



## Research article

## Factors affecting groundnut market supply in Western Oromia, Ethiopia

Oliyad Sori \*

Department of Agricultural Economics, Wollega University, Ethiopia



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## ABSTRACT

Groundnut production is important for consumption, income generation and improves food security of small-holder farmers in Western Oromia. Unlike its importance its production has less concern and its marketing is challenged by the amount produced. The study aimed to analyze determinants of groundnut market supply in western Oromia region, Ethiopia. In order to do this, both primary and secondary data were used to collect qualitative and quantitative data. A multi-stage sampling technique was used to select samples of groundnut producers from the study area. Primary data were collected from randomly select 400 sampled groundnut producers through a semi-structured questionnaire. The multiple linear regression models was used to analyze determinants of groundnut market supply. The results of the model indicated that age, sex, educational level, access to credit services, number of livestock owned, land allocated for groundnut production and distance from the nearest market statistically and significantly affected market supply of the groundnut. Therefore, the study forward that government, non-governmental organization and financial institutions should give attention to grant credit, train farmers to properly utilize their land, develop and strengthening infrastructural service like road to improve groundnut production and sales thereby to increase benefits of farmers from the groundnut production in Western Oromia.

## 1. Introduction

Oilseed sector plays an important role in generating foreign exchange earnings and it is mainstay of rural and national economy of Ethiopia (USAD, 2020; Wijnands et al., 2007). Groundnut (*Arachis hypogaea* L.) is an oilseed crop which is the highly nutritious, economically important and, improve soil fertility through providing nitrogen to soil (Jelliffe, 2020; Aweke et al., 2020; Ali et al., 2016; Forsythe et al., 2015). It requires drained loose and sandy loam soil to grow (Wijnands et al., 2009). Groundnut is mostly used to solve malnutrition problem, improve health and generate income for smallholder farmers for cash (Baraker et al., 2017; Alemayehu et al., 2013; Kumar and Popat, 2010; De Janvry and Sadoulet, 2002; Daniel et al., 2007). Though the product is produced in low land areas and consumed highly, it is affected by aflatoxin. Aflatoxin is a group of mycotoxins produced by fungi which is a central problem in groundnut production and productivity and highly toxic to human and animals (Benkerroum, 2020; Loko et al., 2020; Abdi et al., 2016; Shiferaw et al., 2015; Caliskan et al., 2008; Murshed et al., 2019; Udomkun et al., 2017; ICRISAT, 2016; Alemayehu et al., 2013; Monyo et al., 2012; Zain, 2011; Kumar and Popat, 2010).

Increased use of quality, improved and well-adopted crop varieties seed enhances the production and productivity of agricultural product (Akpo et al., 2020). Incorporation of crop residues has a significant advantage in improving groundnut yield as weather condition might be unfavorable for the product (Mubarak et al., 2007). In low land areas of Ethiopia, oil crops are favourably produced and specifically groundnut is mainly produced in the areas of the country like eastern and western Oromia, Amhara, Gambela and Benishanul Gumuz (CSA, 2017). CSA (2019) report on area and production of crops depicted that groundnut produced was in close to 84,237.01 ha of land leading to a total production of well over 144,091.259 tones.

Availability of the market for agricultural products enables small-holder farmers to move from subsistence to market-oriented farming (Abdullah et al., 2019). Linking farmers with the market and enabling them to supply their produce to the market is an essential task for improving the income of the poor farmers (Njuki et al., 2011). Market balances consumption and sales of farmers' agricultural products. However, marketing of the groundnut at international high value market is mostly constrained due to the presence of aflatoxin disease. The disease negatively affected food safety, livelihood, productivity, income and

\* Corresponding author.

E-mail addresses: [oliyadsorizen@gmail.com](mailto:oliyadsorizen@gmail.com), [sorioliyad@gmail.com](mailto:sorioliyad@gmail.com).

resulted in economic losses (Aweke et al., 2020; Ayelign and Saeger, 2020; Udomkun et al., 2017). Groundnut production is contaminated; its production is constrained and declined in Ethiopia. Its' main causes are poor management practices including delayed harvesting, lack of improved varieties, socioeconomic constraints, moistures or drought, diseases, mechanical damage at the time of harvesting, and limited curing and drying before storage (Berhe et al., 2020; Abady et al., 2019; Alemayehu et al., 2013).

