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Market Chain Analysis of Teff Production in Abeshege Woreda of South Ethiopia

Tsegamariam Dula[1] Abeba Sewunet[2]
1. Department of Agricultural Economics, Wolkite University, College of Agriculture and Natural Resource, Ethiopia
2. Department of Horticulture, Wolkite University, College of Agriculture and Natural Resource, Ethiopia
Corresponding author: Tsegamariam Dula, Department of Agricultural Economics, Wolkite University, College of Agriculture and Natural Resource, PO Box. 07, Wolkite, Ethiopia; Tel: +251910063096
Email: tsegamariamd@gmail.com

Abstract
This research attempted to analyze the market chain of teff in Abeshege woreda of South Ethiopia specifically assessed, the Teff marketing participants, their roles and linkages in Abeshege Woreda and analyzing the determinants of teff supply. Primary data were collected from160 teff producers and 43-grain traders based on two-stage random sampling method. Multiple linear regression models were employed to estimate the determinants of teff supply. The results of the study indicated that out of the total teff produced by sample farmers, 86.2% of teff were marketed. Urban assemblers, regional wholesalers, and regional retailers bought 40%, 37.4% and 16.5% of the teff marketed respectively. Dere lafto sample market was inefficient, characterized by the oligopolistic market structure. The major barrier to entering into the market was a shortage of capital. Licensing and years of trading experience did not hinder entry into teff trading activities. Moreover, the markets were overwhelmed by information asymmetry with the low degree of market transparency. Although trading of teff is profitable across all sample farmers and traders, problems like oligopolistic market structure and information asymmetry made the trading business uncompetitive and inefficient. Among the different variables hypothesized to determine the supply of teff, the econometric result showed that four variables such as quantity produced, access to market information, access to extension service and sex of the household head significantly affected the volume of teff supplied to the market. Moreover, three variables namely quantity produced, access to credit and price of other (pepper) crop significant at 1%, 5% and 10% respectively affected the volume of teff supplied to the market. As hypothesized, all variables took a sign as expected. The study recommends providing policies that improve teff production capacity by identifying new technologies create stable demand for surplus production would enhance farmers' decision in marketable surplus. Strengthening Institutions that convey reliable and timely market information required by all market participant. Strengthening the existing extension system through training in a way to serve grassroots level producers in all aspect is important. The number of farmers and traders who accessed credit is very limited; therefore, financial institutions should design a mechanism to address the challenges of financial access to smallholder farmers and traders. Eventually, policies that strengthen the bargaining power of cooperative are vital in order to reduce the market inefficiency created due to oligopolistic nature of the market structure.
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1. Introduction

Cereals are the most important food crop in the world and it provides the world with a majority of its food calories and about half its protein. They are stapled foods in the diets of the most population. In the year 2007, 2029 million metric tons of cereals were produced globally from 658.5 million hectares of land with an average productivity of 30.83 quintals per hectares. According to (FAO STAT, 2007), the world cereal production in the year 2007 was increased by 4.8% from previous year production. In the same year, Africa's contribution to the world output was 6.35% (about 133.1 million tons).

In Ethiopia, Cereal production and marketing are the means of livelihood for millions of smallholder households and it constitutes the single largest sub-sector in the economy. Cereal accounts for roughly 60% of rural employment, 80% of the total cultivated land, more than 40% of a typical household's food expenditure, and more than 60% of total caloric intake. The contribution of cereals to national income is also large. According to available estimate, cereal production represents about 30% of gross domestic product (GDP). This calculation follows from the fact that agriculture is 39% of the nation's GDP (World Bank Growing Africa, 2013), and that cereals contribute to agricultural GDP is 65% (Diao X., 2007). Maize, teff, wheat, sorghum, finger millet, and barley are the leading cereals crops grown in the SNNPR. Based on the report of (AWARDO, 20021), Hadiya, Guraghe, Kembata Tembaro, Siltie zones and Abeshege woreda is the major cereal producing areas in the region.

Although the region has ample production potential and market access, it has never reaped the opportunity as it would suppose to exploit.

Abeshege is one of the woredas in the south of Ethiopia. The woreda is endowed with favorable climatic and natural resource conditions that can grow diverse annual and perennial crops required for household consumption and the market. Despite the fact that, the woreda produces agricultural products based on rain-fed, the presence of two perennial rivers, Billate and Didjo, can boost the production through irrigation. According to (AWARDO, 2020), the major cereals crops grown in the woreda include maize, teff, wheat, sorghum, and finger millet. Production of teff by smallholder farmers of the woreda is mainly for the market next to red pepper which is the most important and widely known cash crop of the area. The production is mainly subsistence and there are years surplus is produced and also drought years. According to (CSA, 2017), the land area covered by teff in the woreda was 8665.8 hectares. The woreda produced 93,164.6 and 71,356.7 quintals of teff. The productivity of teff in the woreda (10.75qts) is slightly lower than the national average (11.67qts) and higher than the regional average.

In Ethiopia, small-scale subsistence farmers dependent on low input, rain-fed mixed farming agriculture dominated with traditional technologies account for about 95% of the output (Pender, J., et al., 2004). Agricultural cultural production and productivity are very low and the growth in agricultural output has barely kept pace with human population growth. This small-scale subsistence agriculture remains by far the most important sector in the Ethiopian economy and directly supports about 85% of the population in terms of employment and livelihood (Hassen R., 2006).

