

DOI: 10.21608/alexja.2024.331905.1102

Institutional Analysis of Market Participation among Small-Scale Nut Farmers in Kwazulu-Natal Province, South Africa

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ABSTRACT

ARTICLE INFO

Article History

Received: 28/10/2024

Revised: 22/11/2024

Accepted: 31/12/2024

Key words: Institutional factors, market participation, market information system, rural infrastructure

Small-scale nut farming plays a crucial role in the livelihoods of rural households in South Africa by providing dietary nutrients and income generation. However, small-scale nut farmers face numerous challenges which hinder their participation in formal markets. The purpose of this study was to identify the institutional factors affecting the market participation of small-scale nut growers in South Africa's KwaZulu-Natal Province. A semi-structured questionnaire was used to gather information from 100 small-scale nut growers who were chosen randomly. The data were analysed using a descriptive statistics and probit model. The results portrayed that numerous farmers do not participate in the nut market. Probit results showed that institutional factors such as product pricing, output market type, and availability of market information all have a beneficial influence on the participation of market, while market distance has a detrimental impact on the participation of market. The research suggests access to a variety of markets, market informational systems, and price support mechanisms as ways to increase market involvement to foster commercialisation and job creation.

INTRODUCTION

In South Africa, the agricultural sector continues to be the foundation and essential component in the development of many households, where small-scale farming is the ruling livelihood activity (Hlatshwayo et al., 2021). Statistics South Africa (StatsSA) (2022) showed that, in 2021, nearly 17.3% (3.1 million) of all households were involved in agricultural activities with the majority in rural areas. According to Poole (2017), approximately 70% of jobs for rural households stem from small-scale agriculture which is their primary source of income.

Groundnuts and tree nuts such as macadamia and cashew nuts, are the most important complementary food and income crops in small-scale farming systems (Mango et al., 2018). Due to their ability to generate income and supply dietary nutrients, nuts are the most essential crop for small-scale farmers and are imperative for the livelihood of the majority of Africans. Since nuts might be produced on a smaller scale than other crops, they assist farmers in uMkhanyakude in reducing malnutrition and starvation. According to Mango et al. (2018), these high-value crops are able to sustain production in small-scale farming systems and play multiple roles in terms of cash income, food, and improvement of the soil fertility. However, small-scale nut farmers face numerous challenges such as insufficient funds for technology, institutional difficulties, and ineffective connections with

markets, which set the barriers for small-scale farmers to sell their produce in the formal sector market (Hlatshwayo et al., 2021). Agricultural marketing, both produce and input marketing, plays an important role in the transformation of smallholder farming.

Small-scale farmers leverage two types of markets: formal and informal. Formal agricultural markets constitute marketing activities that are regulated and supervised to ensure compliance with taxation and government regulations. Informal markets are decentralised markets in which small-scale farmers sell their produce and exchange money with buyers (Hlatshwayo et al., 2021). Informal markets emerge as a survival strategy for small-scale farmers in the face of a competitive formal market environment. As a result, the inability of smallholder farmers to access formal markets jeopardizes rural livelihoods, making informal markets essential for their survival. The study conducted by Melembe et al. (2021) highlights that market access for small-scale farmers is linked to their capacity for value addition as this enables them to reach broader and potentially more profitable markets.

The dynamics between formal and informal market systems determine the practical possibilities for operating or transforming smallholder agriculture. Due to inadequate connections with formal markets, small-scale farmers produce excess nuts for their consumption and rely on informal

markets to sell the remaining produce (Soukand et al., 2020). According to Hlatshwayo et al. (2021), market participation holds great promise for identifying the perfect opportunity sets required to give small-scale farmers maximum profits and an improved standard of living. However, there are several constraints affecting market participation by small-scale farmers; these incorporate technical, institutional, and demographic factors. The majority of small-scale farmers live in remote areas where roads are poorly maintained and there is inadequate transport, access to information regarding market-related matters, poor agricultural extension services, low educational levels, distance from the markets, lack of financial support, inadequate local markets, and high costs associated with market participation transactions (Sebatta, 2014; Maesela et al., 2023). These marketing constraints constitute the greatest barrier for small-scale farmers in accessing high-value markets and restraining them from making decisions to participate in the market.

