender dis-aggregated information in this aspect is missing. So far, no attempt has been made before to measure the teff productivity difference between male and female-headed household in the study area. Therefore this study identifies actors and their respective roles as well as analyzing performance of market participant, identifying impact of gender gap in teff productivity and readdresses the knowledge/information gap in the study area.

1.3 Basic research question

- a) What does teff value chain look like in Shebel Berenta district?
- b) What does the performance of teff market look like in the study area?
- c) What are the impacts of gender gap in teff productivity in Shebel Berenta district?

1.4 Objective

1.4.1 General objective

The general objective of this study is to analyze value chain of teff in the study area.

1.4.2 Specific objective

- 1) To map the value chains of teff in Shebel Berenta district.
- 2) To analyze performance (value added share) of teff market participant.
- 3) To assess impact of gender gap in teff productivity in Shebel Berenta district.

1.5 Significance of the study

The study provides information on teff value chain from production to consumption within the area. Moreover, this study provides information on teff value chain actors, analyzing the performance of teff market participant and impact of gender gap in teff productivity. The information generated also help organizations like as source for further studies including research and development organizations, policy makers, extension service providers, government and nongovernmental associations to assess their condition and redesign their mode of operations and eventually impact the design and perpetration of programs and strategies. It also helped different actors to identify and dissect new ways of stimulating invention.

1.6 Scope and limitation of the Study

The investigation of the teff value chain from input supplier to the consumer in the Shebel Berenta district is the sole focus of the study. The study was identify the various value chain actors with their functions, the performance of the teff market, and the gender gap of teff productivity in the study area. This study was geographic and time restrictions; geographically, it was only conducted in the Shebel Berenta district; and temporal limitations to make the study more representatives in terms of wider range of area content, limited budget and time horizon. Therefore, temporally it was constrained because cross-sectional data was used.

1.7 Organization of the Thesis

The thesis has been organized under five chapters. Chapter one pinpoints background, statement of the problem, research questions, objectives, significance of the study, scope and limitations of the study. Chapter two presents review of theoretical and empirical attestations to the study.

Chapter three discusses research methodology (description of the study area, slice procedure and sample size determination, data types and sources, styles of data collection and styles of data analysis) of the study. Chapter four presents result and discussion (descriptive, value chain analysis, performance of teff market participant and econometric results) are presented and bandied in detail. Chapter five summarizes the main findings of the study and draws conclusion and recommendations.

2 LITERATURE REVIEW

2.1. Theoretical Review

2.1.1 Basic concepts and definitions

The **value chain** describes the full range of activities, which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), Delivery to final consumers, and final disposal after use. It is an integral part of strategic planning for many businesses today (Kaplinsky and Morris, 2000). The idea of the value chain is based on the process view of the organizations, the idea of seeing a manufacturing (or service) organization as a system, made up of sub systems each with inputs, transformation processes and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources-money, labour, materials, equipment, buildings, land, administration and management. Most organizations engage in hundreds, even thousands, of activities in the process of converting inputs to outputs (Porter, 1985).

Value chain actors: Value chain actors are those involved in input supply, producing, processing, marketing, and consuming agricultural products. They are corporate persons, a natural person or other entity, that is able to influence its direct surroundings. They can be those that directly involved in the value chain (rural and urban farmers, cooperatives, processors, traders, retailers, cafes and consumers) or indirect actors who provide financial or non- financial support services, such as credit agencies, business service and government, researchers and extension agents (Kaplinsky, 2002).

Value chain map is an illustrative way of describing the structure and actors involved in bringing the product or service from its basic raw materials through final consumption. The value chain map can be useful tool to guide the research, and so setting out the map (at least an initial understanding of it) is an important activity to be carried out before the field research begins. The mapping will help determine the approach to the field research, including the sampling strategy for surveying (Gereffi *et al.*, 2001).

Value chain analysis is the process of identifying each of these activities, determining these costs and the value they deliver, and then looking for ways to optimize them in keeping with the

company's overall strategy. Conducting a value chain analysis prompts you to consider how each step adds or subtracts value from final product or service (Kristina 2023).

Marketing; According to American marketing association, Marketing is the activity, set of institutions, and processes for creating communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society (Approved 2017).

Marketing channel; is a business structure of interdependent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Kotler, 2003).

2.1.2 Supply chain versus value chain

The terms production chain, supply chain, market chain and value chain are often used interchangeably, but in fact there are some important differences. In its simplest definition, the terms production chain, supply chain, market chain are synonymously used to describe all participants involved in an economic activity which uses inputs and services to enable a product to be made and delivered to a final consumer. A value chain is understood as a strategic network between a numbers of independent business organizations.

According to Hobbs *et al.* (2000), a value chain is differentiated from a production/supply chain because participants in the value chain have a long-term strategic vision, disposed to work together, oriented by demand and not by supply, shared commitment to control product quality and have a high level of confidence in one another that allows greater security in business and facilitates the development of common goals and objectives. The following table illustrates how a supply chain differs from a value chain approach.

Table 1: The difference between supply chain and value chain

Description	Supply chain	Value chain
Communication (information sharing)	Little or none	Extensive
Value focus	Cost/price	Value/quality
Product	Commodity	Differentiated product
Relationship	Supply push	Demand pull
Organizational structure	Independent	Interdependent
Philosophy	Self-optimization	Chain optimization
Working habit	Work and troubleshooting problems separately	Work and troubleshooting problems together
Goal	Different	Common
Literature is rooted in	Industrial engineering faculties and business schools	development studies and sociology

2.1.3 Agricultural value chain

An agricultural value chain is defined as the people and activities that bring a basic agricultural product like maize or vegetables or cotton from obtaining inputs and production in the field to the consumer, through stages such as processing, packaging, and distribution (Spore, 2012). It examines industry and location specific input-output structures and related technologies, standards, regulations, processes, and dynamic in relationships among chain actors, and thus provides a systematic analytical lens that allows top down and bottom up assessment of industries (Fernandez-Stark *et al.*, 2011).

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

Agricultural value chains can include three or more of the following: producers, processors, distributors, brokers, wholesalers, retailers and consumers. The partners within the value chain will work together to identify objectives and are willing to share risks and benefits and will invest time, energy and resources to make the relationship work. According to (Bammann, 2007), three mediators or agents are involved in the chain includes chain actors who directly deal with the products, i.e. produce, process, trade and own them, chain supporters which are service providers who never directly deal with the product, but whose services add value to the product and Value chain influencers are those regulatory frameworks, policies, infrastructures and etc.

2.1.4 Approach of Value Chain Analysis

Value chain approach used in a value chain analysis is particularly effective at tracking product flows, illustrating the actual processes of value-adding, identifying key actors, and their relationships with other actors in the chain, and measuring the distribution of their benefits. this done by mapping the value chain. Understanding the sequence of events, key players, and linkages involved in the value chain is made easier by mapping the chain. An approach used in value chain analysis depends on the research question (Kaplinsky and Morris 2002). Accordingly, four aspects of value chain analysis have been applied in agriculture:

- I. **Value chain mapping:** a value-chain analysis systematically maps the actors participating in the production, distribution, processing, marketing and consumption of a particular product (or products). This mapping assesses the characteristics of actors, profit and cost structures, and flows of goods throughout the chain, employment characteristics, and the destination and volumes of domestic and foreign sales.
- I. **Identifying the distribution of benefits of actors in the chain:** Through the analysis of margins and profits within the chain, one can determine who benefits from participation in the chain and which actors could benefit from increased support or organization. This is particularly important in the context of developing countries (and agriculture in particular), given concerns that the poor in particular are vulnerable to the process of globalization.
- II. **Examining the role of upgrading within the chain:** Upgrading can involve improvements in quality and product design that enable producers to gain higher value or

through diversification in the product lines served. An analysis of the upgrading process includes an assessment of the profitability of actors within the chain as well as information on constraints that are currently present. Governance issues play a key role in defining how such upgrading occurs. In addition, the structure of regulations, entry barriers, trade restrictions, and standards can further shape and influence the environment in which upgrading can take place. Possible forms of upgrading include: process upgrading, product upgrading and function upgrading.

- III. **Role of governance in the value-chain:** Governance in a value chain refers to the structure of relationships and coordination mechanisms that exist between actors in the value chain. Governance is important from a policy perspective by identifying the institutional arrangements that may need to be targeted to improve capabilities in the value-chain, remedy distributional distortions, and increase value added in the sector by systematically understanding these linkages within a network, one can better prescribe policy recommendations.

2.1.5. Mapping a Value Chain

Mapping value chain is a visual representation of the relationship of actors in a value chain as well as other market players through a simple diagram. Things that need to be mapped can be actor relationship, product flow, information flow, service flow or other like cost and margin of the actors in value chain. Value chain mapping is graphical presentation the various actors of the chain, their linkages and all operations of the chain from pre-production (supply of inputs) to industrial processing and marketing (UNIDO, 2009). In its simplest form, the value chain is simply a flux illustration. Value chain can be complex and contain a big number of actors. Each actor can also be connected to further than one value chain. Therefore decision can be made on where in the chain to start and what to include in the chain analysis. The first step in a value chain study is to identify the actors and the connections between them to get the chain colluded out. This can be done with a qualitative study, followed by a quantitative study when the map of the chain is completed. The quantitative study gives farther information about exertion and relations in the chain and makes the study more certain (Hellin and Meijer, 2006).

2.1.6 Approaches to Study Agricultural Marketing

The study of marketing involves various approaches. Different circumstances involved in the demand and supply of agricultural products, and the unique product characteristics require a different approach for analyzing agricultural marketing problems (Johan, 1988). The major and most commonly used approaches are functional, institutional and commodity approaches.

(1) Commodity Approach or Product Approach

This approach refers to the study of a product in detail. The marketing situation of each product chosen for study is examined from such viewpoints as sources and conditions of supply, producer marketing organizations, policies, different middlemen (wholesalers, retailers etc.) who take part in distributing the product.

Problems with regard to a particular product are studied in detail under this approach. Products of any nature e.g. agricultural products wheat, rice, maize, etc., industrial products like machine tools, lathe-machines, generators, oil engines, etc., and any other products can be covered under this study. In practice, this approach tends to be repetitive and time consuming.

(2) Institutional Approach

This approach relates to various marketing institutions viz., wholesalers, retailers etc., engaged in marketing. In applying this approach, a thorough study with regard to a particular middleman is undertaken. For example, in retailing, nature and significance of retailing in terms of functions and services performed and rendered by retail institutions like departmental stores, multiple shops, mail order houses etc.

Besides wholesalers and retailers, other marketing institutions can be stock exchanges, produce exchanges, banks, regulated markets, etc. In short, it can be said that this approach is applicable on various types of marketing intermediaries.

(3) Functional Approach

As the very name suggests this approach comprises of the study of various activities or functions performed in the process of marketing of goods and services. It analyses each function in relation to the importance of its performance.

Various marketing functions are buying, selling, financing, transportation, banking, risk bearing, market information etc. by analyzing and studying every function in detail and problems confronted in the performance of each function, it is possible to understand marketing properly.

(4) Market Structure, Conduct and Performance (S-C-P) approach

The SCP analysis evaluates markets in terms of whether the number of firms or traders operating in a market are large enough – in number and size distribution – to ensure that competition exists between the firms, which is assumed to reduce prices (for sellers in a market) or increase market prices for goods or services (for buyers competing with each other for a good) (Samad, 2008).

It is an analytical approach used to study how the structure of the market and the behavior of sellers affect the performance of markets. It focuses on the behavior of similar rather than individual firms. It provides a broadly descriptive nature of market attributes, and the relationship between them and performance. This approach has been used extensively by government regulatory agencies to achieve competition and avoid the evil of monopoly power.

Market performance

Market performance refers to the impact of structure and conduct as a measured in terms of variables such as prices, costs, and volume of output (Scott, 1995). It refers to the end results of these policies the relationship of selling price to costs, the size of output, the efficiency of production, progressiveness in techniques and products, and so forth. Market performance can be evaluated by analyzing the costs and margins of marketing agents in different channels. A commonly used measure of system performance is the marketing margin or price spread (Getachew, 2002).

