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Factors Affecting Market Outlet Choice of Groundnut Producers in Digga District of Oromia State, Ethiopia

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Abstract- Various problems constrain farmers in order not to choose appropriate market outlets for their produce. By taking these issues into consideration, this study is undertaken with the objective of identifying determinants of groundnut market channel choice producers in Digga district of Oromia region, Ethiopia. Both primary data which is collected from 123 randomly selected households from four kebeles and secondary data were used. Multi-stage sampling procedure was employed to draw sample of groundnut producers. Multivariate probit model was used to identify factors affecting market outlet choices of groundnut producers and the result revealed that variables like educational level, distance to the nearest market, access to extension service, size of land allocated for groundnut, quantity of groundnut produced, transport facilities, buyers' trust and access to off/non-farm income affected the choice of appropriate market outlets of producers. Providing and strengthening services from extension services, timely and adequately providing production inputs to improve quantity produced, improving road infrastructures are recommended by the study to enhance farmers' choice of suitable market outlets
Keywords: groundnut, market outlet choice, multivariate probit model.

1. Introduction

Groundnut (*Arachis hypogaea*), also known as peanut, is an edible seeds of a legume plant and it is the six most important oilseed crop in the world (FAOSTAT, 2015). More than 90% are developing countries among nearly 100 countries within which groundnut is cultivated (CGIAR, 2004-2005). Groundnut is the second important lowland oilseed of warm climate next to sesame and one of the five widely cultivated oilseed crops in Ethiopia (Wijnands *et al*., 2009). 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 in Ethiopia (CSA, 2016). Groundnut is mainly grown in Oromia region (East and West Harerghe andWollega, Kelem Wollega, Ilubabor), Amhara region, Benishanul Gumuz region (Metekel, Asosa, Kemashi, Mao Komo), SNNP region (Omo), Gambela region (Agnuwak) and Dire Dawa (CSA, 2015).

Groundnut is increasingly important crop from the perspective of food and nutrition security of poor smallholder farmers in developing countries (Nedumaran *et al.*, 2015). It helps small scale producers as a source of cash income and creates foreign exchange earnings through export for Ethiopia (Geleta *et al*., 2007). In Ethiopia, groundnut is affected by aflatoxin at levels much higher than any international acceptable standards (Alemayehu *et al*, 2014). But, afltoxin contamination of groundnut could be minimized through various agronomic and seed handling practices (Ephrem, 2015).

Like other oilseeds, groundnut is produced and supplied for different market channels, and local collector, wholesaler, retailer and consumer market outlets are outlets for which producers supply the product in the study area. In spite of different challenges for outlet choices of the producers; they can select one or more channels among the existing market channels in order to maximize expected utility thereby making a joint decision regarding with the existing constraints of market channel choice and how to get expected further outcomes. Although farmers sale groundnut through different market outlets no empirical evidences has been done on factors affecting market outlet choice of groundnut producers in the study area. So, results of this study is very crucial in terms of providing very important information on the choice of appropriate market outlets through analyzing determinants of groundnut producer channel choice decisions thereby enable them to get reasonable profit in Digga district.

2. Methodology

2.1. Description of the study area

This study was undertaken in Digga district of east Wollega zone, Oromia region, Ethiopia. Geographically, district 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 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 district is composed of 24 kebeles 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 and likewise, 12,890 are urban residents and 72,578 are rural residents (CSA, 2013). By land use pattern, 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 other 1,548.18ha (2.6%) is used for roads and housing (DDAO, 2016).

The district comprises both lowland (60%) and midland (40%) agro- ecologies. Despite fluctuations over the years, generally the district has a mono modal rainfall pattern whereby it receives rain from mid-March through November. The rain is particularly heavy from June to September. January to mid-March is known to be the dry season in the district. Annual rainfall varies from 1200-2100mm in the district. 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 (DDAO, 2016).

