DETERMINANTS OF COMMERCIALIZATION AND CHOICE OF MARKET CHANNELS AMONG SMALLHOLDER GROUNDNUT FARMERS IN THE CAPRICORN DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

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ABSTRACT

Groundnut (*Arachis hypogaea*) is one of the most significant crops in South Africa and Africa due to its various health benefits and diverse uses. Groundnut production provides employment for farmers, starting from the production to the marketing phase. This study aims to analyse the determinants of commercialization and the choice of market channels (local market, urban market and farm gate) among smallholder groundnut farmers. The study was conducted in the Capricorn District of Limpopo Province, South Africa, in the three villages namely; Moletlane, Ga-Molepo and Zebediela. A purposive sampling technique was used to sample 100 smallholder farmers from a sampling frame of 405 groundnut farmers. A semi-structured questionnaire was used to collect data by interviewing 100 selected smallholder farmers and Statistical Package for Social Science (SPSS) version 27.0 was used to analyze the data. The binary logistic regression model was employed to analyze the factors affecting commercialization of groundnuts amongst the smallholder farmers. Furthermore, the study applied multinomial logit model to determine the choice of market channels for groundnuts amongst the smallholder farmers. The study's results indicated that 51% of the smallholder farmers sold their groundnuts at an urban market, 35% at a local market and 14% at the farm gate. The results of the study further indicated that age, gender, level of education, household size, access to extension services, groundnut yield, and employment status had a significant influence on the groundnuts commercialisation by smallholder groundnut farmers. The variables of gender, distance to the market, vehicle ownership and employment status had significant influence on the choice of market channel of the smallholder groundnut farmers in the study area. Smallholder farmers' access to market information is limited, therefore, the local agricultural department and municipalities should initiate an extension programme that will focus and put more emphasis on the access to market information. Policies aimed at improving commercialization among smallholder groundnut farmers should be informed by the factors and determinates found in this study.

Key words: Groundnut, smallholder farmers, commercialization, market channel, multinomial logit model

INTRODUCTION

Groundnut is one of the most popular and universal crops cultivated in more than 100 countries in six continents. Production mainly takes place in the tropical and subtropical regions of the world, particularly in sandy soils, with the bulk of groundnut crop in South Africa produced in light textured soils ranging from coarse and fine sands to sandy loams [1,2]. The groundnut plant has multiple uses as it can be used as animal feed (green material and straw) and industrial raw material (oil cakes and fertilizer). Thus, these multiple uses of the groundnut plant make it a good cash crop for domestic markets as well as for foreign trade in several developing and developed countries [3]. In South Africa, the groundnut crop is commonly known as peanuts. It is mostly grown in rotation with maize to improve disease, weed and pest management in both crops. As with most legumes, the groundnut plant's root system contains nodules of nitrogen-fixing bacteria.

Over 330 products are produced commercially from groundnut, and jobs can be created directly from enhanced groundnut production [4]. This necessitates the need for increasing commercialization of the industry. This commercialization can be achieved through improving the various kinds of technology which will result in more hectares being cultivated and increased yield. Commercialization acts as a catalyst to agricultural development and is viewed as a categorical concept used to classify farmers according to the portion of their produce destined for the market [5]; it also reflects the farmer's stage of development. Increased commercialization shifts smallholder farm households away from traditional self-sufficiency goals toward profit and income-oriented decision-making; farm output accordingly becomes more responsive to market needs. Regardless of the prevailing information on agricultural commercialization, smallholder farmers in the Limpopo Province produce low yields compared to other provinces in South Africa. It thus became imperative to identify the factors that had led to this low production. This study focuses on the determinants of commercialization with the objective of analyzing the factors that have a significant influence on the commercialization of groundnut. Thus, to effectively assist the smallholder farmers to improve their livelihoods and their food security, it is crucial to understand the determinants of groundnut production and how they influence the commercialization of groundnut. Furthermore, various marketing channels are analyzed to identify the factors that affect the smallholder farmers to sell their groundnut through different market channels. Therefore, this study will analyze both the determinants of commercialization and the smallholder groundnut farmers' choice of marketing channels.

