

OPEN ACCESS



Journal of  
**Development and  
Agricultural Economics**

February 2019  
ISSN 2006-9774  
DOI: 10.5897/JDAE  
[www.academicjournals.org](http://www.academicjournals.org)



**ACADEMIC  
JOURNALS**  
expand your knowledge

# About JDAE

The Journal of Development and Agricultural Economics (JDAE) is a peer reviewed journal.

The journal is published monthly and covers all areas of development and agriculture economics.

## **The Journal of Development and Agricultural Economics is indexed in:**

[CAB Abstracts](#) [CABI's Global Health Database](#) [China National Knowledge Infrastructure \(CNKI\)](#)  
[Dimensions Database](#) [Google Scholar](#) [Matrix of Information for the Analysis of Journals \(MIAR\)](#)  
[Microsoft Academic](#) [ResearchGate](#) [the Essential Electronic Agricultural Library \(TEEAL\)](#)

## **Open Access Policy**

Open Access is a publication model that enables the dissemination of research articles to the global community without restriction through the internet. All articles published under open access can be accessed by anyone with internet connection.

The Journal of Development and Agricultural Economics is an Open Access journal. Abstracts and full texts of all articles published in this journal are freely accessible to everyone immediately after publication without any form of restriction.

## **Article License**

All articles published by Journal of Development and Agricultural Economics are licensed under the [Creative Commons Attribution 4.0 International License](#). This permits anyone to copy, redistribute, remix, transmit and adapt the work provided the original work and source is appropriately cited. Citation should include the article DOI. The article license is displayed on the abstract page the following statement:

This article is published under the terms of the [Creative Commons Attribution License 4.0](#) Please refer to <https://creativecommons.org/licenses/by/4.0/legalcode> for details about [Creative Commons Attribution License 4.0](#)

## **Article Copyright**

When an article is published by in the Journal of Development and Agricultural Economics, the author(s) of the article retain the copyright of article. Author(s) may republish the article as part of a book or other materials. When reusing a published article, author(s) should;

Cite the original source of the publication when reusing the article. i.e. cite that the article was originally published in the Journal of Development and Agricultural Economics. Include the article DOI  
Accept that the article remains published by the Journal of Development and Agricultural Economics (except in occasion of a retraction of the article)

The article is licensed under the Creative Commons Attribution 4.0 International License.

A copyright statement is stated in the abstract page of each article. The following statement is an example of a copyright statement on an abstract page.

Copyright ©2016 Author(s) retains the copyright of this article.

### **Self-Archiving Policy**

The Journal of Development and Agricultural Economics is a RoMEO green journal. This permits authors to archive any version of their article they find most suitable, including the published version on their institutional repository and any other suitable website.

Please see <http://www.sherpa.ac.uk/romeo/search.php?issn=1684-5315>

### **Digital Archiving Policy**

The Journal of Development and Agricultural Economics is committed to the long-term preservation of its content. All articles published by the journal are preserved by [Portico](#). In addition, the journal encourages authors to archive the published version of their articles on their institutional repositories and as well as other appropriate websites.

<https://www.portico.org/publishers/ajournals/>

### **Metadata Harvesting**

The Journal of Development and Agricultural Economics encourages metadata harvesting of all its content. The journal fully supports and implement the OAI version 2.0, which comes in a standard XML format. [See Harvesting Parameter](#)

## **Memberships and Standards**



Academic Journals strongly supports the Open Access initiative. Abstracts and full texts of all articles published by Academic Journals are freely accessible to everyone immediately after publication.



All articles published by Academic Journals are licensed under the [Creative Commons Attribution 4.0 International License \(CC BY 4.0\)](#). This permits anyone to copy, redistribute, remix, transmit and adapt the work provided the original work and source is appropriately cited.



[Crossref](#) is an association of scholarly publishers that developed Digital Object Identification (DOI) system for the unique identification published materials. Academic Journals is a member of Crossref and uses the DOI system. All articles published by Academic Journals are issued DOI.

[Similarity Check](#) powered by iThenticate is an initiative started by CrossRef to help its members actively engage in efforts to prevent scholarly and professional plagiarism. Academic Journals is a member of Similarity Check.

[CrossRef Cited-by](#) Linking (formerly Forward Linking) is a service that allows you to discover how your publications are being cited and to incorporate that information into your online publication platform. Academic Journals is a member of [CrossRef Cited-by](#).



Academic Journals is a member of the [International Digital Publishing Forum \(IDPF\)](#). The IDPF is the global trade and standards organization dedicated to the development and promotion of electronic publishing and content consumption.



[COUNTER](#) (Counting Online Usage of Networked Electronic Resources) is an international initiative serving librarians, publishers and intermediaries by setting standards that facilitate the recording and reporting of online usage statistics in a consistent, credible and compatible way. Academic Journals is a member of [COUNTER](#)



[Portico](#) is a digital preservation service provided by ITHAKA, a not-for-profit organization with a mission to help the academic community use digital technologies to preserve the scholarly record and to advance research and teaching in sustainable ways.

Academic Journals is committed to the long-term preservation of its content and uses [Portico](#)



Academic Journals provides an [OAI-PMH](#)(Open Archives Initiatives Protocol for Metadata Harvesting) interface for metadata harvesting.

# Contact

Editorial Office: [jdae@academicjournals.org](mailto:jdae@academicjournals.org)

Help Desk: [helpdesk@academicjournals.org](mailto:helpdesk@academicjournals.org)

Website: <http://www.academicjournals.org/journal/JDAE>

Submit manuscript online <http://ms.academicjournals.org>

Academic Journals  
73023 Victoria Island, Lagos, Nigeria  
ICEA Building, 17th Floor, Kenyatta Avenue, Nairobi, Kenya

# Editor

**Dr. Siddhartha Sarkar**

A.C. College of Commerce  
Jalpaiguri  
India

# Editorial Board Members

**Dr. Austin O. Oparanma**

Rivers State University of Science and  
Technology  
Port Harcourt,  
Nigeria.

**Dr. Henry de-Graft Acquah**

Department of Agricultural Economics and  
Extension  
School of Agriculture  
University of Cape Coast  
Cape Coast,  
Ghana.

**Dr. Benjamin Chukwuemeka Okoye**

National Root Crops Research Institute  
Umudike,  
Nigeria.

**Dr. Bamire Adebayo Simeon**

Department of Agricultural Economics  
Faculty of Agriculture  
Obafemi Awolowo University  
Nigeria.

**Silali Cyrus Wanyonyi**

Yatta School of Agriculture  
Nairobi,  
Kenya.

**Dr. Edson Talamini**

Federal University of Grande Dourados - UFGD  
Cidade Universitária  
Dourados,  
Brazil.

**Dr. Munir Ahmad**

Pakistan Agricultural Research Council  
Islamabad,  
Pakistan.

**Dr. Harris Neeliah**

Sustainable Agri-Food Systems  
Mauritius.

# Editorial Board Members

**Dr. U. Arabi**

Mangalore University  
Department of Economics  
Mangalagangothri  
India.

**Prof. Nejat Erk**

Cukurova University  
Faculty of Economics and Administrative  
Sciences  
Dept of Economics  
Adana, Turkey.

**Dr. Gbadebo Olusegun Odularu**

Forum for Agricultural Research in Africa  
Accra,  
Ghana.

**Dr. N. Rangasamy**

National Institute of Agricultural Marketing  
Jaipur,  
India.

**Dr. Kursat Demiryurek**

Ondokuz Mayıs University  
Faculty of Agriculture  
Department of Agricultural Economics  
Samsun, Turkey.

**Dr. Daniel Solis**

Agribusiness Program - CAFS  
Florida A&M University  
Tallahassee, FL  
USA.

**Prof. Subhan Qureshi**

NWFP Agricultural University  
Livestock Management Department  
Peshawar,  
Pakistan.

**Muhammad Sohail Mazhar**

Australian Centre for International Agricultural  
Research  
Sargodha,  
Pakistan.

**Dr. Farhad Mirzaei**

National Dairy Research Institute  
Department of Livestock Production and  
Management  
Karnal,  
India.

**Dr. Farhad Mirzaei**

National Dairy Research Institute  
Department of Livestock Production and  
Management  
Karnal,  
India.

**Dr. Murat Yercan**

Department of Agricultural Economics  
Ege University  
Izmir,  
Turkey.

**Dr. Benjamin Chukwuemeka Okoye**

National Root Crops Research Institute  
Umudike,  
Nigeria.



# Editorial Board Members

**Dr. Henry de-Graft Acquah**

Department of Agricultural Economics and  
Extension

School of Agriculture

University of Cape Coast

Cape Coast,

Ghana.

# Table of Content

<b>Determinants of rural households' participation in microfinance services: The case of Cheliya District, West Shoa Zone, Oromia National Regional State, Ethiopia</b>	24
Tadele Erena Geleta, Alealign Ademe Mengistu and Solomon Amsalu Gesese	
<b>Sesame post-harvest loss from small-scale producers in Kafta Humera District, Ethiopia</b>	33
Desale Gebretsadik, Jema Haji and Bosena Tegegne	
<b>Market chain analysis of potato and factors affecting market supply in West Gojam Zone, Ethiopia</b>	43
Wondim Awoke and Desselgn Molla	

*Full Length Research Paper*

# **Determinants of rural households' participation in microfinance services: The case of Cheliya District, West Shoa Zone, Oromia National Regional State, Ethiopia**

**Tadele Erena Geleta<sup>1</sup>, Alealign Ademe Mengistu<sup>1</sup> and Solomon Amsalu Gesese<sup>2\*</sup>**

<sup>1</sup>Department of Agricultural Economics, College of Agriculture and Veterinary Science, Haramaya University, Ethiopia.

<sup>2</sup>Department of Agribusiness and Value Chain Management, College of Agriculture and Veterinary Science, Ambo University, Ambo, Ethiopia.

Received 24 October, 2018; Accepted 13 November, 2018

**In under developed countries, most of the poor people have limited access to formal financial services, including credit, savings, and insurance. The study was focused on the determinants of the rural households' participation in microfinance services in the study area. The study was conducted in Cheliya District, Oromia Regional State, Ethiopia. A total of 188 sample households were selected through stratified and simple random sampling techniques and interviewed using a structured questionnaire to elicit data pertaining to participation in microfinance services during the year 2017. The data were analyzed using descriptive statistics and logistic regression model. Logistic regression model was used to analyze determinants of the rural households' use of service in microfinance services. Accordingly, the outcome of the logistic model regression indicated that household heads' sex, education level, cultivated land size, livestock holding and frequency of extension contact positively and significantly affected the rural household's decision to involve in microfinance services; while dependency ratio affected their decision negatively and significantly. It is recommended that the microfinance institutions and other concerning bodies have to arrange the way in which households with high dependency ratio and illiterate can participate in microfinance services. Moreover, attention should be given by microfinance institution staffs and other government bodies to increase female involvement in microfinance services in the study area.**

**Key words:** Microfinance, household, participation, Cheliya, Ethiopia.

## **INTRODUCTION**

In developing countries, microfinance institutions have emerged as a financial institution with the aim of

providing small sized financial service to the poor who were in need of financial services but lack of access to

\*Corresponding author. E-mail: [solomon.amsalu@ambou.edu.et](mailto:solomon.amsalu@ambou.edu.et) or [somassoromo@gmail.com](mailto:somassoromo@gmail.com). Tel: +251 913 996 130.

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

formal commercial banks. The microfinance institutions provide small size of loans, saving, insurance services, money transfer and other relevant services to the target poor people who were excluded by conventional commercial banks due to lack of collateral requirements (Tolosa, 2014). In Ethiopia, many microfinance institutions have been established and have been operating towards resolving the credit access problems of the poor particularly to those participating in the small business (Melese, 2013).

The economy of Ethiopia is predominantly agriculture. The performance of the economy depends on the performance of the agricultural sector. Even though there is a little bit of growth in other economics activities, agriculture is one of the main sector for Ethiopia's economic growth and long-term food security. The stakes are high where 15 to 17% of the Government of Ethiopia's (GOE) expenditures are committed to the sector. Agriculture directly supports 72.7% of the population's livelihoods. It contributes 38.5% of Gross Domestic Product (GDP), and over 80% of export value (NPC, 2016).

The large number population in Ethiopia are rural households, and they have a low level of literacy. Majority of the farm community comprised of subsistence farmers who are not in a position to use high-quality seeds, sufficient fertilizers and improved farm land and limited access to credit. Because of this, small farmers generally characterized by low income, less saving and low capital formation. In line with this, the rural development is hindered due to lack of credits, weak infrastructure, and poor transport systems (Wolday and David, 2010; cited in Simon, 2016).

Lack of finance is one of the basic problems in Ethiopia. It hinders the productivity and income of both rural and urban households. Microfinance institutions are working to solve these problems through providing financial and non-financial services in the country. Moreover, these institutions contribute to reduce poverty and economic growth (Wolday, 2004). The concept of microfinance is not new in Ethiopia but, as an industry, it is a relatively new phenomenon. Traditionally, people have saved with and taken small loans from informal channels for unexpected events from the so-called *Iqub*, that is, an association of people having a common objective of mobilizing finance and distribute it to members through rotating and *Idir*, that is, a group or association insurance established and operated by the volunteer community (Bezabih, 2009).

Even though agriculture plays an important role in Ethiopia's economy, recently the sector receives less than 10% of financial services. Moreover, the rural economy of the county was dominated by low distribution of financial services. Although indicators of financial access and inclusion have improved over the past two decades in Ethiopia, recent estimates show that the country is yet to catch up with other developing countries

(World Bank, 2014).

Most of the poor people who are living in under developed countries have limited access to formal financial services, including credit, savings, and insurance. They instead rely on the informal financial services providers. This occurred due to the formal financial service providers have not considered the poor as a viable market and penetration rates for formal financial services in developing countries are extremely low. Hence, the inability to acquire formal credit support has constrained poor farmers' capability to expand their production and improve technology adoption, nutrition and health status and their living condition (Bauchet et al., 2011).

Feleke (2011) finding result showed that the household's income is positively related to participation in microfinance services. Households participate in microfinance institutions in the expectation that borrowing will increase their earnings, smooth consumption, enhance their food security, sustain self-employment, reduce the risk of vulnerability and increase savings to strengthen the basis for human capital formation. Microfinance also enables households to mobilize and harness their resources and optimally exploit the opportunities available to them. Moreover, microfinance services contribute for the improvement of agricultural productivity by adopting productivity-enhancing inputs and modern farming techniques (Ziaul, 2014).