In western Oromia, the groundnut is an important oilseed crop in terms of serving as a source of food and generating income. Farmers heavily depend on it for consumption either through processing or roasting to fulfill their basic needs and selling it especially poor farmers generate their income from activities related with groundnut production. However, groundnut production and marketing in the study area is constrained by limited improved seed, hidden diseases, storage handling or management of the product, socioeconomic problems, less concern of the government of solving problems with the product, lack of market and absence of fair trade between traders over the product. Since there is no research study conducted so far regarding with the existing groundnut market problems rather than focusing on its improved inputs and production in the study area, this research was targeted to provide awareness and information for intervention for groundnut producers, traders, government bodies, researchers, service providers like NGO's (non-government organizations) and other concerned bodies. Therefore, this study was undertaken to analyze the key determinants of groundnut market supply and forward key policy implications in Western Oromia.

## 2. Materials and methods

### 2.1. Description of the area

Diversity in altitude of Oromia is mainly characterized by the occupying climate and ecological variation. Western Oromia is characterized by the dry and the wet season with over nine months wet period. It lies between 8°00' to 10°00' N and 36°00' to 37°50'E and the elevation range from 1200 m to 3200 m. It is characterized by three agro ecological zones like lowland, midland and highland. The annual precipitation over western Oromia ranges from 1000 mm to 2100 mm. Most rainfall occurs in June, July and August and least rainfall starts from September. The area experiences the annual temperature ranging from 10°c to 30°c, with mean annual temperature of 19°C, where the highlands and mountainous areas in the region receive lowest mean annual temperature, while lowlands and valley bottoms get highest mean annual temperature. Western Oromia wet season runs from May/June to August/September; this is also regarded as the main agricultural summer growing season. The area features a crop-livestock mixed farming system. Coffee, maize, sesame, groundnut, fruits and etc. are the major crops grown in the study area.

### 2.2. Sources and methods of data collection

Primary data were collected from sample farm households using pre-tested semi-structured interview and observations. Besides, relevant secondary data sources include each Zone's Bureau of Agriculture, Central Statistical Authority (CSA), published and unpublished reports, and websites. Data were collected from primary and secondary data sources.

### 2.3. Sample size determination and sampling techniques

A multi-stage sampling technique was used to select samples of groundnut producers from the study area. In the first stage, from Western Oromia zones, four zones namely, Horoguduru Wollega, East Wollega, West Wollega and Bunno Bedele zones were selected purposively depending on their production potential. In the second stage from zones of the area, districts were stratified as groundnut producing and non-producing districts. At the third stage from the districts stratified as

groundnut producing districts, four districts like Abe Dongoro, Gida Ayana, Qondala and Chewaka districts (one district from each zone) were randomly selected. Finally, 400 samples of household heads were randomly selected from four districts of groundnut producers of the study area based on probability proportional to size sampling techniques. and Sample size was determined by Yamane (1967) formula at 5% of significance level.

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

$$n = \frac{116611}{1 + 116611(0.05)^2} \sim 400$$

where n = sample size, N = population size of groundnut producers in all zones, e = level of precision (5%)

### 2.4. Methods of data analysis

Data collected from sampled groundnut producers of the study area were analyzed by using both descriptive statistics and econometric model.

#### 2.4.1. Descriptive statistics analysis

Descriptive data analyses used were percentages, frequencies, means, and standard deviations. It was employed in the household characteristics, describing market supply, farm household characteristics and institutional characteristics.

#### 2.4.2. Econometric model

Factors which determine groundnut market supply was analyzed by using multiple linear regression models. The model is specified as

$$Y_i = X_i \beta + U_i + \alpha \quad (1)$$

where  $Y_i$  is the quantity of the groundnut supplied to market measured by Kg.

$X_i$  is a vector independent variable used in the model

$\beta$  is coefficient of  $i^{\text{th}}$  explanatory variable

$U_i$  unobserved disturbance term used in the model

$\alpha$  is constant

$X_1$  = Age of household head

$X_2$  = Sex of household head

$X_3$  = Educational level of household head

$X_4$  = Family Size

$X_5$  = Distance from the market

$X_6$  = Cooperative membership of household head

$X_7$  = Access to market information

$X_8$  = Access to credit

$X_9$  = Access to transportation services

$X_{10}$  = Number of livestock owned

$X_{11}$  = Access to extension services

$X_{12}$  = Access to improved varieties of groundnut

$X_{13}$  = Land allocated for groundnut production in 2019

$X_{14}$  = Access to off/non-farm income

### 2.5. Hypothesis and measurements of variables

**Quantity of the groundnut supplied to the market:** It is a continuous dependent variable used in the model representing the actual amount of the product supplied to the market in production year which is measured in quintal (100 kg).

Prior to identifying factors affecting the groundnut supplied to market, potential explanatory variables which could affect the dependent variable (groundnut market supply) were carefully selected and hypothesized as follow (Table 1).