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MATERIAL AND METHODS

Study area

The study was conducted in the Moletlane, Ga-Molepo, and Zebediela villages under the Capricorn District Municipality, which is one of the five districts of the Limpopo Province in South Africa. The selected study areas share common features such as smallholder groundnut farming, and certain geological and geographical characteristics.
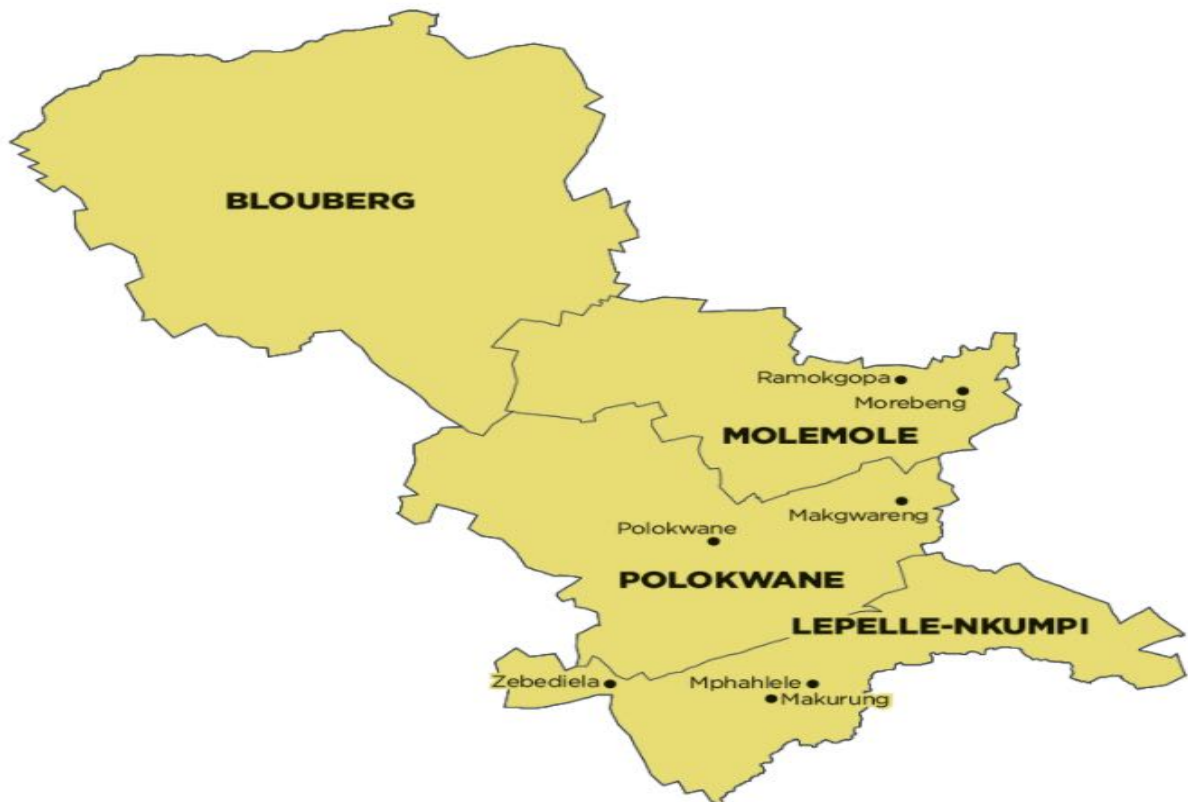

Figure 1: Map of the Capricorn District
Source: [6]

Sampling and Data collection

The purposive sampling technique was used to select 100 smallholder farmers from a sampling frame of 405 groundnut farmers obtained from an updated list of the groundnut smallholder farmers from the Limpopo Department of Agriculture. Probability Proportionate to Size sampling (PPS) was employed to derive the total number of smallholder farmers from each village since the villages consisted of different population size showed in Table 1. Semi-structured questionnaires were used to collect data through face-to-face interviews with sampled groundnut smallholder farmers in the study area. Statistical Package for Social Science (SPSS) version 27.0 was used to analyze the data.