Agricultural marketing is a very important factor in economic development and lack of a well-functioning agricultural market and marketing system severely hinders the increase of social welfare, income distribution, and food security of developing countries. Moreover, markets and marketing system do not develop simultaneously with economic growth. Markets and marketing system should be organized deliberately to enable economic development (Wolday, Amha, 1994).

Therefore, (Kohl, R.L. and Uhl, J.N., 1985) without modern marketing system, including communications, transportation, storage facilities and financial arrangement this is not possible. The efforts of increasing agricultural production and productivity have to be accompanied by a well-performing marketing system which satisfies consumer demands with the minimum margin between producers and consumer prices. Higher prices for a producer can encourage farmers to adopt new technologies, increase production (Wolday, Amha, 1994). However, there are external and internal problems that influence the marketing efficiency in Ethiopia. This has to do with lack of pertinent market information, development of marketing institutions and marketing infrastructure such as storage, transportation etc. However, marketing aspects of only red pepper and haricot bean were undertaken by (Rehima Musema, 2006) while leaving the marketing of teff, which has potential production volume and marketability, unresolved.

Moreover, there is a need to employ a market chain approach to fully understand and resolve the problem of teff at all levels. Yet there is no such study which tries to look into the whole spectrum of marketing chain of these crops and determinants of their supply in Abeshege Woreda. This makes the undertaking of market chain analysis of teff in the Woreda imperative. This study is designed to address the prevailing information gap on the subject and contribute to the proper understanding of the challenges and assist in developing improved market development strategies to benefit of smallholder farmers, traders, and other market participants. The overall objective of this study was to investigate the market chain of teff in Abshege woreda; the specific objectives of the study are the following; To investigate Teff marketing participants, their roles and linkages in Abeshege Woreda. To assess the determinants of marketed supply of teff in the woreda.

2. Research Methods

2.1. Description of the Study Area

Abeshege woreda is one of the rural woredas of SNNP located about 155km south of Adiss Abeba along the Adiss Abeba to Jimma asphalt highway and 233 km south west of Hawassa city (Regional capital of SNNP). The woreda is bounded in the north, south, and west by Oromia regional state and in the east by Cheha woreda and Kebena woreda. The absolute location of the study area extends 80 **27'30'' N to 380 10' 50'' E.**

2.2. Sample Size and Sampling Techniques

Primary data: its source were smallholder farmers randomly selected from four different rural kebeles, farmers service cooperative association (Union) and traders at different levels ranging from farmer traders to regional level wholesales. The data have been collected formally by the method of the individual interview using a pre-tested semi-structured interview schedule questionnaire and informally through focus group discussion with key informants using checklists.

Secondary data: these data were collected reviewing documents of secondary sources namely Abeshege woreda office of agriculture and rural development, office of small-scale trade and industry, tax office and

woreda marketing agency, Central Statistical Authority (CSA), Bureau of Agriculture and Rural Development, and Bureau of Finance and Economic Development of south Ethiopia. Beside relevant published and unpublished reports the researcher browsed websites, and bulletins to generate relevant secondary information focusing on teff production and marketing.

One of the most significant issues investigators has to consider when designing a project concerns the type and number of the respondents who will be included in the study. Sampling enables the researcher to study a relatively small number of units in place of the target population and to obtain data that are representative of the whole target population (Sarantakos, S. (2007).

An important decision that has to be taken while adopting a sampling technique is about the size of the sample. Appropriate sample size depends on various factors relating to the subject under investigation like the time aspect, the cost aspect, the degree of accuracy desired, etc (Rangaswamy, R., 1995). If the sample is too small, it might be difficult to achieve the objectives of analysis. But if it is too large, it may result in resource wastage when dealing with the sample. Sample error will arise because of not studying the whole population. Whenever sampling, it is usual to miss some helpful information about the population (Kothari, C. R., 1990) & (Levin, Richard I., 1989). The higher the desired precision or the level of confidence, the larger (more costly) will be the sample (STARR, R. (1983). Sampling theory is of little help in arriving at a good estimate of the sample size in any particular situation.

A two-stage sampling procedure was used to select the rural kebeles and sample households. In the first stage, out of the 26 rural kebeles of Abeshege woreda 12 rural kebeles were selected purposively, based on the relative better production potential of teff, and from these potential teff producing four (4) kebeles were selected randomly. Before selecting household heads to be included in the sample, teff grower household heads of each rural kebele were identified in collaboration with experts in the department of grain production and protection of Woreda, kebele leaders, key informants and development agents of the respective rural kebele. In the second stage, 80 farm household heads were selected from identified teff growers' lists using systematic random sampling technique taking into account probability proportional to the size of teff growers in each of four selected rural kebeles.

Contrary to farmers, the sampling of traders is not an easy task for the researcher; this might be due to the nature of their mobility and the complexity of the work. But it was tried as much as possible to capture all possible level of representative while doing questionnaire pre-test, rapid market appraisal (RMA), as well as collecting data. The total sample size of traders was 43. The teff traders were selected using systematic random sampling. In addition to regional and rural markets, following the roots of teff market chain, traders from terminal market such as Hawassa, welkite and weliso were also selected using systematic random sampling technique. The sample included licensed and unlicensed market participants. The trader's study focused on all market segments of teff and wheat market. Moreover, while doing pre-test and RMA, the trader fixed the date at which the final formal interview with traders who are selected based on systematic random sampling technique would be held and in doing so the data was collected. All these procedures, made collecting data from traders much extended, time consuming and tiresome.