The factors affecting the market participation of small-scale farmers in nut production in South Africa are multifaceted and encompass various dimensions. Small-scale farmers in South Africa face challenges in market participation because they produce small surpluses that are not attractive to markets, especially international ones (Kalauba et al., 2023). In addition to the endowment of crop production factors like land size, these challenges are influenced by market factors like market infrastructure and distance to markets; household head characteristics like age, gender, education level, and marital status; and institutional services

like access to extension and credit services (Kalauba et al., 2023). The level of market participation among small-scale farmers in South Africa is influenced by observed household engagement in the fresh produce market and their determining factors such as marital status (Hlatshwayo et al., 2021).

Studies on market participation have been carried out in various developing nations, including South Africa (Dube, 2020; Hlatshwayo, 2022; Zondi et al., 2022; Maesela et al., 2023). However, there is limited knowledge regarding the institutional factors affecting market participation of small-scale nut farmers in the South African context. This study sought to contribute to the literature and identify the institutional factors affecting market participation of small-scale nut farmers in the KwaZulu-Natal Province.

MATERIALS AND METHODS

Study area

The study was conducted in the uMkhanyakude district of the KwaZulu-Natal Province (Figure 1). uMkhanyakude district shares borders with Swaziland and Mozambique as well as the Zululand and King Cetshwayo districts which affords the district economic opportunities for trade. The district comprises four municipalities: UMhlabuyalingana, Jozini, Big 5, Hlabisa, and Mtubatuba. The uMkhanyakude district is one of the ten district municipalities of KwaZulu-Natal Province, located in the far northern region of the province.

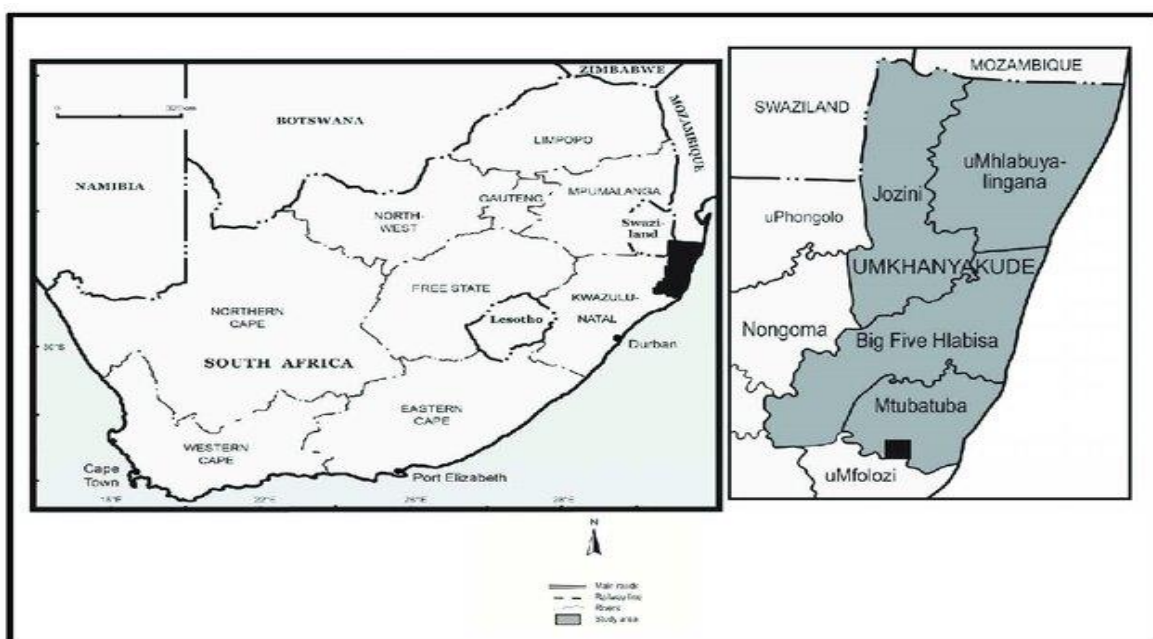


Fig. 1. Map of KwaZulu-Natal with an extract of the study area

Sources: Sibiyi et al. (2022)

It has a population of approximately 11.54 million people accounting for 19.0% of the population of the province. The district is the second largest in the province in terms of land area (Stats SA, 2022). uMkhanyakude District is a rural district municipality with a significant number of small-scale farmers (uMkhanyakude District, 2020) and is considered to be the poorest in KwaZulu-Natal Province (Patrick, 2021). In this district, agricultural productivity and food security account for only 9% of the economy of the district as agriculture is prevalent, particularly in the Pongola floodplain.