**Table 1.** Description of independent variable and hypothesis.

Variable name	Variable type	Measurement	Hypothesis
Age	Continuous	Number of years	+ve
Sex	Dummy	1 = male, 0 = female	+ve
Educational level	Continuous	Year of schooling	+ve
Family size	Continuous	Number of family members	+ve
Distance from the nearest market	Continuous	Numbers of minutes walked	-ve
Cooperative membership	Dummy	1 = yes, 0 = no	+ve
Access to information	Dummy	1 = yes, 0 = no	+ve
Access to credit	Dummy	1 = yes, 0 = no	+ve
Access to transport	Dummy	1 = yes, 0 = no	+ve
Number of Livestock	Continuous	Number of livestock	+ve
Extension services	Categorical	1 = weekly, 2 = twice a month, 3 = monthly, 4 = twice annually	+ve
Improved variates	Dummy	1 = yes, 0 = no	+ve
Land allocated for the groundnut	Continuous	Hectare	+ve
Access to off/no-farm income	Dummy	1 = yes, 0 = no	+ve

Source: Own variable selection, 2019

### 3. Result and discussion

#### 3.1. Socio-demographic characteristics of sample households

Age of farmers has its own role in determining the extent of the groundnut produced which means that aged farmers produce and supply more than others. The result of this research shows that, the average age of farmers was 38 years with minimum and maximum age of 20 and 67, respectively. Out of the total sampled the groundnut producers interviewed, 87.25% was male headed farmers while the remaining was female headed. So, gender composition has great role in the production and marketing of groundnut in the study area. Similarly, the average family member of sampled households is 4 which implies number of individuals contribute for groundnut production and market supply as it is labor oriented in the study area where there is no labor supplement. Regarding educational level of households, on average farmers attended 4 classes of schooling. Similarly, with regard to farmers' market distance from their home on average 24 min to supply their product. The number of oxen owned in the study area on average was 2 while there were farmers with no oxen used others' oxen to plough their land. The size of land allocated for a groundnut in the study area on average was 2 ha with minimum and maximum of 0.25 ha and 1.25 ha, respectively (Table 2).

#### 3.2. Determinants of groundnut market supply

Multiple linear regression models were employed to determine factors which affect groundnut market supply in the study area. The overall goodness of the model was represented Table 3 and found 64.04% which indicate that about 64.04% variation in total the groundnut supplied to

the market was attributed to the explanatory variables used in the model. Fourteen explanatory variables (age, sex, educational level, family size, cooperative membership, access to information, access to credit, access to transport, number of livestock, extension services, improved variates, land allocated for groundnut, access to off/no-farm income) were hypothesized to determine groundnut market supply. Among these total explanatory variables age, sexes, educational levels, distances from the nearest market, access to credit, numbers of livestock, land allocated for groundnut were significantly affected the market supply of the groundnut while other variables had no significant effect on the quantity of the product supplied to market. Strong correlations among independent variables could bring multicollinearity problem and resulted in the undesirable outcome of the model (Gujarati (2003)). Accordingly, the values of VIF estimated variables were less 5, ranging from 1.04 to 2.23 with mean 1.37 which implies there was no multicollinearity problem in the model. Similarly, robust OLS analysis is used to solve heteroscedasticity problem and Ramsey RESET test was indicated that there was no omitted variable in the model.

**Age of household head:** as expected age of household head significantly and positively affected groundnut market supply at 5% significance level. The result identified that one-year increase in age of households increase the quantity of the groundnut supplied to market by 0.014 quintal keeping all other factors constant. It implies aged farmers share greater experience of deciding to share land for producing the groundnut and supply to market. The result is in line with Mossie et al. (2020) who identified direct the relationship between age of farmers and market supply.

**Sex of household head:** Sex of households had significant and positive effect on market supply of the groundnut at 5% significance level as

**Table 2.** Descriptive statistics of both categorical and continuous explanatory variables.

Sex	Frequency		Percentage	
Male	349		87.25	
Female	51		12.75	
	Mean	St. deviation	Minimum	Maximum
Age	38.467	8.056	20	67
Educational level	4.525	2.621	0	13
Family size	4	1.317	2	7
Distance	24.662	10.763	5	50
Number of oxen owned	2	1.112	0	6
Land allocated for the groundnut	0.381	0.215	0.25	1.25

Source: Own computation, 2019.

