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Factors Affecting Groundnut Market Outlet Choice in Moisture Stress Area of Babile District, Eastern Ethiopia: Multivariate Probit Approach

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Abstract

The groundnut plant has the ability to survive in areas of low rainfall because it is a legume and it increases soil fertility by fixing nitrogen in the soil. The study area is known by erratic and uneven rainfall while groundnut is the main cash crop in the area. The study identified the groundnut market outlets, factor affecting groundnut market outlet choice and identifies farm level women role in groundnut production, in Eastern Hararghe, Oromia Region, Addis Ababa, Ethiopia. Both primary and secondary data were collected for the study. Primary data were collected from 120 sample households using questionnaire during the period of January15-February20, 2016. The study implemented multivariate probit regression model to identify factor affecting groundnut market outlet choice. The results show that there is a significant correlation between market outlets suggesting that practice of market outlets is interrelated. Multivariate probit regression estimation also revealed that gender of household head, education level, market distance, size of groundnut land, groundnut production experience, store time, access to extension and labor force of household member found to affect significantly the groundnut market outlet choice of household in study area. This also shows that higher educational level of household head increases the awareness of farmer about the benefits of choosing profitable market outlet. Therefore, a way of access to adult education for household head should be designed.

Keywords: Groundnut, Multivariate probit, Market outlet

1. Introduction

The agricultural sector plays an important role in the economy of Sub-Saharan countries by providing employment, food, and income for the majority of the work force. On average, 71% of the people in Sub-Saharan Africa live in rural areas where agriculture is the main economic activity (World Bank, 2010). The Ethiopian economy is highly vulnerable to droughts and adverse terms of trade by virtue of its dependence on primary commodities and rain-fed agriculture. A 1% change in average annual rainfall is associated with a change of 0.3% in real GDP in the following year (Mwanakatwe and Barrow 2010). Ethiopia is an agrarian country where around 95% of the country's agricultural output is produced by smallholder farmers (MOARD, 2010). The contribution of agriculture to national GDP (50%), employment (85%), export earnings (90%), and supply of industrial raw materials (70%) has remained high (World Bank, 2010).

Groundnut (*Arachis hypogaea* L) is significant source of cash in developing countries that contribute significantly to food security and alleviate poverty (Smart et al., 1990). Groundnut is grown on 26.4 million ha worldwide with a total production of 38.2 million metric tons. Developing countries account for 97% of the world's groundnut area and 94% of the total production (FAO STAT, 2010). However, groundnut yield in this part of the world and particularly in Africa is lower than the world average due to prevailing abiotic, biotic and socio-

economic factors (Pande et al., 2003; Upadhyaya et al., 2006; Caliskan et al., 2008). It is the main source of food in various forms and used as a component of crop rotation in many countries (Gbèhounou and Adengo, 2003).

The groundnut plant has the ability to survive in areas of low rainfall (arid and semi-arid regions) and, because it is a legume, it increases soil fertility by fixing nitrogen in the soil. It requires fewer inputs than many other crops, giving a high return per unit of land, and hence is appropriate for small-scale farmers, including women, (Okello, 2010; Mutegi, 2010). Groundnut production can also be a way for women to earn income and participate in the cash economy. Women account for 70–80% of household food production in sub-Saharan Africa, growing crops to sell in the market, as well as preparing it for their families (Lastarria-Cornhiel, 2008). Thus, any improvements in technical efficiency and productivity will improve the welfare of African farm women and their families.

CSA (2009) survey report revealed that average national yield of groundnut product in Ethiopia was found to be 1123 kg/ha. The survey report (Berhanu, *et al*., 2011 not published) indicated that, the significant yield gap between the farmers' fields and the research centers is due to the lack adequate improved groundnut varieties for the farmers.

According to the CSA report on area and production of crops, more than 352,077 private peasant holding households have grown groundnut in close to 80,000 hectares of land in the 2013/14 cropping season leading to a total production of well over 0.11 million tons (CSA, 2014). According to the same report, Oromia region constitutes the largest proportion of groundnut production areas accounting for 66% (52, 921.26 ha), out of which more than one half (28,909.44 ha) is found in East Harerghe. The Eastern lowland areas of Ethiopia have considerable potential for increased oil crop production including groundnut. Particularly areas such as Babile, Darolabu and Gursum are the major producers of groundnuts for local and commercial consumption (Getnet and Nugussie, 1991; Chala et al., 2012).