The selection of the Umkhanyakude district for this study is well-founded because of the limited existing research, unique agricultural and socioeconomic context, and potential for substantial positive impacts on local farmers. This approach not only fills a critical knowledge gap but also contributes to a broader understanding of small-scale farming in diverse settings within KwaZulu-Natal Province.

Sampling techniques

A random simple sampling method was employed to select 100 small-scale farmers engaged in nut production within the district. The application of specific criteria was pivotal in determining the composition of the sample set, necessitating the active involvement of respondents in small-scale nut farming. Collaboration with local agricultural extension officers affiliated with the KwaZulu-Natal Department of Agriculture and Rural Development (KZNDARD) facilitated the identification and recruitment of small-scale farmers within the Mkhanyakude district. Data were collected through face-to-face interviews using a structured questionnaire, which allowed for the systematic collection of information pertinent to the study objectives.

Data collection

The data gathered primarily focused on quantitative information and transpired over four weeks from October 2022 to November 2022. The survey instrument comprised both closed- and open-ended questions strategically designed to solicit a comprehensive array of responses from the participants. The questionnaire structure aimed to streamline the data collection process by efficiently extracting relevant information from the respondents while minimizing the time investment required for their participation.

The survey questionnaire encompassed a broad spectrum of inquiries spanning demographic characteristics such as gender, age, education level, and farmer status, thereby facilitating a nuanced understanding of the sample population. Additionally, the questionnaire comprised dedicated sections addressing aspects of production and

marketing, thereby enabling a thorough exploration of the factors affecting both realms within the context of nut farming among small-scale farmers.

Conceptual framework

The drivers of market participation are not similar among small-scale farmers globally because farmers may produce saleable products and consume them at the household level if the endogenous prices lie amid the consumer price and the mark-up selling price (Gebremedhin and Jaleta, 2010). Small-scale farmers may also have satisfactory market participation if they reach higher productivity for various reasons incorporating the use of advanced technologies, favorable climate, and many more (Gebremedhin and Jaleta, 2010; Mdoda et al., 2024). Fig 2. presents a conceptual framework used in the study, which was developed based on existing market participation literature (Olutosin et al., 2019; Lekhisa and Muroyiwa, 2024; Mdoda et al., 2024). The framework shows the interrelationship between market participation; a binary dependent variable, and institutional factors as well as demographic factors and farm-level factors.

Numerous studies have outlined the institutional factors affecting the market participation of small-scale farmers producing various products. Studies carried out by Maponya et al. (2018); Negerssa et al. (2020); Maesela et al. (2023); Lekhisa and Muroyiwa (2024) reported a positive association between market participation and market information. Access to relevant market information allows farmers to make better decisions about which product to produce, the amount of time to produce it, the targeted market, and the place to sell it. The negative influence of market distance on market participation was reported by various studies, for example, by Workey et al. (2019) and Negerssa et al. (2020). The assumption is that long distance is relatively associated with higher transaction costs to deliver the products from the point of production to the markets. Access to market prices for agricultural products plays a significant role in the participation of markets (Karanja et al., 2019; Endries et al., 2020). This is so because the availability of market prices will help farmers to know what quantities and which products to distribute to a market. The institutional variables such as training, extension services, credit accessibility, and farmer association membership were also reported as statistical factors affecting market participation (Dube, 2020; Donkor et al., 2021). Demographic and farm-level factors also play a statistically significant role in the market participation of the various agricultural products among the small-scale farmers. The studies conducted by Senbeta (2020) as well as Sori and Adugna (2022) reported the positive relationship

between education level of the farmer and market participation. However, Dube (2020) and Goitom et al. (2018) reported a negative relationship between gender and market participation. Age, family size, farming experience and flock size were among the factors affecting market participation of small-scale farmers (Edosa 2018; Goitom et al., 2018; Negerssa et al., 2020; Haile et al., 2022).

