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Determinants of Marketed Surplus of Groundnut Producers in Digga District of Oromia State, Ethiopia

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Abstract
Lower production and marketing problems of groundnut are the main problems though Digga district is potential in groundnut production. So, this study aims to analyze determinants of groundnut marketed surplus in Digga district of Oromia state. Two-stage sampling procedure was employed to draw a sample of 123 groundnut producers. Descriptive statistics was used for characterizing farmers and econometrics analysis was used for identifying determinants of marketed surplus. Explanatory variables resulted from OLS which significantly affected groundnut marketed surplus were age of the household heads, distance from nearest market, groundnut farming experience, access to extension service, access to credit, and size of land allocated for groundnut. The findings of the study suggest that improving and strengthening institutional services, and infrastructural development to enhance groundnut marketed surplus.
Keywords: Groundnut, Marketed Surplus, Multiple Linear Regression

1. Introduction

Agriculture is the mainstay of the Ethiopian economy and contributes 41.4% of the country's gross domestic product (GDP), 83.9% of the total exports, and 80% of all employment in the country (Matousa *et al.,* 2013). The growth of Ethiopia and food security is driven by agriculture which is the foundation of the country's economy and contributes 15 to 17 percent of the government expenditures. It employs 80 percent of the total population, 43 percent of gross domestic product (GDP), and over 70 percent of export value (UNDP, 2013).

Groundnut (Arachis hypogaea), also known as peanut, is an edible seeds of a legume plant that grow to maturity under the ground. Groundnut is produced in areas with 40 mm or more annual rainfall and there should be at least 20 mm rainfall in the growing season. The most suitable soils are well-drained loose, friable, sandy loams, rich in calcium and moderate amounts of organic matter.

The lowland areas of Ethiopia have considerable potential for increased oil crop production including groundnut. Groundnut is mainly grown in Oromia (East and West Harerghe, Wollega, Kelem Wollega, Ilubabor), Amhara, Benishanul Gumuz (Metekel, Asosa, Kemashi, Mao Komo), Southern (Omo), Gambela (Agnuwak) states and Dire Dawa (CSA, 2015). According to CSA (2016) report on area and production of crops, groundnut was produced on 75,255.73 hectares of land in the 2015/16 cropping season leading to a total production of well over 115,180 tones.

Groundnut is an important crop from the perspective of food and nutrition security of poor smallholder farmers in developing countries, where it is grown widely (Nedumaran *et al*., 2015). It also generates considerable cash income for several small scale producers and foreign exchange earnings through export for Ethiopia (Geleta *et al*., 2007). Groundnut production in Ethiopia is found to be constrained by several biotic and abiotic factors like critical moisture stress especially during flowering and after, lack of improved varieties, inappropriate production and post harvest practices, diseases affecting both above and underground parts of the plant like aflatoxin which affect the produce in the field and at various levels from harvest to market. The supply of the country's groundnut is mostly constrained by different factors which constrain the supply at different supply chain levels like farmers, traders, processors and exporters. (Alemayehu *et al*., 2014)

Lack of capital, competition and low quality of groundnut, low or irregular quantity of groundnut supply, poor road infrastructure, low profit margin, government restriction or high taxes and lack of transportation are challenging groundnut producers in Ethiopia (Fredu *et al*., 2015). Inefficient marketing, improper cleaning and sometimes poor contract discipline led opportunities for oilseed export not fully exploited (Wijnands *et al*., 2007). So, results of this study are very essential in terms of providing appropriate awareness for producers of how to produce more and supply for the market.

2. Methodology

2.1. Description of the study area

Digga district is one of the districts of Oromia National Regional State. The district is bordered in the east by Guto Gida district, in the west by the Gimbi district, in the north by Sasiga district and in the south and southeast by Jimma Arjo and Leka-Dulecha districts. The geographical location of the district is lies between 9^0 2' 41'' North latitude and 36^0 15' 33'' East longitude. There are 24 kebeles in the district of which 21 are rural kebeles and 3 are urban kebeles. The district has a total population of 85,468 of which 43,261 are male and 42,207 are female.

Similarly, from total population, 12,890 are urban residents and 72,578 are rural residents (CSA, 2013). On average, a household has 6 family members in the district.