However, none of past studies identified factors affecting groundnut market outlet choices in *Babile* district of Eastern Hararghe zone. *Babile* district is one of the potential groundnut production and marketing areas in Eastern Hararghe Zone. Groundnut produced in eastern Hararghe (mainly in Gursum and Fadis) districts known by the name of Babile groundnut in the market. In the District, it is common to see household choices among groundnut market outlets. Then, what motivate households to choose among groundnut market outlets available in the study area? Systematic identification of factors faced by households in market outlet choice is increasingly seen by agricultural research as important component of any strategy for reaching the millennium development goals (Giuliani and Padulosi, 2005).

Given *Babile* District's potential for groundnut production, marketing and consumption, results of the study become essential to provide vital and valid information for effective research, planning and policy formulation. Therefore this study provides an empirical basis for identifying options to increase groundnut market outlet choices of households. In doing so, this study attempts to contribute to filling the knowledge gap by identifying groundnut market outlet, assessing factors affecting groundnut market outlet choices and identify women role in groundnut production in *Babile* district.

2. Materials and methods

2.1 Study area

The study was conducted in Oromia National Regional State, East Harerghe Zone. Eastern Hararghe zone is one of the 17 zones of the Oromia National Regional State. It is located in the eastern part of the country. It divided into 19 districts and Harar is the capital town of the zone and is located at the distance of 525 kms from Addis Ababa. The agro climatic range of Zone includes lowland (*kolla*, 30-40%), midland (*weyna dega*, 35-45%) and highland areas (*dega*, 15-20%), with lowest elevations at around 1,000 m a.s.l, culminating at 3,405 m, at the top of Gara Muleta mountain.

Particularly the study was undertaken in Babile woreda which is one of the 19 districts of the eastern Hararghe zone. It is the name of the district as well as administrative center of the district which is located at 35 km away from Harar town, East Hararghe zone capital in East direction on the main road to Jijjiga. The district is bordered with Somali region, Fedis, Gursum in South and East, West and North direction respectively. The district has 21 kebeles administrations 1 town dwellers. Agricultural production agricultural production is the main means of livelihoods for the district. The main crops produced in the area include maize, sorghum, groundnut, sweet potatoes and pepper. Livestock husbandry is dominated by cattle, sheep, goats, chicken camel and donkey. The area coverage of this district is estimated to 5,120.63 square kilometers. The altitude of the district ranges from 950 to 2000 meters above sea level. The temperature and rain fall of the district range from 14 - 32 degree centigrade and 532 – 710 mill meters respectively while rain in the area known by erratic and uneven condition. Based on figures published by the Central Statistical

Agency (2008), extension this district has an estimated total population of 99,379 of whom 50,025 are men and 49,354 are women (Babille district DoARD, 2009)

2.2 Method of data collection and sampling technique

A combination of purposive and random sampling techniques was employed to obtain a sample of respondents for this study. Babile district was purposively selected for availability for potential production of groundnut in the area. A two-stage random sampling technique was then applied to select sample households. In the first stage, four *Kebeles were* randomly selected from groundnut producing kebele's of Babile district. In the second stage, 120 groundnuts producing household heads were selected randomly from four kebeles using probability proportional to size. The data were collected by means of a semi-structured questionnaire during january15-February20/2016.The schedule was first pre-tested and, based on the result of the pre-test; some modifications were made to the questionnaire before the execution of the formal survey.

2.3 Econometric model

Since the market outlet choice decision is inherently multivariate, attempting univariate modeling excludes useful economic information contained in interdependent and simultaneous choice decisions (Dorfman, 1996). Therefore, this paper employs a multivariate probit model (MVP). The MVP technique simultaneously models the influence of the set of explanatory variables on each of the different market outlet choice while allowing for the potential correlation between unobserved disturbances, as well as the relationship between the market outlet of different practices (Belderbos *et al.*, 2004; Yu*etal.*, 2008; Kassie*etal.*, 2009). One source of correlation may be complementarily(positive correlation) or substitutability (negative correlation) between different choice (Belderbos *et al.*, 2004). Positive correlation also occurs if there are unobservable farmer-specific characteristics that affect several decisions but that are not easily captured by measurable proxies. Failure to capture unobserved factors and interrelationships among choice decisions regarding different practices will lead to bias and inefficient estimates (Greene, 2008).