Participation in the nut market among small-scale farmers may also differ because of the above-mentioned factors. Higher levels of nut market participation may lead to improved household income, job creation, commercialisation, growth, and sustainability.

Analytical model used in the study

Descriptive statistics were used to summarise the study, using statistical and data science software (STATA 15). A probit regression model was used to determine the institutional factors affecting market participation by small-scale nut farmers.

In market participation studies, many researchers have used probit, logit, and tobit models, which are binary statistical models that enable a specific analysis of market participation by farmers (Mwalongo et al., 2020). When used for the analysis, the three statistical models can provide more detailed information on the characteristics of a farmer who participates in the market. According to Wooldridge (2010), the probit model is more suitable than other statistical models because of its outstanding properties, particularly the assumption

of normal distribution. Given that the dependent variable in this study is a dummy and can only take two values—one if the small-scale farmer participated in the market and zero if they did not—a probit regression model was employed. Farmers are said to participate in the market if they sell their produce either in the formal or informal markets. A binary model is set up which explains $X=1$ when the farmer participates in the market and $X=0$ when the farmer does not participate in the market, and it can be expressed in the following equation:

$$X_i = D(Y_i \beta) + e_i \tag{1}$$

$X_i = 1$ if participates, 0 otherwise

where $\beta \sim N(0,1)$ β -highest probability, Φ - functions for the cumulative distribution of the standard normal distribution. e_i -error term x : group of explanatory variables. Then, the marginal effects are:

$$\frac{\partial E(X_i)}{\partial y} \tag{2}$$

X_i signifies market participation, and Y_i = independent variables (gender, educational level, farm size, landownership, training, experience, type of market, distance (km), nut price, search for information, transport, and extension services). ∂ = shift in the likelihood of the explanatory variable for a specific shift in the dependent variable. The empirical equations are given by equations (3) and (4).