Data analysis and model specification

The degree of commercialization by the smallholder groundnut farmers was calculated using the following commercial index:

$$HCI = \frac{\text{Gross value of crop sales hh i year j}}{\text{Gross value of all crop production hh i year j}} \times 100 \qquad (1)$$

The index measures the ratio of the gross value of crop sales by household i in year j to the gross value of all crops produced by the same household i in the same year j expressed as a percentage. The index measures the extent to which household crop production is oriented towards the market. A value of zero would signify a totally subsistence-oriented household and the closer the index is to 100, the higher the degree of commercialization. The advantage of this approach is that commercialization is treated as a continuum, thereby avoiding a crude distinction between "commercialized" and "non-commercialized" households [7]. Furthermore, to identify the key determinants of commercialization, the binary logistic regression model was used, and a dichotomous variable was computed to indicate whether the smallholder groundnut farmer was commercialized or not. That is,

$$y = \begin{cases} 1, \text{ if smallholder groundnut farmer was commercialised} \\ 0, \text{ if smallholder groundnut farmer was not commercialised} \end{cases} \qquad (2)$$

The smallholder farmers commercializing or not were the two options considered; a binary model will be set up to define Y = one for situations where the smallholder farmers were commercialized and Y = zero for those who were not. Assuming that X is a vector of explanatory variables and p is the probability that Y = one, probability relationships as applied by Wooldridge [8] can be considered as follows: The logistic regression in this study is specified as:

$$Y = \ln (Pi /1{-}Pi) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + U \qquad (3)$$

$Pi /1{-}Pi$ = Odds ratio
Pi = Probability that smallholder farmers commercialize
1-Pi = Probability that smallholder farmers do not commercialize
β_0 = Intercept of the model
$\beta_1 - \beta_n$ = Estimated parameters
$X_1 - X_n$ = Explanatory variables

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The multinomial logistic model was further employed to determine the factors affecting the choice of groundnut market channels of the smallholder groundnut farmers. The model test consisted of three possibilities, P_j ($j = 1, \ldots, 3$), associated with smallholder groundnut farmers' the three choices of groundnut market channels. The probability of a farm gate market will be P_1, the local market will be P_2, and the probability of the urban market will be P_3. The multinomial logit model was adopted by Mthombeni [9] to estimate the following equation:

$$\log_e \left(\frac{p_j}{p_1}\right) = \alpha_{j+\ \beta_{jk}\ x_{ki}\ +\ \mu_{ji}} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (4)$$

Where:

J = 1, 2, 3 categories (groundnut market channels);
i = 1,….,n observations;
α = intercepts;
β = coefficients;
X_k = 1,….,m explanatory variables;
μ = error terms.

The estimation procedure generates the coefficients of the probabilities of an observation falling into three categories respectably. Alternative comparisons of other probabilities with different bases can be derived from:

$$\log_e \left(\frac{p_j}{p_k}\right) i = \log_e \left(\frac{p_j}{p_1}\right) i - \log_e \left(\frac{p_h}{p_1}\right) i \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (5)$$

Where j = 3 and h = 2, with j not equal to h simultaneously, and by using:

$$\log_e \left(\frac{p_j}{p_1}\right) i = \left(\alpha_j - \alpha_h\right) + \left(\beta_{jk} - \beta_{hk}\right) X_{ki} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (6)$$

The first set of estimated coefficients will be used to calculate the three probabilities of the linkages between the choice of groundnut market channels of the smallholder groundnut farmers.