The observed outcome of market outlet choice can be modeled following random utility formulation. Consider the j^{th} household ($j = 1,..., N$) which is confronting a decision on whether or not to choice the available market outlet on place $p(p=1,...,P)$ over a specified time horizon. Let U_i represent the benefits to the farmer from fixed selling place, and let U_k represent the benefit of market outlet choice practice the k^{th}market outlet choice: ($k = W, L, R, C$) representing market outlet choice of Wholesaler (W), local Assembler (L), Retailer (R) and cooperatives (C).The farmer chooses to sell at the k^{th} *market* outlet of place p if the net benefit that the farmer gains from k^{th}market outlet of the place p if $Y^*_{ipk} = U^*_k - U_i > 0$. The net benefit Y^*_{ipk} that the farmers can gain from K^{th} market outlet on place P is a latent variable determined by observed and unobserved characteristics:

$$Y^*_{jpk} = X'_{jpk}\beta + U_{jp} \quad (k = W, L, R, C) \qquad (1)$$

Where X_{jp} represent observed household Socioeconomic, institutional and demographic characteristics; U_{jp} represents unobserved characteristics; K denotes the type of market outlet and $\beta_k$denotes the vector of parameter to be estimated. Using the indicator function, the unobserved preferences in equation (1) translate in to the observed binary outcome equation for each choice as follows:

$$Y_k = \begin{cases} 1 \text{ if } Y^*_{jpk} > 0 \\ 0 \text{ otherwise} \end{cases} \qquad (k = W, L, R, C) \quad (2)$$

In the MVP model, the error terms jointly follow a multivariate normal distribution (MVN) with zero conditional mean and variance normalized to unity where $(U_W, U_L \; U_R \; U_C) \sim MVN(0,\Omega)$ and the symmetric covariance matrix Ω is given by:

$$\Omega = \begin{pmatrix} 1 & \rho_{WL} & \rho_{WR} & \rho_{WC} \\ \rho_{LW} & 1 & \rho_{LR} & \rho_{LC} \\ \rho_{RL} & \rho_{RC} & 1 & \rho_{RW} \\ \rho_{CW} & \rho_{CL} & \rho_{CR} & 1 \end{pmatrix} \qquad (3)$$

The off-diagonal elements in the covariance matrix represent the unobserved correlation between the stochastic components of the different types of technologies (Teklewold *et al.,* 2013). This formulation with non-zero off-diagonal elements permits for correlation across the error terms of several latent equations. These means, variance-covariance matrix of the cross-equation error terms has values of 1 on the leading diagonal and the off-diagonal elements are correlation to be estimated.

3. Results and discussion

3.1 Socio-economic characteristics of sample respondents

The mean age of the sample respondents was 36.7 with the range from 17 to 67 (Table 1). On average, the sample respondents have cultivated groundnut for more than 13 years. The mean

educational level of the sample households was grade 2.6 and about 26.7 per cent of the respondents were capable of reading and writing though they did not attain formal education. Regarding family size of the sampled households, it varies from 1 to 14 with a mean of 6.5 persons. The mean livestock holding of the sample household in terms of tropical livestock unit(TLU)was 4.1 and the area of cultivated land ranges from 0.1 to 5.7hectares with an average size of about 1.2 hectares.

Regarding institutional variables, 92 per cent of the total sample households surveyed reported that they have received extension service while 83 percent of sample households surveyed have received market information from different source. The mean distance from the nearest market to the homestead was 5.9 kilometers. Currently, extension service is mostly provided by the public sector, operating in a decentralized manner where extension is implemented at the district level (Davis *e al*., 2009).Concerning the groundnut plot characteristics, the mean plot size allocated for groundnut production was 0.6 ha and, on average, producers store groundnut for 2.9 months with maximum of 8 months. Eight percent of groundnut producers were replied that they sold their product during harvesting time on farm.