2.3. Types and Method of Data Collection

The interest of obtaining reliable information from farmers and traders in survey is an issue to be given top priority. Smallholder farmers and traders will show little cooperation unless their concerns are taken care of very seriously. In order to gain their trust, the respondents were carefully informed about the objectives of the survey and the direct and indirect benefits from the research. For farmers, in this regard, chair-persons of the respective rural kebeles were first approached and efforts were made to convince them of the objectives of the study. Farmers and traders were also informed that information related to household and farm characteristics would be kept confidential.

Firstly, the farmers' interview schedule was tested at the farm level on 8 randomly selected farm households. In the light of pre-testing, essential amendments were made on such things as ordering and wording of questions and coverage of the interview schedule. Furthermore, the pre-test enabled to know whether farmers had clearly understood the interview schedule. As a result, some questions were deleted or otherwise overlooked due to language problem but those found important were incorporated in the final version of the interview schedule. After pre-testing and prior to the final administration of the interview schedule, enumerators were given training and briefings on the objective, contents of the interview schedule and were also acquainted with the basic techniques of data gathering and interviewing techniques and on how to approach farmers. Then using the amended structured interview schedule, primary data were collected by using personal interview technique from sampled farmers. The interview schedule was administered by using trained enumerators. In order to increase the reliability of the survey data and to reduce technical and linguistic problems at the farm level; the researcher (author) spent much of his time with enumerators during all survey days. At last, to fill gaps observed during

personal interviews, focused group discussions were conducted with a group of farmers in each selected rural kebeles.

Regarding trader respondents, independent interview schedule questionnaire was designed to collect data and enumerators who were working as the data collector in the site for CSA were recruited and trained on basic data collection principles. During the course of field visit in the study area, the interview schedule questionnaire was tailored to all market conditions. The semi-structured formal interview guidelines were written up in the form of a formal interview schedule questionnaire.

Before collecting traders' data, the interview schedule questionnaire was pre-tested. This entailed the further revision of these lists to make sure that important issues had not been missed. Eventually, the survey was made formally interviewing randomly selected traders using the pre-tested semi-structured questionnaire in the marketplace where traders are located. Furthermore, an informal survey in the form of rapid market appraisal (RMA) technique was employed using checklists for a trader to obtain additional supporting information for the study. The discussion was made with key trading figures and agricultural and other relevant experts from the government offices. RMA was made independently for each group before and parallel with trader questionnaire survey.

2.4. Methods of Data Analysis

In these study, two types of data analysis, namely descriptive statistics and econometric analysis were used for analyzing the data collected from teff producers and traders.

Descriptive statistics; This study applied ratios, percentages, means, and standard deviations in the process of examining and describing marketing services, household characteristics, the role of intermediaries; market and trader characteristics, the structure of production costs, profitability, and major constraints and opportunities of production and supply.

Inferential statistics; in this study, a multiple linear regression model was fitted to survey data to generate information about determinants of teff supply. However, before fitting important variables into the multiple regression models, multicollinearity problem among continuous variables and associations among discrete variables were checked, which seriously affects the parameter estimates. Based on the literature, the teff supply model to be estimated in this study would take the following form

$Yi = Xi\beta + Ui$

Where Yi=market supply of teff

Xi = a vector of the explanatory variable, and 'i'is 1, 2, 3… n

Ui = unobserved

β= coefficient of the Ith independent variable

Factors affecting market Supply; (Tomek, W.G. and K.L. Robinson. 1972) & (Robinson, K.L. 1972) suggested that careful definitions of terms are essential. Total supply in a specific period may depend not only on current production but also on carryover stocks and imports. It is not possible to include an exhaustive set of variables that could affect the household level of marketable supply of the product. But, in this particular study, an attempt was made to estimate determinants of marketable supply of teff production in Abeshege woreda. In the course of identifying factors influencing teff supply, the main task is to analyze which factor influences and how? Hence, potential variables which are supposed to influence the quantity of teff supply need to be explained. Accordingly, the main variables expected to have an influence on the quantity supply of teff are explained.

However, before fitting important variables into the multiple regression models, it is necessary to test the multicollinearity problem among continuous variables and check associations among discrete variables, which seriously affects the parameter estimates. According to (Gujarati, D.N., 2003) indicates, multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because existing strong relationship between them. In other words, multicollinearity is a situation where explanatory variables are highly correlated. There are two measures that are often suggested to test the existence of multicollinearity. These are the Variance Inflation Factor (VIF) for association among the continuous explanatory variables and Contingency Coefficients (CC) for dummy variables. Thus, variance inflation factor (VIF) is used to check the multicollinearity of continuous variables. As R2 increase towards 1, it is a collinearity of explanatory variables. The larger the value of VIF, the more troublesome or collinear is the variable Xi. As a rule of thumb if the VIF greater than 10 (this will happen if R2 is greater than 0.80) the variable is said to be highly collinear (Gujarati, D.N., 2003). Multicollinearity of continuous variables can also be tested variables were identified based on economic theories and the findings of different empirical.

The main hypothesized variables expected to influence the marketable supply of teff in the study area are explained in the following manner:

Dependent Variable: Quantity Supplied (QT_SUPP): It is a continuous variable which represents the dependent variable; the amount of teff actually supplied to the market by household in the year 2017/18 which is measured in quintals.

The Independent Variables: The following explanatory variables were hypothesized to influence the marketable supply of teff in the study area.

Lagged price (PRC-LAG): The variable market price of the product (teff) was measured in Birr per quintal. (Tomek, W.G. and K.L. Robinson. 1972) & (Robinson, K.L. 1972) argued that the product price has direct relations with marketable supply and hence it was expected to affect the household marketable supply of teff positively in such a way that prices of 2006/07 can stimulate the production of teff and thus marketable supply for 2007/08.