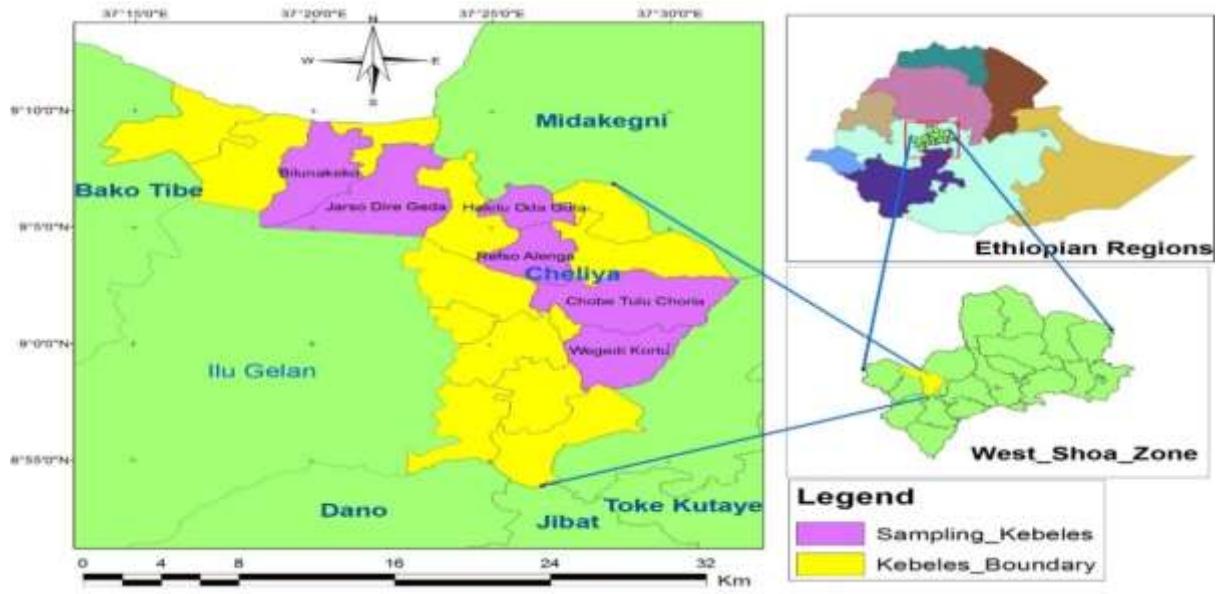
In Ethiopia, the poor households in the country remain with limited access to formal financial services. The majority of rural people and the poor farmers lack access to credit from modern financial institutions. Besides, formal financial institutions are inefficient and inaccessible in providing credit facilities to the poor (Sileshi, 2014).

In the study area, some studies have been conducted. Kebu (2017) studied focusing determinants of financial performance of microfinance institutions in the study area. Further, Birhanu (2016) investigated on the role of microfinance institutions in reduction of unemployment in the study area. However, these studies did not say anything about determinants of the rural households' participation microfinance services on rural households' in microfinance services of the study area. So that this study was focused on assessing determinants of the rural households' participation in microfinance services in the case of Cheliya district, West Shoa zone, Oromia national regional state, Ethiopia.

## RESEARCH METHODS

### Description of the study area

The study was conducted at Cheliya District, West Shewa Zone, Oromia National Regional State. The capital of the district, Gedo town is located at 175 km West of Addis Ababa on the main road to Nekemte. The district has 20 *kebeles* of which 18 are rural and two urban. The boundaries of the district adjoin MidaKegn district in the



**Figure 1.** Map of the Cheliya District.  
Source: OoA (2017).

north, Jibat and Dano districts in the south, Liban Jawi district in the east and Ilu Gelan and Jimma Rare district in the west. The total population of the district was estimated to be 104,448 of which 52,481 are males and 51,967 are females (Figure 1). Among these, about 89,523 are living in the rural areas, and about 14,925 are urban residents (OoA, 2017).

**Types, sources, and methods of data collection**

This study was conducted based on cross-sectional data obtained from both primary and secondary sources. Primary data were collected through face-to-face personal interviews using a structured questionnaire. Focus group discussion and key informant interview were also conducted to gather sufficient information and to capture relevant data from beneficiaries. The focus group discussion was carried out with clients of microfinance institutions.

Five focus group discussions involve 7 to 10 members in each group employed. Six key informants were also contacted with the staff members of microfinance institutions to get information about how the institution was operating in the area and about the opinion of the people towards the program intervention. On the other hand, secondary data were collected from secondary sources such as review of books, journal articles, unpublished study documents and other official reports, and internet sources.

**Sampling technique and sample size**

Cheliya district was selected purposively because of insufficient studies on the impact of microfinance service on rural households' income in the study area. For this study, both simple random and stratified probability sampling techniques were employed to select the sample of respondent households. First, among eighteen rural *kebeles* of the district, six rural *kebeles* were selected, using simple random sampling technique through lottery method. Then, households in the sample *kebeles* stratified into participants and non-participants. Finally, the sample size of the respondents was determined by using Kothari (2004) sampling design formula:

$$n = \frac{Z^2 pqN}{e^2 (N - 1) + Z^2 pq}$$

where n=sample size; N=total population (4332); Z=95%confidence interval under normal curve (1.96); e=acceptable error term (0.05) and P and q are estimates of the proportion of population to be sampled (P=0.5 and p + q= 1). 7% of error term (e=0.07) was used to take representative and cost-effective data for this study. Accordingly, the sample size for the study was determined as follows:

$$n = \frac{(1.96)^2 0.5 \times 0.5 \times 4332}{(0.07)^2 (4332 - 1) + (1.96)^2 \times 0.5 \times 0.5} \approx 188$$

Based on this formula, the total sample size was 188 sample household heads. Finally, from a total of 188 sample households, 94 participants and 94 non-participants were selected to get good matching in the propensity score matching estimation. Table 1 shows the households' distribution and sample size.

**Methods of data analysis**

Both descriptive statistics and econometric analysis were used to analyze the empirical data of the study. These tools are outlined and discussed in the following.

**Descriptive statistics**

Descriptive statistics such as mean, standard deviation, percentage and frequency of distribution were used to describe the socio-economic and demographic characteristics of the participant and non-participant groups. Chi-square and t-test were employed to test the statistical significance for both dummy and continuous variables, respectively.

**Table 1.** Distribution of sample households in *kebeles*.

Rural Kebeles	Participant		Non-participant		Total	
	N		Households	N	N	
Jarso Dire Geda	353	27	887	27	54	
Bilofi Keku	320	24	497	15	39	
Halelu OdaGuta	150	12	361	11	22	
Refso Alenga	200	15	364	11	26	
Chobi Tulu Cori	97	7	641	20	28	
Wegidi Kortu	120	9	342	10	19	
Total	1240	94	3092	94	188	

Source: Own Construction (2017).

### Econometric model

The logit model was used to identify and analyse determinants of the rural household participation in microfinance services in the study area. The mathematical formulation of the logit model is as follows:

$$pi = \frac{e^{zi}}{(1 + e^{zi})} \quad (1)$$

where P= the probability of participation for i<sup>th</sup> household and it ranges from 0-1, e = represents the base of natural logarithms (i.e., 2.718...), z<sub>i</sub>=is a function of n-explanatory variables which is also expressed as:

$$Z_i = \beta_0 + \sum \beta_i X_i + U_i$$

where i = 1, 2, 3, ..., n,  $\beta_0$ =intercept,  $\beta_i$ =regression coefficient to be estimated or logit parameter, U=a disturbance term, X<sub>i</sub>=participant households' characteristics,  $\beta_1, \beta_2 + \dots + \beta_n X_n$ =slope of the equation in the model, and Z<sub>i</sub>=clients' participation.

The probability that a household belongs to non-participant is:

$$1 - p = \frac{1}{1 + e^{zi}} \quad (2)$$

Therefore, the odds ratio can be written as:

$$\frac{pi}{1 + pi} = \frac{1 + e^{zi}}{1 + e^{-zi}} \quad (3)$$

Now, it is simply the odds ratio in favour of participating in microfinance services. It is the ratio of the probability that an individual would participate in the microfinance to the probability that he/she would not participate in the microfinance service. The odds ratio implies the ratio of the probability (Pi) that an individual would choose an alternative to the probability (1-Pi) that he/she would not choose it. Finally, taking the natural logarithm of the Equation 4 and the log of odds ratio can be written as follow:

$$L_i = \ln\left(\frac{pi}{1-pi}\right) = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \beta_n X_n + u_i \quad (4)$$

where  $p_i$  = is a probability of being participated in microfinance

and  $Z_i$  is a function of n explanatory variables ( $X_i$ ) which are also expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_n X_n \quad (5)$$

where  $\beta_0$  is an intercept,  $\beta_2, \dots, \beta_n$  are slopes of the equation in the model which is log of the odds ratio, which is not only linear in  $X_i$  but also linear in the parameters,  $X_i$  = Pre-intervention characteristics of the individual in the study area.

If the disturbance term ( $U_i$ ) is introduced, the logit model becomes:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 \dots + \beta_n X_n + U_i \quad (6)$$

### Variable definition and hypothesis

#### Dependent variable

The dependent variable was participation in microfinance services, which is a dummy variable indicating 1 for participant and 0 for non-participant households.

#### Explanatory variables

The explanatory variables are shown in Table 2.

## RESULTS AND DISCUSSION

It shows the descriptive statistical analyses on the demographic, socio-economic and institutional characteristics of sample households. The descriptive analysis further extended to discuss the participant and non-participant households concerning different explanatory variables. It also presents regression analysis using logistic regression to identify determinants of rural households' participation in microfinance services in the study area.

### Descriptive statistics results

Household's participation in microfinance services is

**Table 2.** Summary of the hypothesis of explanatory variables included in the model

Variable	Definition	Type	Measurement	Expected sign
Dependent variable	Participation	Dummy	"1" for participants and 0 otherwise	
AGEHH	Age of household head	Continuous	Year	+
SEX	Sex of household head	Dummy	1= male; 0 = female	+
EDL	Education level	Categorical	Level of education or year of schooling	+
CULS	Cultivated land size	Continuous	Hectare	+
FMSZ	Family size	Continuous	Number of families	+
VOSTOK	Livestock holding	Continuous	Tropical livestock unit(TLU)	+/-
OCCPHH	Occupation	Categorical	1= farmer, 2= Petty trader, 3=causal labourer, 4=employed and 5= hand crafter	-
DPCR	Dependency ratio	Continuous	The ratio of number of a dependent family to active labour force of the family	-
FEX	A frequency of extension contact	Continuous	Number of visit per year	+
DISMFIs	Distance from home to microfinance institutions	Continuous	Hour	-
HPGL	Households perception on group lending	Dummy	"1" for those perceived group formation as constraint and "0" otherwise	-
ACSNWK	Access to social network	Dummy	"1" for those have access to the social network and "0" otherwise	+

Sources: Own Construct (2017).

determined by various household attributes. Among these attribute, demographic and socio-economic characteristics were the major ones. Hence, these characteristics are presented and discussed in the following.

### **Demographic and socio-economic characteristics of sample households**

#### ***Cultivated land size***

The mean cultivated land size of the sampled households ranged from 0 to 3 ha. In the study area, the average land size owned by the two groups is 1.35 and 1.10 ha, respectively. The overall average land size of the respondents was 1.22 ha. The result of the t-test depicted that the mean difference between the two sample groups about the size of cultivated land holding was statistically significant at 1% significance level. This implies that the average land size of

participant households was higher than non-participants.

#### ***Livestock holding***

The average livestock population held by the sample household was 5.81 in TLU. The mean number of livestock owned by participant and non-participant households was 6.73 and 4.88 TLU, respectively. The mean difference between the treated and control groups regarding the size of livestock was positive and statistically significant at 1% level of significance.

#### ***Dependency ratio***

The result of the finding showed that the mean dependency ratio for the sample households was 0.77. The mean dependency ratio for the participant was 0.65 and 0.89 for non-participants.

There was a significant mean dependency ratio difference between participants and non-participants at 1% probability level. The significance mean difference of the computed dependency ration between the two groups implies that the non-participant has more dependent family members (member of family aged under 15 years and aged above 65 years) than the participant.

#### ***A frequency of extension contact***

As shown in Table 3, the mean frequency of extension contact for the participant and non-participant groups was 8.04 and 4.35 per year, respectively. The analysis also indicated that the participant households had better access to extension service than non-participant with the mean difference of 1.6 and which was statistically significant at 1% significance level.

**Table 3.** Summary of descriptive statistics for continuous variables.

Variable	Participants (N=94)		Non-participants (N=94)		Total (188)		Mean difference	t-value
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev		
AGEHH	43.36	7.75	43.82	8.85	43.59	8.3	-0.46	-0.377
FMSZ	5.97	2.07	6.26	2.33	6.11	2.2	-0.29	-0.894
CULS	1.35	0.71	1.10	0.65	1.22	0.67	0.25	2.506***
LIVESTOCK	6.73	2.37	4.88	1.88	5.81	2.13	1.85	5.903***
DPCR	0.65	0.34	0.89	0.48	0.77	0.41	-0.24	3.775***
DISMFIs	2.33	0.84	2.35	0.73	2.34	0.79	-0.02	-0.140
FEX	8.04	4.35	6.45	4.28	7.24	4.31	1.61	2.568***

\*\*\*Significant at 1% probability level.

Source: Computed from Survey Data (2018).

### **Sex of household head**

As shown in Table 4, among the overall sampled households, 124 (66%) were male-headed while 64 (34%) were female. The result also shows that from the participant households, 71 (75.5%) were male-headed households and 23 (24.5%) were female. On the other hand, 53 (56.5%) of non-participant households were headed male households, whereas 41 (43.6%) of non-participant households were female. The chi-square value ( $\chi^2=7.68$ ;  $p=0.008$ ) indicated that there was a statistically significant difference in the sex of household head between participant and non-participant groups at 1% of significance level. This implies that, male was more participated in microfinance service than female in the study area.

### **Education level of household head**

From the selected household heads for the study, 61.2% were literate while 38.8% were illiterate. As shown in Table 4, out of the total sample households, 52.1% of the participants and 35.1% of non-participants received a primary level education. Similarly, 17% of participants and 11.7% of non-participants received secondary school education level. Besides, 4.3% of the participants and 2.1% of the non-participants have acquired certificate and above, education level. The chi-square result indicated that, the education level of the household heads was statistically significant at 1% significance level. This shows that the educated households were more participating in microfinance credit than the illiterate.