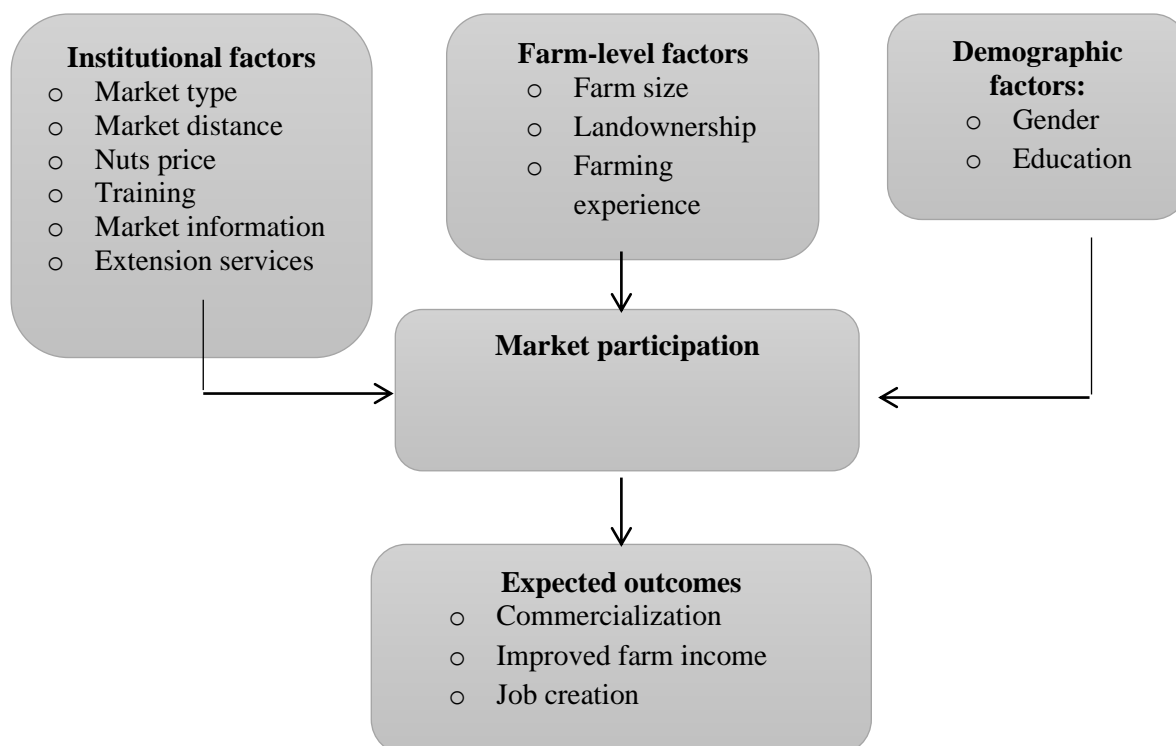


Fig. 2. Nut market participation conceptual framework

Source: Author’s compilation

Table 1: Explanatory variables incorporated in the Probit model

Variable code	Variable name	Variable description	Unit
Dependent variable			
PARTCI	Participation	1 if the farmer participates in the nut market, 0 otherwise	Binary
Independent variable			
Demographic factors			
GENDR	Gender	1 if the farmer is male, 0 otherwise	Binary
EDUCA	Education	1 if the farmer has high school; 0 otherwise	Binary
Farm-level factors			
FMSIZE	Farm size	Farmers' nut production area	Hectares
LNDOWN	Landownership	1 if the farmer owns the land, 0 otherwise	Binary
FMEXP	Farming experience	1 if the farmer has experience in farming, 0 otherwise	Binary
TRANS	Transportation	1 if the farmer owns transport, 0 otherwise	Binary
Institutional factors			
MKTTYP	Market type	1 if the farmer uses informal market, 0 otherwise	Binary
MKTDT	Market distance	Distance to the output market	Kilometres
NUTPRC	Nuts price	Price of nuts per 50kg	Rands
TRAIN	Training	1 if the farmer received training, 0 otherwise	Binary
MKTINF	Market information	1 if the farmer has access to market information, 0 otherwise	Binary
EXTSRV	Extension services	1 if the farmer has access to extension services, 0 otherwise	Binary

Source: Author's work

Table 1 presents the description of variables used in the study.

$$X_1(0,1) = \beta_0 + \beta_1\chi_1 + \beta_2\chi_2 + \beta_n\chi_n + e_1 \quad (3)$$

$$X_i(0,1) = \beta_0 + \beta_1\chi_{GENDR} + \beta_2\chi_{EDUCA} + \beta_3\chi_{FMSIZE} + \beta_4\chi_{LNDOWN} + \beta_5\chi_{FMEXP} + \beta_6\chi_{TRANS} + \beta_7\chi_{MKTTYP} + \beta_8\chi_{MKTDT} + \beta_9\chi_{NUTPRC} + \beta_{10}\chi_{TRAIN} + \beta_{11}\chi_{MKTINF} + \beta_{12}\chi_{EXTSRV} + e_i \quad (4)$$

RESULTS AND DISCUSSION

Descriptive statistics of small-scale nut farmers

Table 2 shows the descriptive statistics of small-scale nut farmers who participated in this study. The results indicated that 53% of the respondents do not participate in the nut market. Participants occupied an average of 3.5 ha of land, while non-participants had an average of 2.5 ha of land. The average distance to a nut market is approximately 12 km, while the average nut price is R756 per 50 kg.

The categorical variables utilized in this study are further displayed in Table 3. The results showed that 70% of the participants in both groups were male and 30% were female. In the participants category, 37% of the farmers had a high school education, while 18% did not have a formal education. Regarding non-participants, 37% had a high school education and 21% had no formal education. About ownership of land, 88% of the market participants owned land, whereas 12% did not. Among the non-participants, 89% owned the land and 11% did not. The results further revealed that the majority (93% and 73%) in both categories had farming experience. The results also show that about 58% of market participants had received training, while 42% had not attended any training. In contrast, 65% of the non-participants had attended training, and the remaining 35% did not do so.

Table 2: An explanation of continuous variables in the data gathered from uMkhanyakude district n=100

Variable	Participants (n=47)		Non-participants (n=53)		All (n=100)		T-tests
	Mean	Std. Err	Mean	Std. Err	Mean	Std. Err	
FMSIZE	3.48	4655	2.52	2743	2.97	2648	0.0347**
MKTDT	10.89	1.96			11.68	1.70	0.6661
NUTPRC	756.75	19.48			635.63	36.27	0.0008***

Note: ***, ** represent the statistical significance of the factors at 10% and 5% respectively.