Quantity produced (QUANPROD): It is an economic factor and continuous variable that can affect the household level marketable supply and measured in quintals per hectare. The variable is expected to have a positive contribution in the smallholder marketable supply of teff as (Tomek, W.G. and K.L. Robinson. 1972) & (Robinson, K.L. 1972) argued, quantity produced is assumed to affect the marketable supply positively because a farmer that obtains high yield can supply more to the market than a producer who had fewer yields.

Size of landholding (FARM SIZE): This variable was a continuous variable measured in terms of the number of hectares allocated to teff and was expected to affect the household level of teff or wheat marketable supply positively (Tomek, W.G. and K.L. Robinson. 1972) & (Robinson, K.L. 1972). This is because producers who own large area holding can produce more than producers who own less area and thus to supply more to the market.

Family size (FAM-SIZE): It is a continuous variable measured in adult equivalent (Storck R, CJ Alexopoulos, HJ Phaff (1991) i.e., the availability of active labor force in the household, which affects farmer's marketable supply. Since production is the function of labor, availability of labor assumed to have the positive relationship with the volume of supply. However, family size is expected to have a positive impact on the volume of sales, but the larger family requires a larger amount for consumption which reduces the marketable surplus. A study revealed that marketed surplus of buffalo milk to be negatively related farm family size. However, a study conducted by (Rehima Musema, 2006) identified that family size has a significant positive effect on the quantity of teff marketed and negative effect on the quantity of maize marketed. From this context, family size is expected to have a positive or negative impact on the volume of sale.

Extension service (EXT_SRV): The variable extension service has been measured as a dummy taking the value of 1 if teff producing household head has contacted with a development agent (DA) and 0 otherwise. An extension is expected to have the positive effect on the volume of marketable supply of teff through its stimulation of production and productivity. Farmers that have frequent contact with DAs will have better access to information and could adopt better technology that would increase their marketable supply of teff.

Access to credit (CRED_ACC): Access to credit was measured as a dummy variable taking the value of 1 if the teff producing farmer had access to credit and 0 otherwise. This variable is expected to influence the marketable supply of teff positively on the assumption that access to credit improves the financial capacity of teff producing farmers to buy modern inputs, thereby increasing production which is reflected in the marketable supply of teff.

An education level of HHH (EDU-LEV): This variable was measured using formal schooling of the household head and hypothesized to affect marketable supply positively. It has taken dummy values 1 if the household head attended any formal education and 0 otherwise. This is due to the fact that a farmer with good knowledge can adopt better practices than illiterate that would increase marketable supply. (Holloway, J.A., 1999) Argued that education had the positive significant effect on the quantity of milk marketed in Ethiopian highlands.

Access to market information (MKT-INFO): This is measured as a dummy variable taking a value of 1 if teff producing farmer had access to market information and 0 otherwise. The general idea is that maintaining a competitive advantage requires a sound business plan. Again, business decisions are based on dynamic information such as consumer needs and market trends. This requires that an enterprise is managed with due attention to new market opportunities, changing needs of the consumer and how market trends influence buying (CIAT), (2004). Here, market information has been hypothesized to affect teff marketable supply of farm households positively. Because producers that have access to market information are likely to supply more teff to the market. Goetz (1992) noted that better market information significantly raises the probability of market participation for potential selling households.

Crops (HOR-PRICE): it is a continuous variable that can affect the marketable supply and measured in birr per quintal. An increase in the price of other crops produced on the farm is expected to have the negative effect on the marketable supply of teff. In this case, the price of pepper was taken as a variable since it is important and potential substitute crop grown in the study area.

Age of household head (AGE): It is a continuous variable and measured in years. This may be the fact that age is a proxy measure of farming experience of the household. Aged households are believed to be wise in resource use, and it is expected to have a positive effect on the marketable surplus

Sex of the household head (SEX): In the mixed farming system, both men and women take part in crop production & management. Generally, women contribute more labor input in the area of land preparation, planting, weeding, harvesting and sale of teff. However, obstacles, such as lack of capital, and access to institutional credit, access to extension service, may affect women's participation and efficiency in teff production. Therefore, it is not possible to tell a prior about the likely sign of the coefficient of sex in sales volume.

Table 1: Description of dependent and independent variables used in the model

Variables	Explanation	Category	Value
QT-SUPP	Quantity supplied	Continuous	Quintal
Independent variables			
PRC-LAG	Lagged Market price	Continuous	Birr
QUANPROD	Quantity produced	Continuous	Quintal
FARMSIZE	Size of land holding	Continuous	Hectare
FAM-SIZE	Family size of HHH	Continuous	Man equivalent
EXT-SRV	Access to extension service	Dummy	0=no 1=yes
CRED-ACC	Access to credit	Dummy	0=no 1=yes
EDU-LEV	Education level of HHH	Dummy	0=no 1=yes
MKT-INFO	Access to market Information	Dummy	0=no 1=yes
HOR-PRICE	Price of other crops	Continuous	Birr
AGE	Age of the HHH	Continuous	Number of years
SEX	Sex of the HHH	Dummy	0=female 1=male

3. RESULTS AND DISCUSSION

This chapter summarizes the major findings of the study. Both descriptive statistics and econometric analysis were used to analyze the primary data. Descriptive statistics were employed to describe the demographic characteristics of sample farmers and traders. Moreover, the cost structure and profitability of teff production and marketing support services, structure, conduct, and performance were studied to measure efficiency. Econometric analysis was used to identify factors affecting the supply of teff in the study area.