### **Determinants of rural households' participation in microfinance services**

The results of logistic regression identify determinants of the rural households' participation in microfinance services in the study area. The marginal effect of logistic

regression results in Table 5 shows microfinance participation was significantly influenced by six of the twelve explanatory variables used in the propensity score estimation model. These include sex of household head, education level, cultivated land size, livestock holding, dependency ratio and frequency of extension contact.

Accordingly, sex of household head had a positive effect on households' participation in microfinance services and it was statistically significant at 1% significance level. The marginal effect of sex was 0.266. The value of marginal effect indicates that the probability of male-headed households' participation in microfinance services increases by 26.6% more than female-headed households, keeping other variables in the model constant.

Moreover, the result presented the education level of the household head had a positive effect on the probability of participation in microfinance service. But, the significant level was different with different levels of education. Here, from education category, illiterate was taken as the base category. Accordingly, there was a statistically significant difference between illiterate households and those households who have attended primary education level at 1% significance level. The marginal effect of a primary education level was 0.254. The result of marginal effect implies that the probability of those who have acquired a primary level households' participation in microfinance services increases by 25.4% than illiterate household.

Similarly, the finding result indicates that there was a statistically significant difference between illiterate household and those households who have attended secondary education level regarding participation in microfinance services at 5% probability level. In contrast, for occupation, the farmer was taken as a base category, but none of the category was significant. The marginal effect of sex was 0.266. The estimated marginal effect result shows that the probability of male-headed households' participation in microfinance services increases by 26.6% more than female-headed households, keeping other variables in the model



**Table 4.** Descriptive analysis of both dummy and categorical variables.

Variable	Participant (N=94)		Non-participant (N=94)		Total		$\chi^2$ -value
	Frequency	%	Frequency	%	Frequency	%	
<b>SEXHH</b>							
Male	71	75.5	53	56.4	124	66	7.68***
Female	23	24.5	41	43.6	64	34	
Total	94	100	94	100	188	100	
<b>EDLHH</b>							
Illiterate	25	26.6	48	51.1	73	38.8	11.96***
Primary	49	52.1	33	35.1	82	43.6	
Secondary	16	17	11	11.7	27	14.4	
Certificate and above	4	4.3	2	2.1	6	3.2	
Total	94	100	94	100	188	100	
<b>OCCPHH</b>							
Employed	2	2.1	1	1	3	1.5	4.23
Farmer	85	90.4	81	86.2	166	88.3	
Petty trader	6	6.4	6	6.4	12	6.4	
Causal laborer	1	1.1	4	4.3	5	2.7	
Handcrafter	2	2.1	2	2.1	2	1.1	
Total	94	100	94	100	188	100	
<b>HPGL</b>							
Perceived as constraint	9	9.6	16	17	25	13.3	2.26
Not perceived as constraint	85	90.4	78	83	163	86.7	
Total	94	100	94	100	188	100	
<b>ACSNW</b>							
Have social network	69	73.4	67	71.3	136	72.3	0.11
No social network	25	26.6	27	28.7	52	27.7	
Total	94	100	94	100	188	100	

\*\*\*Significant at the 1% probability level.

Source: Computed from Survey Data (2018).

constant.

On the other hand, cultivated land size had a positive effect on the rural households' participation in microfinance services and statistically significant at 5% significance level. The finding of the study coincides with Asfaw (2013), who found that landing holding size has a positive and significant effect on households' microfinance participation decision. The marginal effect result shows that a unit increase in livestock holding size increases households' participation in microfinance by 11.1%, keeping other variables in the model constant.

The result of logistic regression showed that the size of livestock positively influenced the probability of participating in the microfinance services at 1% significance level. This result is consistent with the findings of Amine (2016) who found that livestock ownership positively affected the probability of

participating in the microfinance services. Moreover, the marginal effect result shows that a unit increase in livestock holding size increases households' participation in microfinance by 11.1%, keeping other variables in the model constant.

Dependency ratio negatively influenced the rural households' participation in microfinance and it was statistically significant at the 5% significance level. This result is similar to that of Feleke (2011), who found that the dependency ratio had a negative and significant influence on the rural households' participation decision in microfinance services. The marginal effect indicated that a unit increase in the dependency ratio decreases the probability of households' participation in microfinance services by 17.7%, keeping other variables constant at their means.

The result of logistic regression indicated that the

**Table 5.** Marginal effect estimation of logistic regression for determinants of the rural households' participation in micro finance services.

Variable		dy/dx	Standard Error	Z-value	P> Z
SEXHH		0.266	0.092	2.88	0.004***
AGEHH		0.007	0.009	-0.69	0.488
FMSZ		0.011	0.038	0.30	0.768
EDLHH	Primary school (1-8)	0.254	0.077	3.29	0.001***
	Secondary school (9-12)	0.269	0.109	2.47	0.014**
	Certificate and above	0.286	0.211	1.36	0.175
OCCPHH	Petty trader	0.002	0.144	0.01	0.989
	Causal laborer	-0.306	0.181	-1.69	0.090
	Employed	0.216	0.245	0.88	0.377
	Handcrafter	-0.102	0.288	-0.35	0.724
CULS		0.153	0.075	2.04	0.041**
LVSTOKH		0.111	0.025	4.38	0.000***
DPCR		-0.312	0.135	-2.31	0.021**
HPGL		-0.177	0.128	-1.39	0.165
ACSNWK		0.097	0.106	0.92	0.358
DISMFIs		-0.005	0.059	-0.08	0.938
FEXC		0.025	0.011	2.27	0.023**

\*\*\* and \*\*Significant at the 1 and 5% probability levels, respectively.  
Source: Computed from Survey Data (2018).

frequency of extension contact had a positive effect on rural households' participation in microfinance services, and was significant at the 5% significance level. This means that those households getting more extension service have a high probability to participate in microfinance services. The marginal effect of the frequency of extension contact was 0.025. The computed marginal effect result shows that a unit increases in the frequency of extension contact increases the probability of households in microfinance services by 2.5% keeping other variables constant at their means.

## Conclusion

Based on the main finding of the study, the following summary and conclusions is drawn. This study has focused on assessing determinants of the rural households' participation in microfinance services at Cheliya District, West Shoa Zone of Oromia National Region State, Ethiopia. In this study, twelve explanatory variables were hypothesized to explain the determinants of the rural households' participation in microfinance services in the study area. These variables were demographic, socio-economic and institutional determinants to explain participation variable.

The descriptive analysis result showed that the mean

difference between the two groups regarding the sex of household head, education level, cultivated land size, dependency ratio, livestock holding and frequency of extension contact were statistically significant. However, the two groups have shown a statistically insignificant mean difference regarding age of household head, family size, occupation, distance from microfinance institutions, a household perception of group lending and access to a social network.

The estimation result of the marginal effect of the logit model result indicated that among 12 explanatory variables, which were hypothesized, to influence the household heads participation in microfinance services, six variables were statistically significant while the remaining six variables were statistically. The significant variables in the model were sex of household head, education level, livestock holding, cultivated land size and frequency of extension contact are positively and significantly influenced households' participation in microfinance services while dependency ratio is negatively influenced the households' participation in microfinance services in the study area.

## RECOMMENDATIONS

Based on the findings of this study, the following

recommendations are forwarded. The logistic regression model results indicated that dependency ratio had a negative influence on the probability of households' participation in microfinance service. Therefore, microfinance institutions should encourage rural households those who have a high dependent family member to enhance their involvement in the microfinance service.

As observed from the study, education level had a positive influence on the households' participation in microfinance services. Hence, the microfinance institutions should create awareness of its financial services for those illiterate households to enhance their participation.

In the study area, female participation in microfinance services was less than male. Therefore, the microfinance institutions should give attention to encourage female participation in microfinance services. The study showed that households those have large cultivated land size more participate in microfinance services. Therefore, the microfinance institutions should encourage the households those who have a small cultivated land size to enhance their participation. As the study result indicated households who have small number of livestock less participate in microfinance services. Thus, the microfinance institutions need to introduce its service to the households those who have a small number of a livestock.

According to the findings of the research, frequency of extension contact had a positive effect on households' participation in microfinance services. Therefore, development agents should strengthen their support by providing training and technical support for rural households in order to improve households' participation in microfinance services in the area.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## ACKNOWLEDGEMENT

The authors thank the respondent households, Cheliya District Microfinance Institutions staff members and Cheliya Agricultural Office staff members for their cooperation in facilitating data collection.

## REFERENCES

- Asfaw T (2013). Impact of microfinance on the livelihood of Smallholders farmers: the case of Oromia credit and Saving Share Company, Grawa branch, East Hararghe Zone, Oromia National Regional State, M.Sc. Thesis, Haramaya University.
- Bauchet J, Marshall C, Starita L, Thomas J, Yalouris A (2011). Latest Findings from Randomized Evaluations of Microfinance. October P 2.
- Bezabih E (2009). Cooperatives: a path to economic and social empowerment in Ethiopia. Coop AFRICA working paper, Number 9.
- Birhanu G (2016). The Role of Microfinance Institutions in Reduction of Unemployment. Unpublished MA. Thesis, Wollega University.
- Feleke B (2011). Impact of microfinance services on household income: The Case of Digaf Micro Financing Company. M.Sc. Thesis, Haramaya University.
- Kebu C (2017). Assessment of result oriented performance of microfinance institutions: The Case of Cheliya District West Shoa Zone. BA. Unpublished Thesis, Rift Valley University.
- Kothari CR (2004). Research Methodology, Methods and Techniques, 2nd edition New Age International (P) Ltd.
- Melese M (2013). Impacts of Microfinance Institution on the Living Condition of Rural Women: A case study on the Oromia Credit and Save Share Company in Shirka Woreda, Oromia Region, Ethiopia. URL: <http://hdl.handle.net/123456789/1925>
- National Planning Commission (NPC) (2016). Federal Democratic Republic of Ethiopia Growth and Transformation Plan II (GTP II) (2015/16-2019/20). Volume I: NPC May, 2016, Addis Ababa.
- Office of Agriculture (OoA) (2017). Cheliya District Agricultural Office. West Shoa Zone, Oromia National Regional State, Ethiopia. Available at: <https://en.wikipediavailable.org/wiki/Cheliya> [Accessed 12 February 2017]
- Sileshi C (2014). Loan repayment performance of farm households: M.Sc. Thesis, Haramaya University.
- Simon NE (2016). Examining Firm Specific Determinants of Profitability of Micro Finance Institutions in Ethiopia. International Journal of Research in Finance and Marketing 6(9):70-81.
- Tolosa N (2014). Performance of Loan Repayment Determinants in Ethiopia Microfinance: An Analysis. Eurasian Journal of Business and Economics 7:29-49.
- Wolday A (2004). The Development of Microfinance Industry in Ethiopia: Current Status and the Prospect for Growth. Journal of Ethiopian Economy 8:2.
- World Bank (2014). Global Financial Development Report 2014: Financial Inclusion. Washington, D.C: World Bank. License: Creative Commons Attribution CC BY 3.0. doi:10.1596/978-0-8213-9985-9.
- Ziaul HM (2014). Microcredit, household livelihoods and community capacity: case study from Bangladesh. M.SC, Thesis, Pacific University, Asia.

*Full Length Research Paper*

# **Sesame post-harvest loss from small-scale producers in Kafta Humera District, Ethiopia**

**Desale Gebretsadik<sup>1\*</sup>, Jema Haji<sup>2</sup> and Bosena Tegegne<sup>2</sup>**

<sup>1</sup>Tigray Agricultural Research Institute (TARI), P. O. Box 492, Mekelle, Ethiopia.

<sup>2</sup>School of Agricultural Economics and Agribusiness, Haramaya University, P. O. Box 138, Dire Dawa, Ethiopia.

Received 28 December, 2017; Accepted 8 August, 2018

**Sesame post-harvest loss and its determinants in Kafta Humera, Ethiopia of cross-sectional data were obtained from interviewing 128 producers and measurement at 56 fields. The loss found were at harvesting (16.41%), drying (50.44%), un-threshed (11.55%), piles transportation (9.9%), storage (6.73%), cleaning (3.2%), and leads total loss of 23.7% (4260 Birr/ton). The significant determinants of sesame post-harvest loss found were sesame produced, weather, transportation mode, piles transported distance, stacking days, educational level, farm distance, land size, and extension contact. This study so recommends strengthening education, extension, credit, nearby follow up, and frequently visit for reducing sesame post-harvest loss. Introduction of sesame harvesting and drying technologies and machineries are also better in reducing sesame post-harvest losses.**

**Key words:** Kafta Humera, sesame, small-scale, post-harvest loss.

## **INTRODUCTION**

Sesame is one of the important oilseed crops well adapted to semi-arid tropical regions. It best performs on well drained, moderately fertile soils of light to medium texture with temperature ranging from 20 to 35°C (Wijnands et al., 2007). It is one of the six priority crops in the agricultural growth programme of Ethiopian (SBN<sup>1</sup>, 2013). In Ethiopia, sesame is being produced as cash crop by more than 867,347 small-scale producers who cultivate 0.42 million hectares of land and produces 0.29 million tons (CSA, 2015). Nationally, sesame accounts for 3.35% of total area and 1.1% of total grain production (CSA, 2015). In Ethiopia, it is produced in Western Tigray lowlands, North Gondar, Welega, Benishangul Gumuz and South-Omo; where Western Tigray and North

Gondar lowlands contributed more than 68% of the national sesame aggregated product. In Ethiopia, the share of production and productivity as 39, 29 and 21% obtaining 0.66, 0.704, and 0.735 ton/ha productivity by Amhara, Tigray and Oromia, respectively which contribute for the national yield of 0.687 ton/ha (CSA, 2015).

Over the past years, sesame production shows greater increase in area and total production but decreasing in yield. Looking on its trend, nationally sesame covered 0.14 million hectares to produce 0.12 million tons in 2004/2005 (Kindie, 2007) which has increased to 0.29 million tons production in 0.42 million hectares of land in 2014/2015 (CSA, 2015). But, its productivity declines from 0.847 ton/ha in 2004/2005 (Kindie, 2007) to 0.735 ton/ha in 2013/2014 (CSA, 2014) and further to 0.687

<sup>1</sup>SBN is to mean Sesame Business Network which is the Sup-program in Ethiopia.

