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Analyzing the Influential Factors Affecting Groundnut Market Supply: A Case Study Of Babile District, East Hararghe Zone, Oromia National Regional State, Ethiopia

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ABSTRACT

This research tried to analyze the factors influencing the groundnut market supply in the case of Babile district, east Hararghe zone of Oromia national regional state, Ethiopia. Groundnut (*Arachis hypogea L.*) is a source of income generation for many smallholder producers in the district. However many factors affect the supply of groundnut to the market. Hence, improving groundnut producers to arrive at the market is a key concern desired in the study area. Therefore this study aims to analyse the determinants of marketed surplus of groundnut in the district. Multi-stage random sampling technique was used to select 138 smallholder farmers from three kebeles of the district. Descriptive statistics was used for socio-economic characteristics of groundnut producers and econometric analysis was employed to assess factors that determine the supply of groundnut to the markets. Results of the multiple linear regression model revealed that access to credit, lagged price, and quantity of groundnut produced significantly affected the market supply of groundnut. The study suggests there should be appropriate interventions by the government to enhance farmers' bargaining power by establishing an agriculture price information center, increasing farmers' productivity through introducing modern technology and improved varieties, and providing training on financial management.

Key Words: Groundnut, Marketing chain, Multiple linear regressions, Babile

1. Introduction

Groundnut is an important food crop worldwide with an annual production of over 47 million tons on nearly 28 million hectares in 2017/18 (Food and International, 2010). Cultivation, processing, and trading of groundnuts significantly impact the socioeconomic development of a large number of developing and least-developed countries (Tyroler, 2018). In Ethiopia, groundnut is one of the four economically important cultivated oilseed crops largely produced in the eastern part of the country and grown to flavor food consumed at home and the main source of earning cash for peasant holders in the country (Mastewal et al., 2017).

As East Hararge zone is the major area where groundnut is produced there are opportunities to increase the return from the production of groundnut (Kudama, 2013). Studies have been conducted in Ethiopia related to the marketing aspect of groundnut (Gobie et al., 2019; Sori and Ketema, 2017; Getahun and Tefera, 2017). They focused on the market outlet choice and market profitability of groundnut. However, studies conducted in the Eastern part of Ethiopia specifically the Babile district exclusively focused on the evaluation of released varieties, technology adoption of groundnut producers, and awareness and knowledge about aflatoxin contamination and occurrence of Aspergillus species in groundnut (Ahmed et al., 2017; Mohammed and Chala, 2014).

In the district, farmers receive a low market price for their produce (Tura et al., 2016; Jemal and Nick, 2015). The interference of brokers hinders farmers' direct participation with buyers about the price despite the rise in the prices of groundnut in the market (Kudama, 2013; Chala et al., 2014). Hence, strong links to markets for rural producers are crucial in increasing agricultural production generating economic growth, and reducing hunger and poverty (Bayata and Nega, 2020). Improving market links creates a virtuous circle by boosting productivity, increasing incomes, and strengthening food security likewise better access by small producers to domestic can reliably sell more products at higher (Bucheyeki et al., 2010). Therefore, this study attempted to fill the information gap through market analysis to intervene in the sector. Moreover, it employed multiple linear regressions to assess the determinants of groundnut market

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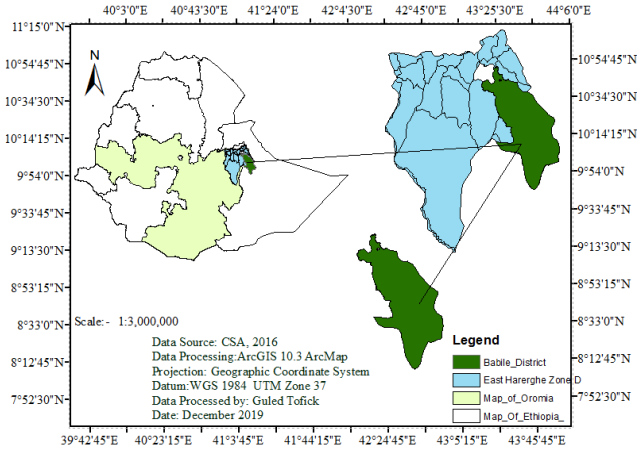

Figure 1: Map of the study area

Source: CSA, 2016

supply in the district and provide stakeholders involved in the production with useful information by identifying factors determining the market supply of groundnut in the Babile district.