RESULTS AND DISCUSSION

Background characteristics analyses

The results of the study in Table 2 showed that female farmers who cultivated groundnuts and sold part of their production were 65% compared to their male counterparts who were 35%. This implies that the female smallholder groundnut

farmers' participation was higher than the male participation in both production and cultivation. This is in concurrence with Hlomendlini and Rangoato [10,11], who reported that in their studies the participation of women exceeded that of men in both market access and productivity. However, in a study by Reyes [12], they found that male-headed households were more likely to participate in the market compared to female-headed households. About 51% of the smallholder farmers had access to extension services. Access to extension services was deemed important by Montshwe [13], who identified the benefits and advantages of smallholder farmers having access to extension services as crucial. The results of the study in Table 2 revealed that 58% of the smallholder farmers were employed elsewhere, meaning that they practiced groundnuts farming part-time or seasonally, while 42% of them were full-time groundnut farmers. This implies that some of the smallholder farmers took up farming as a part-time occupation to supplement their household income.

The results of this study in Table 2 indicate that 51% of the smallholder farmers sold their groundnuts at an urban market. This is due to the increased probability of profit maximization since the markets in urban areas are relatively large compared to local and farm gate markets. Those who sold their produce at the local market constituted 35% whilst those who sold it at the farm gate constituted 14%. The urban market constituted of various and large numbers of consumers, and hence sales were much higher compared to the local market with few consumers and the isolated farm gate market. According to Barrett and Bannor [14,15], most farmers opt for an urban market due to the diverse consumer base and increased selling opportunities.

In Table 2, the results showed that most of the smallholder groundnut farmers (72%) were commercialized with only 28% of the farmers not commercialized. Smallholder farmers who sell more than 50% of their produce are market-orientated [16]. Smallholder farmers' access to credit is one of the most significant and vital issues that leads to increased productivity [17]. The results in Table 2 further revealed that smallholder farmers (65%) had received some kind of credit in commercial banks and from family members to invest in their farming business, while 35% of the smallholder farmers have never applied or received any kind of credit. The farmers received this credit in the form of financial services from commercial banks and donations that impacted their production directly.

Factors affecting the commercialisation of smallholder groundnut farmers
In Table 3 the results from the binary logistic regression model determining the factors affecting whether a smallholder groundnut farmer is commercialized or not,

indicated that the variable age measured in years was negatively significant at a 10% significance level. This indicates an inverted relationship between age and commercialization. This implies that as the smallholder farmer gets older, they become less keen to sell their produce. However, the younger smallholder farmers are more keen to sell their groundnuts, thus making them commercialised [18].

According to Bifarin [19], education improves managerial input and leads to better decision-making in farming. However, the results in this study indicate that the level of education for the smallholder famers was negatively significant at a 10% significant level. This implied that a unit increase in the educational level of the smallholder farmer resulted in a lower chance of that smallholder farmer to commercialize. An increase in the farmers educated may enable them to qualify for other profession outside farming to consider.

Household size was found to be positively significant with a 5% significant level. This implied that an additional household member increased the likelihood of the smallholder farmer to commercialize due to more household members who can work and thus, increase the groundnut production. However, Agwu and Enterline [7,20] argue that as household size increases, the level of commercialization will decrease as more household members will be consuming the products.
Access to extension services was found to be negatively correlated with a 10% significance level. The smallholder farmers with access to extension services were less likely to commercialize compared to those who did not have access to such services. However, a study conducted by Ele [21] reported that farmers with access to extension services can increase their output due to them being introduced to innovative farming techniques.

Groundnut yield is positively significant at a 1% significance level, indicating that a kilogram increase in groundnut produced increases the likelihood of the smallholder farmer to commercialize. Abera [22] found that the chances of commercialization increased as the quantity of output increased. However, some smallholder farmers produced for subsistence, and they tended to sell only the surplus that they could not consume.

The farming status of the smallholder farmer was negatively significant at a 10% significance level. This implies that part-time smallholder farmers are less likely to commercialize compared to those who consider farming as their only source of income. Part-time farming is one of the major constraints militating against agricultural productivity among farmers, particularly smallholder farmers [7]. This is

because these farmers often neglect their farming duties and focus all their attention on their primary source of income.