3.2 Groundnut production and utilization in study area

The results revealed that whole salers were chosen by 65.8 percent of groundnut producers while 50 percent of the producers were used cooperatives to sell their products. Local assemblers and retailer were chosen by below 50 percent of groundnut producers. Out of all market out let local assemblers were chosen by 22.41 percent of groundnut producers while 19.92 percent of producers have chosen retailers that they used to sell their groundnut products.

The activity calendar and storage time of groundnut production in Babile woreda is given in Tables 2 and 3 respectively. The majorities of the producers prepare the land in February to March, and plant it in April-May and harvest groundnut during October-November. Thus, October is the peak groundnut production and marketing seasons which also characterized by low price.

Production season: In the study area the land for groundnut production is cultivated 1 to 2 times with oxen when the rain season has started in March and in the first two weeks of April. Then groundnut planting is done in the last two weeks of April and May. Regarding fertilizer application, 89.4% of the respondents use fertilizer but 10.4% of the respondents did not apply any fertilizer for groundnut production. On average sample respondents have used 28.26kilograms of fertilizer for their groundnut production. Many farmers do hoe-cultivation twice to control weeds and loosen the soil. The first cultivation is done to enhance growth and the second cultivation is at early flowering stage to loosen the soil for easing entrance of the moisture into the soil where the pods are developed. Groundnut planted in April is matured after five months that is in September-October, and harvested in October with a spade when the leaves' color changed to yellow and started shedding. The uprooted plants are left in the field for some days facing the root with the pods upside to the sun for proper drying, and the pods are collected from the plants by hand. If the pods are not dried enough at the field, they are further dried by spreading groundnut with pods on the floor around the homestead.

Table 1. Socio-economic characteristics of sample respondents

Variable	Mean	Std. Dev.	Min	Max
Age HH	36.7	12.75	17	67
Education HH	2.6	2.80	0	12
Market distance	5.9	5.00	0.16	20
Family Size	6.5	2.70	1	14
Labor Force	2.4	1.01	0	5
Farm Size	1.2	0.90	0.1	5.7
Groundnut Area	0.6	0.27	0.2	1.2
Farm Experience	19.6	10.80	2	45
Groundnut Experience	13.8	5.94	2	23
Store Time	2.9	1.84	0	8
Livestock (TLU)	4.1	3.96	0	19.5
Gender Hous. Head(1or 0)	0.9	0.32	0	1
Access Extension(1 or 0)	0.9	0.26	0	1
Access Market info.	0.8	0.37	0	1

Table 2. Groundnut production activities calendars in the study area

Main activities	Sep	Oct	Nov	Dec	Janu	Feb	Mar	April	May	Jun	July	Aug
Land preparation												
Planting												
Weeding												
Harvesting												
Marketing												

The producers' farmers stored groundnut in sacks for some months even up to planting time or until the market price of dried groundnut increases. On average 92 percent of respondents said that they store groundnut for market and seed (Table 3). On the other hand, around 8 percent of respondents said that they do not store groundnut and sold their product on the field. The respondents mentioned that if the pods are not dried as required the color of the seeds is blackened, has a bad smell and bitter taste. The haulm of groundnut is used for animal feed and some of the respondents use the hull/shell as fire wood.

In calculating cost of producing groundnut, respondents were asked regarding each activity that was under taken from land preparation to transportation fee to the market. Unit cost of each operation is measured. In calculating these costs, market price for purchased goods and services were considered. For imputed value of family labor and owned oxen which the households use in production without paying direct cost, opportunity costs of the commodities were used.

Table 3. Percentage respondents storing groundnut in respective month

Duration of groundnut storing in Months	Frequency	Percent
0	10	8
1-4	85	71
5-7	23	19
8-9	2	2
Total	120	100

Table 4. Cost and benefit analysis of groundnut producers

No	Cost and benefit	Babile (N=120)
1	Average cost of producing one quintal of groundnut	453.59
2	Average producers selling price of unshelled product	816.5
3	Net benefit of producers	363.03

Productivity: On average, in the study area the respondents' farmers allocate 0.56ha for groundnut production during 2016. Moreover, average groundnut yield is 11.12Qt/ha Babile area with 7Qt/ha and 14Qt/ha of minimum and maximum of groundnut production respectively. The average yield of groundnut production is lower than that of reported in literature. The lower level of groundnut productivities may be attributed to the types of groundnut varieties farmers growing which are usually local or old improved variety, poor seed quality, disease and poor management practice.