Out of the district's total area of 59,545.413 hectares of land, 40,609.97 ha (68.2%) is arable land, 7,264.54ha (12.2%) is grazing land, 10,063.17ha (16.9%) is forest land and the rest 1,548.18ha (2.6%) is used for roads and housing (district's Agriculture Office document, 2016). According to Digga district Bureaus of Agriculture, more than 1097.9 hectares of land could be used for production of groundnut in the district. The district comprises both lowland (60%) and midland (40%) agro- ecologies. The district features a crop-livestock mixed farming system. The types of crops grown and the general livelihood adaptation in the district have been shaped by agro-ecology. In the midland part of the district, *teff*, neug, coffee, maize, barley and faba bean take the major share of production; while the lowland area is dominated by maize, sorghum, groundnut, sesame, and fruit trees.

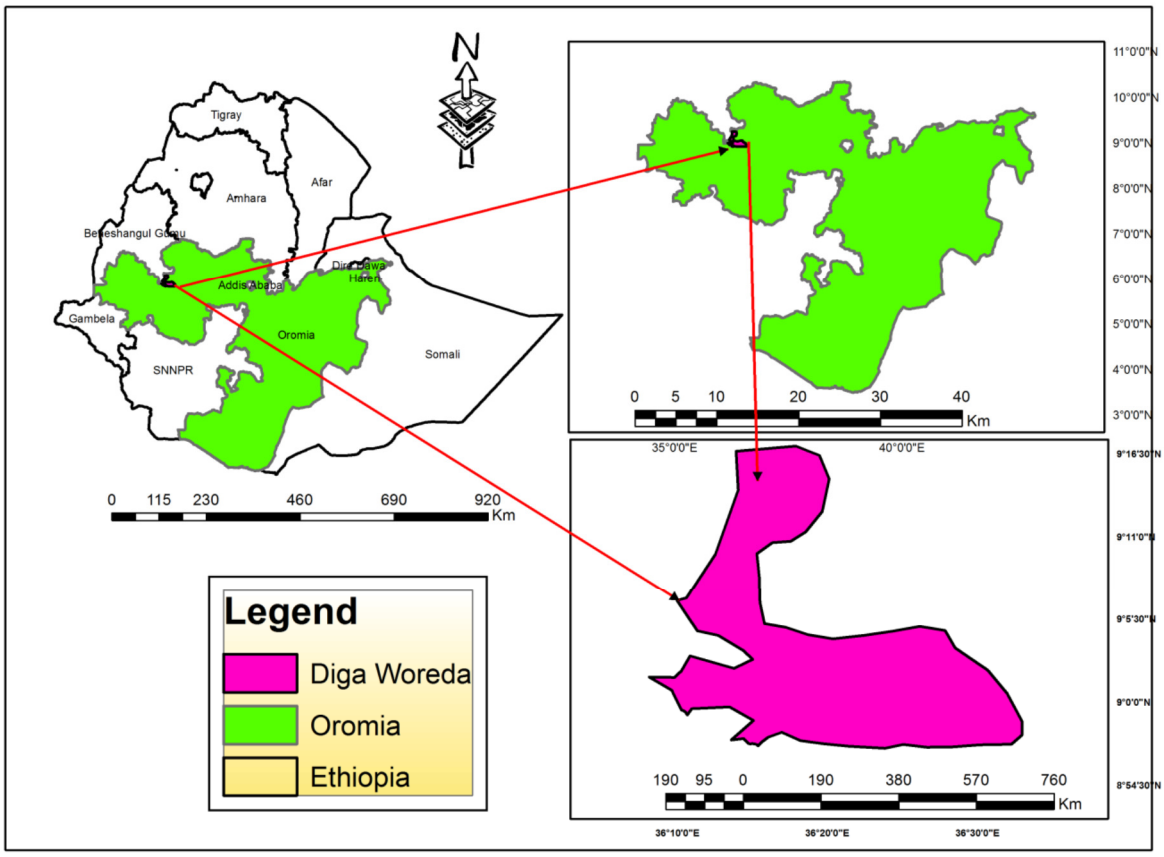

Figure 1. Geographical location of the study area
Source: Adapted from Ethiopia map.