Determinants of the choice of market channel among the smallholder groundnut farmers

In Table 4, the results from the multinomial logistic regression model determining the choice of market channel among the smallholder groundnut farmers revealed that gender had a negative relationship with the choice of market channel and was only significant in relation to the urban market. This implies that gender plays a role in the choice of market channel, meaning that a unit increase in the number of male-headed households increases the likelihood that the groundnuts will be sold at a local market rather than at an urban market (compared to female-headed households). Female farmers are more progressive and enterprising than male farmers in the study area, this may be due because they sell in groups of women compared to males who are mostly selling alone. Wosene [23] reported that male-headed households tended to sell groundnuts more at local markets than urban markets.

Distance to market had a negative relationship with the choice of market channel and was only statistically significant in relation to the urban market at a 1% significant level. This implies that a unit increase in the travel distance increases the likelihood of the smallholder farmer selling the groundnuts at the farm gate. This could be because the smallholder farmers prefer not to travel long distances as a way of reducing transport costs. According to Wosene [23], farmers residing far from the nearest market were less likely to sell to a consumer market channel and were more likely to sell to other market channels like a wholesaler and local collector market channels.

Vehicle ownership was positively significant at a 5% significant level, and an increase in the number of vehicles owned by the smallholder farmer increased the likelihood of the smallholder farmer selling at an urban market rather than the farm gate and local market. Female smallholder groundnut farmers who owned vehicles were reported to be 26 in numbers compered to their 15 male counterparts, and a total number of 25 female smallholder groundnuts farmers (37.9%) were selling in urban market. Farmers' own vehicles allow them to access markets that are far away at a lower cost and within a shorter period [24]. Farming status had a positive relation to the urban market at a 5% significant level. This implies that those who travel to work are more likely to travel with their produce to their nearest market and sell it there rather than selling it locally where they are not physically present the entire day. These results concur with those of Njuki [25], who found that

smallholder farmers who were engaged elsewhere were more likely to sell their produce in the area where they spent most of their time.

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

Socio-economic factors such as age, gender, level of education, household size, access to extension, groundnut yield and employment status had an influence on commercialization. The study suggests an increase in farmers' yields for groundnut production will increase commercialization. This will bring about higher production that will also mean more surplus to for farmers to sell. More female famers should also be motivated and supported with resources to improve their level of commercialization in this enterprise. There is a need to improve the extension service package for the farmers to have positive influence on commercialization. Also advise the farmers employed in other areas outside farming to devote more attention to the groundnut farming to improve their income from the groundnut production.

Famers choose the market that they prefer based on the amount of produce they reap each season and the benefits they will gain from selling at an urban market. The multinomial logistic model analyses the significant factors were gender, distance to the market, vehicle ownership and farming status. It is, therefore, recommended that policies and support for the smallholder groundnut farmers should be informed by the determinants. Thus, the farmers are advised to have own transport to sell in the local and the urban markets for better prices for their products by reducing the transaction costs.

ETHICAL ASPECTS

This study took several ethical considerations to ensure it was conducted in an appropriate manner. Permission to collect data from small-scale crop farmers within the vicinity of the Gauteng Province was obtained from the Gauteng Department of Agriculture and Rural Development (GDARD). Ethical clearance to conduct the research was obtained from Ethics Committee of the University of South Africa (UNISA) prior to data collection. During data collection, consent was requested from the farmers to participate in the study and participation was voluntary. Farmers were also informed that the data will be used for the purpose of the study only.