\*Corresponding author. E-mail: [aadesuseedtari@gmail.com](mailto:aadesuseedtari@gmail.com).

ton/ha in 2014/2015 (CSA, 2015).

In Tigray region, 176030 small-scale producers (CSA, 2015) and more than 1100 commercial farms (KHLAdO<sup>3</sup>, Documented file on list of farmers in Kafta Humera district with their land size allocated, 2015) were engaged in sesame production that had supplied 88.7% of their total sesame production (CSA, 2014). According to CSA (2014), Tigray region had scored the second rank in terms of area coverage and production which was 28.74 and 29%, respectively. Within the region, Western zone Tigray had got the lion share in the region's sesame area (76.33%) and production (76%) for the average productivity estimated to be 0.7 ton/ha (CSA, 2015). In Kafta Humera district, sesame own majority and leading economic importance (KHARDO<sup>4</sup> Annual Report, 2015). The district also provided employment for more than 370000 seasonal laborers coming from other zones of Tigray, Amhara, Oromia and SNNP regions (KHARDO Annual Report, 2014).

Post-harvest loss is the loss of grain between the moments of harvest and consumption that occurs at all stages of post-harvest handling; processing, transportation, storage, packaging, and marketing. Generally, it is estimated that by 2050 the current population will reach 10.3 Billion showing an increase of the current food demanders by 33% (UN March, 2013), which requires food supply to increase by 60% (Alexandratos and Bruinsma, 2012). It is also understandable that most of the formerly conducted studies in developing countries were focusing on cereal crops. In Ethiopia, particularly in Western zone Tigray, sesame is an important cash crop; even though, its post-harvest loss at harvesting, drying, threshing and storage were high, estimated at 15 to 26% of the total production (Kahsu et al., 2014). Regardless of the high percentage of grain loss, as far as the researcher's knowledge is concerned beyond estimation of the amount loss, there was no study conducted on the sources of post-harvest loss and its possible solutions. It is also fact that food availability could be improved by increasing production and/or reducing loss by addressing the possible loss contributing factors. So, estimating post-harvest loss of sesame grain and identifying its source in the study area was important to design mechanisms to minimize the loss. Considering these problems, the objectives designed are to estimate post-harvest loss from small-scale producers and to identify its major sources in Kafta Humera district.

### Theoretical framework

From the farmer's perspective (producer or decision-making units), in microeconomics (production economics) principles, it is indicated that farmers are rational in

decision making for their business. This is to mean that small scale farmers are utility maximizers based on their allocation of the limited resources they have. So, this study summarizes as the rational choice theory which is also known as the rational allocation theory is the basic theory employed for the farmer's decision making along resource allocation in sesame production and post-harvest loss reduction in the study area.

From the consumer's perspective, in partial market equilibrium theory, it is explained that if the market is competitive market or free market economy, the amount supplied of a single commodity equates with the quantity demanded; so that, the price re-adjusts the quantity. But, if there is disturbance in the quantity that is if the quantity supply is lower than the quantity demanded, then the commodities price will raise up so consumers are forced to pay higher price regardless of their income level. This disturbance in partial market equilibrium may further lead to affect the consumers with lower income level. The reduction in supply amount could rise due to many cases out of which due to lower productivity and high post-harvest losses take the larger share. So, partial equilibrium theory is the basic theory in this study associated with the sesame marketing effect of its post-harvest loss.

### METHODOLOGY

The study was conducted in Tigray regional state, Western zone, Kafta-Humera district. The district has a population of 53945 male, 49792 female and total of 103692 with 26352 households covering an area of 4542.33 km<sup>2</sup> with 396852 ha cultivable land (KHARDO Annual Report, 2014). The study area has chromic vertisol soil type which is black in color characterized with very deep clay textured where water logging is very high during heavy rainfall. The annual temperature of the area ranges from 22.2 to 42°C with annual rainfall ranging from 400 to 650 mm in the months from June to September (Hagos and Fetien, 2011).

The study area is known for cultivations of various cereals in which it was most dominantly covered by sesame and sorghum. These crops are the district's important marketable crops as the reports of KHARDO Annual Report (2014) and HuARC<sup>5</sup> Productivity Improvement Report (2014).

As it is presented in Figure 1, from the sesame producing kebeles in Kafta Humera district, four kebeles (Adebay, Baeker, Mai-kadra and Rawyian) were selected randomly by picking a rolled paper. These kebeles could represent the district's sesame potential kebeles as owing society having similar culture, economic status, climatic condition and agro-ecology, practicing similar farming system, facing similar topography and geographic arrangement, cultivating on similar soil type, etc. These kebeles also share similar administrative bodies and similar expertise support from the district. The average distance from one kebele to the other next kebeles is about 19 km. The kebeles' average distance from Humera town ranges between 7 and 50 km.

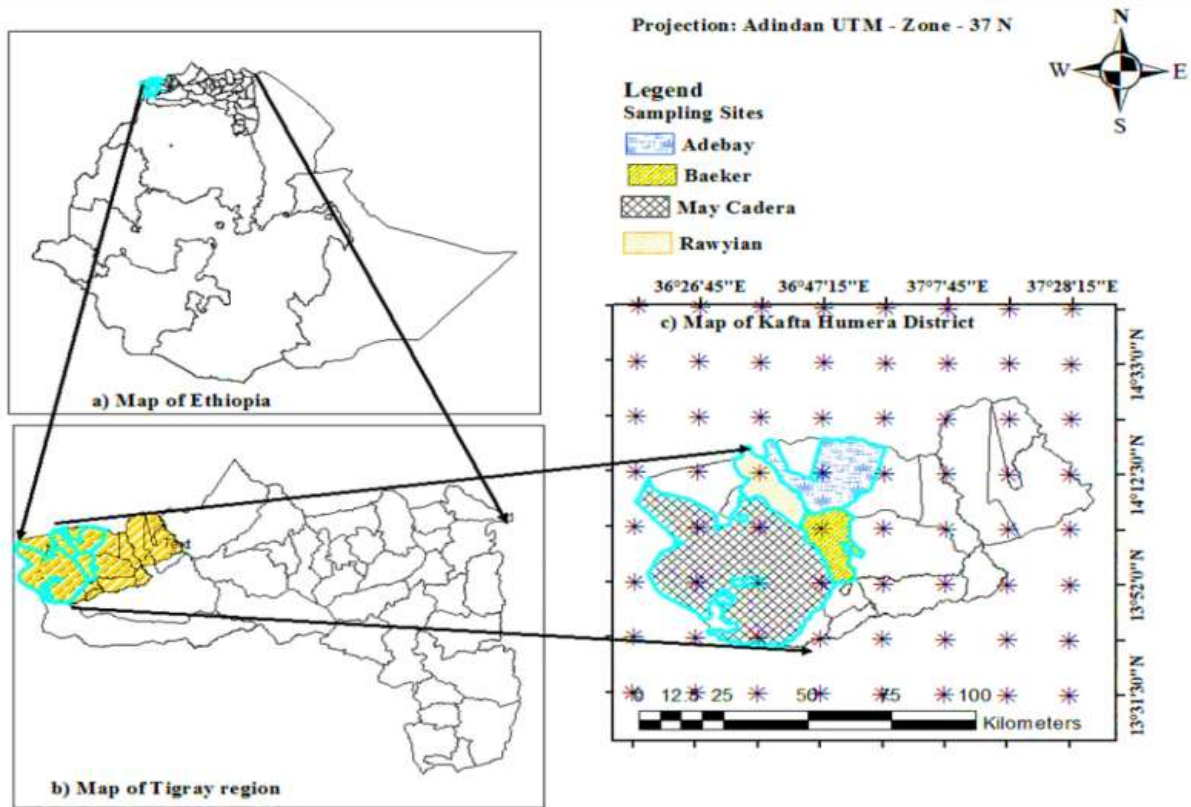
### Data types, sources and methods of data collection

Both primary and secondary data sources were conducted to

<sup>3</sup>Kafta Humera district of Land Administration Office

<sup>4</sup>Kafta Humera district of Agriculture and Rural Development Office

<sup>5</sup>Humera Agricultural Research Center



**Figure 1.** Map of the study area, western zone Tigray, Kata Humera district.

collect data for analysis and this was done using field survey and from different published and unpublished sources.

#### **The primary data sources**

It is collected using formal survey procedures from small-scale sesame producers through semi-structured questionnaires and by measurement of the loss amount at each stage of harvest and post-harvest handling in four randomly selected sesame producing kebeles (Mai-Kadra, Baeker, Adebay and Rawiyan) (Figure 1). The respondents for post-harvest loss data were selected by considering to be interviewed during field survey. The post-harvest loss data was collected through the following methods.

During harvesting first, a 10 m × 10 m quadrant was measured in the farm from which the capsules opened, dropped during harvest time and remain un-harvested were counted and the seeds in those capsules were also counted by seed counter. Then, in nearby to the quadrant measured one piles sesame was harvested and stacked/stand on sheet. This stand stayed for an average of 14 days for drying. Then during threshing, threshers were informed to thresh it on other sheet. Here, the distance from piles standing to threshing place was covered by long plastic/Abujedid and so threshing workers were informed to go on that way only. Finally, the threshed sesame straw bar was secondly threshed and loss during cleaning time was recorded.

The loss during transportation from farm to store was measured by collecting the dropped amount during transport. During storage time also the loss was obtained by measuring while entered and withdraws store. The loss while transporting from store was obtained by measuring when it is ready for transportation and as it

reaches the market, the difference was taken.

#### **Secondary data sources**

The secondary data was collected from the selected kebeles agricultural development office, district's office of agriculture and rural development, district's office of land administration, HuARC, western zone zonal office, different books, different published and unpublished reports, bulletins, and websites.

#### **Sampling procedure and sample size**

The study used multi-stage sampling technique to select sample sesame producers. First, from Western zone Tigray, Kafta Humera district was selected purposively because of the availability of small-scale sesame producers in the same location. Then, four kebeles (Mai Kadra, Baeker, Adebay and Rawiyan) were selected randomly (Figure 1 and Table 1). Following, depending on the probability proportional to size of sesame producing small-scale farmers from each sample kebeles, the specified numbers of respondents were obtained based on random sampling technique. The intended total sample size was determined based on the following formula developed by Yamane (1967). Considering confidence level of 90% and accepting the error (e) of 9%:

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

**Table 1.** Number of sampled small-scale producers from each kebele.

Kebele	Total population	Sample	Percent
Adebay	2817	36	28.13
Baeker	1953	24	18.75
Mai kadra	3526	45	35.16
Rawiyan	1805	23	17.97
Total	10101	128	100

Source: KHARDO (2014).

where  $n$  = sample size,  $N$  = total population which is equal to 26352 for small scale producers. Based on the calculation, 128 small-scale sesame producers were sampled (Table 1).

For analysis of sesame post-harvest loss, data was also taken by direct physical measurement from the four kebeles selected in the aforementioned procedure. For this purpose, a total of 56 small-scale sesame producers were selected randomly from those formerly selected for the survey interview purpose.

#### Methods of data analysis

Across the globe measurements and estimation of post-harvest losses are varying from commodity to commodity. But, most of them agreed that direct measurement is better for consistency even though it requires huge resource for its management. So in this study, both descriptive statistics and econometric models are employed for analyzing the data obtained from survey and field measure (direct loss measurement at different stages). Descriptive methods include percentages and mean which is employed to describe the amount/quantity of sesame grain lost using mean and frequency/ratio. However, the econometric method is used by applying multiple linear regression to analyze the linear relationship between explanatory variables and sesame grain post-harvest loss. That is to estimate the sources of sesame grain post-harvest loss in the study area using cross sectional data obtained from small producers from harvesting to selling. The model is given as:

$$Y_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \dots + \alpha_{14} X_{14i} + \varepsilon_i \quad (2)$$

where  $i = i^{\text{th}}$  respondent  $i = 1, 2 \dots 15$ ;  $\varepsilon$  = random-error,  $Y_i$  = the post-harvest loss quantity of sesame in kg/Qt., which is continuous variable;  $\alpha$ =coefficients;  $X$ =the explanatory variable.  $X_1$ =age of the household head in years,  $X_2$ =education level of the household head in years of schooling,  $X_3$ =total amount of sesame production in quintal,  $X_4$ =area under sesame production in hectare,  $X_5$ =weather which is dummy variable '0' if the weather during harvesting is favorable otherwise '1',  $X_6$ =mode of sesame grain transportation that is a dummy variable values as 1=by donkey/caro, 2=by tractor or tracker,  $X_7$ =distance of sesame farm from residence in kilometers,  $X_8$ =duration at store in number of weeks sesame has stored,  $X_9$ =road infrastructure availability that is dummy variable that takes '1' for human and animal road; '2' for pista/standard road,  $X_{10}$ =harvesting and threshing management that is dummy variable valued as '0' for good and carefully done, '1' for carelessness,  $X_{11}$ =distance of piles transported to threshing place in meters,  $X_{12}$ =number of extension contact in frequency/times of contact,  $X_{13}$ = Total amount of credit obtained in birr, and  $X_{14}$ =total amount of off-sesame farm income obtained in Birr.

## RESULTS AND DISCUSSION

It is in this chapter that, the results of the study are presented and discussed. The results obtained are presented in two separate sections; the descriptive statistics results and the econometric model results.

### Descriptive statistical results

Descriptive statistics results of sampled households' demographic and socio-economic characteristics, institutional services and inputs used in the econometric models are discussed here.

#### *Demographic features and availability of production resources*

The average family size of small-scale sesame producers in the study area was five persons per family with ratio of one to one between male and female members (Table 2). In this table, it was observed that the total active and non-active family members were three and two persons, respectively.

The sampled small-scale sesame producers have an average age of 45 years (Table 2) with the average educational level of about three years of schooling (Table 2). As presented in Table 2, the average distance of sesame farm land from residence of small-scale sesame producers was about 20.21 km; so that, they visited their sesame farm on average of 46 times per the production season. Regarding the income obtained from different sources of off-sesame farm income sources of the sampled small-scale sesame producers was about 14522.22 Birr (Table 2).