2.2. Types and sources of data

Both qualitative and quantitative data were collected from primary and secondary data sources. Primary data were collected from sample farm households using pre-tested semi-structured interview schedule and observations. Besides, relevant secondary data sources include Digga district Bureau of Agriculture, Central Statistical Authority (CSA), published and unpublished reports, and websites were used in addition the survey data.

2.3. Sampling techniques and sample size

A two-stage sampling technique was used to select representative groundnut producers from the study area. Digga district was selected purposively based on the potential it has for groundnut production in the zone. In the first stage, from kebeles which produce groundnut, 4 kebeles were randomly selected. In the second stage, 123 samples of household heads were randomly selected from total groundnut producers in the district and the sample households were drawn randomly from each *kebele* based on probability proportional to size sampling techniques. Sample size was determined by Yamane (1967) formula at 9% of significance level.

$$n = \frac{N}{1+N(e)^2} \qquad n = \frac{15867}{1+15867(0.09)^2} \sim 123$$

Where n= sample size, N=population size, e= level of precision (9%)

Table 1: Sample distribution of household in selected kebeles

No.	Kebeles	Total number of groundnut producers in each kebele.	Number of sampled households in each kebele
1	Arjo Qonan Bula	662	33
2	Bacbac	739	37
3	Mada Jalala	454	23
4	Dimtu	587	30
	Total	2442	123

Source: Digga district bureau of agriculture, 2016

2.4. Methods of data analysis

Descriptive statistics and econometric analysis were used to analyze the data collected from groundnut producers. Descriptive statistics employed were percentages, frequencies, means, maximum, minimum, range, and standard deviations in the process of describing households' characteristics. Econometric analysis uses multiple linear regression model to analyze factors affecting groundnut marketed surplus in the study area because all groundnut producers participate in the market. Model specification of marketed surplus function is given as the following. $y_i = \beta_0 + \beta_1 X_i + U_i$

Where, y_i is quantity of groundnut marketed surplus, β_0 is intercept, β_1 is coefficient of i^{th} explanatory variable, X_i is a vector of explanatory variables, U_i is disturbance term. Groundnut marketed surplus is a continuous dependent variable used in the multiple linear regression model. It is measured in quintal and represents the actual supply of groundnut by farm households to the market in the year 2016/17 whereas the summary of independent variables used in this model are presented below in Table 2.

Table 2. Description of explanatory variables used in the multiple linear regression model

Variable name	**Types**	**Measurement**	**Hypothesis**
Age of household heads	Continuous	Year	+ve
Sex of household heads	Dummy	0=female, 1=male	+ve
Education level of household heads	Categorical	1=illiterate, 2= primary school, 3, secondary school, 4=certificate holders and above	+ve
Distance from residence to market center	Continuous	Walking hours	-ve
Farming experience of household heads	Continuous	Years	+ve
Number of livestock owned	Continuous	Number of animals	+ve
Access to market information	Dummy	1= yes, 0=no	+ve
Access to extension services	Dummy	1= yes, 0=no	+ve
Access to credit services	Dummy	1= yes, 0=no	+ve
Family size	Continuous	Number of family Member	+ve/-ve
Land allocated for groundnut	Continuous	Hectare	+ve
Access to off/non-farm income	Dummy	1= yes, 0=no	+ve

3. Results and Discussions

3.1. Demographic characteristics

The result of the study revealed that the average age of total sample households was about 40.77 years. The lowest age of households was 22 and the highest was 71. Out of total household heads interviewed, 26.02% were female headed households while 73.98% were male headed households. According to the result, about 30.08% of the sampled household heads were illiterate. However, 47.79% and 17.89% attended primary school and secondary school, respectively, whereas the smallest proportion (4.07%) are certificate holders and above. Average family size of sampled households was 6. The households have an average of 6.80 years of farming experience in groundnut production which implies that the cultivation of groundnut in the study area is not stretched many years long ago (Table 3)

Table 3: Characteristics of sample households

Variable	Category		Frequency	%
Sex of household heads		Male	91	73.98
	Female		32	26.02
Education of household heads		Illiterate	37	30.08
		Primary	59	47.97
		Secondary	22	17.89
	Certificate		5	4.07

	Mean	SD	Minimum	Maximum
Age	40.77	9.02	22	71
Family size	5.59	1.87	2	10
Farming experience	6.80	2.50	2	13

Source: Own survey result, 2016

3.2. Farm land allocation

Based on the survey results, the average land holding of the sample households was found to be 2.44ha with standard deviation of 1.39. The average land allocated for groundnut production area was 0.6ha with 0.25ha and 2ha lowest and highest land allocated for groundnut production, respectively (Table 4).