Marketing margin: A marketing margin is the percentage of the final weighted average selling between what the consumer pays and what the producer/farmer receives for his product. In other words it is the difference between retail price and farm price (Cramers and Jensen, 1982). Marketing margin is a commonly used measure of the performance of a marketing system (Abbot and Makeham, 1981).

Marketing cost: Includes all costs, which are incurred to perform marketing activities in transferring of goods from producers to consumers. Marketing cost includes handling cost (packing, loading and unloading putting inshore and taken out again), transport cost, product

loss, storage costs, processing cost, capital cost (interest on loan), commission, and unofficial payments (Heltberg and Tarp, 2001).

2.2 Review of Empirical Studies

2.2.1 Value chain approach

There are a number of studies that have employed the value chain approach to agricultural commodities.

Efa *et al.*, (2016) used functional and institutional approach of the value chain to analyze of teff value chain in Bacho and Dawo districts of south west Shewa, Ethiopia. He used value chain approach for identifying and categorizing the value chain actors, evaluate their roles, value added by value chain actors and relationships in the value chain. The result of his study revealed those 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.

Sultan (2016) used value chain approach to analyze wheat value chain in the case of sinana district, Bale zone, Oromia region, Ethiopia. This approach used for identifying and categorizing the value chain actors and evaluate their roles in the value chain. The main wheat value chain actors in the area are input suppliers, farmers/producers, assemblers (collectors), wholesalers, millers/processors, retailers, commission agents and cooperatives. Primary cooperatives/ union and private input suppliers are the main source of input supply of the study area. Unions/cooperatives deal with fertilizers, herbicides and fungicides only while sole proprietor trade in herbicides, fungicides and pesticides. Assemblers play an important role in collecting produce from smallholder producers at farm gate and delivering to wholesalers and retailers at different levels.

Dereje (2007) used value chain approach to study the competitiveness of Ethiopian coffee in the international market. The study indicates that Ethiopian farmers have low level of education, large family size with small farmland and get only 3% of the retail price in the German market. Thus, policy intervention was suggested to improve farmers' performance.

Vegetable value chain study conducted in Ejere district, west Shoa zone, oromia national regional state of Ethiopia by Addisu (2016) used value chain approach to analysis vegetable value chain. the main actors identified in the study include input suppliers, producers, rural collectors, brokers, retailers, wholesalers, processors and consumers. The chain is governed mainly by wholesalers with the assistance of brokers. Producers are price takers and hardly negotiate the price due to fear of post-harvest loss, in case the product is not sold.

Ababo (2016) used value chain approach to study value chain analysis of maize in the case of Nedjo Woreda, oromia national regional state he used value chain approach for identifying value chain actors and evaluate their roles. In his study the results indicate that input suppliers, producers, farmer traders, wholesalers, retailers are the main actors in the study area.

According to Tibebu and Girma (2023) study on Analysis of Maize (Zemays) Value Chain in Hoko District, Sidama Region, Ethiopia indicate that the actors in teff value chain are input suppliers, producers, processors, local collectors, wholesalers, retailers, millers, cooperatives, farmers' cooperative union and consumers. Research, districts' agriculture and natural resource development, non-governmental organizations, transportation service providers, coop/union, commercial bank, omo microfinance institution, and Sidama omo microfinance institution were major supportive organizations are Value chain supporting actors .

2.2.2 Market Structure, Conduct and Performance approach

A number of studies have used Structure, Conduct and Performance approach as a measure Of market performance (Haregitu, 2019; Dibaba, 2021; Yonnas, 2018).

Haregitu (2019) used market structure – conduct –performance analysis approach to assess the performance of teff market in Dejen district, east Gojjam zone, Ethiopia. Teff market in the study area was ineffective due to unreasonable cost and profit share among teff market chain actors.

Dibaba (2021) Evaluated performance of teff market in Tole Woreda, Ethiopia using structure, conduct and performance approach. He found that the four firm's concentration ratio (CR4) indicated that the four largest traders handled 59.44% of the total volume of purchased teff. Suggesting that, the structure of the teff market in the study area was somewhat strong oligopoly feature.

Yonnas (2018) conducted value chain analysis of wheat (*triticum aestivum*) in the case of Dembecha district, west Gojjam zone, Ethiopia. He used structure – conduct –performance analysis approach to evaluate performance of wheat market in Dembecha district. Analysis of marketing margins indicated that from total gross marketing margin processors received the highest (39.72%) marketing margin and retailers received the least marketing margins (4.85%) in wheat value chain. Wheat market is also characterized by relatively good producers' share when they sale to consumers, collectors and wholesalers but they incurred high operating cost which reduces their profit level. Even though, wheat market in the study area deviate from competitive market norms as a result of oligopolistic market structure and conduct, profitability analysis of wheat market showed all market actors operated at profitable level.

2.2.3 Gender differences and its impact on agricultural productivity

A number of studies such as (Bacha et al., 2019; Gebre *et al.*, 2021; Markew and Melese, 2021; Joe- Nkamuke *et al.* 2019) investigated about gender differences and its impact on agricultural productivity.

Bacha *et al.* (2019) examined on gender difference and its impact on agricultural productivity in the case of yubdo district in West Wollega zone Oromia national regional state Ethiopia. The model of data analysis is Decomposition model and Cobb- Douglas production function model. Their result shows that in estimation of the production function farm land, inorganic fertilizer, labour, number of oxen and number of extension contact were statistically significant in impacting the productivity of men headed households while farm land, inorganic fertilizer, labour, pesticide and bettered seed were significant variables affecting the productivity of women headed households. The comparison of the marginal value product with the factor cost showed that both men and women- headed households could increase productivity using further labour and cropland. The agricultural productivity difference between men and women- headed households was about 70.84% in the study area. On the other hand, if women- headed households had equal access to the inputs as men - headed households, gross value of the affair would be advanced by 17.6% for women- headed households. He suggests that women- headed households would have been more productive than men - headed households if they had equal access to inputs as men - headed households.

Gebre *et al.* (2021) conducted the study on impact of gender differences on maize productivity in Dawuro Zone, southern Ethiopia. They employed Cobb – Douglas production function and exogenous switching treatment effect regression (ESTER) model in a counterfactual frame for measuring product effectiveness was used to estimate the goods of gender on maize productivity. They set up that cropland size, fertilizer, improved seed, family laborers, number of oxen, contact with extension agent, and agro-ecological variations are significant factors affecting the gross value of output per hectare for the pooled sample.

Tadele and Mahendran (2015) examined on gender difference and its impact on agricultural productivity in case of sheko district in Bench Maji zone of SNNP, Ethiopia. The model of data analysis is Cobb- Douglas production function model and Decomposition model. Their result shows that in estimation of the production function the seven explanatory variables were included among which four variables namely, livestock holding, pesticide use, land size and men labour were statistically significant for MHH while livestock holding, pesticide use, land size and women labour were statistically significant for FHH, the comparison of the marginal value product(MVP) with the factor cost showed that MHH could increase productivity using further herbicides and men labour while FHH could do so by using further herbicides, men and women labour. The agricultural productivity difference between MHH and FHH was about 66.76% in the study area. still, if FHH had equal access to the inputs as MHH, gross value of the affair would be advanced by 21.39% for FHH.

Joe- Nkamuke *et al.* (2019) analyzed the gender gap in the product of legumes in Malawi by using the Oaxaca – Blinder decomposition model. As in groundnut plot, the number of months spent on the farm, age, responsibility in the community and the volume of seed used are positively significant to the productivity of the women- managed plot while plot size has a significantly negative effect on productivity. For the productivity of the men - managed plot, the quantity of manure and seed used, connubial status have a significantly positive effect on productivity. In addition, the results show that pigeon pea plot managed by a men is more productive than women- managed plot, although not statistically significant. Age and distance to agricultural field officer have a negative effect on the productivity of men pigeon pea growers in Malawi with distance to agricultural field officer having a significant positive effect on the productivity of the women- managed plot.

2.3 Conceptual Framework

The value chain includes direct actors who are commercially involved in the chain (producers, traders, retailers, consumers) and circular actors who give services or support the functioning of value chain. Value chain describes different links that connect all the actors and conditioning involved in the movement of agricultural products from the producer to the final consumer. There are also determinants, which substantially affect gender differences in teff productivity. These determinants can be distributed as demographic factors like labor application and teff product experience and socio- profitable factors like position of education, number of oxen owned, size of farm land and institutional factors like amount of credit used, frequency of extension contact and husbandry Inputs like Inorganic fertilizers, improved seed.

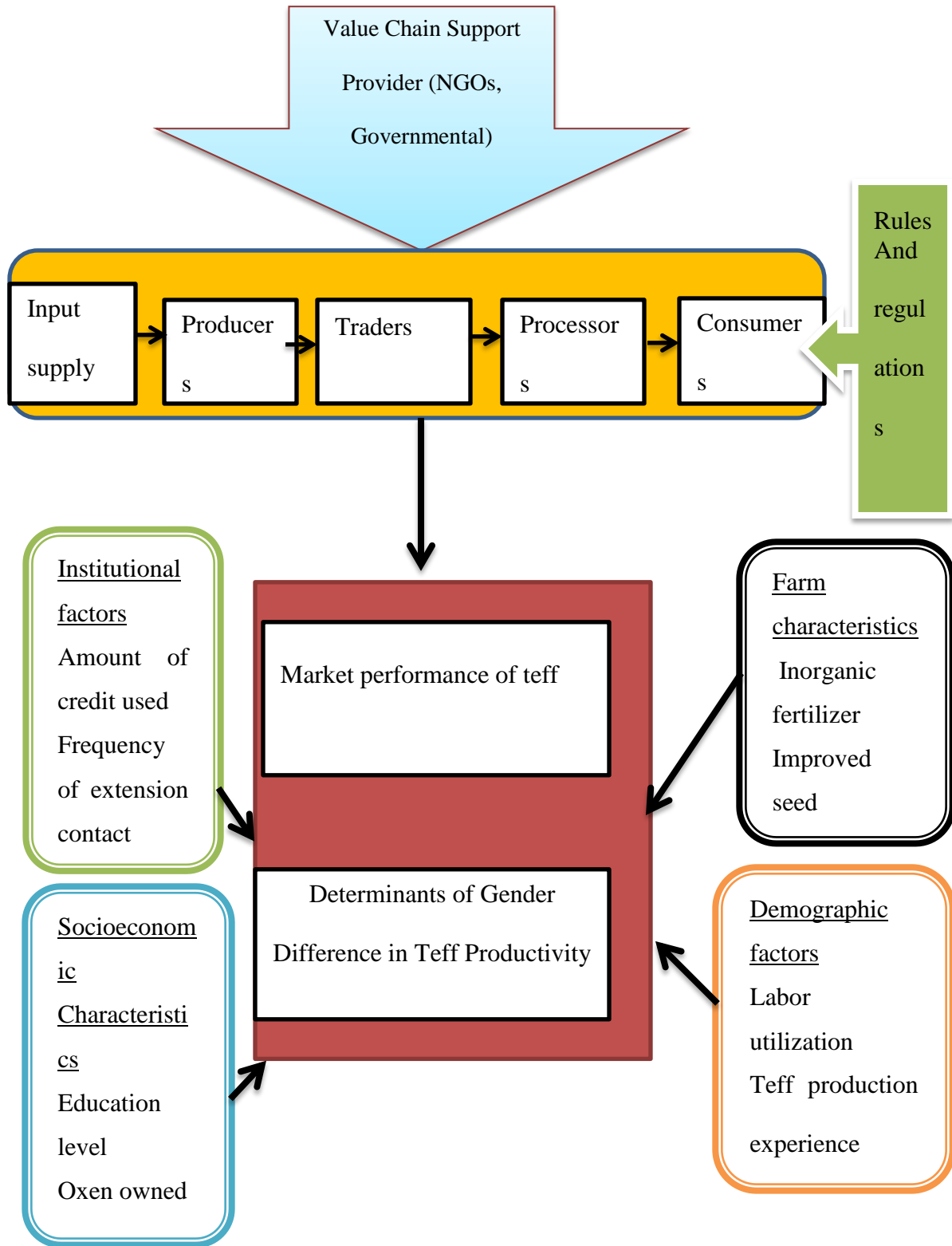


Figure 1: Conceptual framework

Source: Own sketch through review of literature

3 RESEARCH METHODOLOGY

3.1 Description of the study area

The study was conducted in Shebel Berenta district, which is Part of the Misraq Gojjam Zone, Amhara Region, Ethiopia. Shebel Berenta is framed on the southwest by Dejen, on the northwest by Enemay, on the north by Enarj Enawga, and on the east by the Abay River which separates it from the Oromia Region. The major city in Shebel Berenta is Yed Wuha. The District has 26 Kebeles, of which 2 are urban and 24 rural Kebeles. Grounded on the 2007 public tale conducted by the CSA, this district has a total population of 103,988, an increase of 35.39 over the 1994 tale, of whom 50,938 are men and 53,050 women; 4,230 or 4.07 are civic occupants. With area of 898.37 square kilometers, Shebel Berenta has a population viscosity of 115.75, which is lower than the Zone normal of 153.8 persons per forecourt kilometer. An aggregate of 24,584 households were counted in this district, performing in a normal of 4.23 persons to a household, and 23,942 casing units. The maturity of the occupants rehearsed Ethiopian Orthodox Christianity, with 94.86 reporting that as their religion, while 5.07 of the population said they were Muslim.