The survey result (Table 5) shows that the average yield of groundnut production was found to be 7.0 Quintal of shelled groundnut in Babile area. The large proportion of the groundnut (80.1) % of product was sold in woreda. The average quantity of groundnut product that was consumed and saved for seed was 0.71 quintals and 0.69 quintal respectively in Babile woreda during study the year. As own product is the major source for seed source about 9.8% of groundnut product was saved as seed in the study area. This quantity of groundnut product is amount of product that used for next cropping year. Different groundnut market outlets are described as follow:

Wholesalers: There are very few wholesalers, who have the license to do wholesale in the Babile town. But the majority of wholesalers are located outside the districts mainly in Harar. Wholesalers in the local area are closely working with local traders/collectors to buy the groundnut collected in bulky and sell it to other wholesalers in Babile and Harar. They started collecting groundnut from local traders or order them to collect only when they got call from brokers. Wholesalers mostly purchase both shelled and unshelled groundnut from farmers, local assembler and cooperatives in the area. These wholesalers then transport and send the shelled groundnut product to different major towns like Jijiga, Ciro, Hirna, Badesa, and Adama. Wholesalers that found in Babile and Harar buy both shelled and unshelled groundnut from farmers, local traders and other wholesalers.

Processers/Retailers: Large scale groundnut processing is non-existent in eastern Hararghe in general and in the study areas in particular. Unshelled wet and roasted groundnut also consumed in the early

time before harvesting. In urban areas it is also usually consumed as '*Mushabak*' and '*Halawa*' product with other supplementary commodity. These products are commonly purchased and consumed in different social ceremony and while visiting relative in other area. Most commonly, street vendors prepare dry roasted and unroasted shelled groundnut using both kilogram and local measurement '*Tasa*' like a can material then supply to consumers in the market in varies quantity. Retailers are key actors in groundnut marketing within and outside the study area. They are the last link between producers and consumers. They mostly buy from wholesalers and local traders then sell to urban consumers. Sometimes they could also directly buy unshelled groundnut from the producers and sell shelled products wholesalers and consumers. Other retailers also sell groundnut in the market on market days using local measurements called '*Tasa*'.

Consumers: Consumers usually buy the product from retailers as they offer according to requirement and purchasing power of the buyers. Groundnut consumers are individual households (rural and urban dwellers) in different form. Groundnut is largely consumed locally and outside the study area. However, in towns local retailers/vendors buy groundnut from producers and wholesalers and sell to consumers that use groundnut with 'Chat' in open market. Most consumer, consume groundnut with 'Chat'and other as cookies. Otherwise, they never chew chat without groundnut.

Local Assemblers: Local assemblers procure groundnuts from farmers at farms. They act in one of two ways. They either use their own finance to buy the produce from farmers to sale to the next level or they could work on a commission bases so that they collect groundnuts from farmers on behalf of wholesalers or they are paid their commission. Since groundnut production in Ethiopia is dominated by small scale farmers who cultivate on fragmented plots of land, collection of produce from large number of small farmers widespread in different areas is a challenge. The village collectors play an important role in bridging the gap between producers and the next level of outlet in the groundnut marketing– wholesalers and processors. Most of the collection from farmers is made via the village collectors.

Cooperatives: In a similar fashion, cooperatives in the major groundnut producing area supply inputs to groundnut farmers and collect their produce and supply to the market mainly to wholesalers and union. However, the role of cooperatives in this regard is limited. Cooperatives are sometimes used as source of groundnut seed for local farmers.

3.3 Econometrics Model Results

3.3.1 Relationship between market outlets

The results of the correlation coefficients of the error terms from the MVP are significant for any pairs of equations($p<0.000$)and they are statistically different from zero in five ofthesixcases(Table6),confirmingtheappropriatenessoftheMVPspecification.Theresultshowsthatthelikelihoodsof households to choose wholesaler, local assembler, retailer and cooperative practices were 65.0, 46.0, 41.0 and 40.0 per cent respectively. It also shows that the joint probability of choosing all market outlets was 3.4 per cent and the joint probability of failure to choose all market outlets was4.6 per cent. The results of correlation coefficients of the error terms indicate that there is negative correlation (substitutability) between different market outlets choice. The results indicated that there were negative and significant relationships between household decision to choose local assembler and wholesaler, wholesaler and cooperative; and local assembler and retailer; local assembler and cooperative. The results also show that there were negative and significant relationships between choosing cooperative and retailer groundnut market outlet.