#### *Land size and ownership*

As the Ethiopian land law, land cannot be sold rather can be sharecropped and/or rented in/out. As a result, the sample sesame producers had practiced renting in/out. The share cropping and/or renting out/in was for the reasons that either farm was far distant from their living

**Table 2.** Household characteristics for both small and large-scale sesame producers.

Variable	Small-scale	
	Mean	Std. Err
Age	45.22	0.70
Total family size	5.46	0.17
Education level	3.29	0.23
Extension contact	2.54	0.19
Off-sesame income amount	16249.06	1869.65
Amount borrowed money	19037.01	3084.94
Amount of own income	14522.52	1845.20
Average distance from residence (Km)	20.21	0.81
Frequency of farm visit (No)	46.00	1.20

Source: Survey Result (2016).

**Table 3.** Land holding and allocation of sample producers in Kafta Humera district, 2015/2016.

Land source and allocation	Small-scale		
	Mean	%	Std. Err.
Total land size	7.42	-	0.68
Own land	4.48	60.58	0.41
Land rented-in	2.94	39.42	0.41
Land rented out	0.19	2.60	0.08
Uncultivated land	0.074	0.95	0.048
Sesame land	5.45	73.45	0.58
Sorghum land	1.69	22.78	0.20
Pulses land	0.016	0.22	0.015

Source: Survey Result (2016).

**Table 4.** Amount and share of sesame produced and allocated for different purposes.

Purpose of sesame produced	Total (Qt.)	Mean (Qt.)	%	Std. Err
Sold	1806.7	14.12	99.1	0.002
Seed	0.75	0.124	0.86	0.002
Consumption	15.84	0.006	0.04	0.0003

Source: Survey Result (2016).

home and/or un/availability of finance to perform activities. As presented in Table 3, the average land holding of sampled small-scale sesame producers was 7.42 ha. As presented in Table 3, from the total land cultivated by the sampled small-scale sesame producers 60.58% was obtained from their own, while the remaining 39.42% plough rented-in land. In the study area, 73.45% of the total cultivated land by small-scale sesame producers was allocated for sesame production, while 22.78% was allocated for sorghum production (Table 3).

As presented in Table 4, of the total sesame produced by the sampled small-scale producers, 99.1% was for

selling, 0.04% for home consumption and 0.86% for seed purposes.

#### **Post-harvest loss of sesame grain**

As presented in Table 4, the amount of sesame grain loss in piles stacking (drying) accounts for the highest percentage of the total loss in small-scale producers (50.44%). Taking the average price during the study year, this leads to financial loss (total return loss) for average selling price was Birr 426 (that is,  $1795.15 \times 0.237$  Qt) per



**Table 5.** Average amount of sesame grain loss at different stages.

Stage that sesame grain loss occurred (kg)	Mean/hhd	Per-ha	Per-Qt.	Return loss in Birr (loss×1795.15)/Qt.	%
Re-cleaning loss	0.66	0.12	0.05	0.90	1.195
During selling	0.25	0.05	0.02	0.36	0.073
Transport store to Market	0.38	0.07	0.03	0.54	0.113
Storage	22.73	4.17	1.60	28.72	6.73
Poor quality sack	0.82	0.15	0.06	1.08	0.244
Transport farm to store	1.16	0.21	0.08	1.44	0.343
Cleaning	10.75	1.97	0.76	13.64	3.184
Un-threshed	38.98	7.15	2.74	49.19	11.56
Threshing	2.81	0.52	0.20	3.59	0.834
Piles transport	33.50	6.15	2.36	42.37	9.924
Piles stacking/drying	170.10	31.21	11.96	214.70	50.40
Harvesting	55.38	10.16	3.89	69.83	16.40
total grain loss	337.52	61.93	23.73	425.99	100.00

Source: Own Measured Data (2016).

one quintal production. Similarly, the country losses an additional Birr 29 from losses not exported (that is,  $1909 \times 0.237$  Qt-(424 Birr)). The loss during harvesting time (pod dropped, un-harvested remains and grain drops as the pod opens during harvesting) which accounts for 16.41%, holds the second rank for small-scale producers (Table 5). However, the lowest loss (0.07%) of sesame produced by small-scale sesame producers was during selling (Table 5).

The average amount of sesame grain loss per individual small-scale producer in the study area was about 3.37 Qt (0.62 Qt/ha) (Table 5). This total loss amount lead to the ratio of loss to total production obtained (that is, the percentage of loss) of 23.68%. The result found is consistent with the results obtained by Aramyan and Gogh (2011), FAO (2011) and Tefera et al. (2011) who found the range of loss of 20 to 40%. It is also similar with the result obtained by Hodges et al. (2011) that the cumulative post-harvest loss of wheat, sorghum and maize, for Ethiopia was 15 to 25%. The result obtained also matches with the result of post-harvest loss found by Hodges (2012) for Tanzania was about 22% and for Benin was about 27%.

Following the calculation  $1795.15 \times$  the amount loss per quintal at each stage, the amount of Birr loss per quintal at each stages of the chain for the producers could be calculated. Similarly, the overall national impact of the losses at each stage could be calculated by multiplying the export price to the amount loss per quintal at each stage. Basappa et al. (2007) also found the loss at harvesting, threshing, cleaning, drying, storage, transportation, packaging taking the share of about 30, 12, 3, 22, 13, and 5%, respectively.

But, what differs from most of the studies was that sesame in Ethiopia, particularly in Kafta Humera district was not stored longer as it is an exportable commodity.

So storage loss was lower in this study. Rather due to its highly shattering nature and it is staying longer for drying, the highest loss was recorded during piles stacking/drying. The Food and Agriculture Organization (FAO, 2014) had estimated 32% of global food production loss after harvest and up to 37% in sub-Saharan Africa, which is higher than the amount obtained in this study. The detailed discussion of the amount of sesame grain loss is as follows:

**Sesame post-harvest loss during harvesting:** This is the stage at which useful part of the standing sesame was cut, collected and piles stacked. Harvesting is performed as the crop matures; when pods become brownish color and its life become yellow and dropped. Loss at this stage was due to over maturity of the crop (pods opened) and pest attack, when there is poor handling of the laborers some of the harvested part fails and part of the standing sesame remains not yet cut/un-harvested. Due to these faults sesame grain loss happened which account for 55.38 kg per individual small-scale producers (3.89 kg/Qt) (Table 5). The loss during harvesting stage takes second rank in small-scale sesame producers (16.4%) (Table 5). Regarding its maturity level, producers during the field measurement section explained that it is better if sesame is harvested while the first lower three capsules/pods are opened, so that one could say that sesame field is really matured. For this reason producer stay until balanced maturity is in reached even though the lower part is lost. The solution for this problem might be adoption to improve non shattering seed varieties.

**Sesame post-harvest loss during piles stacking/drying:** This is the stage at which harvested sesame stays for drying so that pods will tear, become

easily to thresh. In this stage, the pests (termite, ants and webworm) and weather hazards such as wind and rainfall result in sesame grain loss in the study area. The poor stacking performance was also the other additional factor for sesame grain loss during drying. The harvested sesame stayed for an average of 16 days for drying. During drying period on average, a total loss of 170 kg (that is, 11.96 kg/Qt) occurred from the individual small-scale farms which account for 50.4% for the small-scale producer's total production (Table 5). This indicates that it is the stage at which greater amount of sesame post-harvest loss occurred.

**Sesame post-harvest loss during piles transportation:** This refers to the transportation of stacked piles from the place where it was standing to the place where it would be threshed. According to this study result, the average distance for the harvested sesame moved for threshing was 15.2 m. The average amount of sesame grain loss per individual producer in this stage was 33.5 kg (that is, 2.36 kg/Qt), which accounts for 9.92% from the total loss (Table 5).

**Sesame post-harvest loss during threshing:** Threshing is the stage in which sesame grain extracted/separated from sesame pods/capsules. Grain loss occurred at this stage because of poor performance of threshing workers. According to the study results shown in Table 5, the average amount of sesame grain loss at this stage per household was 2.81 kg (0.2 kg/Qt) and 74.8 kg (0.25 kg/Qt) from small and large-scale producer's field that hold the percentage share of 0.834 and 1.01% for small and large-scale, respectively (Table 5).

**Sesame post-harvest loss due to un-threshed remaining pod:** This is not a stage by itself rather it is sub-process beside to the threshing process. In this sub-process loss could happen by threshing while the pods are not fully dried; so that, grain could not withdraw from pods during threshing. On the other case, poor performance of threshing workers made grain to remain inside sesame straw bar. Because of these reasons, the average amounts of sesame grain loss per individual small-scale producer was 38.98 kg (that is, 2.74 kg/ha); which accounts for 11.56% from the total loss of small-scale producers (Table 5).

**Sesame post-harvest loss during cleaning:** Cleaning stage includes winnowing and packaging processes. In this stage, loss resulted due to poor performance, high wind force and limited coverage of the materials used. Due to these causes, the average amount of sesame grain loss from individual small-scale sesame producer was 10.75 kg (that is, 0.76 kg/Qt); with the share of 3.184% (Table 5).

**Sesame post-harvest loss during storage:** Sesame

producers in the study area had used either standardized store or in their home with themselves. The standard store could be either rented or their own. The average sesame grain loss during storage for individual small-scale producers was 22.73 kg (1.6 kg/ha) which accounts for 6.73% of the total loss that occurred (Table 5).

### Analyses of sesame post-harvest loss determinants

Here, identifies the determinants of sesame post-harvest loss of small-scale producers in Kafta Humera district. These factors were identified by applying a multiple linear regression model. VIF test was used for detecting multicollinearity problem, Breusch-Pagan test used for testing heteroskedasticity problem, Ramsey RESET test used for testing the omitted variable problem and Durbin and Wu-Hausman test used for testing the endogeneity problem.

The result of VIF test of each variable in the model is lower than 10 with the overall mean value of two (Table 6). The study also proved that, there is no omitted variable problem as tested by applying the Ramsey RESET test. The Ramsey RESET test using powers of fitted values considering degrees of freedom is  $F(3, 100) = 0.27$  with  $P > F = 0.85$ . The endogeneity test also shows that there is one direction endogeneity problem between the explanatory variable of total sesame output and the dependent variable. The solution for this problem is the utilization of instrumental variable (IV) tested by applying the Durbin and Wu-Hausman (score). Being this, the instrumental variable selected is the average sesame productivity. After applying this IV model consistency is proved. Based on the Breusch-Pagan test for heteroskedasticity, the null hypothesis could not be rejected as  $\text{Chi}^2(1) = 0.80$  with P-value of 0.37. So, there was no heteroskedasticity problem in the model (Table 6); proving that there is constant variance in the model. Besides, the adjusted R-squared value of 0.81 which implies that 81% of the sesame post-harvest loss amount from small-scale producers was explained by the explanatory variables in the model. Taking the model validity tests and proving as the model is valid, the study determines the post-harvest loss determinant variables. As presented in Table 6, post-harvest loss determinant variables were not the activities that harvested sesame passes. Rather those determining factors were the demographic, socio economic, farm attributes and institutional factors. In determining sesame post-harvest loss from small-scale producers, this study found variables such as; age of the household head, number of days sesame stored, total amount of loan obtained, total amount of off-sesame farm income obtained, type of road from sesame farm to store and sesame threshing management were statistically insignificant variables (Table 6).

The significant sesame post-harvest loss determining variables as presented in Table 6 will be discussed as

**Table 6.** Determinants of sesame post-harvest loss for small and large-scale producers.

Variable	Coefficient	Std. Err	VIF
Age	0.003	0.01	2.56
Education level	-0.073**	0.03	2.26
Land size	0.02*	0.01	2.52
Distance of sesame farm	0.02*	0.009	3.58
Ln Total sesame output	0.24***	0.02	4.42
Weather condition	0.04***	0.009	1.42
Distance hila transported	0.01***	0.005	1.20
Days stored	-0.002	0.003	1.56
Road facility	-0.037	0.036	1.59
Extension contact	-0.16**	0.07	1.25
Ln loan obtained	-0.01	0.014	1.66
Ln off sesame income	0.009	0.012	1.45
Threshing management	0.048	0.05	1.22
Days staked	0.06***	0.0176	1.27
Mode of transportation	0.065*	0.035	2.00
Constant	2.13**	0.99	
Mean VIF			2.00
Adj. R-squared		0.8125	
Hettest $\chi^2(1)=0.80$		Prob. = 0.3707	
Ovtest $F(3, 100)=0.27$		Prob. = 0.8155	

\*, \*\*, \*\*\* significance level at 10, 5, and 1%, respectively.

follows. But, while interpreting the results it is important to take the assumptions of holding other variables constant at certain level, with the existing type of technology and at specified time period. So this assumption is considered in the following.

#### **Education level of the household head (eduhhd)**

It significantly and negatively determines post-harvest loss of small-scale sesame producers at 5% significance level. The result shows that, if the household head attained one more year of schooling, he/she could reduce his/her sesame grain post-harvest loss by 7.3%. The reason for this relation may be that education enables producers to properly manage and control production activities. Thus, reduces the post-harvest loss. The result found in this study is in line with the study results obtained by Basavaraja et al. (2007).

#### **Land size (landsz)**

The result found shows that this variable is statistically significant at 10% significance level and positively related in affecting sesame post-harvest loss from small-scale producers. The relationship of the variable for small-scale producers implies that as sesame farm size increases by 1 ha, the amount of sesame post-harvest loss increases by 1.8%. The reason for the relationship of land size to

post-harvest loss may be, that the probability of small-scale producers in obtaining laborers for handling the harvesting and threshing activities is limited as workers goes to large-scale production. Small-scale producers also manage their farm by themselves which lacks frequently follow up. Thus, aggravates loss. The result found is consistent with the results of Basavaraja et al. (2007).

#### **Distance of sesame farm from residence (distfh)**

It is significant and positively related to variable in determining post-harvest loss at 10% significance level for small-scale sesame producers. According to the result found if sesame farm is far distant from residence by 1 km, the amount of sesame grain post-harvest loss from small-scale producer increases by 2%. The reason for this relationship could be as farm is distant, laborers may not properly manage the harvesting and threshing activities, secondly the frequency of follow up and management becomes reduced and thirdly grain loss increases while it is transporting. The result of this study is similar with the result of Ayaneliji et al. (2011).

#### **Total amount of sesame production in 2015/2016 (lnTSsY)**

This is significantly and positively related to sesame post-

harvest loss at 1% significance level for small-scale producers. The result implies that if total production increases by 1%, sesame grain post-harvest loss increases by about 24%. This result shows that, total production is the most determinant factor of sesame post-harvest loss in both small and large-scale producers. This relationship could be due to the fact that, as production increases the managerial aspects could be shared out for the entire product. It may also be for the reason that as the amount of output increases, the storage capacity to accommodate all becomes limited. The result found in this study is in line with the results of Ayandiji and Adeniyi (2011) and Basavaraja et al. (2007).