Shebel Berenta district covers a total land area of 89,714 ha. Topographically, 8 of the District is mountainous, 44 plain, and 48 is vale. Its altitude ranges from 1800 to 2150 ma.s.l. It has two agro-ecological zones with (28) middle land and (72) lowland. The largest part of the district is positioned in the lowlands (Kolla) along the Abay swash couloir and is extremely depleted, defoliated, and eroded. Regarding the ecological features, 31, 13, 5, and 4 are covered by crops, natural and mortal made timbers, grazing lands, and domestic areas, independently. Ravines, steep pitches, and other areas that aren't favorable for husbandry cover the remaining 47. With regard to the soil type, 29 of the soil is black, 30 brown, 11 red, and 30 “ gracha ” following the original soil groups, attending the organic carbon content, soil texture, and parent accoutrements. Agriculture is the dependence of the district livelihood conditioning for rural resides characterized by subsistence crop product, substantially dependent on downfall, which is erratic in nature; the dominantly traditional husbandry system results in low input- affair crop yields (Mekuriaw, 2006).

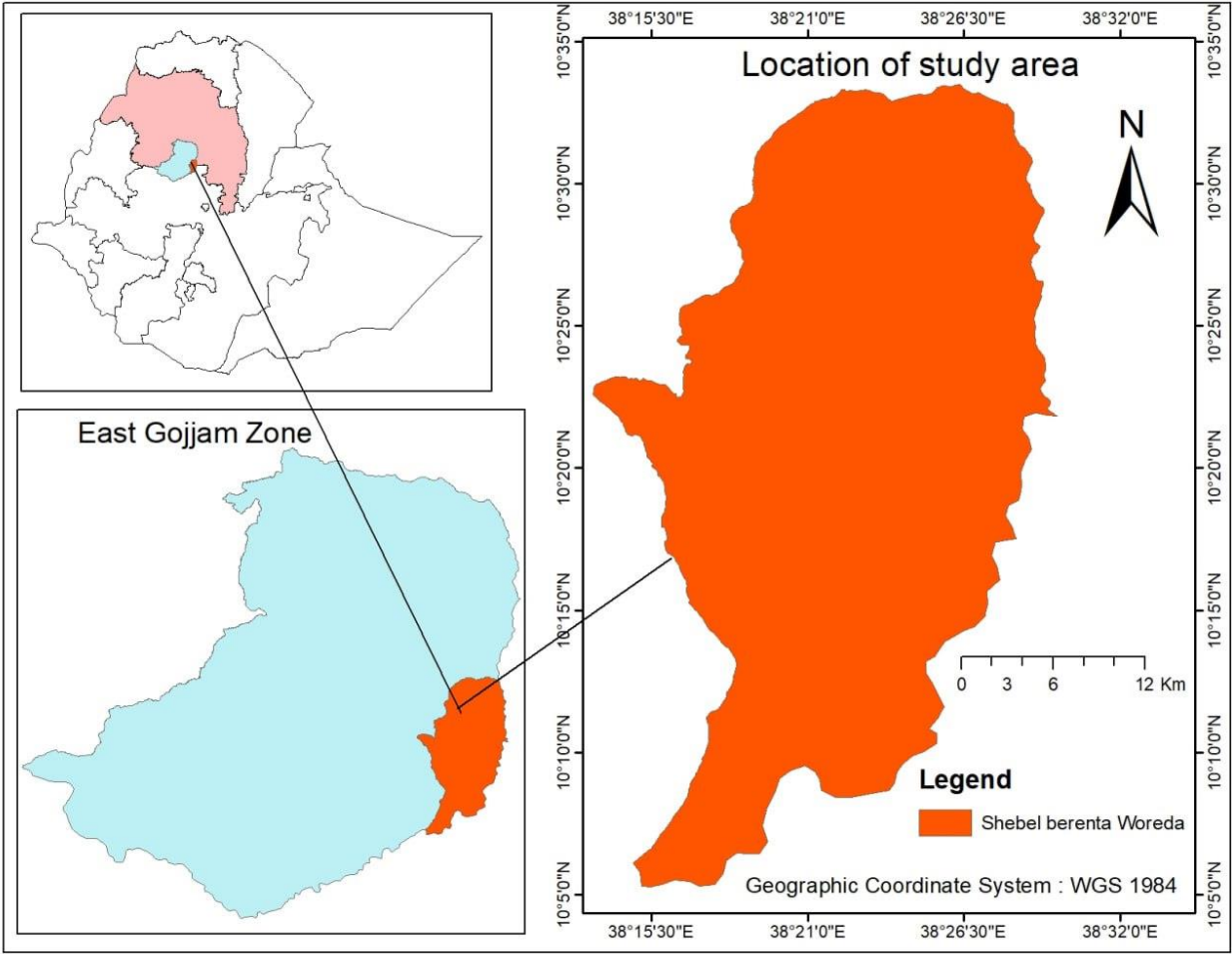


Figure 2: Map of the study area

3.2 Data Types, Sources and Methods of Data Collection

3.2.1 Data types and sources

The data for this study were collected from both primary and secondary sources. Formal and informal sample survey methods were used to collect primary and secondary data. Primary data sources were randomly interviewed producers and from purposively selected wholesalers, retailers, rural collectors, injera makers and consumers. Secondary data sources were from CSA, Shebel Berenta district office of agriculture and rural development, Trade and Industry office of Shebel Berenta district, different journals, books, and other published and unpublished documents from Internet. Both quantitative and qualitative data were collected from secondary and primary data sources.

3.2.2 Methods of data collection

Primary data were collected using semi structured questionnaire and rapid market appraisal. The semi structured questionnaire which is developed, modified, estimated and pre-tested before the final data collected. The questionnaire covered different motifs in order to capture applicable information related to the study objectives. Informal survey were conducted using rapid market appraisal technique using checklists. Formal survey were undertake with randomly selected farmers and purposively selected wholesalers, retailers, rural collectors, injera makers and consumers representatives using a pre-tested semi structured questionnaire for each group.

3.3 Sampling Procedure and Sample Size determination

Farmers sampling

The study area, Shebel Berenta district, was selected as a study since the area has high potential for teff production and marketing. Two stage sampling procedure was applied to select sample teff producer households in the study area. In the first stage, out of 24 teff producer rural kebeles in Shebel Berenta district four kebeles namely mojjen, Mergech and akababiw, meraf yerasoch and yethana were selected randomly. Then, in the second stage teff producers from the sample kebeles with the intended sample size were selected randomly using probability proportion to population size sampling technique. The sample size is determined by using Yamane (1967) formula.

$$n = \frac{N}{1+N(e)^2} = \frac{3915}{1+3915(0.1)^2} = 98 \dots \dots \dots (4)$$

Where: n = sample size, N=total population in four sampled kebele and e = level of precision assumed 10%. Accordingly, the required sample size at 90% confidence level with level of precision equal to 10% was used to obtain a sample size required which represent a true population.

Table 2: Sample distribution of household in selected Kebeles

No	Sample kebeles	Total number of teff producer in each kebele			No of sampled households in each kebele		
		Male headed households	Female headed households	Total	Male headed household	Female headed households	Total
1	Mergech	1255	205	1460	31	5	36
2	Mojjen	916	218	1134	23	6	29
3	Meraf	519	74	593	13	2	15
4	Yethana	658	62	728	16	2	18
Total		3348	559	3915	83	15	98

Source; OSBWARD 2021

Traders, processors and consumers sampling

In addition to growers, data from traders, processors, and consumers also collected for assessing performance (value added share) of teff market. The sites for the trader surveys were market towns and villages in which a good sample of teff traders exists. Based on flow of teff, two markets (Mergech and Yehuda) were named as the main teff marketing sites for the study areas. It's 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. Thus, intentional samples were used to select (8 wholesalers, 12 retailers, 10 rural collectors, 6 injera makers' and 14 consumers).

3.4 Methods of data analysis

Descriptive statistics and econometric analysis were used for analyzing the data from producers, processors, wholesalers, retailers, rural collectors and consumers. The first two objectives of the study were examined through descriptive statistics while the remaining objective was analyzed using econometric methods of data analysis with the help of STATA version 15.

3.4.1. Descriptive analysis

Descriptive statistics such as mean, standard deviation, frequency and percentage were applied to describe the demographic, socio-economic and institutional characteristics of respondents, Mapping of teff value chains, market channels and market performance. Inferential statistics like chi-square test and t-test were employed to compare the availability of socio economic difference among male and female-headed households.

3.4.1.1 Value chain analysis

The analysis consists of relating chain actors at each stage and discerning their functions and connections; determining the chain governance, or leadership, to grease chain conformation and strengthening; and relating value adding conditioning in the chain and assigning costs and added value to each of those conditioning (UNIDO, 2009). It 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.

3.4.1.2 Market performance

Market performance can be evaluated by analysis of costs and margins of marketing agents in different channels. A commonly used measure of system performance is the marketing margin or price spread (Getachew, 2002). Performance of the market is reflection of the impact of structure and conduct on product price, costs and the volume and quality of output (Cramer and Jensen, 1982). Margin or spread can be useful descriptive statistics if it used to show how the consumer's price is divided among participants at different levels of marketing system.

Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage (Mendoza, 1991).

$$TGMM = \frac{\text{consumer price} - \text{producer price}}{\text{consumer price}} \times 100 \dots \dots \dots (1)$$

Where, TGMM is total gross marketing margin. It is useful to introduce the idea of ‘producer’s participation’, ‘farmer’s portion’, or ‘producer’s gross margin (GMMP) which is the portion of the price paid by the consumer that goes to the producer.

Production and marketing costs are frequently difficult to determine in many agricultural value chains for the reasons that costs are often cash and imputed, the gross and not the net marketing margin is calculated. The producer’s margin is calculated as a difference among end buyer price and marketing gross margin.

$$GMMp = \frac{\text{consumer price} - \text{gross marketing margin}}{\text{consumer price}} \times 100 \dots \dots \dots (2)$$

Where, GMMp is the producer's share of consumer price or gross marketing margin of producers.

Furthermore, marketing margin of each actor at a given stage (GMM) computed as

$$GMM = \frac{\text{selling price} - \text{buying price}}{\text{selling price}} \times 100 \dots \dots \dots (3)$$

3.4.2 Econometric analysis

Econometric analysis of impact of gender on teff productivity using Oaxaca Blinder Decomposition model was applied with the help of STATA version 15.

The causal relationship between the dependent variable and the explanatory variables estimated. Hence, model specifications for this variable are present as follows.

Many empirical studies, Bacha (2018), Girma (2019), Tadele and Mahendran (2015) have employed OB decomposition model to analyze gender gaps in agricultural productivity. In this study OB decomposition model is more appropriate model to obtain teff productivity difference between male and female-headed households. Because this model is essential to explain differences in any continuous outcome across any two groups in measurable characteristics such as education, age, number of oxen owned, teff production experience, frequency of extension contact, labour, use of inorganic fertilizer, use of improved seed, crop rotation, amount of credit

used, and size of farmland. Although, decompositions are relevant for estimating the relative contribution of different factors to a difference in the outcome across the group.