Source: Author's work

About 55% of the participatory group reported that they use informal markets while 57% of the non-participants indicated that they prefer informal markets. Furthermore, 58% of the participants had contact with an extension officer, while 42% were unable to do so. Among the non-participants, 57% had access to extension services, whereas 43% lacked access. This indicates that, compared to the non-participants, the participants had better access to extension services. Nearly 51% of the participants did not have access to market information compared with 49% who did, while 54% of the non-

participants did not receive market information.

The determinants of institutional factors affecting market participation of small-scale nut farmers

Table 4 presents a Variance Inflation Factor (VIF) result which was used to check multicollinearity among the explanatory variables. Findings revealed no correlation among the variables because the average VIF (1.26) is less than five. According to James et al. (2013), VIF less than five indicates a low correlation among the independent variables and is accepted.

Table 3: Categorical variables description of data collected from uMkhanyakude district

Variable	Category	Participants (%)	Non-participants(%)	All (%)	z-tests
GENDR	Male	70	70	70	0.4911
	Female	30	30	30	
EDUCA	No formal education	18.18	19.61	21.25	0.5502
	Primary	24.24	19.61	22.50	
	High school	27.27	37.25	28.75	
	Tertiary	30.30	23.53	27.50	
LNDOWN	Yes	88	89	89	0.486
	No	12	11	11	
FMEXP	Yes	93	73	84	0.186
	No	7	27	16	
TRAIN	Yes	58	65	61	0.382
	No	42	35	39	
MKTTYP	Informal market	54.55	56.86	55.95	0.087*
	Formal Market	45.45	43.14	44.05	
MKTINF	Yes	51	46	49	0.161
	No	49	54	51	
TRANS	Yes	63	68	65	0.416
	No	37	32	35	
EXTSRV	Yes	58	57	58	0.161
	No	42	43	42	

Note * represents the statistical significance of factors at 1% respectively

Source: Author's work

Table 4: Variance Inflation Factor results

Variables	VIF
GENDR	1.30
EDUCA	1.25
FMSIZE	1.62
LNDOWN	1.44
FMEXP	1.17
TRAIN	1.15
MKTTYP	1.21
MKTDT	1.18
NUTPRC	1.35
MKTINF	1.19
TRANS	1.16
EXTSRV	1.12
Mean VIF	1.26

Source: Author's work

Table 5 presents the factors affecting the market participation of small-scale farmers in KZN. The results indicate that the model's parameters fit the data in a satisfactory manner, as indicated by the Pseudo-R² value of 39% and the LR chi², which is statistically important at 1%.

The results revealed that the educational level (EDUCA) was positive and statistically important at the 5% level towards the small-scale nut farmers' participation in markets. This implies that having a high school education increases the odds of participation by 43%. The education level of small-scale farmers is very important in enhancing market participation as it enables them to acquire new ideas and modern techniques for agricultural production, thereby increasing market access. This result falls in line with the findings of Dube (2020), Senbeta (2020), and Sori and Adugna (2022), who found a positive and significant relationship between education level and market participation. Farming experience (FMEXP) exerts a significant and negative influence on market participation at the 1% significance level. This finding highlights that those farmers with farming experience were less likely to participate in the market and the chances of participation decreased by 53%. Although it was expected that farming experience would have beneficial effects on the involvement in market selling, with the assumption that nut farmers may have knowledge and experience but lack access to nut markets; hence they were less likely to sell. This result is consistent with the findings of several studies, for instance, Edosa (2018), Haile et al. (2022), and Mdoda et al. (2024) who found that farming experience has a negative effect on market participation. However, Mossie et al. (2020) reported opposite results that farming experience

improves the level of market participation.