Table 4: Farm characteristics of sampled households

Variable	Mean	St.dev	Min	Max
Total land (hectare)	2.44	1.39	0.5	7.5
Cultivated land (hectare)	2.30	1.26	0.5	7
Land allocated to groundnut (hectare)	0.6	0.35	0.25	2

Source: Own survey result, 2016

3.3. Institutional characteristics

Out of the total sampled households of groundnut producers about 71.54% had access to extension service in 2016 production season. Sample households in the study area travels average walking hour of 0.73 ranging from 0.33 to 1 walking hour to access development center or FTC. About 56.10% and 64.23% of sampled households access to credit services and market information from different sources, respectively. The distance needed for households to travel to nearest market place is 0.75 walking hour average which ranges from 0.33 to 1.5 hours (Table 5).

Table 5: Access to services of sampled households

Variables	Response	Frequency	Percent
Extension service	Yes	88	71.54
	No	35	28.46
Credit	Yes	69	56.10
	No	54	43.90
Market information	Yes	79	64.23
	No	44	35.77

Variable	Mean	SD	Minimum	Maximum
Distance from development center (hour)	0.73	0.22	0.3	1
Distance from nearest market (hour)	0.75	0.23	0.3	1.5

Source: Own survey result, 2016

3.4. Factors affecting groundnut marketed surplus

Analyses of factors affecting of groundnut marketed surplus were found to be important. Prior to fitting multiple linear regressions, the hypothesized explanatory variables were checked for existence of multicolliniarity, heteroscedasticity and omitted variables problem. VIF was employed to test the existence of muliticollinerarity among explanatory variables and the result showed that the mean VIF was 1.24 which indicates no problem of multicollinarity among explanatory variables in the model. Robust OLS analysis with heteroscedasticity was used and the result indicated that heteroscedasticity was not a problem. Furthermore, test of omitted variables result showed that no omitted variables in the model.

For this study 12 explanatory variables were hypothesized as factors affecting household level of groundnut marketed surplus. The hypothesized variables were age of the household heads, farming experience of the

household heads, sex of household heads, educational level of household heads, family size, access to market information, access to credit, distance to nearest market, land size of groundnut, livestock ownership, extension contact, and access to off/non-farm income to affect groundnut marketed surplus. Based on the OLS estimation result, six variables (age, distance, farming experience, extension, credit, and size of land allocated) influenced marketed surplus of groundnut significantly. The F-test calculated value F (12, 110) = 14.15 was significant; and the coefficient of multiple determinations (R^2) was used to check goodness of fit for the regression model. Hence, R^2 indicates that 68.51 percent of the variation in the quantity of groundnut supplied to market was explained by the variables included in the model.

Table 6: Determinants of groundnut marketed surplus

Variables	Coefficient	Standard error
Constant	0.208	1. 274
Age of the household head	0.047***	0.018
Sex of the household heads	-0.327	0.388
Educational level of the household heads	0.140	0.180
Distance from nearest market	-1.519*	0.799
Groundnut farming experience	0.140**	0.069
Livestock	-0.018	0.058
Access to market information	0.192	0.368
Access to extension service	0.654*	0.377
Access to credit	0.667**	0.314
Family size	0.069	0.094
Size of land allocated	5.143***	0.916
Off/non farm income	0.432	0.317
Number of observations	123	
F(12, 110)	14.15	
R-squared	68.51	
Muticollinearity (mean VIF)	1.24	
Model specification (ovtest: prob>F)	0.4901	

Note: Dependent variable is groundnut marketed surplus in Qt, ***, ** and * show the values statistically significant at 1%, 5% and 10% significance level, respectively.