OB decomposition model is a statistical method that decomposes differences in mean outcomes across two groups in to a part that is due to group differences in the level of explanatory variables and a part that is due to differential magnitudes of regression coefficients.

OB decomposition model of the productivity differential between male and female farmers were to decompose the productivity difference (Oaxaca, 1973). Although this approach is to decompose the wage gap, it can also apply to decompose productivity difference between, men and women farmers (Uzoamaka *et al*, .2018). The decomposition model present as follows:

Let the teff productivity (Y); α = intercept; β = slop coefficient; M and F indicate male and female, respectively, Where X is explanatory variables; D =difference and ϵ = error term

$$YF = \alpha F + \beta F XF + \epsilon F \dots\dots\dots (1)$$

$$YM = \alpha M + \beta M XM + \epsilon M \dots\dots\dots (2)$$

$$\text{We want to understand: } YM - YF \dots\dots\dots (3)$$

We want to look at productivity differentials between men and women, so we construct a counterfactual equation (intercept & coefficient replaced with those from men’s equation).

$$Y^*F = \alpha M + \beta M XF + \epsilon F \dots\dots\dots (4)$$

$$YM - YF = YM - YF^* + YF^* - YF \dots\dots\dots (5)$$

$$\text{Explained difference} = YM - YF^*$$

$$\text{Unexplained difference} = YF^* - YF$$

The Blinder---Oaxaca decomposition equation is a combination of

Characteristics effects (explained variation): $YM - YF^* = \beta M (XM - XF)$ and

Coefficients effects (unexplained variation): $YF^* - YF = (\alpha M - \alpha F) + (\beta M - \beta F) XF$

$$YM - YF = [\beta M (XM - XF)] + [(\alpha M - \alpha F) + (\beta M - \beta F) XF] \dots\dots\dots (6)$$

$$YM - YF = [\beta M (M (SIZEFL+INFERT+EDUC+CROPR+CRD+NOXW+LBOUR+TPEXP$$

+FREQEXT+IMPSEED) - F (SIZEFL+INFERT+EDUC+CROPR+CRD+NOXW+LBOUR
 +TPEXP+FREQEXT +IMPSEED)] + [($\alpha_M - \alpha_F$) + ($\beta_M - \beta_F$) F (SIZEFL+INFERT+EDUC
 +CROPR+CRD+NOXW+LBOUR+TPEXP+FREQEXT +IMPSEED)]

It is important to check multicollinearity and heteroscedasticity problems before estimation of the models. Multicollinearity problem arises due to a linear relationship among explanatory variables. the severity of multicollinearity (the linear relationship) among continuous explanatory variables will be check by computing the Variance Inflation Factors (VIF). VIF shows how the variance of an estimator is inflated by the presence of multicollinearity. Following (Gujarati, 2003), the VIF is given as:

$$VIF(X_j)_X = \frac{1}{1 - R_j^2}$$

Where; R_j^2 represents a coefficient for determining the subsidiary or auxiliary regression of each independent continuous variable X. Conversely, test for heteroscedasticity had been undertaken for this study. There are a number of test statistics for the detect heteroscedasticity. For this study, Breusch-Pagan test of heteroscedasticity was employed for correcting the problem.

3.6 Hypothesis and Definition of variables

Dependent variable

The amount of teff productivity (productiv) expressed in quintal per hectare is used as a dependent variable to address the impact of gender gap on teff productivity.

Independent variables

Level of education (EDUC); this variable is treated as continuous variable and measured using formal time training of the household head. Hawa *et al.* (2019) has indicated that the household head position of education affects productivity of teff positively. It's believed that if a planter attained formal education of any position there's capability of reacquiring, penetrating and interpreting the information entered in a better manner. Educated person also make better use of their time and available resources. Thus, it's also hypothesized that education position of household would have influence productivity of growers positively.

Amount of credit used (CRD); it's a continuous variable that represents the quantum of credit employed by tried households in 2021/22 product time and measured in birr. For small- scale growers, access to credit is believed to play important part in adding the agricultural productivity. The finding of Leulseged *et al.* (2015) showed that use of further credit would enhance the fiscal capacity of the farm households to buy the necessary accoutrements and increases affair and therefore leading to further productivity. And also quantum of credit used affected productivity of teff positively. This is because those growers who have access to credit are believed to borrow and use ultramodern technology than the noncredit users. Hence, it would be anticipated to have positive relationship with productivity.

Oxen owned (NOXW) is a continuous independent variable indicating total oxen holding of the household. Oxen are one of the introductory farm means and are one of the sources of traction power in the area. The study by Leulseged *et al.* (2015) showed that Number of oxen owned had positive influence on quantum of teff productivity. This is because producers who owned oxen are more likely to cultivate (plough) in time than producers who haven't oxen. Thus, this variable was anticipated to have a positive association with quantum teff productivity.

Labour utilization (LBOUR) Labour is one of the major inputs for agricultural production. It's expressed in number and taken as continues variable. The variable includes all labour spent in the major type of conditioning on farm. The findings of Bacha (2018) revealed that an increase in man- days increases the production and productivity. Hence, it was anticipated to have positive relationship with productivity.

Teff production experience of the household (TPEXP): it is a continuous variable represents the number of times a household spent in teff product. A household with better experience in teff husbandry are supposed to have better capability in assessing the characteristics and implicit benefits of new technology. Also, growers with longer husbandry experience are anticipated to be more knowledgeable and skillful. The result of the study by Hawa *et al.* (2019) revealed that growers with advanced times of husbandry experience may have accumulated product capacity. Thus, number of times of household's " husbandry experience is anticipated to have a positive relationship with quantum of teff productivity.

Farm size (SIZEFL); this variable is assumed to have a positive relation with the dependent variable and is a continuous variable pertaining to the total area of farm land a planter owned

measured in hectare. Increase in the area of land covered by teff can directly increase the productivity. Hence area allocated for teff is hypothecated to impact productivity positively. The findings of Bacha (2018) revealed that the larger the total area of the farm land the planter owns, the larger land is allocated for agricultural commodity and the productivity was advanced.

Frequency of extension contact (FREQEXTC); this is continuous variable which is the number of days that planter had contact with extension agent for agricultural work supervision in a time. The ideal of the extension service is introducing growers to bettered agricultural inputs and to more styles of product. Further frequent DA visits help the growers borrow new technologies and accesses to right market information. The study by Debalke (2016) showed that frequent extension connections can deliver services like advice, training and information on agricultural and other affiliated issues. Therefore, the number of extension connections is anticipated to have a positive effect on the total value of farm productivity.

Inorganic fertilizers (INFERT); the variable daises for all kinds of chemical fertilizer (UREA and NPS) measured in terms of kg per ha which is taken as a continuous variable. According to Bacha (2018) Chemical fertilizer is used to increase soil fertility and hence proliferation in the productivity. Thus, it was hypothecated to affect productivity of teff positively.

Improved seed (IMPSEED); An advanced seed variety plays a vital part in perfecting productivity and taken as continues variable the findings of Gebre *et al.* (2021) revealed that utmost of the growers were stoner of it. Growers who use bettered seed (measured in kilogram) anticipated to get advanced quantum of product per plot of land. Therefor this variable was anticipated to have a positive influence.

Crop rotation; it's An ersatz variable taking 1 for yes and 0 for no. the study by Gebre *et al.*(2021) showed that it's considered a good agricultural practice to increase productivity. Thus, it was hypothecated to affect the value of teff productivity positively.

Table 3: Summary of definitions of variables and working hypothesis

Variable	Notation	Category	Measurement	Sign
Level of education	EDUC	Continuous	Grade	+

Amount of credit used	CRD	Continuous	Birr	+
Oxen owned	NOXW	Continuous	Number	+
Labor utilization	LBOUR	Continuous	Number	+
Teff production experience of the household	TPEXP	Continuous	Year	+
Farm size	SIZEFL	Continuous	Number	+
Frequency of the extension contact	FREQEXTC	Continuous	Number	+
Inorganic fertilizer	INFERT	Continuous	Kg	+
Improved seed	IMPSEED	Continuous	Kg	+
Crop rotation	CROPR	Dummy	1=yes 0=no	+

Source: Own computation from survey result 2021/2022.

4 RESULTS AND DISCUSSION

This chapter presents the major findings of the study and discusses it in comparison to results of similar studies. Section one presents demographic and socioeconomic characteristics of sampled

households, teff value chain actors, roles and interaction, existing market channels and market performance of teff. Section two presents econometric model result.

4.1 Descriptive statistics

Descriptive statistics presents the demographic and socioeconomic characteristics of the respondents sampled.

4.1.1 Demographic Characteristics of sample teff producers

Labour utilization of the household head (LBOUR)

The average number of labour that means all workers in the production of teff was 4.5 and 3.8 for male and female-headed households respectively. As the t-test result shows that the mean difference between the two groups was -1.8 and the difference between the two groups was significant at 10% probability level (Table 4).

Teff production experience of the household head (TPEXP)

The mean years of teff production experience of the sample households of MHH and FHH in the study area was 31.4 and 22.5, respectively (Table 4). This shows that the MHH are more experienced than FHH in the study area. Implying that MHH respondent farmers have enough knowledge and competence in Teff farming and making informed farm management choices than that of FHH. As the t-test result indicates the difference between the two groups were statistically significant at 1% probability level.

Table 4: Demographic characteristics of respondents

Demographic	Male	Female	Overall	Diff	t test
--------------------	-------------	---------------	----------------	-------------	---------------

variable	Mean	SD	Mean	SD	Mean	SD	Mean	
Labor utilization	4.5	1.33	3.8	1.26	4.4	1.33	-0.7	-1.8*
Teff production								
Experience	31.4	10.2	22.5	9.34	30.04	10.5	-8.86	-3.14***

Source: Own computation from survey result 2021/2022.

4.1.2 Institutional Factors Affecting Sample Teff Producers

Table 5 below depicts institutional factors affecting sample teff producers of Shebel Berenta. Grounded on this the average teff producers “ frequency of extension contact for MHH was 7 days per time; while 4 days per time for FHH. This indicates that men are more deposited to gain use full information that may empower them in the Teff value chain although, the difference between two groups were significant at 10% probability level. The average quantum of credit for MHH and FHH were 3505.22 and 1001.4 respectively.

Table 5: Institutional factors affecting sample teff producers

Institutional factor	Male		Female		Overall		Diff	t test
	Mean	SD	Mean	SD	Mean	SD		
Amount of credit used	3505.22	6821.95	1001.4	3872.6	3121.98	6505.92	-2503.82	-1.4
Frequency of extension contact	7	5.4	4.47	1.6	6.6	5.1	-2.5	-1.8*

Source: Own computation from survey result 2021/2022.

4.1.3 Socio economic factors of teff producers

Level of education (EDUC)

Table 6 presents the socioeconomic characteristics of the respondents sampled. The findings revealed that the mean educational level for males was 4.82 and 1.3 for females. This indicates

that greater proportion of females had lower levels of education compared to that of their male spouses at Shebel Berenta district, In general, rural Ethiopian people have a low educational status, and the situation of rural women is even worse. And the mean difference between the two groups was -6.63, which was statistically significant difference based on t test at 10%. The result is also consistent with that of Bacha (2018) in the case of yubdo district in west wollega zone oromia national regional state Ethiopia.

Number of oxen owned (NOXW)

On the average, MHH had about 2.6 oxen while FHH had 1.73 oxen, the comparison of number of oxen owned between male headed household and female headed household revealed statistically significant difference at 1% probability level (table 6). This shows that FHH had less access to draught oxen as compared to MHH in the area. The most widely used method of overcoming shortage of oxen was exchange of labour for oxen, pairing oxen with others, borrowing oxen from relatives and hiring oxen.

Size of farmland (SIZEFL)

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. This study found that there was land holding difference in the study area between the two groups. The mean size of land owned by MHH and FHH were 1.5 and 1.1 respectively. This shows that a greater proportion of females had lower size of land compared to that of their male spouses.