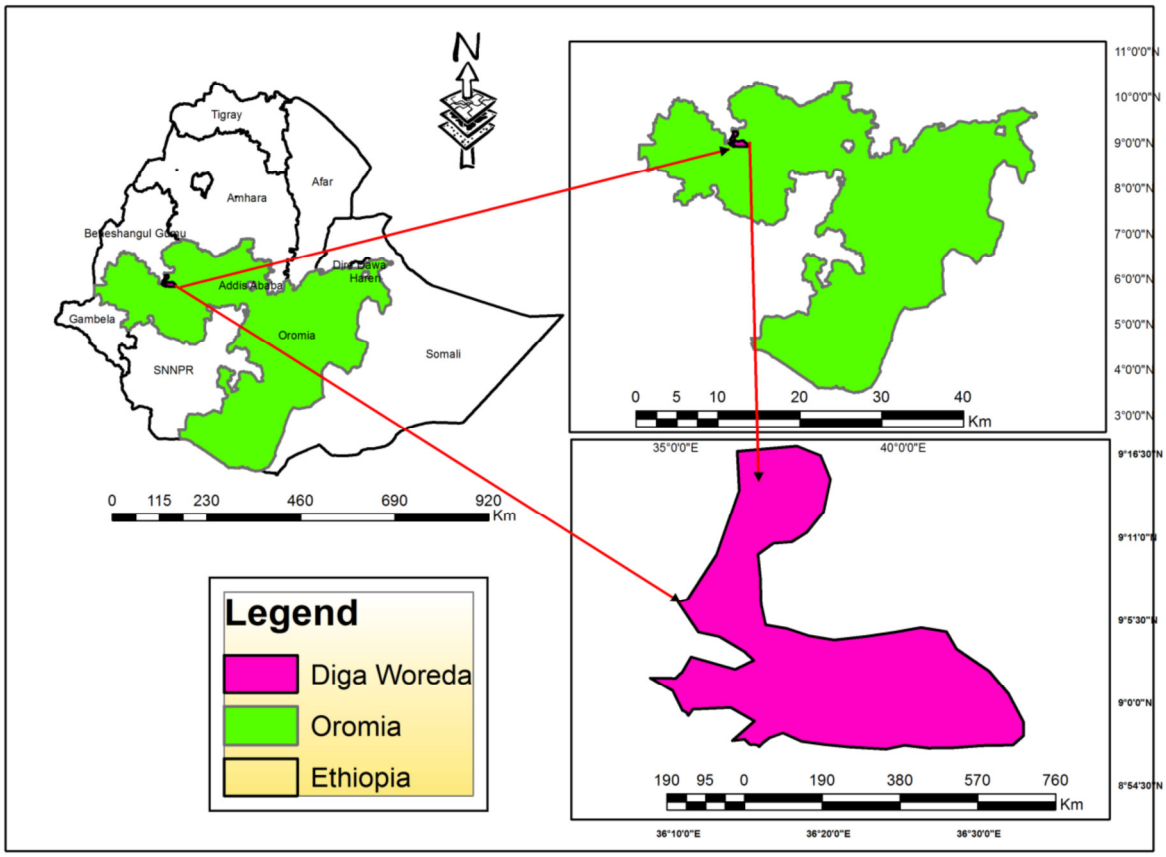

Figure 1. Geographical location of the study area.
Source: Adapted from Ethiopia map.

2.2. Data types and methods of data collection

For this study both primary and secondary data were used. Survey was undertaken through formal interviews with randomly selected groundnut producer farmers using pre-tested semi-structured questionnaires. Secondary data were obtained from Central Statistical Authority (CSA), published and unpublished reports.

2.3. Sampling techniques and sample size determination

To draw sample for this study, a multi-stage sampling technique was used to select representative groundnut producers from the study area. In the first stage, Digga district was selected purposively based on the potential it has for groundnut production in the zone. In the second stage, from kebeles which produce groundnut, 4 kebeles were randomly selected. Third, 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 agricultural office, 2016

2.4. Methods of data analysis

Descriptive statistics and econometric analysis were used to analyze data collected from groundnut producers. Descriptive statistics employed were percentages, frequencies, means, maximum, minimum and standard deviation in the process of describing households' characteristics. Econometric analysis uses multivariate probit (MVP). Some empirical studies on market outlet choice assume that the addition or deletion of alternative outcome categories does not affect the odds among the remaining outcomes and the odds of choosing a particular market outlet over the other do not depend on which other outcomes are possibly chosen. But in the study area there are several market outlets (local collectors, wholesalers, retailers and consumers) and farmers have the possibility to select more outlets simultaneously to maximize the expected utility and due to this there is some overlapping and many farmers sell to more than one market outlet. Multivariate probit approach simultaneously models the influence of the set of explanatory variables on choice of market channels, while allowing for the potential correlations between unobserved disturbances, as well as the relationships between the choices of different market channels (Belderbos *et al*., 2004). So, using multinomial logit model for outlet choice is not viable due to market channel choice might not mutually be exclusive; considering the possibility of simultaneous choices of channel and the potential correlations among these market channel choice decisions. Multivariate probit model is preferred over the multinomial logit model because of the independence of irrelevant alternatives (IIA) assumption and the relative risk of choosing one outlet can be affected by the relative risk of the choosing the other (Greene, 2003).