3.3.2 Factors affecting groundnut market outlet choice

Although farm household choose combination of groundnut market outlet, there are a number of factors that can influence their decision to choose a particular market outlet. This section has identified the variables which determine the choice of various groundnut market outlets using MVP(Table7).Thirteen explanatory variables of which four were dummy and nine continuous were included in the model. The selection of those explanatory variables for the model was done through literature review.

The estimates of the simulated multivariate probit model with 5 replications are reported in the following (Table 7). The statistical significance of the model is examined by using a likelihood ratio test of the null hypothesis that all slope estimates are zero. The Chi square statistic with 52 degree of freedom is 142.24 indicating rejection of the null hypothesis.

Gender of household head is a dummy independent variable. Female contribute more labor in the area of planting, weeding, harvesting, pod collection, decortications, marketing of groundnut products. Females, as expected, are more likely to choose for groundnut sale than males. Female household head and cooperatives as market outlet have positive and significant relationship. This implies that female household head may have

groundnut product as main source of household income. They have to choice best market outlet that minimizes transaction cost and risk of fluctuation of groundnut price. Most of the time cooperatives are found in farmers residence that in nearby kebele center. This reduces transportation cost of groundnut product to the market.

Literate households are expected to have better skills and better access to information and ability to process information. Education plays an important role in adoption of new technologies and believed to improve readiness of a head to accept new ideas and innovations. It also enables a head to get updated demand and supply information. Therefore, formal education of household head is hypothesized to affect cooperative groundnut market outlet positively and significant relationship. This result showed that higher educational status increases the awareness of farmer about the benefits of choosing profitable market outlet. Village cooperatives most of the time pay higher price for groundnut product purchased from farmers and groundnut seed that intern sell to different development organization in the area. Therefore, this variable has significant and positive relationship with cooperative groundnut market outlet choice.

As it was indicated in the (Table 7) the results of multivariate probit model reveled that market distance from farmer residence is one of the variables that determine groundnut market outlet choice. This is a continuous independent variable measured in kilometer. The closer a household to the nearest urban center, the lesser would be transportation costs and better access to market information and facilities. Berhanu and Moti (2010) found out negative relationship between market participation and distance to the nearest urban market center. Therefore, households who are at far away from urban center are hypothesized to affected local assembler and cooperative groundnut market outlet positively and significantly. This shows that as market distance increase farmers choose local assembler and cooperative that found in the village. This is because producers want to reduce transportation cost and save time. The findings were in agreement with Tru (2009) who conducted research on factor affecting choices of fresh lychee marketing channels in Vietnam.

The number of economically active members in the family was found to be positive and significant at 1% significant level. This finding is in line with the results reported by Chilot *et al.* *(*2009).Groundnut production requires large number of labor force in rural area. Households that have larger number of working group members were more likely to be included in groundnut production and marketing. The results of multivariate probit model reveled that, wholesaler market outlet has a positive and statistically significant relationship with use of higher labor, most likely due to the higher level of labor requirement during groundnut digging, harvesting and decorticating activities involved.

Land size for groundnut production was found to be significant statistically and positively with retailer market outlet at 10% probability level. This probably true, since those producers who allocated more land for groundnut production expected to produce more groundnut; which in turns affect the quantity of the product to be sold. Consequently, it attracts attentions of purchaser because economies of scale (availability larger quantity of groundnut to be sold at a time minimizes transaction and transportation costs over smaller quantity) in collecting groundnut provided that the product meets their requirements.

Groundnut production experience is a continuous independent variable measured in the number of years a household has been engaged in groundnut production and marketing. Households who have been in groundnut production and marketing for many years are expected to have rich experiences regarding opportunities and challenges of groundnut production. Staal etal. (2006) included the variable in probit model and found out that the variable revealed positive relationship to groundnut market outlet choice. Moreover, farmers with longer groundnut production experiences are expected to be more knowledgeable and skilful. This in turn enables them to manage groundnut product than farmers with short experience. Therefore, the variable found to be related positively and significantly with wholesalers and local collectors market outlet choice.