Table 1: Sample size in respective villages

| | Villages | | | |
	Moletlane	Zebediela	Ga-Molepo	Total
Total number of smallholder farmers	120	178	107	405
Percentage of smallholder farmers (%)	30	44	26	100
Smallholder farmers interviewed	30	44	26	100

Source: Own calculations based on the survey (2021-2022)

Table 2: Demography of smallholder groundnut farmers

Variables	Description	Percentages (%)		
Gender	1 if the farmers is male; 0 female	Male = 35%	Female = 65%	
Access to extension services	1 if farmer has access to extension services; 0 otherwise	Access = 51%	Otherwise = 49%	
Farming status	1 if farmer fulltime; 0 part-time	Full-time = 42%	Otherwise = 58%	
Small-scale choice of groundnut market channel	Farm gate = 1; Local market = 2; Commercial = 3	Farm gate = 14%	Local market = 35%	Commercial = 51%
Household commercialization	1 if a smallholder groundnut farmer is commercialized; 0 otherwise	Commercializes = 72%	Otherwise = 28%	
Access to credit	1 received some kind of credit for farming; 0 otherwise	Access = 65%	Otherwise = 35%	

Source: Own calculations based on the survey (2021–2022)

Table 3: Factors affecting the commercialization of smallholder groundnut farmers

Variables	Coefficients	Standard	Wald	P-value
Age	-0.144	0.077	3.535	0.060*
Gender	1.779	0.994	3.201	0.074*
Education	-0.342	0.186	3.383	0.066*
Household size	0.768	0.353	4.733	0.030**
Distance to the market	-0.009	0.037	0.063	0.801
Land size	-0.710	1.667	0.182	0.670
Vehicle ownership	-1.000	0.802	1.556	0.212
Extension services	-1.959	1.054	3.457	0.063*
Groundnut yield	0.048	0.016	9.283	0.002***
Farming status	-1.364	0.819	2.770	0.096*
Access to credit	0.344	1.020	0.113	0.736
Access to the road	0.076	0.767	0.010	0.921
Access to input	0-.911	0.796	1.308	0.253
Farmers' association	0.169	0.813	0.043	0.835
Constant	8.405	6.028	1.944	0.163

Source: Own calculations based on the survey (2021–2022)

***$P < 0.001$ = 1%, **$P < 0.05$= 5%; *$P < 0.10$= 10%; N=100

Table 4: Multinomial logit regression estimates of factors influencing the choice of market channel among the smallholder groundnut farmers

Participation	Variables	Coefficients	Standard error	Wald	P-value
Local market	Age	0.002	0.049	0.368	0.544
	Gender	-0.612	0.634	0.932	0.334
	Education	0.054	0.099	0.295	0.587
	Household size	-0.227	0.263	0.722	0.395
	Distance to the market	-0.025	0.032	0.600	0.439
	Land size	0.855	0.773	1.226	0.268
	Vehicle ownership	-0.714	0.690	1.073	0.300
	Extension services	0.566	0.666	0.721	0.396
	Groundnut yield	-0.004	0.004	0.791	0.374
	Farming status	0.639	0.622	1.055	0.304
	Access to credit	-0.472	0.652	0.525	0.469
	Farmers association	0.314	0.623	0.254	0.614
	Marketing group	-0.071	0.635	0.012	0.911
	Intercept	-0.529	3.989	0.018	0.894
Urban market	Age	-0.030	0.049	0.368	0.544
	Gender	-3.051	0.853	12.788	0.001***
	Education	0.055	0.095	0.329	0.566
	Household size	-0.416	0.263	2.503	0.114
	Distance to the market	-0.100	0.032	9.701	0.002***
	Land size	-0.513	0.810	0.400	0.527
	Vehicle ownership	1.238	0.658	3.545	0.060*
	Extension services	-0.510	0.627	0.661	0.416
	Groundnut yield	0.000	0.004	0.011	0.917
	Farming status	1.583	0.662	5.716	0.017**
	Access to credit	-0.934	0.664	1.979	0.159
	Farmers association	-0.542	0.664	0.666	0.414
	Marketing group	0.252	0.626	0.162	0.687
	Intercept	7.576	4.058	3.486	0.062

Source: Own calculations based on the survey (2021–2022)
***P < 0.001 = 1%, **P < 0.05= 5%; *P < 0.10= 10%; N=100

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