The observed outcome of market channels choice can be modeled following random utility formulation. Consider the i^{th} farm household (i=1, 2, 3…N), facing a decision problem on whether or not to choose available market. Let U_0 represent the benefits to the household who chooses wholesalers, and let U_k represent the benefit of household to choose the K^{th} market choice: where K denotes choice of collectors (Y_1), retailers (Y_2), wholesalers (Y_3), and consumers (Y_4). The household decides to choose the K^{th} market channel choice if $Y^*_{ik} = U^*_k - U_0 > 0$. The net benefit ($Y^*_{ik}$) that the household derives from choosing a market channel choice is a latent variable determined by observed explanatory variable(X_i) and the error term (ϵ_i).

$$Y^*_{ik} = Xi\beta + \epsilon_i, \qquad k = (Y_1, Y_2, Y_3, Y_4) \qquad (1)$$

Using the indicator function, the unobserved preferences in equation (1) translates into the observed binary outcome equation for each choice as follows:

$$Y^*_{ik} = \begin{cases} 1, & if\ Y * ik > 0 \\ 0, & Otherwise \end{cases} \qquad K = Y_1, Y_2, Y_3, Y_4 \qquad (2)$$

Dependent variable.

Market channel choice is a categorical dependent variable in nature and measured by the probability of household heads selling groundnut product to different market outlets. The outlet choices might be along households decision involving in alternative markets. It was represented in the model as ρ_1 for those households who choose to sell groundnut to collectors, ρ_2 for households who choose retailers, ρ_3 for households who choose wholesalers and ρ_4 for households who choose consumers outlets to sell groundnut.

Table 2. Description of explanatory variables and hypothesis in multivariate probit model

Variable name	Types	Measurement	Hypothesis
Education level of household heads	Categorical	1=illiterate, 2= primary school, 3, secondary school, 4=certificate holders and above	+ve/-ve
Cooperatives membership	Dummy	1= yes, 0=no	+ve/-ve
Distance from residence to market center	Continuous	Walking hours	+ve/-ve
Access to market information	Dummy	1= yes, 0=no	+ve/-ve
Access to extension services	Dummy	1= yes, 0=no	+ve/-ve
Family size	Continuous	Number of family member	+ve/-ve
Land allocated for groundnut	Continuous	Hectare	+ve/-ve
Quantity of groundnut produced	Continuous	Quintal	+ve/-ve
Transport facilities ownership	Dummy	1= yes, 0=no	+ve/-ve
Buyers trust	Dummy	1= yes, 0=no	+ve/-ve
Access to off/non-farm income	Dummy	1= yes, 0=no	+ve/-ve

Note: +ve/-ve either negatively or positively affects the likelihood channel choice.

3. Results and Discussions

3.1. Demographic characteristics of sampled households

The average age of total sample households was about 40.77 years with minimum and maximum 22 and 71 years, respectively. From the sample households, 26.02% were female headed households while 73.98% were male headed households. Similarly, in the study area family size of the total sample households ranges from 2 to 10 persons with average family size of 6 years. 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. 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 (Appendix Table 3).

3.2. Farm land allocation of sampled households

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.

3.3. Institutional characteristics of sampled households

Out of the total sampled households of groundnut producers about 71.54% access to extension services 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. 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. Among the sampled households of the study area, 52.03% are membership to their kebele's cooperatives. Different cooperatives which were emerged in the district's kebeles include Refu Kane, Dimtu, Burka Didessa, Cokorsa and Geleta Argane. Market information facilitates the supply of the produce timely and selection of appropriate outlets. Similarly, 64.23% of sampled households access to market information from different sources. The availability of well-functioning transport network is very important because it creates place utilities of the product. Accordingly, about 64.23% of households have their own transport facilities (Appendix Table 4).