Store time is a continuous independent variable measured in the number of months that household has been stored their groundnut product for future marketing purpose. Storage time of groundnut is one of the variables that affect market outlet. This probably true, since those producers who allocated more land for groundnut production expected to store more groundnut for many months; which in turns affect the quantity of the product to be sold for different market outlet. Therefore, the variable found to be related positively and significantly with wholesalers market outlet. Similarly, this variable was found to be related negatively and significantly with local assemblers and cooperatives market outlet at 5and 10 percent probability level, respectively. This negative relationship implies that local assemblers and cooperatives market outlet operate fully at pick harvesting time.

Access Extension service is a dummy independent variable taking the value 1 if a household had access to extension services and 0 otherwise. It is expected that Farm extension service widens household knowledge with regard to use of improved agricultural technology. Agricultural extension services are expected to enhance households' skills and knowledge, link households with technology and markets (Lerman, 2004). The number of extension agent visits improves household's intellectual capitals and helps in improving groundnut production and impacts groundnut market outlet choices. Access to groundnut production extension services such as information, training, field days, field visits and field tours received by households positively and significantly affected accessing wholesalers' market outlet choice.

3.3.3 Role of women in groundnut production and marketing

Women's participation in socio-economic development and poverty alleviation has continued to be undermined. Rural women have primary responsibility for maintaining the household. They raise children, grow and prepare food, manage family poultry, and collect fuel wood and water. But they play an important, largely unpaid, role in generating family income, by providing labor for planting, weeding, harvesting and threshing crops, and processing produce for sale. Furthermore, women are primarily responsible for selling surplus production and purchasing inputs, especially fertilizer. Thus, despite the fact that women do not always work on the farm as much as men, they play a crucial role in the farming household.

In the study area, women participate in every corner of agricultural production including groundnut production and marketing. Survey result shows that, out of sample respondents about 12.5 percent of female and 87.5 percent of male replied that women participated in cultivating groundnut. While around 5.26 percent of female and 94.7 percent of male respondents replied that women participated in weeding activities in groundnut production (Table 8).

Although women make substantial contributions to household well-being and agricultural production, men largely control the sale of crops and animals and use of the income. In the area women participated in pod collection, decortications and other farm facilities in addition. During data collection, most of the women role in groundnut marketing was also observed. Decorticating or shelling groundnut is one tedious and time consuming activities of groundnut. Almost all groundnut retailers of unshelled and shelled-roasted groundnut were women in the study area. The result is of particular interest in developing countries like in our country where the role of women in agricultural farm planning business is not widely recognized.

Table 5. Groundnut production and utilization per household in study area

	Production(Qtl)	Utilization (Qtl)			Utilization (%)		Total	
		Sold	Consumed	Seed	Sold	Consumed	Seed	
Babile	7.0	5.59	0.71	0.69	80.1	10.1	9.8	100

Table 6. Correlation matrix of the groundnut market outlet from the multivariate probit model

Coefficients	Wholesalers	Local Assembler	Retailer	Cooperatives
Local Assembler	-0.298(0.131)**			
Retailers	-0.001(0.143)	-0.430(0.139)***		
Cooperatives	-0.285(0.135)*	-0.663(0.131)***	-0.269(0.143)***	
Predicted probabilities	0.65	0.46	0.41	0.40
Joint probability (success)		0.034		
Joint probability (failure)		0.046		

Likelihood ratio test of rho21=rho31 = rho41 = rho32 = rho42 = rho43 = 0:$Chi^2(6)$ = 38.098

Pro > Chi^2 = 0.0000

Source: own calculations, ***, ** and * significant at 1%, 5% and 10% probability level, respectively

Table 7. Multivariate probit simulation results of household market outlet choice