Source: Own computation from survey result, 2016.

Age of household is positively affected groundnut marketed surplus at 1% significance level as hypothesized. As age of household increase by one year, the quantity of groundnut supplied to the market increase by 0.05 quintal keeping other variables constant. Older farmers could make better production decision of allocating large size of land and supply larger volume of the product to the market than younger aged farmers. The result is consistent with Wubshet (2010) who found that, age of household head has positive effect on coffee supply.

Distance to nearest market affected groundnut marketed surplus significantly and negatively as hypothesized at 10% significant level. As the proximity from the farm to market increases by one hour, the volume of groundnut supplied to the market decreases by 1.51 quintals. The farther from the market the higher would be the transportation cost and opportunity time spent so that it makes marketed surplus of groundnut to be supplied in smaller quantity. The result is consistent with Efa *et al.* (2016) and Mahilet (2013) who indicated that distance to nearest market significantly and negatively affected volume of *teff* and malt barely supplied to the market, respectively.

Farming experience of the household had significant positive effect on groundnut marketed surplus at 5% significance level. Accordingly, the study resulted that a one year increase of farming experience would increase the quantity of groundnut supplied to the market by 0.14 quintal keeping other variables constant. Farmer with longer year farming experience might be equipped with the use of production inputs, produce and supply more to the market than less experienced farmers. The result is consistent with study of Bizualem *et al.* (2015), El *et al.* (2013), Jemal (2013), and Benjamin (2013) illustrated farmers' farming experience increased marketed surplus of coffee, volume of crops, coffee and groundnut supplied to the market, respectively.

Access to extension service as expected, has significant positive effect on the marketed surplus of groundnut at 10% significance level. This implies that farmers accessed extension service would increase the groundnut marketed surplus by 0.65 quintal per year than who did not access with extension services. This could be attributed to the fact that extension service would provide up to date information regarding agricultural technologies that might improve productivity and therefore increase the marketed surplus. The result is consistent with the study by Tadele *et al.* (2016) which indicated that access to extension service increases the quantity of *teff* supplied to the market.

The result of the study indicated that access to credit has significant positive effect on the groundnut marketed surplus as expected at 5% significance level. This implies that farmers who got credit access would increase the

groundnut market surplus by 0.66 quintal per year than who did not access with credit. Credit makes traditional agriculture more productive through the purchase of farm equipment and other agricultural inputs, and technological developments so that farmers produce and supply more to market. The result is consistent with the finding of Bizualem *et al.* (2015) found that farmers who got credit access would increase marketed surplus of coffee.

Size of land allocated for groundnut has significant positive effect on the quantity of groundnut supplied to the market at 1% significance level. Allocating large size of land for groundnut production increases the product thereby increases the amount supplied to market. The model output predicted that as the household's allocation of land for groundnut production increases by one hectare, the marketed surplus of groundnut would increase by 5.14 quintal keeping other variables constant. The result is consistent with the finding of Efa *et al.* (2016) where positive relationship between farm size and amount of *teff* supplied to the market is indicated.

Conclusions and Recommendations

The purpose of this study was to identify the determinants of groundnut marketed surplus among smallholder producers. The primary data were collected from individual interview using semi-structured questionnaire from 123 randomly selected groundnut producer households. Secondary data were obtained from different sources like CSA published and unpublished reports, and websites. Both descriptive statistics and econometric analysis were used for data analyze. The descriptive statistics measures like mean, maximum, minimum, percentage, standard deviation were used in characterizing demographics, farm land allocation, institutional and services. Multiple linear regression model was used to identify factors affecting groundnut marketed surplus of smallholder producers. Similarly, multiple linear regression model resulted that, groundnut extension and credit services, and size of land allocated for groundnut of household heads of which all positively affected groundnut marketed surplus except distance from nearest market. The result of the study recommends that farmers have to be trained and consulted in order to strength their experience of how to produce and supply more to the market, have to use improved inputs on the existing size of land and by protecting the fertility of the existing land in order to increase their production capacities thereby enhance their groundnut marketed surplus, use both formal and informal existing provision of credit institutions of their surroundings and use it for productive purposes, improving and strengthening road infrastructures can improve the delivery of groundnut to the market.

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