Table 6: Socio economic factors of teff producers

Socio economic factor	Male	Female	Overall	Diff	t test
------------------------------	-------------	---------------	----------------	-------------	---------------

	Mean	SD	Mean	SD	Mean	SD	Mean	
Oxen owned	2.6	0.94	1.73	0.7	2.47	0.95	-1.3	-3.42***
Farm size	1.5	0.94	1.1	0.47	1.43	0.89	-0.4	-1.63
level of education	4.82	7.14	1.3	0.6	4.3	6.7	-6.63	-1.92*

Source: Own survey result 2021/2022. *, **, ***denote level of significance at 10%, 5% and 1% respectively.

4.1.4 Farm Characteristics of household head

Use of fertilizer, improved seed

Comparing the two groups of the households, male-headed households were better in using agricultural input than the female-headed households. The average improved seeds used by male-headed households were 3.2kg where as the result found for the female headed households were 2.1. The deferential results between the two groups in using improved seed were significant at 1% probability level as described in the (table 7). While the average inorganic fertilizer used by male and female headed household were 364Kg and 426Kg respectively. The difference between the two groups was significant at 10% probability level.

Table 7: Farm Characteristics of household head

Institutional factor	Male		Female		Overall		Diff	t test
	Mean	SD	Mean	SD	Mean	SD		

Use of improved seed	3.2	0.14	2.1	0.22	3.01	1.25	-1.08	-3.22***
Use of inorganic fertilizer	364	125.55	426	164.6	374	133.21	62.21	1.6*

Source: Own survey result 2021/2022. *, *** denote level of significance at 10% and 1% respectively.

Crop rotation

Crop rotation, which is considered a good agricultural practice to increase productivity. On average 75% and 8% of MHH was rotate and not rotate crops respectively. While 9% and 8% of FHH was rotate and not rotate crops respectively. It tends to benefit MHHs more than their female counterparts. The difference between the two groups is statistically significant at 1% probability level based on chi square test as described in the (figure 3).

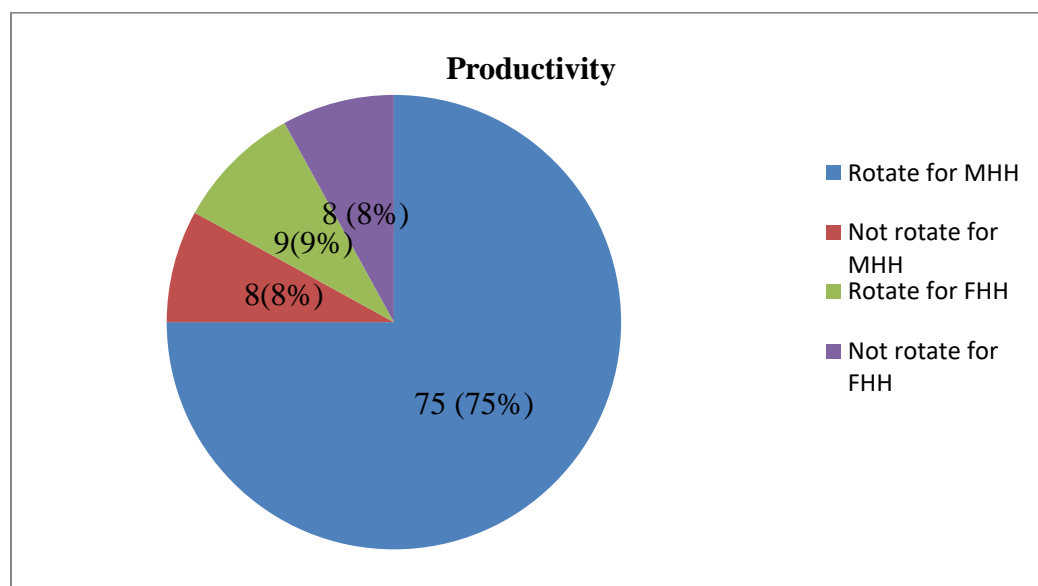


Figure 3: Use of crop rotation of household

$\chi^2=9.56***$, $P=0.002$ Source: Own survey result 2021/2022. *** denote significant at 1%

4.1.5. Sample characteristics by outcome variables

Productivity

Productivity is an important variables used as proxy to measure the economic impact. It was measured in terms of yield (Qt) per (ha). The overall average farm level of teff productivity was

6.9 qt/ha. The result showed that the mean productivity of male-headed and female headed households were 7.02 qt/ha and 6.7 qt/ha respectively. This implies that male headed households were productive than that of female counterparts.

Table 8: Description of sample respondents by outcome variable

Economic variable	Male		Female		Overall		Diff	t test
	Mean	SD	Mean	SD	Mean	SD		
Productivity	7.02	2.12	6.75	2.59	6.98	2.19	-0.27	-0.44

Source: Own computation from survey result 2021/2022.

4.1.6 Demographic and Socio- economic Characteristics of Traders

Demographic characteristics of traders in terms of age, household size, experience and education level were summarized in (Table 10). The average family size of the traders is 3.64 persons and ranges from 1 to 7. The average age of traders was 41.47 years and ranges from 20 to 78 years. The traders have an average of 9.53 years of experience in teff trading (ranging from 1 to 31years trade experience). The survey further indicates that 66.67% of the sample traders were males while 33.33% of them were females. With respect to educational level of the sample traders the average number of years of schooling completed was 7.36 years with a standard deviation of 3.79 years. The average initial capital of sampled teff traders were birr 25447.22 with ranges from 5000 to 200,000 birr. With, regard to current working capital, the survey result shows in 2022 average working capital of sampled teff traders was birr 247944.4 birr ranges from 2000 to 900,000 birr. (Table 9).

Table 9: Demographic characteristics of sampled traders

Variable	Minimum	Maximum	Mean	SD
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Age of traders in years	20	78	41.47	15.17
Household size	1	7	3.64	1.71
Education status of traders	0	12	7.36	3.79
Experience in teff trading	1	31	9.53	1.31
Initial capital (Birr)	5000	200000	25447.22	40358.08
Working capital (birr)	2000	900000	247944.4	294805.3

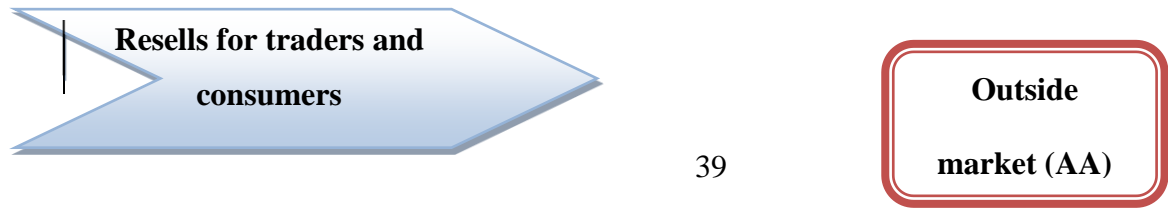
	Frequency	Percent (%)
Marital status (married)	29	80.56
Single	4	11.11
Divorced	3	8.33
Sex		
Female	12	33.33
Male	24	66.67

Source: Own computation from survey, 2021/2022

4.2 Results of Value Chain Analysis

4.2.1. Map of teff Value Chain

The simplified flow chart indicating the flows of products, information and finance in the supply chain for Teff in the study area was presented in Figure 4.



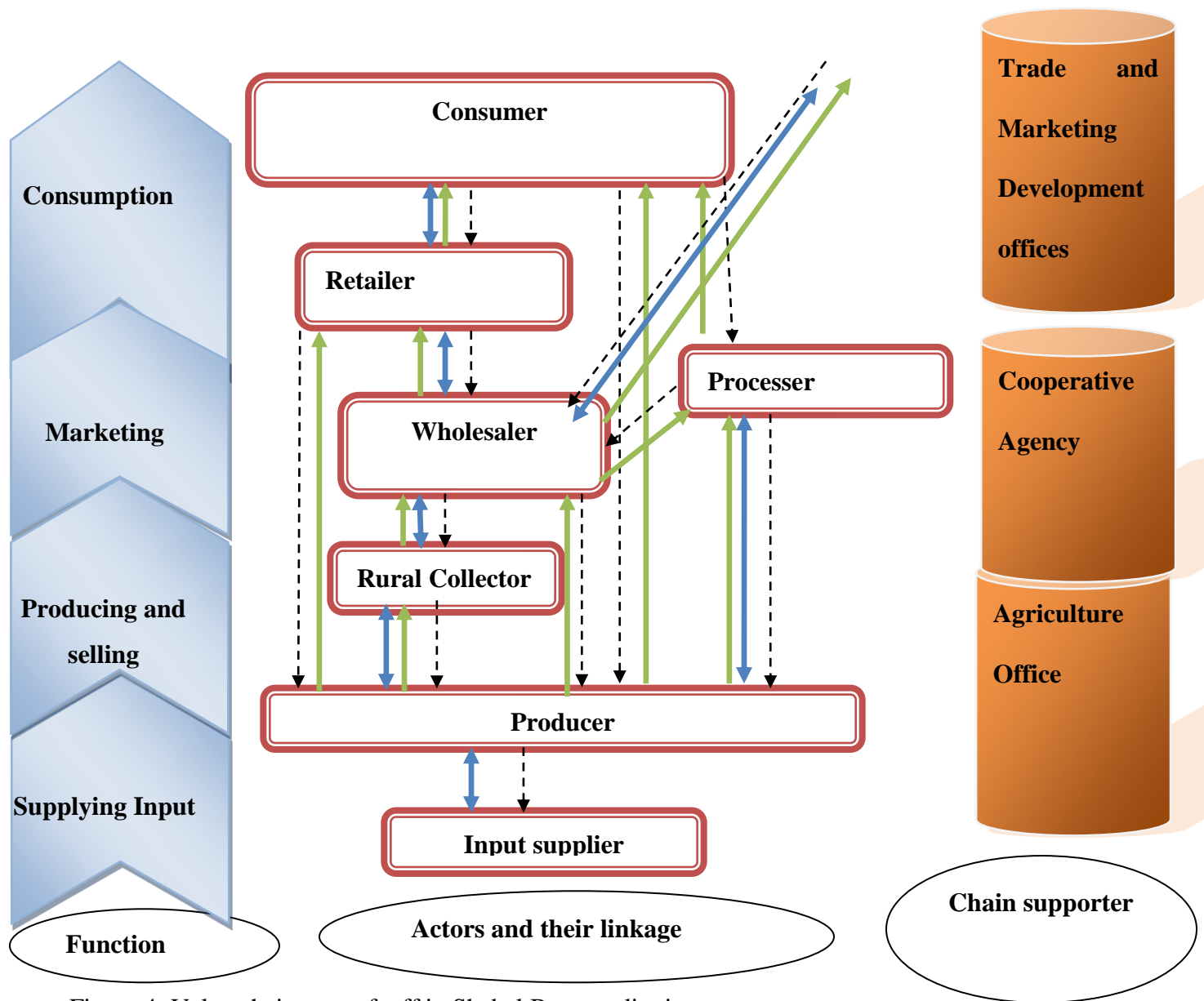


Figure 4: Value chain map of teff in Shebel Berenta district

Source: Own computation from survey, 2021/2022

Financial flow -----> Information flow <====> product flow ->

4.2.2 Teff value chain actors and their roles

Value chain can be defined as the organizational arrangements linking and coordinating the producers, processors, traders, and distributors who perform these functions (Joshi and Gurung, 2009). The main actors involved in the teff value chain, their places and inter connections are banded below Figure 4 shows different situations of the teff value chain in the study area. It

includes different situations, actors and functions involved in the inflow of the product, and the inflow of product amounts through different situations.

Input suppliers

Agriculture value chain analysis begins at the input force position. Input suppliers deliver inputs similar as bettered seed, herbicides, fungicides, farm tools and fertilizers. The District Office of Agriculture, cooperatives, traders, and informal growers to growers exchange are the main actors responsible for the force of inputs. Development agents play a facilitation part in collecting growers' input demand and in input distribution. Input force in the town let's surveyed is dominated by men who can fluently travel long distances to buy inputs from wholesalers located in the areas. Women's part in input force, procurement and distribution is veritably limited. This is because misters circumscribe the movement of their women, therefore reducing their part in input force conditioning. For major teff produced in Shebel Berenta district, the maturity of tried producers used seed by their own seed. The check result indicates that about 50% of tried producers used their own seed. Regarding chemicals, the results indicated that utmost of the tried producers who used chemicals carried it from market (private dealer) (82.89 %), from cooperatives (11.85 %) and from DOA (5.26 %).