Variables	Wholesaler		Local Assembler		Retailer		Cooperatives	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Gender of HH	0.14	0.373	0.494	0.399	0.085	0.415	0.701*	0.41
Education HH	0.096	0.06	0.006	0.052	0.003	0.05	0.102*	0.053
Market distance	-0.029	0.027	0.096***	0.029	0.003	0.026	0.047*	0.028
Labor Force	0.342**	0.153	-0.076	0.156	0.085	0.152	-0.107	0.143
Groundnut Area	-0.427	0.634	0.386	0.598	1.058*	0.601	-0.5	0.616
Farm Size	0.161	0.191	-0.02	0.214	-0.037	0.199	-0.107	0.171
Groundnut Exp.	0.064**	0.029	0.053*	0.029	0.011	0.029	-0.04	0.03
StoreTime	0.161*	0.083	-0.158**	0.077	0.08	0.079	-0.137*	0.074
Livestock (TLU)	0.032	0.031	0.032	0.036	0.022	0.031	-0.038	0.033
Market Info.	0.297	0.354	-0.167	0.348	-0.402	0.352	0.049	0.334
Access Exten.	1.192**	0.563	-0.385	0.518	0.313	0.579	0.39	0.483
Age of HH	0.01	0.014	0.014	0.015	0.009	0.014	0.008	0.014
When sell	0.047	0.149	0.208	0.135	-0.137	0.141	0.151	0.138
cons	0.442	0.855	-0.116	0.827	-0.335	0.825	-0.153	0.822

Numbers of the obs =120 Wald $Chi^2(52)$ = 142.26

Log Pseudo-likelihood = -266.54 Prob > Chi^2 = 0.000

*, ** and *** mean significant at10%, 5% and 1% probability level ,respectively

Table 8. Role of women in groundnut production and marketing in the study area

Women activities in groundnut production		Gender of the Household Head		
		Female	Male	Total
Not participated	No	0	3	3
	%	0	100	100
Cultivation	No	3	21	24
	%	12.5	87.5	100
Weeding	No	1	18	19
	%	5.26	94.7	100
Pod collection	No	7	35	42
	%	16.67	83.33	100
Decortications	No	3	26	29
	%	10.34	89.66	100
Other facilities provide	No	0	3	3
	%	0	100	100
Total	No	14	106	120
	%	11.67	88.33	100

4. Conclusion and recommendations

The groundnut plant has the ability to survive in areas of low rainfall (arid and semi-arid regions) and, because it is a legume, it increases soil fertility by fixing nitrogen in the soil. It requires fewer inputs than many other crops, giving a high return per unit of land. Farmers producing groundnut in the area using rain feed only. So, to increase the benefit farmer may get from groundnut production, there should be good for their product. It should be middlemen free marketing and sell to profitable market outlet. Based on the empirical findings reported in this study, the following recommendations are forwarded:

The study indentified the groundnut market outlets, factor affecting groundnut market outlet choice and identifies farm level women role in groundnut production, in Eastern Hararghe, Oromia Region. Both primary and secondary data were collected for the study. Primary data were collected from 120 sample households using questionnaire. Results shows that correlation coefficients of the error terms indicate that there is negative correlation (substitutability) between different market outlets choice. The results indicated that there were negative and significant relationships between household decision to choose local assembler and wholesaler, wholesaler and cooperative; and local assembler and retailer; local assembler and cooperative. The results

also show that there were negative and significant relationships between choosing cooperative and retailer groundnut market outlet.

Similarly, multivariate probit models are applied to the modeling of choosing of market outlet by farm households facing multiple outlet choice which can be practiced by farmers in various alternative combinations. The results show that there is a significant correlation between marker outlets suggesting that practice of market outlets is interrelated. The analysis further shows that the probability of decisions to practice market outlets is influenced by many factors.

Education plays an important role in adoption of new technologies and believed to improve readiness of a head to accept new ideas and innovations. It also enables a head to get updated demand and supply information. Therefore, formal education of household head is found to affect cooperative groundnut market outlet positively and significant relationship. This result showed that higher educational level increases the awareness of farmer about the benefits of choosing profitable market outlet. Strengthening educational capacity of whole community leads to acceptance of important new technology and increase household benefit. Therefore, a way of access to adult education should be designed.

It is expected that Farm extension service widens household knowledge with regard to use of improved agricultural technology. Agricultural extension services are expected to enhance households' skills and knowledge, link households with technology and markets. Access to groundnut production extension services such as information, training, field days, field visits and field tours received by households positively and significantly affected accessing wholesalers' market outlet choice. This implies farmers that have access to extension service may analysis agricultural commodity price information and sell their products to appropriate market outlet.

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