2. Materials and Methods

2.1. Description of study area

The study was conducted in the Babile District of Oromia National Regional State of Ethiopia. It is part of the East Hararghe zone which is geographically located at 7o52'30" to 10o54'45" N Latitude and 40o3'0" to 44 o6'0" E Longitude and also the altitude of this woreda ranges from 950 to 2000 meters above sea level, covers an area of 207,217 hectares and located 546 km from the capital Addis Ababa. Agro-climatically it is classified into low land which constitutes about 95% and wina-dega 5%, the average temperature ranges between 240C to 280C and is characterized by semi-arid conditions having sandy loam soil and annual rainfall of over 600 mm (BDANRO, 2019/20). According to the (CSA, 2019), population projection estimate, the total population of Babile woreda is 118,537. Out of this males constituted 66,173 while females were 66,083. On the other hand, 26,058 people were living in an urban area while 92,479 people have been residing in rural areas.

2.2. Data Types, Sources, and Methods of Data Collection

Both primary and secondary data were collected for the study. Primary data were collected from sample groundnut producers using semi-structured questionnaires. Interviews were made with key informant farmers and agricultural experts from government organizations. Group discussions were undertaken to have a general overlook of the current situation of production and marketing opportunities and problems, availability's and functioning of services like credit, extension contact, groundnut price information, and transportation. Secondary data were collected from different published and unpublished sources, such as the district trade and market development office, and CSA reports.

Table 1: Distributions of sample households by kebeles

Kebeles	Total Households	Producers	Sample Households
Abdulqadir	700	662	43
Ramat Selam	549	460	30
Ifadin	1093	988	65
Total	2342	2110	138

Source: BWANRO and Own Design (2020)

2.3. Sampling Procedures and Sample Size Determination

2.3.1. Producers

The target populations for the study were groundnut producer households in the district. Multi-stage sampling technique was employed to draw sample groundnut producers. In Babile District there are 21 Kebeles. In the first stage, among 21 kebeles who produce groundnut, 12 kebeles were purposively selected. In the second stage, from the 12 kebeles producing groundnut, three kebeles were selected randomly. Finally, the required sample size was determined using the sampling formula provided by (Cochran, 1977). Accordingly, 138 representative sample households (respondents) were randomly selected based on the proportion of households in the selected kebeles using a 95% confidence level (i.e $z = 1.96$), 10% estimated proportion of an attribute in the population (p), and 5% level of precision (e) the formula is:

$$n = \frac{Z^2\, pq}{e^2} \tag{1}$$

Where n is the sample size, **Z** is the standard distribution that corresponds to the level of confidence 0.05, **e** is the desired level of precision (in this case 0.05), **p** is the estimated proportion of an attribute in the sample kebeles household from the district and q is $1 - p$.

$$n = \frac{1.96^2 * 0.1 * 0.9}{0.05^2} = 138$$

2.4. Analytical methods

Both descriptive statistics and econometric models were employed for analyzing the data obtained from sample producers. Descriptive statistics employed like mean and percentage to describe the groundnut producers' socioeconomic characteristics and an econometric analysis linear regression model was used to analyze factors affecting groundnut market supply.

OLS model specification of marketed surplus function is given by:

$$Y = \beta_0 + \beta_1 X_i + U_i \tag{2}$$

Where, Y is the quantity of groundnut marketed surplus, β_0 is intercept, β_1 is the coefficient of the i_{th} explanatory variable, X_i is a vector of explanatory variables, U_i is a

disturbance term. When assumptions of the Classical Linear Regression (CLR) model are violated, the parameter estimates of the OLS model not be the Best Linear Unbiased Estimator

(BLUE). Therefore, before fitting important variables into the regression models for analysis it is essential to check the presence of Multicollinearity, endogeneity, and heteroscedasticity According to (Damodar, 2003). Thus, the Variance Inflation Factor (VIF) is used to check multicollinearity among continuous variables. As a rule of thumb, the variable is said to be highly collinear if the VIF is greater than 10 which happens if R^2 is greater than 0.90 (Damodar, 2003). A measure of multicollinearity associated with the variance inflation factors is computed as:

$$VIF(X_i) = (1 - R_i^2) \tag{3}$$

Where R_i^2 is the multiple correlation coefficients between explanatory variables. The larger the value of R_i^2 is, the higher the value of VIF (X_i) causing higher collinearity in the variable (X_i). Contingency coefficient is used to check multicollinearity or association between discrete variables. The value ranges between zero and one, with zero indicating no association between the variables and a value close to one indicating a high degree of association between variables.

The measure of multicollinearity associated with the CC is calculated as:

$$CC = \sqrt{\frac{x^2}{N + x^2}} \tag{4}$$

Where CC is the contingency coefficient, c^2 is the chi-square test and N is the total sample size. The problem of endogeneity occurs when an explanatory variable is correlated with the error term in the population data-generating process, which causes, the ordinary least squares estimators of the relevant model parameters to be biased and inconsistent. The source of endogeneity could be omitted variables, measurement error, and simultaneity (A, 2003). The Hausman test and Durbin-Wu-Hausman (DWH) test were applied to check the productivity of groundnut included in the explanatory variables that could cause endogeneity bias. Contrariwise, a test for heteroscedasticity was undertaken for this study. According to (Damodar, 2003), there is no ground to say that one test statistic of heteroscedasticity is better than the others. Therefore Breusch-Pagan / Cook-Weisberg test of heteroscedasticity was used for this study.