Table 10: Sources of teff seed from sample respondent

Source of seed	Frequency	%
Own seed	60	50
DOA	4	3.3
Market	13	10.83
Fellow farmers	35	29.17
Cooperatives	8	6.67
Total	120	100

Source: Own computation from survey, 2021/2022

Table 11: Sources of fertilizers and chemicals for teff production

Chemical use	Frequency	%
Yes	76	63.3
No	44	36.7
Total	120	100

Sources of chemicals (herbicides and pesticides)		
Market(private traders)	63	82.89
Cooperatives	9	11.85
DOA	4	5.26
Total	76	100

Sources of fertilizer		
Market	22	18.3
Cooperative	98	81.7
Total	120	100

Source: Own computation from survey, 2021/2022

The survey results further revealed that (table 11), producers purchase fertilizers from different sources. The major suppliers of fertilizers are cooperatives (81.7%) followed by market (18.3%).

Teff producers are smallholder growers who produce teff for market and/ or both market and consumption. They transport teff to the nearest market by themselves either using pack animals, livestock driven wagons, or using mortal labor. About 25% of men and 75% of women transport teff grain to the market. The major value chain functions that teff producers perform include ploughing, sowing, fertilization; weeding, pest/ complaint controlling, harvesting, post-harvest handling and marketing are substantially accepted by growers. With respect to Marketing, teff producers had several options to sell their product. They tend to rural collectors who assemble Teff from large number of growers. Some of the growers in the sample also sell their Teff to the wholesalers and consumers. Growers sell lower volume of Teff on village market.

Rural collectors are growers or part time traders in the chain who buy small volume of teff

from growers at original markets, by staying them on a roadside near the market during market days and reselling it to wholesalers. They also rely by themselves, either carrying by themselves or using burros either using pack animals, or livestock driven wagons, to transport yield to wholesalers. They're important actor who facilitates sale by serving as a conciliator among teff producers and wholesalers. Buying, assembling, transporting, packing and dealing to wholesalers is the main exertion accepted by them. This actor owns lower capital than other traders because they use profit earned from reselling teff products for family charges.

Wholesalers are involved in buying teff from collectors and producers in larger volumes in Mergech and yedwuha market centers. They've strong working capital, better storage house, and communication access than other traders of the district. They take over different value addition conditioning like sorting, grading, storing, lading/ unloading, and packaging. There are 8 wholesaler repliers in the study area and all are men. They resell within and outside the district market. Within a district they resell retailers and injera merchandisers. They assemble teff from different directions and store in bulk and they sell large quantum of teff (69 %) to Addis Abeba market.

Retailers are traders who buy teff from producers and wholesalers and retail it in small units to consumers. Based on the study result, retailers bought large quantum of teff (20%) from wholesalers. They perform several value additions conditioning similar as buying, transporting and dealing to end users. The problem raised by retailers during the survey was limited fiscal capacity that hinders them from being involved in larger trade. They always prefer to buy from growers than other actors and not resell for other actors except for consumers.

Injera makers and merchandisers in the district they buy teff grain from wholesalers and producers. They reuse Injera and supply it to consumers. This exertion was performed solely by women. They always prefer to buy from growers than wholesalers because they earn further profit by adding some values.

Consumers are the end users of teff who buy goods and service for consumption directly or other use but not to resale it. They're market actors who buy either raw Teff or reused Teff for their own consumption directly from the producers or original collectors, retailers and processors. Consumer's utmost of the time prefers to buy from growers than traders and processors due to quality and price difference. Lack of uniformity and inconsistency in quality

remain the main complaints by the consumers. Teff price was different grounded on their quality and color. White teff was the loftiest price and red was the smallest. Therefor Consumers in the district were consumed red teff mixed with maize and sorghum. Utmost of the time they used mixed teff. Consumer outlet was preferred by growers and all traders because of consumer price were advanced than others price and make fair decision on price setting than any actors.

Supportive actors (value chain supports) give supplementary services and represent the common interests of value chain drivers. The main teff value chain supporters in the study area are the Agriculture Office, Cooperative Agency and Trade and Marketing Development services. The Agriculture Office plays a critical part in creating mindfulness and structure capacity of teff growers (through similar measures as training, input force, credit installation etc.). The Office of Trade and Market Development facilitates market liaison and business networking.

4.3 Marketing Channels of teff in the study area

Market channel analysis is important to provide a systematic knowledge of the flow of products from producer to consumers. Therefor teff marketing channel for this study were designed based on the direction and volume of flow of product. The main identified channels of teff during the survey in the study area are stated as follows.

Channel I; Producers → Consumers 20.01 %

This channel is the shortest channel at which producers directly sell to consumers at market days. The result in the figure four shows that in this channel about 20.01% of teff are transacted or marketed. As a result, the channel is the 3rd most important channel in terms of volume.

Channel II; Producers → Retailers → Consumers 17.13%

In this channel, Retailers bought Teff directly from growers and they in turn sell it directly to the consumers. In this case the raw Teff is sold to consumers by the retailers without any processing is carried out. In this channel about 17 percent of the total volume of Teff transacted in the chain. This channels stands as the fourth important channel in the study area in terms of volume transacted.

Channel III: Producers → Processors → Consumers 10.98%

This is the channel in which processors bought Teff directly from growers and they in turn sell it directly to the consumers. In this channel about 10.98 percent of the total Teff retailed during the survey period. As a result the channel stands as the fifth marketing channels in terms of volume.

Channel IV; Producers → Wholesalers → Retailers → Consumers 6.19%

This is the channel in which wholesalers bought Teff directly from growers and they in turn sell it directly to the retailers. In this case, the raw Teff is sold to consumers by both the Retailer and Wholesalers without value addition process. In this channel 6.19 percent of the total Teff retailed during the survey period. This channels stands as the sixth important channel in the study area in terms of volume transacted.

Channel V: Producers → Wholesalers → Processors → Consumers 3.4%

This is the channel in which wholesalers bought Teff directly from growers and they in turn sell it directly to the processors. In this case, the raw Teff is sold to consumers by the processors after value addition processing is carried out. In this channel about 3.4 percent of the total Teff retailed during the survey period. As a result the channel stands as the least (7) marketing channels in terms of volume.

Channel VI: Producer → rural collector → wholesaler → processor → consumer 20.93%

This channel is the channel in which farmers sell the Teff they produced to the collectors and the collectors sell it without any value addition to the wholesalers and wholesalers again resell it to the processors without value addition process. In turn, the processors sell it by adding some amount of value to consumers. In this channel 24 percent of total volume of Teff transacted/marketed in the study area during the survey period. As a result the channel stands as the second most important marketing channels in terms of volume.

Channel VII: Producer → wholesaler → outside market → consumer 21.35%

This channel is the channel in which wholesalers are buying teff from producers in the study area and resell to outside district markets by adding more value. In this channel about 21.35percent of the total Teff marketed during the survey period. This channels stands as the first important channel in the study area in terms of volume transacted.

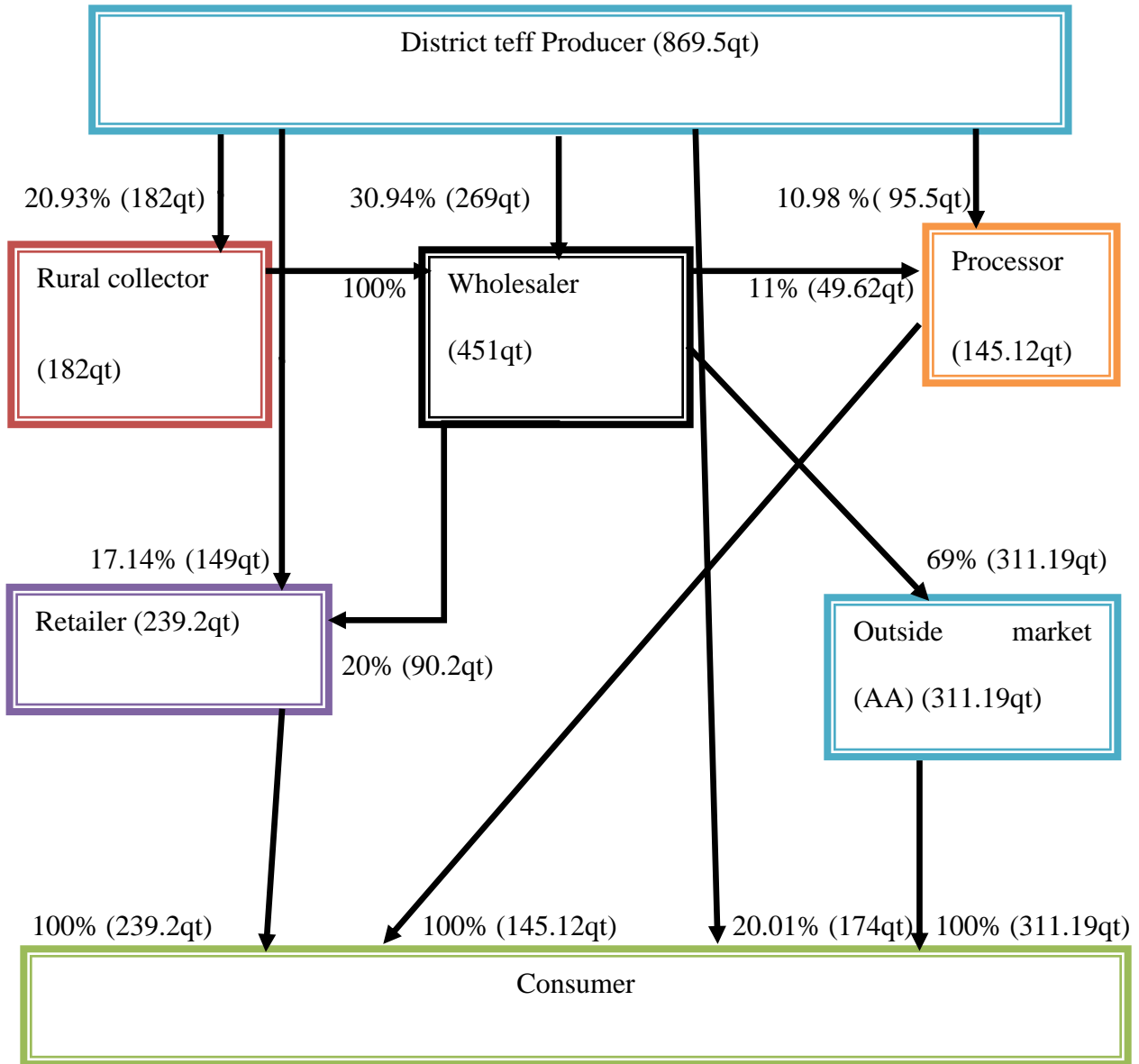


Figure 5: Market channel of teff in the study area

Source: Own computation from survey, 2021/2022

4.4 Performance of Teff Market participants

The performance of teff market was evaluated by considering associated costs, returns and marketing margins. The Ethiopian Birr (ETB) per quintal was used as a standardized unit of measurement for performance analysis.

4.4.1 Marketing cost and margin analysis

Marketing costs are estimated to cipher the share of profit captured by crucial actors in the marketing chain. Value chain actors add value to the product when it passes from producer to consumers by incurring marketing costs like transportation, lading, dealer/ buyer searching, and cleaning, packaging, sorting, storehouse costs like rent. In addition, smallholder growers incurred costs for product costs of seeds, diseases, factory protection chemicals, land, labor and oxen. Table 13 below shows those different types of costs, which the growers incurred during production process.

Table 12: Average production cost/quintal (birr) of teff producers in 2021/2022.

Production cost items	Cost (Birr/hectare)
Land rent	4,000
Weeding/ herbicides	400
Labour cost for ploughing and seeding	600
Seed	650
Fertilizer	5,500
Labour cost for harvesting	1,000
Other cost (Food and drink)	550
Tax	200
Total production cost/ha	12,900
Volume produced per hectare (qt)	6.98
Total production cost/qt	1,848.14

Source: Own computation from survey, 2021/2022

The mean productivity of teff was 6.98 qt/ha and its cost was 1,848.14 ETB per quintal which were reported by sampled households rental value of land was imputed by taking in to account the prevailing rents in the study area per hectare per year of teff.