#### ***Weather condition (weazer)***

It is found that this variable is significantly and positively related to sesame grain post-harvest loss at 1% significance level for small-scale sesame producers in the study area. So, as wind and rain is happening during harvesting to threshing time, the amount of sesame grain post-harvest loss increases by 3.7%. The result obtained in this study is so consistent with the result of Basavaraja et al. (2007).

#### ***Distance piles transported to threshing place (disthila)***

This is a significant variable that positively affect the determination of sesame post-harvest loss at 1% significance level for small-scale sesame producers. The result found shows that as the distance piles transported from stacking place to threshing place increases by 1 m, sesame grain post-harvest loss increases by 1%.

#### ***Extension contact (extn)***

This is statistically a significant variable which it negatively determines sesame grain post-harvest loss for small-scale producers at 5% significance level. So that, as the number of extension contact on sesame production of the small-scale sesame producers increases by one, sesame grain post-harvest loss could reduce by 16%. The reason for this relation may be, as extension service is provided to capacitate producers in managing their production and handling problems. Thus, enables to control the post-harvest loss amount.

#### ***Number of stacking days (daystak)***

It is statistically significant that positively it determine the amount of sesame grain post-harvest loss for small-scale sesame producers at 1% significance level. This result

shows that if the number of drying/stacking days increases by one, the amount of sesame grain loss for small-scale sesame producers increase by 6.4%. The positive contribution of this variable may be, as the number of drying days increases there are pests to consume the seed (e.g. webworms and rodents) and wind and rain have also made grain to lose out of pods. The result found is complementary with the result of Ayaneliji et al. (2011).

#### ***Mode of sesame grain transportation (modtrSfh)***

This is statistically significant that positively affect sesame grain post-harvest loss at 10% significance levels for small-scale producers. The result shows that if small-scale sesame producers used caro/donkey for transportation, their sesame grain loss is reduced by 6.51% as compared to transportation by tractor/trackers. The reason for this relationship might be that mostly the load/unload activities in tractors/trackers is done by hired workers who might provide less attention and care while performing the loading/unloading activities. Thus, induces higher amount of sesame grain loss as relative to the caro/donkey that may be easily managed. So, what is needed is to properly control/manage the workers performance so to manage as that of the caro/donkey.

#### **Conclusions**

The result of the study revealed that the percentage of sesame grain post-harvest loss shared from the total production obtained by the small-scale producers was 23.68%. This shows that about one fourth of the total production was lost after maturity. The determinant sources of this sesame grain post-harvest loss, as found in this study were farm size, total sesame grain produced, weather condition, distance piles transported, stacking days, distance of sesame farm and mode of grain transportation that were significantly and positively related with sesame grain loss. But, educational level and extension contact significantly and negatively affected sesame post-harvest loss from small-scale producers at 5% significance level.

To reduce the impact of these positively contributing variables to sesame grain loss, technologies for piles drying, piles transporting, reducing weather hazards impact and pest attack effects from harvesting until threshing that could reduce post-harvest loss amount by more than half is important to be introduced. It may also be important that, loss may be minimized as government and other stakeholders together initiate producers to effectively manage and follow up their farm activities. Strengthening the capacity of producers through further education may reduce sesame loss. It is also better to reduce the sesame post-harvest loss, if the extension

service provided for small-scale producers is strengthen with practice at field level.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## ACKNOWLEDGEMENT

The authors thank GDN, BERCEA supporting program for its financial support provided for the study.

## REFERENCES

- Alexandratos N, Bruinsma J (2012). World agriculture towards 2030/2050: the saving water. From Field to Fork-Curbing Losses and Wastage in the Food Chain 2012 revision. Working paper: FAO: ESA No. 12-03, P 4.
- Aramyan LH, van Gogh JB (2011). Reducing post-harvest food losses in developing economies by using a network of excellence as an intervention tool. Drafted in preparation of the 2014 IFAMA and CCA Food and Agribusiness World Forum: 'People Feed the World'. June 15-19, Cape Town, South Africa.
- Ayandiji AR, Adeniyi OD (2011). Determinant post-harvest losses among tomato farmers in Imeko-Afon local government area of Ogun State, Nigeria. *The Global Journal of Science Frontier Research* 11(5):23-28.
- Basappa G, Deshmanya JB, Patil BL (2007). Post-harvest losses of maize crop in Karnataka: An economic analysis. *The Journal of Agricultural Science* 20(1):9-71.
- Basavaraja H, Mahajanashetti SB, Naveen U (2007). Economic analysis of post-harvest losses in food grains in India: A case study of Karnataka. *Agricultural Economics Research Review* 20:117-126.
- Central Statistical Authority (CSA) Federal Democratic Republic of Ethiopia (2014). Agricultural sample surveys: Area and production of major crops (Private Peasant Holdings, Meher Season) Vol. 1, Addis Ababa, Ethiopia.
- Central Statistical Authority (CSA) Federal Democratic Republic of Ethiopia (2015). Agricultural sample surveys: Area and production of major crops (Private Peasant Holdings, Meher Season) Volume III, Addis Ababa, Ethiopia.
- Food and Agricultural Organization of the United Nations (FAO) (2011). Global food losses and food waste: Extent, causes and prevention. Study conducted for the International Congress. Rome, Italy. (Accessed on April 18, 2016, at <http://www.fao.org/docrep/014/mb060e/mb060e.pdf>)
- Hagos T, Fetien A (2011). Additive main effects and multiplicative interactions analysis of yield performance of sesame genotypes across environments in Northern Ethiopia. *Journal of the Drylands* 4(1):259-266.
- Hodges RJ (2012). Post-harvest weight losses of cereal grains in Sub-Saharan Africa. African Postharvest Losses Information System (APhLS). (Accessed on May 28, 2016, at: [http://www.erails.net/FARA/a post-harvest loss is/a post-harvest loss is/weight losses-/](http://www.erails.net/FARA/a%20post-harvest%20loss%20is/a%20post-harvest%20loss%20is/weight%20losses-/)).
- Hodges RJ, Buzby JC, Bennett B (2011). Global food and farming futures: Post-harvest losses and waste in developed and less developed countries: opportunities to improve resource use. *The Journal of Agricultural Science* 149:37-45.
- Kahsu K, Melisew M, Annemarie GK (2014). Sesame yields and post-harvest loss in Ethiopia: Evidence from the field. Summited to Sesame Business Network (SBN), Gondar, Ethiopia. Available at: <https://images.agri-profocus.nl/upload/Yields-and-post-harvest-losses-study-report1471524141.pdf> .1-30 p.
- KHARDO (Kafta Humera Agricultural and Rural Development Office) (2014). Annual report on crop production and productivity: In Kafta Humera woreda. Kafta Humera, Humera, Ethiopia.
- KHARDO (Kafta Humera Agricultural and Rural Development Office) (2015). Annual report on production and productivity of agriculture in Kafta Humera woreda. Kafta Humera, Humera, Ethiopia.
- Kindie A (2007). Sesame market chain analysis: The case of Metema district Amhara regional state, Ethiopia. MSc Thesis, Haramaya University, Haramaya, Ethiopia 143 p.
- SBN (Sesame Business Network) Support Programme (2013). Launching Workshop Report: In North Western Ethiopia. May 15-16, 2013. North Western Ethiopia, Gondar, Ethiopia. Available at: <http://sbnethiopia.org/wp-content/uploads/2013/08/Launching-Report-final.pdf> 1-21p.
- Tefera T, Stephen M, Yoseph B, Haron K, Regina T (2011). Grain yield, stem borer and disease resistance of new maize hybrids in Kenya. *African Journal of Biotechnology* 10(23):4777-4783.
- United Nations (UN) (2013). Food and Agricultural Organization. Global Food Losses and Food Waste- Extent, Causes and Prevention. Rome. Think Eat Save. Available at: <http://www.thinkeatsave.org/index.php/be-informed/fast-facts>. Accessed on July 12, 2018.
- Wijnands HM, Biersteker J, Heil R (2007). Oilseeds business opportunities in Ethiopia. The Hague.
- Yamane TI (1967). Statistics: An introductory analysis: 2<sup>nd</sup> edition. New York: Harper and Row.

*Full Length Research Paper*

# **Market chain analysis of potato and factors affecting market supply in West Gojam Zone, Ethiopia**

**Wondim Awoke<sup>1\*</sup> and Desselgn Molla<sup>2</sup>**

<sup>1</sup>College of Agriculture and Rural Transformation, University of Gondar, P. O. Box 196 Gondar, Ethiopia.

<sup>2</sup>College of Agriculture and Environmental Sciences, Bahir Dar University, Ethiopia.

Received 31 August, 2018; Accepted 19 October, 2018

The study was conducted in South Achefer and Jabi Tehinan districts of West Gojam Zone with the objectives of identifying the major potato marketing channels, to analyze potato marketing cost and margins, and to examine determinants of producer's potato supply to market. The study took a sample of 100 producers, 70 traders and 40 end consumers randomly. Both quantitative and qualitative data were collected and analyzed through marginal and econometrics analysis. In South Achefer district, producers, wholesalers, retailers and processors earn 11.44, 7.54, 16.85 and 64.17% share of profit margin, respectively. Whereas in Jabi Tehinan district, the percent shares of profit margin for producer, collector, retailers and processors was 26.35, 25.52, 19.13 and 29.01%, respectively. In Jabi Tehinan, regression analyses revealed that distance to nearest market centre (5%), owned ox number (10%), experience (5%), access to credit (10%), total amount of potato produced (1%) and market information (5%) were significant. In South Achefer district, total amount of potato produced and market information were found to be factors affecting supply of potato to the market at 1% probability level. Therefore, governmental and non-governmental organizations should take part in fulfilling the gap of different market chain actors through their intervention especially in term of market information.

**Key words:** Determinants, district, market chain, marketing channels, potato.

## **INTRODUCTION**

Wider production of high-value vegetables can provide a viable mechanism to generate additional household income and supplement nutritional intake (USAID, 2000). According to the EIAR and ARARI (2013), potato is the priority world's no-grain food high-value vegetable crop. The global production over the past two decades has expanded from 267 to 375 million tone and market opportunities make it most popular food crop for urban populations. It also generates employment opportunity for

low-income farmers through access to higher value markets along the potato market chain.

Potato also plays a very significant role in the agricultural economy by providing wonderful yields per unit area compared with other food crop (Javeed et al., 2013). Potato and its products could replace cereal or cereal products in either cooked or processed food items (Danielle and Stan, 2011). Potato production seasons in study area were main, residual and irrigation. The most

\*Corresponding author. E-mail: wondimawoke@gmail.com.

practiced season was main season through sole cropping production method. Additionally there is a practice of intercropping potato with maize (Yazie et al., 2015). According to Amhara National Regional State (ANRS) (2003), raising consciousness about the economic and nutritional value, marketing, and conduct marketing research to explore expansion potentials into local and export markets are interventions required to raise production and consumption of vegetables like potato. Even if it has immense importance for human being, there were many factors, which affect potato marketing and production. In the study area, disease, lack of improved varieties and lack of marketing information were some of the problems that faced farmers in production and marketing of potato (Yazie et al., 2015).

Agricultural goods, and products and money flow in two opposite directions, that is, agricultural goods and products move up the chain and money flows down the chain. Market chain is the term used to describe the various market channels through which a product or service moves until reaching the end user (Lundy et al., 2007). According to Spilsbury et al. (2004), a market chain has the three main components of a marketing chain with their links and their functions. These are production function, post harvest processing and marketing. Channel is the route through which a product moves between the producer and end consumer (Lee et al., 2008). Marketing channel is the link through which a specified commodity passes among different value chain actors (Artimessia and Germandar, 2012).

To the best of my knowledge, there is little/no-empirical evidence on market chain analysis of potato in Ethiopia particularly South Achefer and Jabi Tehinan districts. Besides, studies conducted on market chain were not commodity and location-specific. Therefore, it was in this background that market chain analysis of potato was conducted to fill the information gap with regard to potato production and marketing in South Achefer and Jabi Tehinan districts. Hence, objectives of the study were: (1) Identifying the major potato marketing channels in the study districts, (2) To analyze potato marketing cost and margins for marketing channels and (3) To examine determinants of producer's potato supply to the market.

## METHODOLOGY

### Description of the study area

Both South Achefer and Jabi Tehinan districts belong to West Gojam Zone. The topography of the South Achefer district is 72% plain, 10% mountain, 12% undulating and 6% valley. The altitude of the district ranges from 1500 to 2500 m.a.s.l. Agroecologically, the district comprises 13% low land and 87% mid-high land area. The minimum and maximum annual rainfall of the district ranges from 1450 to 2500 mm/year. It has a soil type of mainly 50% red, 40% brown soil and others cover the rest (WOA, 2015a). The topography of the Jabi Tehinan district is 65% plain, 15% mountain, 15% undulating and 10% valley. Altitude of district ranges from 1500 to 2300 m.a.s.l. The district has 12% low land and 88% mid-high land

area. It has a soil type of mainly 60% red, 25% brown and 15% black soil (WOA, 2015b).

### Sample producers demographic characteristics

Among the total sample respondents, 96% were male-headed households and only 4% were female-headed in South Achefer district, whereas 82% was male-headed households and 18% was female-headed households in Jabi Tehinan district. With regarding to educational status of the two districts, 70 and 58% were literate in South Achefer and Jabi Tehinan, respectively. Average respondent age was 42.22 and 44.32 years in South Achefer and Jabi Tehinan districts, respectively. In both districts, the average family size of the total sample respondents was six persons.

### Sampling techniques and sample size

Two sampling techniques were employed namely, purposive and simple random sampling. Capacity Building for Scaling Up of Evidence Based Best Practices in Agricultural Production in Ethiopia (CASCAPE) perform different research activities related to potato to enhance livelihood of the farmers through providing potato production and marketing information in South Achefer and Jabi Tehinan districts. The main aim of the project is to "improve agricultural productivity in Ethiopia by strengthening the capacity of stakeholders in identifying, validating and disseminating best practices" (Mengistu, 2014). Therefore, CASCAPE intervention districts and kebeles were selected purposive. Sample respondents were selected through simple random sampling technique. Those sample respondents were taken from producers, traders (input supplier, wholesalers, collectors, retailers and processor) and end consumers.