Institutional factors such as market type, market distance, nut prices, and market information statistically influence the market participation of nut farmers. The findings show that, at the 10% level, there is a negative correlation between market participation and the estimated coefficient of market distance (MKTD), which is statistically significant. This indicates that the likelihood of selling at the nut market drops by 1% for every 1 km increase in the distance to the nut markets. The findings indicate that rural farmers, who are often situated far from urban centers are compelled to make lengthy trips to access markets; thus, farmers are less inclined to participate in them. This is likely due to the high cost of transportation. Similar findings were reported by Workye et al. (2019) and Negeressa et al. (2020) who showed the negative correlation between market distance and market participation. Market type (MKTTYP) had a positive and vital influence on marketing participation at the 5% level, highlighting that those farmers using informal markets had a high chance of participating in the market and the likelihood of participation increased by 40%. Informal markets are generally more accessible to smallholder and resource-constrained farmers because they tend to have fewer entry barriers compared to formal markets. Informal markets often have less stringent quality and certification requirements, lower transaction costs, and fewer bureaucratic obstacles. Additionally, the findings showed that, at the 5% level, price (NUTPRC) significantly and favourably influenced marketing participation. This suggests that the likelihood of taking part in the nut market increases by 10% for every rand increase in the nut price.

Table 5: Probit model of institutional factors affecting market participation by small-scale nut farmers

Variables	Coef.	Std. Err.	P>z	dy/dx
GENDR	0.426	0.443	0.336	0.165
EDUCA	1.115	0.433	0.010**	0.433
FMSIZE	0.608	0.804	0.450	0.023
LNDOWN	-0.854	0.678	0.208	-0.331
FMEXP	-1.362	0.490	0.006***	-0.529
TRAIN	0.198	0.398	0.619	0.076
MKTTYP	1.024	0.408	0.012**	0.397
MKTD	-0.026	0.145	0.070*	-0.010
NUTPRC	0.023	0.010	0.029**	0.100
MKTINF	0.773	0.421	0.066*	0.300
TRANS	-0.309	0.406	0.446	-0.120
EXTSRV	-0.518	0.396	0.191	-0.201
_cons	-0.754	1.073	0.482	
LR chi ² (12) = 43.45*** Log-likelihood = -35.5001 Pseudo R ² = 0.393 N=100				

Note: significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

Source: Author's work

This might be so because the price of tree nuts is high and marketable. The result aligns with the findings of Workye et al. (2019), Karanja et al. (2019), and Endries et al. (2020), who demonstrate that product prices affect the producer market participation positively.

The results which were statistically significant at the 10% level showed that variable market information (MKTINF) had a positive significant effect on market participation. This signifies that the availability of market information increases the odds of participation by 30%. The outcome suggests that the availability of information regarding the market provides farmers with the necessary direction to determine which crops to cultivate and when to market their produce. To make well-informed decisions, farmers must be informed about the market conditions, including the quantity of produce available, appropriate pricing, and level of competition. The results correspond with those of Maponya et al. (2018), Maesela et al. (2023), and Lekhisa and Muroyiwa (2024) who also found that market information and the choice to enter the market were positively correlated.

CONCLUSION

The purpose of the study was to identify the institutional factors determining market participation among small-scale nut farmers in the KwaZulu-Natal Province, South Africa. Most of the farmers do not participate in the nut market. The probit results indicated that the nut market participation in Kwa-Zulu Natal is positively influenced by institutional factors such as market type, market information, and nut price but negatively influenced by market distance. Additionally, market participation is influenced by education level and farming experience. Most of the produce produced by farmers is sold at the farm gate with a low market value. Farmers travel long distances to marketplaces, which discourages them from selling. All formal markets are located distant from the point of production. Knowledge is essential for small-scale market participation because the availability of price information in the market and products in high demand increases the farmers' confidence in marketing their produce. Sadly, small-scale farmers have limited access to market information and tend to make poor decisions.

To enhance market participation, the study recommends that farmers should have access to diverse markets, market information systems, and price support mechanisms. Additionally, the study suggests improved farmer education, investment in rural infrastructure, promotion of local markets, and the support of farmer cooperatives to overcome distance and experience-related barriers.

ACKNOWLEDGMENTS

The authors express their sincere gratitude to the KZNDARD for the data collection support provided for this study.

Conflicts of interests

The authors declared no potential conflicts of interest with respect to the research, funding, and/or publication of this article.

AUTHOR CONTRIBUTIONS

The authors contributed as follows: Conceptualization – Mathenjwa, Maesela and Senyolo, Data collection – Mathenjwa, Data analysis – Mathenjwa and Maesela. Data interpretation and Manuscript writing – Mathenjwa and Maesela. Manuscript review – Ramashala and Senyolo.

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