Table 13: Marketing cost for different marketing agents (ETB/qt)

Marketing Cost (ETB/qt)	Producers	Rural collectors	Wholesalers	Processors	Retailers
Sack price/					
packaging material	15.5	10	15	-	9.5
Loading and unloading	10	10	7.6	12	10
Processing	-	-	-	254	-
Transportation	15	10	14.75	10	-
Storage	-	-	10	-	8.6
Permanent and temporary workers	12	1.5	30	20.2	-
Tax	-	2.4	20.5	15.6	-
Telephone cost	2.5	1	10	7.8	6.2
Other cost	6.5	1.5	7.4	54.8	12
Total	61.5	31.4	104.2	374.4	46.3

Source: Own computation from survey, 2021/2022

Marketing margin

Marketing margin is a measure of the chance of price paid by the consumer that's maintained by each agent in the marketing chain. These include the total gross marketing margin, producer's gross marketing margin, and net marketing margin. Still, it may also describe price differences between other points in the marketing chain, for illustration, between producer and noncommercial, or noncommercial and retail prices. Thus, for this section of the study, marketing margin is analyzed by considering the average deals prices of different actors in the Teff market channel and considering margin and cost computation for Teff marketing channels.

Table 14: Teff marketing margin for different channels (Birr/qt)

	GMMp	GMMrc	GMMwh	GMMpr	GMMr	TGMM
I	100					0
II	95.3				4.7	4.7
III	87.97			12.03		12.03
IV	89.7		7.5		2.8	10.3
V	83.19		8.66	8.145		16.81
VI	79.72	6.06	6.06	8.145		20.28
VII	82.76		17.24			17.24

Source: Own computation from survey, 2021/2022

Where GMMp, GMMrcoll, GMMwh, GMMpr, GMMr and TGMM means gross marketing margin for producers, rural collectors, processors and total gross marketing margins respectively.

As depicted in Table 14 above, total gross marketing margin (TGMM) is loftiest in channel VI which reckoned for 20.28% and followed by VII and V, which accounts for 17.24% and 16.81% respectively and it was smallest in channel II (4.7%). Producers share (GMMp) was loftiest in channel II which regard 95.33% from the total consumer's price and smallest in channel VI and VII which is 79.72% and 82.76%, respectively. This result shows as the number of marketing agents decreases the producers partake increases and vice versa. This is due to the reason that the advanced number of mediators in the commodity market, the further profit they retain for their services.

Out of this total gross marketing margin, wholesalers had taken the loftiest margin which is 39.46%. Rural collectors had smallest chance of gross margin compared to others which is 6.06%. The remaining 7.5% and 28.32% is the gross marketing margin of retailers and processors respectively.

The results also shows that the maximum gross marketing margin from traders was taken by wholesalers, which accounts 17.24% of the consumer's " price in channel VII and followed by processor which was 12.03% in channel III. This implies share of market interposers in the consumer's price was substantial and there was a need to reduce market interposers to minimize

the marketing perimeters and thereby enhance the producer's " income. The minimal gross margin is taken by retailer which was 2.8% in channel IV.

4.4.2 Profitability Analysis

With respect to profitability of teff Table (15) below depicted gross gains for all channels linked in Shebel Berenta district. The results showed that teff producers gross profit was highest when they direct sell to consumers in channel I which is 3,319 birr/ qt and processors in channel III which is 3,269 birr/ qt while take the smallest profit when they direct sell to rural collectors in channel VI which is 2,719 birr/ qt. this implies that producers are more profitable if they sold to consumers and retailers. Comparing traders with respect to gross profit, wholesalers have loftiest profit than other traders, which reckoned for birr 757.1 birr/ qt as they buy from producer in channel VII and they sold to outside market. Rural collectors gained the alternate loftiest profit of 318.8 birr/ qt from channel VI when they buy from producer and sold to wholesaler. Teff processors made a profit of 245.6 birr/ qt on channel III and 103.7 birr/ qt for retailers in channel IV. This implies that wholesalers and rural collectors were entered the loftiest remuneration from teff retailed in the study area while retailers took the lowest gains shares from teff value chain (Table 15).

In general, all market channels are advantaged and there's positive profit for all teff market actors. Indeed if there's positive gross profit for teff traders, the profit participated between them isn't similar. The study indicated actuality of big price and cost difference among actors redounded difference in benefit share. Thus, the performance of teff market in Shebel Berenta district is characterized as inefficient.

Grounded on the result of performance analysis of teff market in the study area, it's insolvable to say that the teff market is effective. According to the study, inimitable cost and profit share among teff market chain actors are the pointers of market inefficiencies. Thus, the performance of teff market in Shebel Berenta district is characterized as inefficient.

Table 15: Teff marketing margin and profitability analysis (ETB/q)

Actors		I	II	III	IV	V	VI	VII
Producer	production cost	1819.5	1819.5	1819.5	1819.5	1819.5	1819.5	1819.5
	Total cost	1881	1881	1881	1881	1881	1881	1881
	Selling price	5200	5100	5150	4800	4800	4600	4800
	Gross profit	3319	3219	3269	2919	2919	2719	2919
Rural collector	Total cost						4631.2	
	Selling price						4950	
	GPrC						318.8	
Wholesaler	Total cost				4904.2	4904.2	5054.2	5042.9
	Selling price				5200	5300	5300	5800
	GPwh				295.8	395.8	245.8	757.1
Processor	Total cost			5524.4		5674.4	5674.4	
	Selling price			5770		5770	5770	
	GPpr			245.6		95.6	95.6	
Retailer	Total cost		5,146.3		5,246.3			
	Selling price		5350		5350			
	GPr		203.7	245.6	103.7			
TGP	Birr		203.7	245.6	399.5	491.4	660.2	757.1

Source: Own computation from survey, 2021/2022

4.5 Econometric Result

Test for multicollinearity: The mean VIF among independent variables is 1.3 and each continuous independent variable has VIF of less than 5. This indicates absence of serious multicollinearity problems among regressed variables (Appendix Table 1).

Test of heteroscedasticity: heteroscedasticity tests were performed using Breusch-Pagan test for heteroskedasticity and there was problem of heteroskedasticity in data set because of (chi2 (1) = 14.74, Prob > chi2 = 0.0001) (Appendix Table 2).

Oaxaca blinder decomposition model

This model allows for the quantification of the contributions of the explanatory variables to the productivity differential for male and female headed household. In the absence of an advantage to any particular group, the expected values for the coefficients for each group must be the same. Therefore, the only source for observed yield differences between groups should be based on differences in characteristics.

Blinder-Oaxaca decomposition	Number of obs	=	98
	Model	=	linear
Group 1: female = 0	N of obs 1	=	15
Group 2: male = 1	N of obs 2	=	83
Explained: $(X1 - X2) * b1$			
Unexplained: $X2 * (b1 - b2)$			

Table 16: Results of Oaxaca Blinder Decomposition model

productiv	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
overall						
group_1	6.7	0.71	9.50	0.000	5.36	8.14
group_2	7.02	0.24	29.03	0.000	6.55	7.5
difference	-0.2728	0.75	-0.36	0.716	-1.74	1.2
explained	0.95	4.31	0.22	0.825	-7.48	9.4
unexplained	-1.22	4.24	-0.29	0.773	-9.57	7.12
explained						
EDUC	-2.22	4.3	-0.52	0.604	-10.63	6.2
CRD	-0.89	0.7	-1.30	0.194	-2.21	0.45
NOXW	2.83	1.22	2.32	0.020**	0.44	5.23
LBOUR	0.4	0.38	1.02	0.31	-0.356	1.14
TPEXP	-1.9	0.8	-2.44	0.015**	-3.53	-0.38
FREQEXT	2.69	1.5	1.80	0.071*	-0.24	5.62
INFERT	-0.12	0.19	-0.59	0.553	-0.49	0.27
IMPSEED	-1.17	0.54	-2.17	0.030**	-2.22	-0.11
CROPR	0.204	0.61	0.34	0.737	-0.98	1.4
SIZEFL	1.2	0.77	1.53	0.126	-0.33	2.7
unexplained						
EDUC	2.76	5.79	0.48	0.634	-8.6	14.11
CRD	1.28	0.78	1.64	0.100	-0.25	2.82
NOXW	-9.55	3.13	-3.05	0.002***	-15.69	-3.42
LBOUR	-3.07	2.27	-1.35	0.176	-7.53	1.38
TPEXP	5.65	2.05	2.76	0.006***	1.64	9.66
FREQEXT	-7.32	3.59	-2.03	0.042**	-14.38	-0.26
INFERT	-0.74	1.28	-0.58	0.564	-3.24	1.76

IMPSEED	3.15	1.46	2.17	0.030**	0.30	6.01
CROPR	-0.413	2.32	-0.18	0.859	-4.97	4.15
SIZEFL	-2.008	2.32	-0.87	0.386	-6.55	2.53
_cons	9.02	3.57	2.53	0.012	2.02	16.023

Source: Own survey result 2021/2022.

The decomposition results do not offer a causal effect of the covariates on productivity, it allows us to delve deeper into how different factors contribute to the gender gap.

As shown in the above table it can be seen that the total teff productivity difference between the two groups was about -27.18% in favor of the male headed household. It implies that male headed households are 27.18% more productive than female headed household. The results also showed that 95.35% of this difference is accounted for by the explained difference (endowment effect), which defines that part of the gender gap due to the differences in average characteristics. While -122.66% of this difference is the unexplained/structural (portion due to differences in returns) effect. The result was relatively confirmed with Bacha (2018) in their study of gender differences and its effect on agricultural productivity in the case of yubdo district in west wollega zone oromia national regional state Ethiopia.

The detailed decomposition — in Table 16, the estimates indicates that how important each factor contributes to or reduces the difference. Positive measure widens the gap while a negative measure reduces the gap. For the explained gender gap which accounts for utmost of the difference, the factor which contribute significantly to widening it are number of oxen owned and frequency of extension contact. The descriptive statics reported in table 6 shows that higher proportion of males had advanced number of oxen compared to that of their women consorts. And there are statistically significant factors that reduce the gap. Teff production experience and improved seed reduces the gender gap significantly at 5% probability level. This indicates that these factors contribute about the same returns to productivity for men - and women- households.

Considering the unexplained part of the gender gap, teff production experience and improved seed widening the gender gap at 5% probability level significantly. In addition to this number of oxen owned and frequency of extension contact reduces the unexplained gap significantly at 1% and 5% probability level respectively.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary and Conclusion

The study examined on analyzing value chains of teff. The specific objective of the study include mapping the value chain of teff, analyzing performance of teff market participant and assessing impact of gender gap in teff productivity in the study area. Both quantitative and qualitative types of data were used to address the specified objectives. The data were collected from both primary and secondary sources. The primary data used in this study were collected from 98 teff producers (83 MHH and 15 FHH) and 30 traders, 6 processor and 14 consumers from the district through an interview.

Descriptive statistics and econometric model (Oaxaca blinder decomposition model) were used to analyze the data collected from teff value chain actors. Descriptive statistics was used to identify teff value chain actors and their role, to analyze performance of teff market participant. Independent t-test was used to test the differences between MHH and FHH in terms of continuous variables and χ^2 -test for categorical variables. Moreover, Cobb Douglas production function and Oaxaca blinder decomposition model was estimated to measure productivity difference between MHH and FHH.

The results of descriptive statistics showed that, FHH were found to have relatively lower access to extension service, teff production experience, amount of credit used than MHH. With respect to socio- economic characteristics of household heads, greater proportion of females had lower levels of education compared to that of their male spouses. The mean number of oxen owned of male was 2.6 while 1.7 was female. The mean size of land owned by MHH and FHH were 1.5 and 1.1 respectively.

The result of Teff value chain analysis of the study areas revealed that the main direct value chain actors involved were input suppliers, teff Producer, rural 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 Office of Shebel Berenta District Agriculture and Rural Development (OSBWARD), Cooperative agency, trade and marketing development office.