3.4. Factors affecting market outlet choice of the groundnut producers

Farmers who produce groundnut in Digga district have different market outlet choices for selling groundnut. Multivariate probit was used to analysis the producers' groundnut market channel choices among four different channels included in the model. The P-value of the Wald test statistics for the overall significance of the regression is satisfactory (0.0000) indicating that the multivariate regression is significant. The likelihood ratio test of rho is significant (P value= 0.0050) indicating that a multivariate probit specification fits the data. The correlation coefficients among the error terms are significant indicating that the decision to choose one market outlet affects the decision of choosing the other. The simulation results indicate that the probability that groundnut producers choose collector, retailer, wholesaler and consumer market outlets were 55%, 50%, 60% and 49%, respectively, which shows that the models have good predictive values. The ρ_{31} (correlation between the choice for wholesaler and collector) and ρ_{43} (correlation between consumer and wholesaler) are negatively interdependent and significant at 10% and 5% probability level, respectively and ρ_{41} (correlation between the

choice for consumer and collector) is positively interdependent and significant at the 1% and probability level.

According to the result obtained multivariate probit model, one variable significantly affected collector market outlet; five variables significantly affected wholesaler outlet; two variables significantly affected retailer outlet and five variables significantly affected consumer outlet choices at 1, 5 and 10 percent probability levels (Appendix Table 5).

Educational level has significant and negative relationship with the likelihood of choosing collectors market outlet and positively affected wholesalers market outlet at 1% and 5% significance level, respectively. This indicates that educated farmers would more likely sell groundnut to wholesalers than other channels. Farmers with no education are more likely to sell their products to collector market outlet. The possible reason might be that as the educational level of farmers enable them to produce more and supply for appropriate outlets. Education increases the knowledge of farmers that can be used to collect information, interpret the information received, and make informed decisions on the choice of appropriate market channel. The result is consistent with the study by Abraham (2013) who found that educational level has significant negative relation with collector market outlets.

The likelihood of choosing both wholesaler and consumer channel outlets significantly and negatively affected by distance to the nearest market at 10% and 1% significance levels, respectively. This result shows that a unit increase in walking hour to the market would decrease the probability of choosing wholesaler and consumer only channel. This is due to the fact that, most farmers prefer to sell their products at farm gate without incurring transaction costs. The result is consistent with a study by Sultan (2016) and Nuri (2016) indicated that increase in distance to the nearest market center would decrease the probability of choosing wholesalers channel.

Access to extension service had significant negative effect on the likelihood of choosing consumer outlets at 5% significant level. Households who have access to discussion with extension agents sell less to collectors and consumer outlets rather might supply for other market outlets. Access to extension service increased the ability of farmers to acquire important market information as well as other related agricultural information which in turn increases farmers' ability to choose the best market outlets for their product. This is in line with the findings of the study by Mekonnin (2015) who found that access to extension service has significant negative relation with the choice of end consumer outlet in coffee market outlet choice.

Size of land allocated to groundnut influenced the likelihood choice of wholesaler and retailer outlets positively at 10% and 5% significance levels and affected consumers outlet at 10% significance level. An increase in land allocated to groundnut increases farmers' likelihood of choosing retailer and wholesaler channels than consumers outlet. This is due to the area of land covered by the crop can directly increase the marketed supply of groundnut products and farmers supply large volume of the produce to retailers and wholesalers for selling. In contrary to this, farmers who allocated small size of land for groundnut production produce small quantity of groundnut and prefer to sell their produce on farm gates and to consumers.

The likelihood of choosing wholesaler and retailer market outlets is positively and significantly affected by the quantity of groundnut produced at 5% and 1% significance levels, respectively. This means that large quantity of groundnut increases the likelihood of selling groundnut to wholesaler and retailer market outlets than other market outlets. Farmers produce groundnut in larger quantity might have a link with wholesalers and retailers to supply larger volume and these outlets have the capacity to purchase larger amount than other outlets. Farmers that produce small amount of products might prefer to sell to collectors and consumers market outlets. The result is consistent with Nuri (2016) indicated that large quantity of bulla increases the likelihood of selling bulla to wholesalers and retailers market outlets.

Transport facilities significantly and positively influenced the likelihood of choosing wholesaler market outlet at 5% significance level. Transport facilities increase the likelihood that farmers select wholesalers outlet while those who do not have such facilities supply through collectors outlet. The availability of transportation facilities helps farmers to reduce long market distance constraints. The result is in line with the finding of the study by Nuri (2016) who indicated that transport facilities ownership by farmers increased the likelihood of choosing wholesalers outlet.

The model indicated that buyers' trust has a significant negative effect on the choice of consumer outlet at 5% significance level. The negative sign indicates that groundnut farmers who have trust in buyers less likely choose consumers market outlet for selling their product than other market outlets. This might be due to farmers use other market outlets for selling their product to the nearest market outlets without wasting their money and resource including time of transporting produce at a distance as they believe the market. The result is in line with Addisu (2016) indicated households who trust in buyers are less likely to deliver onion to consumers outlet and deliver more to collectors outlet.