2.5. Quantity of groundnut supplied to the market (Y)

It is the dependent variable and is the amount of groundnut supplied by households to the market in the 2018/19 harvest season which was measured in quintals. Groundnut marketed surplus is a continuous dependent variable used in the linear regression model.

Table 2: Description of socio-economic characteristics of groundnut producers

Variable	Category	Frequency	Percent
Sex	Female	33	23.91
	Male	105	76.09
Marital status	Married	115	83.33
	Single	12	8.70
	Divorced	4	2.90
	Widowed	7	5.07
Education	Illiterate	19	13.77
	Literate	119	86.23

Source: Survey Result (2020)

Table 3: Characteristics of Sampled Groundnut Producer

Variable	Mean	Std. Dev.	Min	Max
Age	42.28	11.31	22	62
Experience	16.23	8.95	2	37
Family size	5.13	2.04	1	10
Farm size	1.70	0.64	1	4
Area allocated	1.09	0.37	0.5	2.5
Productivity	8.04	2.5	1.12	15
Distance to market	138	11.87	7.93	3

Source: Survey Result (2020)

3. Results and Discussions

3.1. Descriptive Analyses

Socio-economic characteristics of sample groundnut producers

The result of the study indicates that out of the total sampled households, 105 (76.09%) were male-headed households and the remaining 33 (23.91%) were female-headed households. In terms of marital status, most (83.3%) of the sampled respondents were married while (8.7%) were single, (5.07%) were widowed and (2.9%) were divorced. Furthermore, education status indicates that 13.77% of sampled households were illiterate and couldn't read and write while 86.23% of household heads were literate that is they could read and write either through joining adult education, formal education, or religious teaching (Table3).

The mean age of the sampled households was 42 years with minimum and maximum years of 22 and 62 respectively. The average groundnut farming experience in the Babile district was 16 years with a minimum an experience of 2 years and a maximum experiences of 37 years. A family size ranged between 1 and 10 among the groundnut producer with an average family size of 5. The result indicated that the total land holdings of sample households vary from 1 to 4 hectares with the average landholding of 1.70 hectares. From the total land holding, sampled groundnut producer allocated an average of 1.09 hectares for the production of groundnut and on average their productivity of groundnut was 8.04 quintals per hectare. The sample groundnut producers had to travel an average of 11.87 km to reach the nearest market.

3.2. Factors Affecting Market Supply of Groundnut

Analyses of factors affecting groundnut marketed surplus were found to be important. Before fitting multiple linear regressions, the hypothesized explanatory variables

Table 4: Determinant of groundnut market supply

Quantity Sold	Coef.	Std.Err	t	p>|t|
Gender	0.047	0.252	0.19	0.852
Education	0.140	0.334	0.42	0.676
Off-Farm Income	0.002	0.005	0.36	0.721
Family Size	-0.066	0.085	-0.78	0.439
Farm Experience	0.009	0.012	0.72	0.473
Distance To Market	0.006	0.015	0.41	0.684
Market Information	0.068	0.268	0.25	0.800
Access To Credit	-0.865***	0.327	-2.64	0.009
Extension Contact	0.0067	0.025	0.27	0.791
Lag Price	0.098**	0.044	2.2	0.029
Membership To Coop	0.235	0.314	0.75	0.455
Livestock Ownership	0.015	0.040	0.37	0.711
Quantity Produce	0.743***	0.040	18.33	0.000
_Cons	-2.868	1.569	-1.83	0.07

n=138, R-squared = 0.74, Adj R-squared = 0.71, F (13,124) =33. *** And ** show the value statistically significant at 1% and 5%.

were checked for the existence of Multicollinearity, heteroscedasticity, and omitted variables problems. The degree of multicollinearity among the explanatory variables has been tested using VIF for continuous variables and CC for dummy variables. The results for all VIFs were ranging between 6.16 and 1.06 with a mean VIF of 1.88. The result of the contingency coefficient was also less than 0.75. Hence, if VIF is less than 10 and CC is less than 0.75 there could not be a multicollinearity problem. The heteroscedasticity test was done by using the Breusch-Pagan / Cook-Weisberg test. Based on the result there is no heteroscedasticity problem and the test of the Omitted variable was done by the Ramsey RESET test using powers of the fitted values of the dependent variable. Based on the Hausman test and the Durbin-Wu-Hausman test of endogeneity, there is no endogeneity problem.