About seven different market channels of teff were identified in the study area. The Total gross marketing margin (TGMM) is highest in channel VI which accounted for 20.28% and followed by VII and V which accounts for 17.24% and 16.81% respectively and it was lowest in channel II (4.7). Producer's share (GMMp) was highest in channel II which account 95.33% from the total consumers' price and lowest in channel IV 79.72%, respectively. Among teff traders wholesalers have got the highest gross marketing margin (17.24%) from all traders whereas retailers have got the lowest marketing margin (4.7%). In general, all market channels are advantaged and there is positive profit for all teff market participants. Even if there is positive gross profit for teff traders, the profit shared between them is not comparable. The study indicated existence of big price and cost difference among actors resulted difference in benefit share. Therefore, the performance of teff market in Shebel Berenta district is characterized as inefficient.

The OB decomposition model result shows that the study further suggests that men's productivity of teff was 27.28% higher than that of women's. For the explained gender gap the factor which contributes significantly to widening it are number of oxen owned and frequency of extension contact. Teff production experience and improved seed reduces the gender gap significantly at 5% probability level. Considering the unexplained gap, teff production experience and improved seed widening the gender gap significantly at 5% probability level and number of oxen owned and frequency of extension contact reduces the unexplained gap significantly at 1% and 5% probability level respectively.

5.2. Recommendations

The teff productivity of men headed and woman headed households was affected by different factors in the study area and unstable profit and cost element among actors in the district makes teff market inefficient. Based on the result of the study and serious issues linked in the study, the following points need to be considered as possible policy implications in order to increase the productivity of growers in general and that of women growers in particular and to increase market competitiveness in the study area.

- ✓ As the result the market performance in the study area is inefficient. Hence, there's a need to enhance teff producers' logrolling power through establishment of cooperatives and

resolve the walls to entry to market so as to enable implicit traders to enter into the teff market, which ameliorate the competitiveness of the market.

- ✓ There's also a need of government or other stakeholders ‘‘ intervention to strengthen the relation of teff market actors through training and fiscal supports.
- ✓ Strengthening the relation/ commerce among value chain actors, there's a need to change the outlook of actors, by developing ground rules that will bind the relationship between producers and traders.
- ✓ Positive stations toward cooperation, commerce, networking and literacy need to be developed among main actors in the value chain. So the chain actors should work in an intertwined way to ameliorate product and to strengthen sustainable market relation in the study areas.
- ✓ In additions to this, organizing (freely) traders and producers and establish trusting and strong trade agreements between the two institutions is pivotal to minimize illegal price created by brokers. With a strong relationship between traders and producers.
- ✓ Policies need to take into account differences in morals, markets, and institutions more astronomically in order to increase the productivity of women growers in the study area.

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7. APPENDICES

Appendix Table 1: Test of Multicollinearity for Explanatory Variables

Variables	VIF	1/VIF
NOXW	1.57	0.635132
INFERT	1.37	0.729945
SIZEFL	1.70	0.589034
TPEXP	1.11	0.901035
FREQEXT	1.33	0.749597
EDUC	1.23	0.810488
LBOUR	1.10	0.910366
IMPSEED	1.14	0.875310
CROPR	1.30	0.770245
CRD	1.15	0.870094
Mean VIF	1.30	

Source: Own computation from survey result, 2021

Appendix Table 2: Test of Heteroscedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Variables: fitted values of productiv

chi2 (1) = 14.74

Prob > chi2 = 0.0001

Source: Own computation from survey result, 2021

Questionnaires

**HOUSEHOLD SURVEY QUESTIONNAIRE ON VALUE CHAIN ANALYSIS OF TEFF,
THE CASE OF SHEBEL BERENTA DISTRICT, EAST GOJJAM ZONE OF AMHARA
REGIONAL STATE OF ETHIOPIA**

1. General Information

1.1 Questionnaire number: _____

1.2. Name of the enumerator: _____ Signature: _____ Phone
number _____

1.3. Date: _____/_____/_____

1.4. Name of Kebele _____

1.5. Name of the village _____

2. Household Characteristics

2.1. Name of household head _____

2.2. Sex of household head; 1= Male 0= Female

2.3. Age of household head _____ years

2.4. Education level of household head 0.illiterate 1.adult education 2.primary 3.secondary

2.5. Marital status of the household head; 1. Single 2.Married 3.Divorced 4. Widows

2.6. How many family members in the household

Male _____

Female _____

7. How many of your family members do permanently work on farm? _____

3. Production

3.1. Total land holding owned _____ (ha)

A. Total land hired in _____ (ha)

B. Cultivated area _____ (ha)

C. Land allotted for teff _____ (ha)

3.2 .When did you started teff production (teff farming experience) _____ (years)

3.3. Have you used agricultural inputs (improved seeds, chemicals and inorganic fertilizer) for teff production? 0. Yes 1. No

3.4. What Type of inputs and from which source did you get such agricultural inputs? (Multiple responses are expected).

Type of inputs	Sources	How
Improved seed	1.local market	1.Through purchase
Pesticides/herbicides	2. fellow farmers	2.On credit bases
Fertilizers	3. cooperative	3. As gift
Farm implements and others	4.district office of agriculture (specify)	4.Through exchange (specify)

3.5. If Q3.3 is yes, how much did you use? _____ kg

3.6. Did you rotate crop? 0. Yes 1. No

3.7. Do you have your own oxen? 1. Yes 0. No

3.8. If Q7 is yes, how many oxen do you have? _____

4. Access to credit services

4.1. Do you have access to credit? 1. Yes 0. No

4.2. Have you received formal credit in 2021/22 E.C? 1. Yes 0. No

4.3. If Q2 is yes, how much did you take? _____

4.4. If Q2 is yes, for what purpose you used? 1. Farm inputs purchase. 2. Livestock purchase
3. Household consumption 4. Land rent. 5. Purchase of plough oxen 6 = Purchase of agricultural
inputs 7=Others (Specify) _____

4.5. From where did you get the credit service? 1. Cooperatives 2. Micro finance 3 .NGO
4. Local money Lender 5. Saving and credit Association 6. Others (specify) _____

4.6. If Q2 is no, why? 1.High interest rate 2.you are self sufficient 3.Lack of Collateral
4. Fear of inability to repay 5. No service 6.others specify_____

4.7. What was the precondition to get credit? 1. Membership 2. Personal guarantee 3. Land
holding 4. Collateral 5.Partial payment 6. Others (specify) _____

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

4.9. If Q8 is yes, what is the nature of your credit problem(s)? 1. Inadequacy of credit 2. High
interest rates 3.Restrictive procedures 4. Unfavorable repayment 5. Absence of
informal sources 6. Few supplies 7. Others (specify) _____

5 Extension Services

5.1. Did you have an extension access in 2021/22? Yes =1 No=0

5.2. If yes, how often the extension agent contacted you specifically for teff production,
frequency of contact? (Total number of visit per year)_____?

5.3. What type of extension service did you get? 1=Use of fertilizer 2=Natural resource
advice 3=Animal production advice 4=Use of credit 5=Home economics 6=Use of
insecticides/herbicides 7=others (specify)

5.4. What are your sources of finance for purchase of agricultural inputs? 1=Crop sales
2=livestock sales 3=Off-farm activities 4=Credit 5=others

6. Marketing aspect

6.1. What is the total amount of teff you sold in 2021/22? _____qt.

6.2. To whom did you sold? 1. Direct to consumers 2. To wholesalers 3. To rural collectors 4. To processors 5. To retailers

6.3. What was the price per Kg in 2021/2022? _____ Birr/Kg.

6.3. Where do you sell/ market place? 1= within village 2=Outside village 3= within district 4= Outside district 5=others

6.4. Do you have constant customer? 1= Yes, 0= No

6.5. Do you sell your teff produce at credit? 1= Yes, 0= No

6.6. Do you have any linkage with traders? 1= Yes, 0= No

6.7. If your answer is yes, why you are made linkage with traders? 1= to negotiate price 2= to determine price 3= transfer information

QUESTIONNAIRE DEVELOPED FOR TRADER

Checklist for traders (Wholesalers, rural collectors, retailers, processor)

1. Demographic Characteristics

1.1 Name of traders: _____ Tel: _____

1.2 Age: _____

1.3. Sex: 1. Male 2. Female

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

1.5 Country _____ Religion _____ District _____ Kebele _____

1.6 Family Size: Male _____ Female _____ Total _____

1.7 Type of traders: 1. Wholesaler 2. Retailer 3. Rural collector 4. Processor

1.8 Education level of respondent _____

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

1.10 How long have you been operating the business? _____ (year).

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

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

1.13 Total Number of people employed in your business? 1. Male _____ 2. Female _____
Total _____

2. Capital

2.1. How much your initial working capital when you started the business? _____Birr

2.2. How much was the amount of your working capital in 2022? _____ Birr

2.3. What was the source of the working capital? 1. Own 2. Loan 3. Gift
4.Share 5. Others (specify) _____

2.4. If it was loan, from whom did you borrow? 1. Relative/family 2. Other traders
3. Friends 4. Private money lender 5. Banks

2.5. What was the reason behind the loan? 1. To build store 2. To purchase a car
3. For working capital 4. Others (specify) _____

3. Purchase practice

3.1. How much amount of teff did you purchase In 2022? _____qt.

3.2. How much was the purchased price? _____Birr/Kg

3.3. How much amount of teff did you sold In 2022, _____qt.

3.4. How much was your selling price? _____Birr/kg

3.5. What was the main reason for your teff choice to purchase? 1. High supply 2. High
demand 3. High selling price 4. Long storage life 5. Others
(specify) _____

3.6. Who purchase teff for you? 1. Myself 2. Friends 3. Through brokers
4. Family members 5. Commission agent 6. Others_____

3.7. If you used brokers and commission men, what was the advantage of using them?
1. You could get enough quantity 3. Reduce transaction cost 5. Save your time 2. You could
get quality teff 4. Purchased at low price 6. Other (specify)_____

3.8. 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)_____

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

3.10. How did you attract your supplier? 1. By giving better price relative to others
2. By fair scaling (weighing) 3. Other (specify)_____

3.11. How did you attract your buyers? 1. By giving better price relative to others 4.
By giving credit 3. By fair scaling 2. By providing Quality teff 5. Other
(specify)_____

3.12. Who were your major buyers? 1. Wholesalers 3. Retailers 5. Urban
assembler 2. Millers/processors 4. Urban consumers 6. Gov't organizations 7.
Others_____

3.13. How is your usual purchasing price compared to your competitors?
1. Higher 2. Lower 3. The same

3.14. If it was higher in Q. 13 what was the main reason? 1. To attract more supplier 2.
To buy more quantity 3. To get better quality teff 4. To kick out your competitor
from the market 5. Others (specify) _____

3.15. Who set your purchasing price? 1. Myself 2. The seller 3. By market 4.
Negotiation with suppliers (

3.16. Is there longstanding r/ship between traders and suppliers (farmers)? 1= Yes 0=No

3.17. Do you provide premium price for your permanent suppliers? 1= Yes 0= No

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

3.19. If Q17. is yes for what purpose you pay premium price for suppliers? _____

3.20. 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 _____

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

3.22 If traders are transporting using Isuzu trucks, how many quintals can they transport in one load? _____ Quintals

3.23. What are the major problems in transporting? _____

3.24. Did you pay tax for the teff you purchase and sell? 1. Yes 2. No

3.25. If yes how many you pay per year? _____

4. Cost

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

Cost of Marketing	Cost per unit in birr
Packing cost	
Loading/unloading cost	
Transportation cost	
Storage cost	
License and tax	
Cost of temporary workers	
Processing cost	
Wage for permanent employee	
Telephone Cost	
Other costs (specify)	

5. Market Information

5.1. How do you get market information (source)? From: 1. Other traders 3. Cooperatives 5. Radio 2. Brokers 4. Newspaper 6. Telephone 7. Others (specify)_____

5.2. To whom do they transfer this information? _____

5.3. How often do traders get market information? _____

5.4. What problem do you have during trading?

6. Value addition

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

6.2 If your answer for Q1 Yes 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)	

6.3.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
Farmer trader					
Rural collector					
Wholesaler					
Retailer					
Processor					
Consumer					