Access to off/non-farm income has a negative significant effect on the likelihood of choosing consumer outlet at 10% significance level. Farmers who have access to off/non-farm income have less interest to choose consumer outlet compared to those who have no access to off/non-farm income. Income from off/non-farm income generating activities strengthens the financial capacity of farmers and enables them to purchase different

inputs required to produce more groundnuts and they prefer wholesalers and retailers to sell large volume of groundnut. Due to this reason they less sell the product to consumer market outlet rather they might supply for other market outlets.

4. Conclusions and Recommendations

The study was carried out with the aim of identifying determinants of groundnut producer market outlet choices. The primary data were collected from individual interview using pre-tested semi-structured questionnaire. Secondary data were obtained from different sources like CSA, published and unpublished reports. Both descriptive statistics and econometric analysis were used for data analyze. The descriptive statistics measures like mean, percentage; minimum, maximum, and standard deviation were used in characterizing demographics, farm land allocation, and institutional services of households. Multivariate probit model revealed that, educational level of households negatively and significantly affected collector outlet. The choice of retailer outlet is influenced by size of land allocated for groundnut and quantity of groundnut produced variables. Educational level, distance from nearest market, size of land allocated for groundnut, quantity of groundnut produced and access to transportation services variables significantly determined the choice of wholesaler outlet. The choice of consumer market outlet is significantly affected by distance from nearest market, access to extension services, size of land allocated for groundnut, buyers trust and access to off/non-farm income.

The finding of the study identified that land size allocated for groundnut enables farmers' selection of appropriate market outlets. Hence, farmers have to use improved inputs on the existing size of land and use resources efficiently in order to produce more and increase their probability of choosing appropriate market outlets. Increasing the quantity of groundnut produced enhance the choice of appropriate market outlets so that focuses have to be considered with quantity of groundnut produced. The result of the study indicates that extension service has a great role in increasing the choice of suitable market channel. So, extension workers have to provide adequate education and training for farmers of how to store the produce and select pertinent market outlet. The road condition of the district is poorly structured so that improving road infrastructures can improve producers' selecting appropriate market outlets. Farmers have to engage in off/non-farm income generating activities which could enable them to produce more thereby select market channels they need.

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6. References

Abraham Tegegn. 2013. Value Chain Analysis of Vegetables: The Case of Habro and Kombolcha Woredas in Oromia Regional State, Ethiopia. M.Sc. Thesis. Haramaya University, Haramaya, Ethiopia.

Alemayehu Chala, Berhanu Abate, Mulugeta Taye, Abdi Mohammed, Tameru Alemu, and Helge, S. 2014. Opportunities and Constraints of Groundnut Production in Selected Drylands of Ethiopia. Drylands Coordination Group, 74.

Addisu Hailu. 2016. Value Chain Analysis of Vegetables: The Case of Ejere District, West Shoa Zone, Oromia National Regional State of Ethiopia. M.Sc. Thesis. Haramaya University, Haramaya, Ethiopia.

Belderbos, R., Carree, M., Diederen, B., Lokshin, B. and Veugelers, R. 2004. Heterogeneity in R and D Cooperation Strategies. *International Journal of Industrial Organization*, 22 (9): 1237-1263.

CGIAR, 2004-2005. Research and Impact: Areas of Research: Groundnut. Available on: http://www.ccgiar.org/impact/research/groundnut.html.CGIAR 2004-2005.

CSA (Central Statistical Agency). 2013. Population Projection of Ethiopia for all Regions at Wereda Level from 2014 – 2017. Federal Democratic Republic of Ethiopia Central Statistical Agency, CSA, Addis Ababa, Ethiopia.

CSA (Central Statistical Agency). 2015. Reports on Area and Production of Crops (Private Peasant Holdings, Meher Season). Addis Ababa, Ethiopia.

CSA (Central Statistical Agency). 2016. Reports on Area and Production of Crops (Private Peasant Holdings, Meher Season). Addis Ababa, Ethiopia.

DDAO (Digga District Agricultural Office). 2016. Annual Report of the Woreda. Digga, East Wollega Zone, Ethiopia.

Ephrem Guchi. 2015. Aflatoxin Contamination in Groundnut (*Arachis hypogaea* L.) Caused by *Aspergillus* Species in Ethiopia. *Journal of Applied & Environmental Microbiology,* 3(1):11-19.

FAOSTAT (Food and Agriculture Organization of the United Nations). Groundnut world production, 2015.