From reading literature review, different scholars determine sample size depending up on their nature of study so that there was no fixed rule that govern sample size determination for different market chain actors. Even applying constant sample size determination would be applicable for some segment of the market chain actor and may not applicable for the other market chain actor to determine sample size. Therefore, sample size for this study was a function of the variability of the population characteristics (either homogenous or heterogeneous), time and resource availability. The researchers used Kothari (2004) formula due to finite nature of population size and easiness of formula to measure the value of information to meet stated objectives. Kothari (2004) formula:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 (N-1) + z^2 p \cdot q}$$

was used to determine sample size of the producers, where,  $n$  =sample size,  $Z$ =value of standard variant at 95% confidence interval,  $p$ =sample proportion (0.035),  $q=1-p$ ,  $e$ =the estimate which should be within 3.5% of the true value, and  $N$ =the total household population.

$$n = \frac{1.96^2 (0.035)(0.965)(1959)}{(0.035)^2(1959 - 1) + (1.96)^2(0.035)(0.965)}$$

$$n = \frac{254.18}{2.52}$$

$$n = 100.87$$



**Table 1.** Variable definition and hypothesis for market supply of potato.

Dependent variable	Measurement	Hypothesis
Quantity of potato supplied to market	Continuous (quintal)	
<b>Independent variable</b>		
Owned oxen number (OWOXNU)	Continuous (km)	+
Distance to nearest market (DIS MKT)	Continuous (km)	-
Amount/yield of potato produced (YLDOPOT)	Continuous (quintals)	+
Access to credit (ACTC)	Dummy (1=if the HH have access to credit, 0=otherwise)	+
Access to extension service (ACEXT)	Dummy (1=if the HH have access to extension service, 0=otherwise)	+
Access to market information (ACMKT)	Dummy (1=if the HH have access to market information, 0=otherwise)	+
Education of household head (EDHD)	Dummy (1=literate, 0= no formal education)	+
Experience in potato production (EXIPOT)	Continuous (years)	+ or -

Therefore, total sample size of producers was 100. Fifty producers from each district were taken from total population of potato producers. After determination of total number of sample respondents, sample producers were selected based on proportion to sample size from each kebele. However, 70 traders and 40 end consumers were taken based on variability of the population characteristics. Hence, 210 sample respondents were used for the study.

**Data collection and data analysis**

Important data for study were collected through focus group discussion, key informant interview and sample household interview by structured questionnaire. A focus group discussion and key informant interview were seized with community leader and governmental organizations such as agriculture, cooperative, trade and transport offices. In addition, farmers and traders were incorporated in key informant interview and focus group discussion. A focus group discussion was held to obtain data by prepared questions ranging from 8-12. Data collected through focus group discussion and key informant interview were qualitative in support of data collected by structured questionnaire. Data collected through sample household interview were household general information (sex, marital status, educational level, and family size), farm size, yield, cost, return, source of input, marketing channel, buying and selling price of potato. In addition,

quantity of potato supplied to market, owned oxen number, distance to nearest market, access to credit, access to extension service, access to market information and experience in potato production were collected.

After the collection of appropriate data for the study, both marginal and econometrics analysis were utilized. Marginal analysis was used to analyze potato marketing cost and margin.

The estimation procedure for marketing margin analysis is presented next. Marketing margin at a given stage ‘i’ (MMi) is computed as:

$$MMi = SPi - PPi$$

where SPi is selling price at i<sup>th</sup> link and PPi is purchase price at i<sup>th</sup> link.

Then percent share of marketing margin at i<sup>th</sup> link (%SMMi) is given as:

$$\% SMMi = \frac{MMi}{TPM} \times 100$$

Where, TPM is total marketing margin.

Profit margin at stage i (PMi) is given as:

$$PMi = SPi - TCi$$

Where, SPi is selling price at i<sup>th</sup> link and TCi is total cost at i<sup>th</sup> link.

Then percent share of profit margin at i<sup>th</sup> link (%SPMi) is given as:

$$\%SPMi = \frac{PMi}{TPM} \times 100$$

where TPM is total profit margin.

Under econometric analysis, multiple linear regression analysis was used to analyze the effect of the hypothesized independent variables on supply of potato output to the market as dependent variable. Therefore, the mathematical specification of the model is (Table 1):

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3... + \beta_nX_n$$

where Y= dependent variable, β<sub>0</sub>= the slope of the equation, β<sub>1</sub>...β<sub>2</sub>...β<sub>n</sub>= coefficients to estimates, X<sub>1</sub>...X<sub>2</sub>... X<sub>n</sub>= independent variables.

**RESULTS AND DISCUSSION**

**Potato marketing channels**

The marketing channel is the means by which



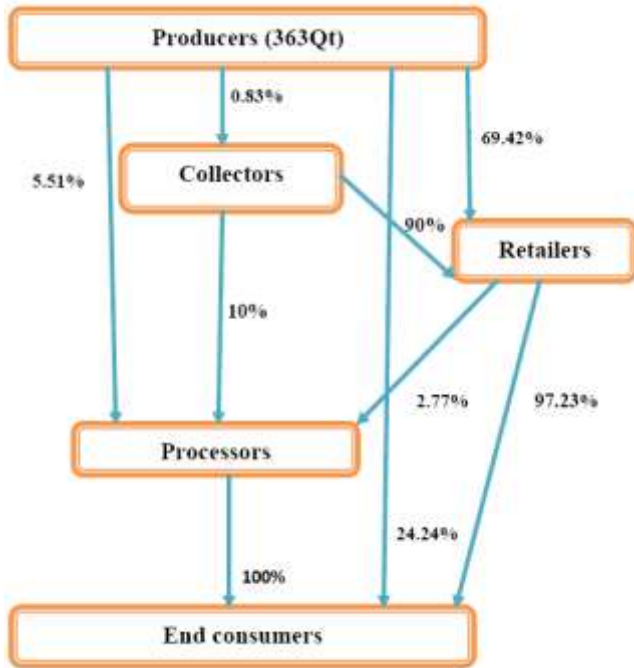


Figure 1. Potato marketing channel of Jabi Tehinan district.

product moves from one value chain actor to the other (Lee et al., 2008). It is used to show how product flows from beginning to end of the chain. In both districts, different number of marketing channels and value chain actors were identified in exchanging potato between producers and end consumer. Therefore, the result of study was revealed separately for each study districts.

According to the study result, seven main marketing channels were identified for potato marketing in Jabi Tehinan district (Figure 1). Retailers received the major quantity of the potato produced in district and they took 69.42% share. Marketing channel comparison was made based on amount of potato passed through each channel. Thus, the channel of Producers - Retailers - end Consumers and Producers - Collector - Retailer - Processors - end Consumers carried out the largest and least channels in the market chain, respectively.

- I. Producers → End consumers (87.99Qts)
- II. Producers → Collectors → Retailers → End consumers (2.64Qts)
- III. Producers → Retailers → End consumers (245.01Qts)
- IV. Producers → Retailers → processors → End consumers (6.98Qts)
- V. Producers → Collectors → Processors → End consumers (0.3Qts)
- VI. Producers → Processors → End consumers (20.00Qts)
- VII. Producers → Collector → Retailer → Processors → End consumers (0.08Qts)

According to the study, there were six main marketing

channels identified for potato marketing in South Achefer district (Figure 2). Wholesalers, retailers, processors and consumers were the main market chain actors that receive potato product from producers with the percent share of 5.13, 52.16, 0.11 and 42.60% in South Achefer district, respectively. The same with Jabi Tehinan district marketing channel comparison was made based on amount of potato passed through each channel. Therefore, the channel of Producers - Retailers - End consumers and Producers - Processors - End consumers took the largest and least amount of product in the channel, respectively.

The market channel of the potato in South Achefer seems as follows:

- I. Producers → End consumers (187.01Qts)
- II. Producers → Retailers → End consumers (227.97Qts)
- III. Producers → Retailers → Processor → End consumers (0.80Qts)
- IV. Producers → Processor → End consumers (0.50Qts)
- V. Producers → Wholesalers → Traders outside Woredas (22.52Qts)
- VI. Producers → Retailers → End consumers outside Woredas (0.87Qts)

### Analysis of marketing margins

Estimating the marketing margins was used as tool to analyze performance of market in both districts. According to Smith (1992), a marketing margin is pertinent to provide clues to significant weakness and inefficiencies in the system. Marketing margin is the difference between the value of product at one stage in the marketing process and the value of an equivalent product at another stage or it is simply the difference between the sale price and the purchase price. Therefore, the marketing margin analysis was presented below for both study districts, separately.

### South Achefer district

Table 2 shows marketing margin cost and benefit share of different market chain actors who were involved in marketing of potato. The overhead cost was highest next to production cost in producers. Among traders, the processors have incurred the highest cost. This was due to their performing more value-adding activities than the others. Purchaser (wholesaler) who came from other areas covered wholesaler costs related to labor, loading/unloading, transport cost, overhead cost, packaging and storage cost /manufacturing. The lowest marketing cost among actors was the wholesalers because they link farmers with wholesalers outside the district and they did not sell to consumers or retailers who were living around

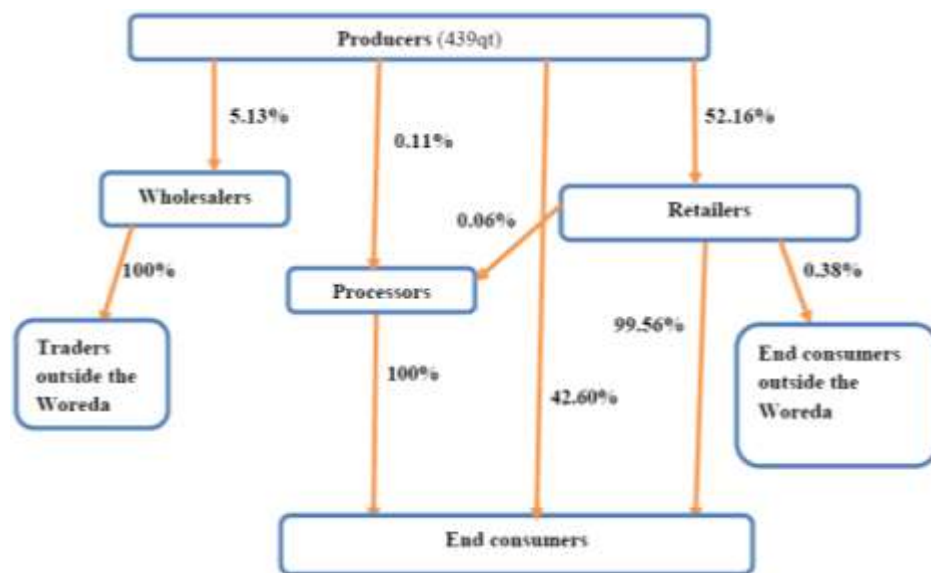


Figure 2. Potato marketing channel of South Achefer district

Table 2. Marketing margin analysis (per quintal) in South Achefer.

Item	Producer	Wholesaler	Retailer	Processor	Sum
Purchase price	-	291.67	316.46	280	
Production cost	135.42	-	-	-	135.42
<b>Marketing cost</b>					
Labor	20.91	-	2	171.43	194.34
Loading/Unloading	-	-	0.9	-	0.9
Personal travel cost	0.4	0.07	0.82	3.43	4.72
Transport cost	11.4	-	22.22	4.29	37.91
Loss	9.97	-	0.9	15.36	26.23
Telephone	-	0.64	0.02	-	0.66
Overhead cost	28.36	-	3	24.29	55.65
Packaging/Container	5.3	-	5.95	5.71	16.96
Processing cost	-	-	-	185.36	185.36
Storage cost/manufacturing	0.27	-	1.53	42.86	44.66
License/Tax	0.41	2.74	0.81	-	3.96
<b>Total marketing cost</b>	77.02	3.45	38.15	452.73	571.35
<b>Total cost</b>	212.44	3.45	38.15	452.73	706.77
Sale price	295.74	350	477.32	1200	2323.06
Marketing margin	160.32	58.33	160.86	920	1299.51
% share of marketing margin	12.34	4.49	12.38	70.80	100
Profit Margin	83.3	54.88	122.71	467.27	728.16
% share of profit margin	11.44	7.54	16.85	64.17	100

the district.

The producer profit share was only 11.44% whereas 88.56% of the profit share was traders. This may make producers not to participate in the market supply of

potato. In the marketing chain of potato in South Achefer district, the wholesalers, retailers and processors earn 7.54, 16.85 and 64.17% share of profit margin. According to the result of study, the processors (64.17%) among

**Table 3.** Marketing margin analysis (per Qt) in Jabi Tehinan district.

Item	Producer	Collector	Retailer	Processor	Sum
Purchase price	-	272.5	332	349.41	953.91
Production cost	95.15	-	-	-	95.15
<b>Marketing cost</b>					
Labour	17.56	0.25	0.5	5.19	23.5
Loading/Unloading	-	-	-	-	-
Personal cost travel	0.5	1.95	0.31	0.77	3.53
Transport cost	10.5	1	0.29	4.98	16.77
Loss	9.89	1.5	0.28	1.94	13.61
Telephone	-	0.35	0.5	1	1.85
Overhead cost	33.39	-	0.43	7.93	41.75
Packaging	5.57	0.23	3.2	8	17
Processing cost	-	-	-	12.77	12.77
Storage cost	0.34	0.6	1.73	2.02	4.69
License/Tax	0.44	-	0.5	-	0.94
<b>Total marketing cost</b>	<b>78.19</b>	<b>5.88</b>	<b>7.74</b>	<b>44.6</b>	<b>136.41</b>
<b>Total cost</b>	<b>173.34</b>	<b>5.88</b>	<b>7.74</b>	<b>44.6</b>	<b>231.56</b>
Sale price	277.16	378.93	415.12	508.33	1579.54
Marketing margin	182.01	106.43	83.12	158.92	530.48
% share of marketing margin	33.56	19.62	17.53	29.3	100
Profit Margin	103.82	100.55	75.38	114.32	394.07
% share of profit margin	26.35	25.52	19.13	29.01	100

actors with high marketing cost charged more than half of profit margin. Processors did much value-adding activities such as transporting, cleaning, sorting and grading, processing and packing for achieving a better share of profit margin.