3.1. Access to markets and other services

Access to different services has an important contribution to improving production and productivity and thereby increasing marketable surplus and ultimately for increasing the income of smallholder farmers. The most important services that are expected to promote the production and marketing of teff in the study area include proximity to markets, access to credit, access to extension service, and access to market information.

Proximity to markets: Regarding the distance taken to travel from home to the nearest marketplace where they sold their product, sample teff producing farmers reported that they had to travel an average of 57.13 minutes with corresponding standard deviations of 29.12 minutes. The minimum and the maximum distance that sample teff producing respondents had to travel to access nearest market centers were 10 minutes.

Access to market information: The amount of marketable surplus primarily depends on access to market information and the willingness and ability of farmers to use the information. The role of market information in the decision-making process is to reduce risks and uncertainties related to market and enable farm households to make the right decision in sales and price of the product produced and inputs used in the production process. Access to market information is extremely limited in the Ethiopian grain market. At the producer level, farmers have very limited information on price prevailing even in nearby markets (Wolday, Amha, 19940).

It is assumed that producers and traders with access to market information can make the better decision on how much to produce and market. However, there was no organized market information system to support farmers in the study area. According to Table 6, about 90% of teff producing sample households revealed that they search the price information of the nearby market before they sold their product. About 6.25% of teff producers had obtained price information from the central market before selling their produce.

Table 2: Farmers' access to price information

Variable	N=80
Nearby market information (yes, %)	90
Central market information (yes, %)	6.25
Sources of information	
Traders (%)	93.05
Billboard (%)	2.78
Brokers (%)	1.39
Telephone (%)	2.78

Sample respondents were also asked the source of the price information. About 93.05% of the teff producing sample households revealed that they obtained price information from traders. Besides traders, respondents indicated that brokers, the mobile telephone and billboards displayed in the marketplace with the support of IPMS were information sources contributing to less than 7% of price information obtained for teff producing farmers (Table 2)

Access to credit: Access to credit is one way of improving smallholder farmers' production and productivity. Farmers' ability to purchase inputs such as improved seed and fertilizer is tied with access to credit. Farmers with access to credit can minimize their financial constraints and buy inputs more readily than those with no access to credit. Thus, it is expected that access to credit increases the production of agricultural crops in general and teff and wheat in particular. In the study area, access to credit is influenced by the availability of cash on hand. Farmers access to credit from formal (banks, MFI, and cooperatives) and informal sources (Iqub, traders' friends, relatives and money lenders).

Government institutions and NGOs also provide credit to farmers. The Woreda Office of Agricultural and Rural Development and farmers' service cooperatives were organizations that distribute improved seed and fertilizer on credit, but they require down-payment as a condition to provide credit. Thus, only those farmers who can pay the required down-payment can benefit from input credit service of the government. On the other hand, farmers who cannot pay the down-payment would be devoid of the opportunity.

Table 3: Access to credit and extension services

Variables	N=80	N=80
Credit support (yes, %)		16.25
Amount taken (birr)		292.43(980.48)
Extension contact (yes, %)		33.75

In the study area, input credit was made available to farmers through the woreda office of Agriculture and Rural Development and Service Cooperatives. Table 7 shows that only 16.25% of teff producing farmers reported that they had access to credit while the remaining majority (83.75% of teff producing sample respondents) reported that they had no access to input credit that can be used to buy improved seeds and fertilizer.

Access to extension services; Access to agricultural extension services is expected to have the direct influence on the production and marketing behavior of the farmers. The higher access to the extension service, the more likely that farmers adopt new technology and innovation. To this end, the government has been attempting to fill the required knowledge and achieve food self -sufficiency in the country by placing in each Kebele administration three development agents (DAs) and building a farmer training center (FTC). The kebele level development agents are the most important sources of extension services to transfer agricultural technologies and innovations to farmers. The effort to disseminate new agricultural technologies is influenced by the efficiency of communication between the development (change) agent and the farmers at the grassroots level.

Table 3 depicts that out of the total respondents of teff producing sample households, only 33.75% of teff producers had access to extension services provided by development agents of the Woreda Office of Agriculture and Rural Development. The remaining 66.25% of teff producing sample households responded that they did not receive any extension services from development agents. The result of this study questions the efficiency and effectiveness of the government extension program.

3.2. Production, storage and marketing of teff

Following red pepper, the production of teff is the main source of cash for farmers in the study area. Production of teff in the study area is a rain-fed with only once in a year harvest.

Table 4: Area cultivated, production and productivity of teff

Variables	N=80
Area cultivated (ha)	0.83(0.61)
Quantity produced per HH(qt)	6.18(5.26)
Productivity per ha (qt)	7.63(2.41)
Amount marketed per HHH (qt)	5.33(4.69)

Table 4 depicted that the average land allocated for the production of teff by sample teff producing respondents was 0.83 hectare with corresponding standard deviation of 0.61 hectares. The minimum and maximum land allocated by sample respondents to the production of teff was 0.125 hectare and it was 0.02 hectares production, respectively. The average quantity of teff produced per sample households was 6.18 quintals but the average productivity of teff per hectare was 7.63 quintals (Table 4).

3.3. Teff marketing participants, their roles and linkages

In this study, different stakeholders were involved in bringing teff from the point of production (farm gate) till it reached the final destination (consumers). According to the data obtained market participant identified in the transaction process of teff in the study area include farmers/producers, farmer traders, urban assemblers, regional wholesalers, retailers, processors (millers, flour mill) and commission agent. The market participants involved in different activities (wholesale, retail, assembly etc), in the study area were categorized into different categories.

Producers/farmers: these are marketing agents who participate both in production as well as marketing of surplus commodities they produce. As the same time, they transport teff to the nearest markets (village market) or regional markets by themselves, either using pack animals, or animal driven carts, or else medium-size Isuzu trucks, over an average distance of 57 minutes by teff producers. They had several options to sell their product, selling directly or selling through the broker to assemblers (rural and urban assemblers) and regional wholesalers. Alternatively, they sell to village assemblers known as "farmer traders" who assemble teff from a large number of farmers. Farmers also sell their products directly to regional wholesalers in regional markets. Some of the farmers in the sample also sold their teff to the consumers in the regional market. Village markets are markets which are closest to farmers' resident, having less marketing facilities such as road, electricity, potable water etc. Farmers sell the smaller quantity of teff on such markets. Whereas regional markets are surplus markets that are found in the woreda town where most of the surplus agricultural products are transacted. Contrary to regional markets, deficit markets that are found in larger towns where most surplus products are flown termed as Terminal markets.

Farmer trader/rural assemblers: Farmer traders/rural assemblers are farmers or part-time traders in the assembly markets who used to buy the small quantity of teff from farmers in village markets during the slack period for the purpose of reselling it to consumers or regional wholesalers in either in the rural or regional market. They use their financial resources and their local knowledge to buy teff from the surrounding area.

Urban assembler: The assemblers play important role in the system of assembly. They consolidate the produce of individual farmers to produce and prepare it for marketing. Assemblers not only know the areas of surplus well but also speak the local language well. They also relieve their customers of the burden of quality by controlling the small quantities of teff typically offered by farmers. On the market days early in the morning, they took money from regional wholesalers to buy the product so that they transfer the purchased product to the trader who already delivered them money on the same market day. Although regional wholesalers are the main customers of urban assemblers, they also sell the product to retailers and consumers.

Brokers: these are agent middlemen who facilitate trades (buying and selling) between farmers and traders (wholesalers, urban assemblers, retailers), but does not usually physically handle products. These agents are not permanent brokers rather their main economic activity is farming during the production season of the year. These intermediaries play important role in bringing farmers of their home residence to sell their marketable surplus to the trader whom they undertook their brokerage activity. Brokers obtain their reward based on the amount they facilitate transaction usually 10 to 20 birr per market day.

Wholesalers: Wholesalers are major market participants of the marketing system who usually buy teff of larger volume than any other actors in the marketing system and resell the products to urban retail merchants and processors than ultimate customers. Wholesalers reside in woreda market town and purchase teff either through the broker or directly from farmer or farmer trader or urban assemblers. Commodities bought from different sources put together in one place (store) to be processed so that uniformity of the product will be attained. Moreover, the processed commodities will be supplied to the deficit terminal markets (Adiss Abeba, Weliso,) for sale either directly or through commission agents to the buyer.

Retailers: these market actors are located at the end of the marketing chain, directly servicing the ultimate consumers of the marketing system. They perform numerous marketing functions such as buying, processing, storing, selling and other functions related to marketing. Based on their location of existence are classified as regional and urban retailers

Regional retailers: these are market actors in the final link of the market chain and reside on the woreda town. They buy the teff from farmers' customer directly or through the broker in the market and on their purchasing and selling verandahs on the days other than the market days.

Urban Retailers: Retailers are persons or company that sells the commodity to end users (consumers and processors). They reside in the terminal market and buy the product either from wholesalers or urban assemblers or regional retailers. Terminal market retailers are characterized by owning verandahs on which buying and reselling functions are undertaken. Besides buying and selling urban teff retailers particularly residing at Adiss Abeba often provide processing and grinding services to consumers as they own miller and processor.

Commission Agents: agent middlemen who physically handle products for buyers and sellers and paid for the service they delivered per quintal bases usually 2 to 3 birr per quintal both from buyer side as well as the seller. They reside in terminal markets and do not invest their own capital. They often disseminate price and

other information to the market participants and play a key role in influencing teff transaction and price information mainly in terminal markets of Adiss Abeba, Wolkite, and Weliso.

Cooperatives: these are farmers' service cooperative associations that supply agricultural inputs to farmers in a time of production and buy farmers' agricultural output at harvest. Although existing service cooperatives received enough credits from Bureau of the regional rural fund with interest rate of 1.5 percent, they are not efficient enough in terms of timely provisions of agricultural input, buying of their harvested products and financial management. The existence of farmers personnel with poor educational background are not fitting to manage the large volume of fund released from the region.

3.4. Determinants of teff market supply

In the study area, production of teff is mainly for market and is important cash commodities next to red pepper. Data collected from sample respondents indicated that 86. 2% of teff produced in the year were supplied to the market. According to the survey report, all sample respondents of the two commodities were potential market suppliers during the survey period. Several variables are hypothesized to influence the volume of market supply of teff by sampled producers. There are several determinants that influence farmers' marketable supply. Different researchers described these determinants depending on the purpose of their study and listed relevant variables to be considered.

In this study the independent variables thought to have relationship with marketable supply of teff are described as sex of the household head, age of the household head, family size, quantity produced, farm si ze, lagged price, access to credit, access to market information, price of other crops. Prior to running the OLS regression model, all the hypothesized explanatory variables were checked for the existence of multi-co linearity problem.

The study used Variance inflation factor (VIF) to investigate the degree of multi-collinearity among continuous explanatory variables and contingency coefficient (CC) among discrete (dummy) variables. A statistical package known as SPSS12 was employed to compute the VIF and CC values. The result of values of VIF for teff ranges from 1.563 and 1.885. Likewise, the values of CC for teff ranged from 0.708 to 0.713 and. Hence, multi-co linearity was not a serious problem both among the continuous and discrete variables.

The overall goodness of fit of the regression model is measured by the coefficient of determination (R2). It tells what proportion of the variation in the dependent variable, or regress and, is explained by the explanatory variable. R 2 lies between 0 and 1, the closer it is to 1, and the better is the fit. Hence, the overall model goodness of fit represented by model count R2 for teff is very good that are 99.5 indicating that 99.5% of teff sample households were correctly predicted out of 80 sample household heads of the commodity.

Econometric results of the OLS model

Estimates of the parameters of the variables expected to determine the marketable supply of teff displayed in Table 5. For teff producers, among a total of 11 explanatory variables (8 continuous and 3 dummy) included into the econometric model only four variables were found to significantly influence the marketable supply of teff positively. These are sex of the household head, the quantity of teff produced, access to market information and access to extension services. The remaining seven variables were found to have no significant effect on the marketable supply of teff.

Sex of the household head (SEX): since both men and women take part in production and management of crops, previously the likely sign of the coefficient of sex on sales volume was not hypothesized. However, sex of the household head influenced the marketable supply of teff positively and statistically significant at 10% significant level. The positive sign implies that if the household is male headed the probability of teff to be marketed increased by 47.6%. This can be explained by the fact that males have relatively better labor (ME) advantage to produce and supply more volume. Secondly, males are subjected to different expenditure. The need of cash for expenditure made them to supply a higher volume of teff to the market. Earlier study by (Gujarati, D.N., 2003) also revealed that sex of the household head is one of the factors that affect the probability of marketable supply of poultry positively in Alamata and Atsbi- womberta woredas of Tigray.

Quantity of teff Produced (QUANPROD): as hypothesized the multiple linear regression output variable was significant at 1% significant level, a positive coefficient implies that an increase in the quantity of teff produced increases the volume of marketable supply of teff by farmers. It indicates that households who produce more quantity of teff had also supplied more to the market. The result shows that a one quintal increase in the teff production causes a 0.803 quintal increase in the volume of marketable supply of teff. This is in agreement with previous studies conducted by (Wolday, Amha, 1994), (Wolelaw, S., 2005), (Rehima Musema, 2006), (Kindei Aysheshm, 2007), (Bosena Tegegne, 2008), and (Assefa Abebe, 2009), found that the amount of grain, rice, red pepper, sesame, cotton and honey respectively, produced by household affected marketable supply of each of the commodities significantly and positively.

Table 5: OLS estimation results of determinants of teff

Variables	Coefficient	Standard error	t-ratio	P – value
Constant	-2.365	1.801	-1.313	0.201
SEX	0.476	0.238	1.999	0.384
AGE	0.009	0.011	0.833	0.413
EDU-LEV	0.035	0.034	1.041	0.308
FAMISIZE	0.052	0.067	0.770	0.419
FARMSIZE	0.173	0.188	0.919	0.367
QUANPROD	0.803	0.050	15. 967	0.000***
PRLAGGED	0.004	0.004	0.887	0.057*
HOR-PRC	-0.010	0.017	-0.588	0.575
CRD-ACSS	-0.088	0.271	0.326	0.046**
ACCMKINF	0.504	0.239	2.106	0.747
EXT-ACCS	0.424	0.227	1.870	0.074*

N=80 R2=99.5 Adj. R=99.3

***, **, and * show the value statistically significant at 1%, 5% and 10% respectively.

Access to market information (ACCMKINF): market information access is also another factor, which positively affects the quantity supply of teff at 5% significance level. The positive and significant relationship between variables indicates that as farmers accessed market information, the quantity of teff sold at the market also increases. The coefficient also confirmed that accessing market information to farmers will tend to increase the marketable supply of teff by 0.504 quintals. The implication is that obtaining and verifying information helps to supply more quantity of teff.

Access to extension (EXT-ACCS); Result of the finding indicated that access to extension service was positively and significantly related to the volume of teff supplied to the market at 10% significance level. On average, if a teff producer gets an extension to contact the amount of teff supplied to the market increases by 0.424 quintals.

This suggests that access to extension service avails information regarding technology which improves production that affects the marketable surplus. The result of this study goes along with the findings of many authors. For instance, (Yishak Gecho, 2005) (Rehima Musema, 2006), and (Gujarati, D.N., 2003) found that access to extension service on improved maize seed, red pepper, and improved haricot bean respectively affected the marketable supply of each of the commodities significantly and positively.

4. CONCLUSION AND RECOMMENDATION

The study was conducted in Abeshege woreda located about 155 km in South of Addis Ababa. The area is known for its surplus production of agricultural commodities. However, analysis of the market chain of agricultural crops in general and teff, in particular, are not well understood. The study attempted to investigate the marketing chain of teff in the area. Selection of the teff crops was mainly based on its relative importance and marketability. The study was conducted in order to identify production and marketing support services, structure-conduct-performance of the market, determinants of supply of teff in the area.

Production of teff in the study area is mainly for the market. Hence, the commodities are the important source of cash for smallholder farmers', following red pepper. Nationally, the area is known for its surplus production. In the area, the average land allocated for the production of teff per household was 0.83 and 0.67 hectares respectively. The respective average production of teff per hectare was 7.63 quintals. During the survey, it was observed that the majority of respondents do not clearly know the appropriate fertilizer and seed rate. Although fertilizer plays important role in increasing the production and productivity of agricultural crops, its application rate by sample respondents was below the research recommendation.