Geleta Tarekegn., Purshotum, K.S., Wijnand, J.S, and Tana Tamado. 2007. Integrated management of Groundnut Root Rot Using Seed Quality and Treatment. *International Journal of Pest Management,* 53(1): 53 - 57.

Greene, W.H., 2003. Econometric Analysis,5th Edition, Prentice Hall. Inc, London. 1026p.globalvaluechains.org
Mekonnin Abara. 2015. Determinants of Market Outlet Choice and Livelihood Outcomes of Coffee Producing Farmers: The Case of Lalo Assabi Woreda, Oromia, Ethiopia. M.Sc. Thesis. Haramaya University, Haramaya, Ethiopia.
Nedumaran, S., Abinaya,P., Jyosthnaa, P., Shraavya, B., Parthasarathy, R. and Cynthia, B. 2015. Grain Legumes Production, Consumption and Trade Trends in Developing Countries. ICRISAT, No. 60.
Nuri Lefebo. 2016. Value Chain Analysis of *Enset (Ensete Ventricosum)* in Hadiya Zone, Southern Ethiopia. PhD Dissertation. Haramaya University, Haramaya, Ethiopia.
Sultan Usman. 2016. Analysis of Wheat Value Chain: The Case of Sinanan District, Bale Zone, Oromia Regional State, Ethiopia. M.Sc. Thesis. Haramaya University, Haramaya, Ethiopia.
Wijnands, J., Biersteker, J. and Loo, E. 2009. Oilseeds Business Opportunities in Ethiopia. Market Study Report on Oil Seed Marketing in Ethiopia Commissioned by Ministry of Agriculture, Nature and Food Quality, the Netherlands.
Yamane, T. 1967. Statistics: An Introductory Analysis. 2nd Edition. Harper & Row, Publishers, New York, 1967.

Table 3. Demographic characteristics of sample households

Variable	Category	Frequency	Percent
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

Table 4. 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
Own transport	Yes	79	64.23
	No	44	35.77
Membership to cooperatives	Yes	64	52.03
	No	59	47.97

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

Table 5: Determinants of groundnut producers' market outlets choice

Variables	Collectors		Retailers		Wholesalers		Consumers	
	Coef	RSE	Coef	RSE	Coef	RSE	Coef	RSE
Constant	1.148	0.849	-1. 897*	1.035	-2.882**	1. 160	3.837***	0.970
Education	-0.43***	0.153	-0.209	0.199	0.464**	0. 211	-0.091	0.150
Distance mark	0.271	0. 609	-0. 944	0.704	-1.348*	0. 786	-1.931***	0. 662
Member coop	-0.012	0. 272	-0.068	0.314	0.201	0. 330	-0.169	0. 273
Information	0.032	0. 258	-0.033	0.313	-0.527	0. 337	0.022	0. 262
Extension	-0.002	0. 296	0.225	0.352	-0.003	0. 361	-0.754**	0.310
Family size	-0.010	0. 067	-0.038	0.086	0.065	0. 100	-0.023	0. 069
Size of land	-0.146	0.517	1.189*	0.620	2.528**	1. 133	-1.136*	0. 625
Output	-0.018	0.064	0.297***	0.086	0.218**	0. 099	-0.061	0. 069
Transport	-0.407	0.304	0.191	0.339	0.722**	0.332	0.202	0.304
Trust	-0.052	0.320	0.347	0.367	-0.292	0. 370	-0.705**	0. 326
Off/non-farm income	0.329	0.266	0.131	0.322	0.079	0. 354	-0.463*	0. 264
Predicted probability	0.55		0.50		0.60		0.49	
Number of draws (#)	5							
Observations	123							
Log Likelihood	-228.087							
Wald(χ2 (44)	115.66							
Prob > χ 2	0.0000***							

Estimated correlation matrix

	ρ_1	P_2	P_3	P_4
ρ_1	1			
P_2	-0.162(0.183)	1		
P_3	-0.338* (0.185)	-0.015(0.207)	1	
P_4	0.526***(0.132)	-0.069 (0.169)	-0.428**(0.201)	1

Likelihood ratio test of $\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$
chi2(6) = 18.5562
Prob > χ^2 = 0.0050

Note: ***, ** and * indicate statistical significance at 1, 5 and 10%, respectively. RSE is Robust standard error, Coef=Coefficient,ρ_1=Collectors,ρ_2=Retailers, ρ_3=Wholesalers and ρ_4=Consumers.
Source: Own computation from survey result, 2016.