**Table 3.** Multiple linear regression model estimations of groundnut market supply.

Explanatory variables	Coefficient	t-ratio
Age of household head	0.041***	3.21
Sex of household head	0.603**	2.25
Educational level of household head	0.097 **	2.47
Family size of household head	0.041	0.72
Distance from the nearest market	-0.012 **	-1.98
Cooperative membership	0.219	1.31
Access to information	-0.138	-0.76
Access to credit	0.382***	2.61
Access to transport	0.248	1.58
Number of Livestock	0.543***	7.88
Extension services	0.038	0.51
Improved variates of a groundnut	-0.279	-1.14
Land allocated for a groundnut	6.055***	13.19
Access to off/no-farm income	0.146	1.29
Constant	-2.495	-3.48

Source: Own survey result, 2019

Note: Dependent variable = Quantity of groundnut supplies to market, N = 400, F(14, 385) = 45.23, Prob > F = 0.0000, R-squared = 0.6404 and \*\*\*&\*\* implies level of statistical significance at 1% and 5%, respectively.

hypothesized. The model result identified those farmers who are male headed supply 0.603 quintal than other female headed farmers, keeping other factors constant. The male headed farmers have the probability of gaining agricultural inputs, produce more and contact buyers to supply their produce than the female headed farmers. The research outcome of [Sebatta et al. \(2018\)](#), [Mossie et al. \(2020\)](#), who found that male-headed households supply greater product than the female headed farmers.

**Educational level of household head:** Educational level of households significantly and positively affected the quantity of the groundnut supplied to the market as expected at 5% significance level. An increment to the level (class schooling) of the household by one year increases the quantity of the groundnut supplied to market by 0.097 quintal, keeping other factors constant. Educated farmers produce more and supplied more to the market than less educated farmers. The result confirms the research outcome of [Falmata \(2018\)](#) and [Aslam et al. \(2013\)](#) who found greater level of education enhances market supply.

**Distance from the nearest market:** As expected distance of households from the nearest market significantly and negatively affected the quantity of the groundnut supplied to market at 5% significance level. The econometric model result indicated that every minute increase in distance of farmers' home from market decreases the quantity of a groundnut supplied to market by 0.012 quintal, keeping other factors constant. The result is in line with the research findings of [Kyaw et al. \(2018\)](#), [Abera et al. \(2016\)](#), and [Aslam et al. \(2013\)](#) who identified that as farmers far from the market they supply less to market.

**Access to credit:** Farmers' access to credit as hypothesized significantly and positively affected the quantity of a groundnut supplied to market at 1% significance level. It indicates that farmers who had accessed to credit service supply more by 0.38 quintal than who did not access. This might be due that credit enables farmers to purchase improved varieties, fertilizers, oxen, hire labor, and other supplementary machineries which could help them to produce larger quantity of a groundnut and supply more to market. The research finding of [Jaji et al. \(2018\)](#), [Faris et al. \(2018\)](#), [Sharma \(2016\)](#) and [Gobie et al. \(2019\)](#) are in line with the result of this study.

**Number of Livestock:** Number of oxen has significantly and positively affected quantity of the groundnut supplied to market at 1% significance level as hypothesized. As the number of oxen increase by one unit, the quantity of groundnut supplied the market increase by 0.54 quintal. This implies that farmers who have oxen can plough their land

timely and produce more which can help them to increase their contributions in supplying more groundnut to the market. The result confirms the research finding of [Gobie et al. \(2019\)](#) and [Workye et al. \(2019\)](#) who discussed that the as the number of oxen owned increase the quantity of product supplied to market.

**Land allocated for a groundnut:** The size of land allocated for groundnut production significantly and positively affected the quantity of a groundnut supplied to market at 1% significance level. Keeping other variables constant, as the size of land allocated for a groundnut cultivation increase by 1ha results in an increase of the quantity of groundnut supplied to market by 6.055 quintals. This indicates that an increment to land allocation for groundnut cultivation bring larger amount groundnut to supplied to the market. The result is in line with the findings of [Gebremedhn et al. \(2019\)](#), [Jaji et al. \(2018\)](#), [Aslam et al. \(2013\)](#) who identified the direct relationship between the size of land allocated and quantity supplied to market.

#### 4. Conclusion and recommendation

Production and marketing of a groundnut are undertaken by small-holder farmers in order to improve their living standards in western Oromia. Farmers who engaged in this farming are getting low income as the activity is constrained both at production and marketing stages. The study was conducted to identify determinants of groundnut market supply in western Oromia region, Ethiopia. Multiple linear regression models was applied for data analysis which were collected from randomly selected 400 respondents and the result showed that age, sex, educational level, distance from the nearest market, access to credit, number of livestock and land allocated for groundnut was statistically and significantly affected the market supply of the groundnut. Therefore, providing access to financial services and coaching producers to use it for productive purposes, training farmers about method of a groundnut production, marketing and marketing information, strengthening infra-structural services to minimize transportation cost and escalating groundnut business through investment should be the concern of government, NGO's and financial institutions.

#### Declarations

##### Author contribution statement

Oliyad Sori: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data included in article/supplementary material/referenced in article.

##### Declaration of interests statement

The authors declare no conflict of interest.

##### Additional information

No additional information is available for this paper.

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