In the study area, during the year under the study, out of the total teff produced by sample farmers 86.2 % (80,308 quintals) of teff were supplied to the market. The remaining 13.8% of teff hold by farmers for consumption, repayment for borrowed seed and as the source of seed for the next production year.

The estimated farmer's average production cost per hectare was 1428.58 ETB for teff. The major costs incurred by the farmers in the study area in the order of importance for the production of teff were 21.4 % for land rent, 20.2% for fertilizer purchase and 10.6% for oxen rent. The average profitability of farmers per hectare from the production of teff was 1511.81 ETB.

Rain failure, higher cost of fertilizer and delayed delivery, soil erosion, labor shortage, lack of credit access, draft power, and prevalence of crop disease were some of the production problems faced by farmers. Besides, unfair pricing and weighing, lack of institutions providing market information, multiple taxes, high input prices and chemical herbicide adulteration were farmers marketing problems.

The study also identified the main marketing agents through whom teff was channeled from producer to final consumers, such as farmer traders, urban assemblers, wholesalers, regional retailers, urban retailers,

cooperatives, and NGOs. Accordingly, teff sample producers supplied 40% (32, 123.2 quintals) of their produce to urban assemblers, 37.4% (30,035.2 quintals) to wholesalers, and 16.5% (13,250.8 quintals) to regional retailers. Regarding structure of the market, the four firms concentration ratio (CR4), that is the share of the largest four wholesale traders in the total volume of teff purchased at Wolkite regional market, hold 65% and 71.5% of the total volume of teff purchased respectively, in the year 2007/08, indicating that Wolkite regional market has strong oligopolistic market structure.

A barrier to entry in terms of licensing and years of trade experience did not hinder entry into teff market, but capital requirement did. The market information system is not transparent between farmers and traders. However, all traders have information from different informal sources. Concerning the conduct of teff market, generally, trading is mainly on eye -appraisal and exchange take place on bargaining. Traders are highly mobile and purchased from different market per week. The average number of market visited per week by all traders was 1.43. The frequency of market visit by urban assemblers (2.25) was the highest of all traders followed by wholesalers (1.58).

Capital shortage, lack of credit access, poor product quality, lack of market information, market infrastructure, multiple taxations, transportation cost, lack of demand and unfair competition with unlicensed traders were some of the marketing problems faced by trader Results of econometric model indicated the relative influence of determinants of different variables on marketable supply of teff a in the study area. A total of eleven (8 continuous and 3 discrete) explanatory variables were included in the model for teff independently. Of the total 11 variables, four variables of the teff had shown a significant relationship with the marketable supply of teff. Accordingly, the quantity of teff produced, access to market information, access to extension and sex of the household head were found to have the positive and significant influence on a marketable supply of teff.

The contribution of teff to the household's nutrition, income, and food security is tremendous. It also provides job opportunities for youth and the landless and for traders and poor urban dwellers engaged in its processing activities. Regardless of its contribution, however, its production and productivity are still low compared to the world and regional average. As a result, the institutional support provided to the sector such as access to credit, market information, and extension services were below the expected level. These factors together with several household personal, demographic and socio-economic factors greatly affected the marketable supply of teff consequently the production and productivity of the sector. Based on the research findings of this study, the following points are recommended to improve the marketing chains of teff so as to enhance its production and productivity.

The wider range difference among farmers in the rate of fertilizer application and seeding rate per hectare and its deviation from recommended rate was found partly due to poor extension services as well as lack of financial capacity of farmers to apply fertilizer according to the recommendation. Therefore, provision of extension service has to be strengthened so as to improve farmers' access to information and extension advice through giving training and other related supports. Moreover, improving access to credit and reconsidering the existing. bureaucratic input administration procedure is also crucial to allow easy access to promote investment and trade. Furthermore, revisiting the previous research recommendations is highly important.

In addition to this as discussed in the descriptive part of the study, larger numbers of farmers have reported the existence of disease problem in the study area. The presence of crop diseases created frequent yield reduction in the sector and it affected the efficiency of production and hampered the supply development. In order to avoid the frequent reduction in output and increase supply, in short run, major diseases should be controlled by strengthening the present crop protection services through availing important chemicals required to prevent the disease at the reasonable price. In the long run, development of high yielding and disease resistant varieties is a solution to the prevalence of crop disease.

The enhancement of teff producers' bargaining power through cooperatives is the best measure that should target at reducing the oligopolistic market structure in the Abeshege regional market. The measure also favors the sustainable supply of teff at a reasonable price to consumers. A quantity of teff produced is one of the determinant factors that affect the volume of teff supplied to the market positively. Therefore, the policy proposed should focus on increasing the production and productivity of the sector. This could be partly achieved by identifying new technologies and management systems that would improve the production and productivity of the crops. Creating a stable demand for surplus production would also enhance farmers' decision on teff production consistently.

The result of this study has shown that access to market information affected the quantity of teff supplied positively and significantly. Farmers in the study area do not get timely market information upon which to base their marketing decision. They depend on traders and other farmer friends for price information. Therefore, there has to be an institution that can convey reliable and timely market information required from all stakeholders simultaneously. This would make the marketing system to operate efficiently and harmoniously. The availability of timely and precise market information increases producers' bargaining capacity to negotiate with buyers of their produce. In order to obtain this advantage, there is a need to improve extension system which focused on

market extension and linkage of farmers with markets is necessary to ensure a reliable market outlet for producers of the study area.

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