In Analyzing factors affecting the farm-level marketable supply of groundnut 13 variables were hypothesized to affect the farm-level marketable supply of groundnut. OLS models were employed to identify the factors that affect groundnut market supply among explanatory variables. Estimates of the parameters of the variables expected to determine the marketable supply of groundnut positively or negatively. Based on the OLS estimate out of 13 explanatory variables (8 continuous and 5 dummy) included in the econometric model, three variables were found to affect the quantity of groundnut supplied to the market. These are access to credit, lagged price, and quantity produced. The F-test calculated value F (13, 124) = 33 was significant; and the coefficient of multiple determinations (R2) was used to check goodness of fit for the regression model. Hence, R2 indicates that 0.71 percent of the variation in the quantity of groundnut supplied to the market was explained by the variables included in the model.

Access to credit: The result shows that access to credit significantly and negatively affected marketable surplus at a 1% significance level. This indicated having access to credit decrease in the quantity supplied to market by 0.865 quintals. This was because those producers who had access to credit services, could use the credit for household consumption rather than for activities like purchasing agricultural input, farm equipment, and technological development that ultimately increased production and productivity which eventually increased the supply of the groundnut to market. This is in line with a study by (Deksiso et al., 2016) which found access to credit has a negative and significant impact on the volume of wheat marketed at a 1 percent significance level.

Lagged price: This variable was found to be a positive and statistically significant influence on the quantity supply of marketed ground at a significance level of 5%. The positive and significant relationship between the variables indicates that when one year lagged price increased by one Birr per kilogram, the market supply of groundnut increased by 0.098 quintal. This is in line with the studies by (Wosene et al., 2018) and (Asfaw and Ketema, 2014) who found that lagged market prices positively and significantly influence the quantity supplied to the market of pepper and wheat respectively.

Quantity of groundnut produced: The regression result shows that marketed surplus significantly affected groundnut quantity supplied at a 1% significance level. The positive coefficient indicates that a unit increase in the quantity of groundnut produced increased the marketable supply of farmers. The result also implied that a unit increase in the quantity of groundnut produced caused an increase of 0.743 quintals of the market supply of groundnut. This result was in line with (Gobie et al., 2019; Tesfaw, 2014; Goshme et al., 2018) which found that the quantity of groundnut, red pepper, and sesame affected the quantity supplied to the market positively and significantly.

4. Conclusion and Recommendations

The Babile district's groundnut producers boast extensive experience and substantial potential in groundnut production and marketing. Despite this, the prevailing trend involves the utilization of informal methods for marketing their produce. The results obtained from the econometric model underscore the significance of specific variables in influencing the marketable supply of groundnuts.

Among the various factors considered, three variables emerged as statistically significant in their impact on the marketable supply of groundnuts. Firstly, the quantity of groundnuts produced was identified as having a positive and significant influence on the marketable supply. This implies that an increase in the quantity of groundnut production positively contributes to the availability of groundnuts in the market.

Secondly, lagged price, or the historical pricing of groundnuts, was found to have a positive and significant effect on the marketable supply of groundnuts. This suggests that past prices play a role in shaping current market dynamics, influencing the supply of groundnuts.

On the other hand, access to credit was identified as a significant factor that negatively influences the marketable supply of groundnuts. This implies that limited access to

credit acts as a bottleneck, hindering the market supply of groundnuts in the study area.

In light of these findings, it is imperative to take proactive measures to address the identified bottle necking factors affecting groundnut market supply in the Babile district and beyond. This may involve implementing strategies to enhance access to credit for groundnut producers, as well as exploring avenues to further optimize groundnut production and pricing mechanisms. By addressing these challenges, the district can unlock its full potential in groundnut production and contribute to a more efficient and resilient groundnut market.

Promotion of Improved Varieties: It is imperative to encourage and facilitate the adoption of improved groundnut varieties that are well-suited to the local agro-climatic conditions. These varieties should be selected based on their resilience, disease resistance, and higher yield potential. Collaborations with agricultural research institutions and extension services can aid in the dissemination of such improved varieties to farmers.

Adoption of Modern Agricultural Technologies: The introduction of modern agricultural technologies, including precision farming practices, efficient irrigation systems, and mechanization, can significantly enhance the efficiency and yield of groundnut production. Farmers should be provided with training and resources to adopt these technologies, leading to a more sustainable and productive agricultural system.

Establishment of an Agriculture Price Information Center: The creation of an Agriculture Price Information Center in the district is crucial to empower farmers with real-time information on groundnut prices, demand, and supply. This center would serve as a valuable resource for farmers, enabling them to make informed decisions about when and where to sell their produce, thereby optimizing their income.

Provision of Credit Services and Training: Recognizing the negative impact of limited access to credit on groundnut production, it is recommended to establish mechanisms that facilitate easier access to credit for farmers. Furthermore, training programs should be implemented to educate farmers on the judicious utilization of credit for enhancing their agricultural practices. This would contribute to the overall growth and sustainability of groundnut farming in the district.

Conflict of Interest

The author declares that they don't have conflict of interest.

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