### Jabi Tehinan district

The percent profit margin for each market chain actors was calculated and shown in the Table 3. Hence, producer, collector, retailers and processors earn 26.35, 25.52, 19.13 and 29.01% share of profit margin, respectively. Among the traders only, the processors receive highest percent share of marketing margin (29.30%) whereas retailers receive the lowest percent share of marketing margin (17.53%). The highest profit margin was processors (29.01%), but producers receive only 26.35% profit margin.

The producer profit share was only 26.35% whereas 73.65% of the profit share was traders. This may make producers not to participate in the market supply of potato. In the marketing chain of potato in Jabi Tehinan district, the wholesalers, retailers and processors earn 25.52, 19.13 and 29.01% share of profit margin. According to this result, the processors (29.01%) among actors with high marketing cost charged more than other

actors in the marketing chain of potato. Processors did much value-adding activities such as transporting, cleaning, sorting and grading, processing and packing for achieving a better share of profit margin.

### Econometric model outputs

#### *Determinants of potato market supply*

Even if there was variation in amount of potato supply in both study districts, all sample households were good suppliers of potato to the market. Therefore, analysis of factors affecting producer's potato supply to the market by using multiple linear regressions was important. Before running the multiple linear regression model, all the hypothesized explanatory variables were checked for the existence of multi-collinearity through variance inflation factor (VIF). In South Achefer, the result for all VIF values ranges between 1.05 and 1.31. The value of VIF in Jabi Tehinan district lies between 1.15 and 1.26. The result indicates that multi-collinearity was not a serious problem among the variables since VIF results were less than 10. The overall goodness-of-fit of the regression model was measured by the coefficient of determination ( $R^2$ ). The value of  $R^2$  was 0.84 and 0.95 in South Achefer and Jabi Tehinan districts, respectively.

**Table 4.** Determinants of potato quantity supplied to the market in South Achefer.

Variable	Coefficients		Sig.
	B	Std. Error	
(Constant)	-16.88	8.341	0.049
Education level of household head	0.876	1.722	0.614
Owned oxen number	-0.639	0.854	0.458
Experience in potato production	-0.040	0.106	0.710
Total amount of potato produced	0.551	0.039	0.000*
Access to extension service	1.714	2.470	0.491
Access to market information	7.316	2.149	0.001*
Access to credit	0.860	3.799	0.822

Dependent variable is total amount of potato supplied to the market in quintal. \*Statistically significant at 1%.

**Table 5.** Determinants of potato quantity supplied to the market in Jabi Tehinan district.

Variable	Coefficients		p-value
	B	Std. Error	
(Constant)	-6.062	6.334	0.344
Education level of household head	-1.488	1.056	0.166
Distance to market in km	-0.819	0.319	0.014**
Owned oxen number	1.092	0.562	0.059***
Total amount of potato produced in qt	0.726	0.030	0.000*
Access to extension service	-0.567	1.204	0.640
Access to market information	5.925	2.724	0.035**
Access to credit	-3.373	1.754	0.061***
Experience in potato production	-0.117	0.048	0.020**

Dependent variable is total amount of potato supplied to the market in quintal. \*\*\*, \*\* and \*Statistically significant at 10, 5 and 1%, respectively.

The value lies between zero and one, which is closer to one that shows better fit of the model (Krause et al., 2005).

In both study districts, different explanatory variables were hypothesized to determine the household head. Some variables like price and total land coverage were not included under the analysis due to multi-collinearity problem. In South Achefer district, among the hypothesized seven variables, only total amount of potato produced and market information were found to be significantly affecting the households' potato supply to the market (Table 4).

In Jabi Tehinan district, among the hypothesized eight variables, only owned ox number, experience in potato production, distance to nearest market, access to credit, total amount of potato produced and market information were found to be significantly affecting the household potato supply to the market. The rest of variables (education of household head and access to extension service) have no significant effect on market supply of potato (Table 5).

### **Econometric result in South Achefer district**

**Total amount of potato produced:** As hypothesized, the result confirms that the total amount of potato produced and market supply has positive effect and statistically significant at 1%. Therefore, farmers who produce more amount of potato per hectare may supply more potato to the market than those who produce low amount of potato. The result of the study also shows that a unit increase in the quantity of potato produced has caused an increase of 0.551 qt of potato supply to the market. This is in line with Abay (2007), Adugna (2009), Assefa (2009), Ayelech (2011) and Abraham (2013).

**Access to market information:** As hypothesized, the access to market information was positive and significantly at 1% significance level, a positive coefficient implying that an increase in access to market information would increase market supply of potato. This means that the farmer who has a good access to market information (selling price, place where and time when they sell) would

likely produce more quantity of potato and supplied more potato to the market. This result indicates that an increased unit in access to market information leads to increases in the potato supply by 7.316 qt. This is in line with Muhammed (2011) and Abraham (2013).

### ***Econometric result in Jabi Tehinan district***

**Owned ox number:** As expected, the owned oxen number influences market supply of potato positively and statistically significant at 10% level. The most probable reason could be that the farmer who own oxen might not have incurred cost for hiring the ox for plowing and reduce cost. As owning of oxen increase the market supply of potato by 1.092%, the result is in line with that of Abay (2007).

**Experience:** The result has shown significant negative effect at 5% level for potato market supply of household contrary to hypothesis. This may be because as farmers became experienced, they were also being laggard due to age increase and could not increase productivity of potato and family size will be decreased. As a result, market supply of potato to the market may be decreased. The result implied that as farmer's experience increase by one year, the potato supply fall by 0.117 qt. This is in line with result of Woldemichael (2008) on market participation of farmers on milk.

**Access to credit:** Contrary to prior prediction, the variable has inverse relation with market supply of potato, which was significant at 10% probability level. The result show that as access to credit increase by one unit the household supply of potato to the market decrease by 3.373 qt. This may be due to the improper or unwise use of credit, lack of advice on how to use credit they took and lack of follow-up for what purpose they use it. Respondents mentioned that they did not get credit at the right time. In addition, producers who took credit may be resource poor and cannot supply potato like resource rich producers so that credit may be negatively correlated with market supply of potato. However, Alemnew (2010) found that access to credit and market supply positively related on pepper. This may not be applicable for potato because experts may not give equal extension service like other crop for the potato.

**Distance from the nearest market:** As hypothesized, the explanatory variable significantly affected potato supply to the market at 5% significance level. The result shows that as the distance from the nearest market increased by one kilometer the quantity of potato supply decreased by 0.819 qt. This may be due to the reason that as the distance to the nearest market increases, marketing costs (transportation, labor, loading, unloading and personal travel costs) increases. Besides this, the

potato by its nature is highly perishable and a bulky product, thus, taking far distance will lead to loss and marketing costs being increased. The result is in line with Woldemichael (2008), Ayelech (2011) and Abraham (2013).

**Total amount of produced potato quantities:** As prediction, result shows that total amount of potato produced significantly affect potato market supply of household at 1% probability level. The result of study implies that, a unit increase in the quantity of potato produced has an increase of 0.726 qt. By nature, potato is a perishable crop; and as they produce more they should supply to market to reduce perishability. In study areas, farmers has no more experience to keep potato for long period of time, that is, they did not have diffused light storage except some CASCAPE project technology users. This result is in line with Abay (2007), Adugna (2009), Assefa (2009), Ayelech (2011) and Abraham (2013).

**Access to market information:** As hypothesized, access to market information was positive and significantly at 5% significant level; a positive coefficient implies that an increase in access to market information would increase market supply of potato. It shows that a farmer who has access to market information would produce more potato and supplied more to the market. An increase of a unit access to market information will increase producer's potato supply to the market by 5.925 qt. This was in line with Mohammed (2011) and Abraham (2013).

## **CONCLUSION AND RECOMMENDATION**

The finding of the study indicated that the result obtained from both districts was different. In both districts, different marketing channels were identified in potato marketing chain. Nevertheless, there was variation on the amount of potato passed through each channel and participation of the market chain actors. Retailers were the most participant in purchasing of a lot of potato product from producers. Each market chain actors had different percentage share of profit margin. Retailers earned the most percentage share of profit margin next to the processors in South Achefer district, whereas producers earned the most percentage share of profit margin next to the processors in Jabi Tehinan district. Processors took the biggest share of the percentage profit margin. The processing industry is still very small-scale and undeveloped. However, it is a good sector for creation of job for youth. Econometric analysis result revealed that distance from nearest market, owned ox number, experience in potato production, access to credit, total amount of potato produced and market information were found to be significantly affecting the market supply of

potato. Market should be competitive to make farmers beneficiaries and marketing linkage should be enhanced through provision of marketing information and training. Generally, governmental and nongovernmental organization should take part in fulfilling the gap of different value chain actors through their intervention.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## ACKNOWLEDGEMENTS

The authors appreciate the CASCAPE project for grant to undertake the research work, and Mr. Molla Tafere for his guidance, and constructive comments provided to conduct research. Authors' sincere thanks go to CASCAPE project coordinator, Yihane G/Selassie (PhD) for his facilitation during the financial services. In addition, special thanks also go to all Jabi Tehinan and South Achefer district experts, enumerators, farmers, and traders who provide pertinent data and collaborate during office and field data collection.

## ABBREVIATIONS

**ARARI**, Amhara Regional Agricultural Research Institute; **CASCAPE**, Capacity Building for Scaling Up of Evidence Based Best Practices in Agricultural Production in Ethiopia; **EIAR**, Ethiopian Institute of Agricultural Research; **ANRS**, Amhara National Regional State.

## REFERENCES

- Abay A (2007). Vegetable Market Chain Analysis. The Case of Fogera District, South Gondar in Amhara National Regional State: MSc Thesis, Haramaya University, Ethiopia.
- Abraham T (2013). Value Chain Analysis of Vegetables: The Case of Habro and Kombolcha Districts in Oromia Region. MSc Thesis, Haramaya University, Ethiopia.
- Aduugna G (2009). Analysis of Fruit and Vegetable Market Chains in Alamata, Southern Zone of Tigray: The Case of onion, Tomato and Papaya. MSc Thesis, Haramaya University, Ethiopia.
- Alemnew A (2010). Market Chain Analysis of Red Pepper: The Case of Bure District, West Gojjam Zone, Amhara National Regional State. MSc Thesis, Haramaya University, Ethiopia.
- ANRS- Bureau of Rural Development (2003). Rural households' socioeconomic baseline survey of 56 Districts in the Amhara region, Bahir Dar, Ethiopia.
- Artimessia, Germandar (2012). Market chain analysis. Securing Rights and Restoring Lands for Improved Livelihoods Project. Available at: [https://www.iucn.org/sites/dev/files/import/downloads/marketing\\_analysis.pdf](https://www.iucn.org/sites/dev/files/import/downloads/marketing_analysis.pdf)
- Assefa A (2009). Market Chain Analysis of Honey Production: In Atsbi Wemberta District, Eastern Zone of Tigray National Regional State. MSc Thesis, Haramaya University, Ethiopia.
- Ayelech T (2011). Market chain analysis of fruits for Gomma District, Jimma Zone, Oromia National Regional State. An M.Sc. thesis presented at Haramaya University.
- Danielle D, Stan K (2011). Role of potato in human health. Plant science Department and school of Dietetics and Human Nutrition McGill University, Montreal. Available at: [https://www.agrireseau.net/pdt/documents/donnely\\_kubow.pdf](https://www.agrireseau.net/pdt/documents/donnely_kubow.pdf)
- EIAR, ARARI (2013). Production and dissemination experiences, challenges and prospects .proceeding of the national workshop on seed potato tuber production and dissemination 12-14 march 2012, Bhair Dar, Ethiopia.
- Javeed Q, Peer A, Ahmad N, Kaur J, Chesti M, Shabir H, Anil H, Bhat B (2013). Study on economics of potato growing towards livelihood security. African Journal of Agricultural Research, Haryana, India. Available at: [https://academicjournals.org/article/article1385716405\\_Peer%2520et%2520al.pdf](https://academicjournals.org/article/article1385716405_Peer%2520et%2520al.pdf)
- Kothari R (2004). Research methodology methods and techniques. Former principal, college of Commerce University of Rajasthan, Jaipur (India). Available at: <http://www.modares.ac.ir/uploads/Agr.Oth.Lib.17.pdf>
- Krause P, Boyle D, Båse F (2005). Comparison of different efficiency criteria for hydrological model assessment. Advances in Geosciences, European Geosciences Union pp. 89-97.
- Lee S, Ronald J, Biondo, Daniel J, Pentony (2008). Agricultural Marketing. Center for Agricultural and Environmental Research and Training Danville.
- Lundy M, Verónica M, Ostertag C, Best R, Ferris S (2007). Participatory Market Chain Analysis for Smallholder Producers. Centro Internacional de Agricultura Tropical (International Centre for Tropical Agriculture) Cali, Colombia.
- Mengistu K (2014). Unpublished Pamphlet paper About CASCAPE. Accessed on 10/08/2014. Available at <http://www.haramaya.edu.et/wp-content/downloads/announcement/CASCAPE%20Pamphlet%202014.pdf>
- Muhammed U (2011). Market Chain Analysis of Teff and Wheat Production in Halaba Special District, Southern Ethiopia. MSc Thesis, Haramaya University, Ethiopia.
- Smith D (1992). Costs, margins and returns in agricultural marketing. Marketing and Agribusiness Development No. 1. Department of Political Economy University of Glasgow, Rome.
- Spilsbury J, Ferris S, Walker S, Nyapendi R (2004). Evaluating the Marketing Opportunities for Rice and its Products in the Principle Rice Growing Countries of ASARECA.
- USAID (2000). Amhara National Regional State Food Security Research Assessment Report. Bahir dar, Ethiopia. Available at: <https://www.ctahr.hawaii.edu/sm-crsp/phase1/pdf/amhara.pdf>
- Woreda Office of Agriculture (WOA) (2015a). Annual Report, Unpublished document. Jabi Tehnan district, Finotselem, Ethiopia. Hard copy available at Woreda agricultural office.
- Woreda Office of Agriculture (WOA) (2015b). Annual Report, Unpublished document. South Achefer district, Durbetie, Ethiopia. Hard copy available at Woreda agricultural office.
- Woldemichael S (2008). Dairy Marketing Chains Analysis: The Case of Shashemane, Hawassa and Dale District's Milk Shed, Southern Ethiopia. MSc Thesis, Haramaya University, Ethiopia.
- Yazie C, Akalu T, Yalfal T, Baye B (2015). Characterization of potato production, marketing, and utilization in North Western Amhara Region, Ethiopia. Journal of Horticulture and Forestry 9(3):17-25.



## Related Journals:

