



(RESEARCH ARTICLE)



Analysis of factors influencing market access of smallholder farmers in Ninh Thuan Province

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Abstract

This study aims to investigate the factors affecting farmers' market access in Ninh Thuan Province. Data was gathered through direct interviews with 433 smallholder farmers using a structured questionnaire. Results from the logit model revealed seven significant factors influencing market access: education level, experience, farm size, production linkages, agricultural extension training, information access, and distance to markets. Notably, agricultural extension was found to have the most substantial positive impact on farmers' market access in Ninh Thuan Province. The study offers new insights for policymakers seeking to improve market access for farmers in the province.

Keywords: Farmer; Logit model; Market access; Ninh Thuan Province

1. Introduction

Agriculture has long been recognized as a cornerstone of Vietnam's economy, contributing 12% to the GDP and supporting the livelihoods of over 60% of the rural population [1]. It is also one of the key sectors generating income for the ethnic minority population in Ninh Thuan Province. Ninh Thuan, a central province in Vietnam, has developed various crops, including green apples, grapes, asparagus, aloe vera, and onions. In 2022, the province cultivated approximately 1,249 hectares of grapes, 1,017 hectares of green apples, 350 hectares of aloe vera, 900 hectares of onions, and 426 hectares of asparagus. However, the agricultural production in the province faces numerous challenges that hinder the sector's growth. Additionally, an unstable output market and limited market information have lowered farmers' incomes [2]. One of the major obstacles to this problem is that farmers' accessibility to the market is restricted. Thus, examining the factors influencing farmers' market access in Ninh Thuan Province is crucial. Gaining insights into these factors can help policymakers and managers design strategies that enhance market accessibility, boost farmers' incomes, stimulate economic growth in farming communities, and promote sustainable agricultural development in the province.

2. Theoretical Framework and Research Model

Farmers' market access is vital for agriculture as it directly influences the sustainability, profitability, and development of the sector [3]. It refers to farmers' ability to connect with input suppliers and interact with buyers to sell their produce at a profitable price [4]. According to Mukwevho and Anim (2014) [5], market access is the degree of ease or availability with which farmers can access and participate in markets. When market access is effective, it can lead to sustained income growth for farmers and boost rural employment [6]. Conversely, limited market access often forces farmers to sell their products at prices dictated by buyers, thereby reducing their earnings [5].

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Previous empirical studies have investigated the factors influencing farmers' market access. For instance, Mukwevho and Anim (2014) [5] highlight that household characteristics (such as age, gender, and education level), costs (including production, transaction, and transportation), distance from farm to market, and access to extension services are significant factors affecting farmers' market access. Additionally, Ssajakambwe et al. (2020) [7] note that the farmer's experience, education, household size, extension services, and credit access positively impact market access. Furthermore, Permadi and Winarti (2018) [8] suggest that knowledge, motivation, infrastructure, and relations with the middlemen significantly influence farmers' market access. In a study conducted in Nigeria, Nomor and Tersugh (2024) [9] postulate that gender, educational attainment, farming experience, and vehicle ownership significantly impact market accessibility. Additionally, in Vietnam's Ben Tre Province, Nghi et al. (2021) [10] report that age, training, telephone, linkage, distance, and acreage influence farmers' market access.

In summary, earlier studies on market access have identified differential factors influencing farmers' market access. Building on findings from relevant studies and field surveys in the study area, we propose the following research model for factors affecting farmers' market access in Ninh Thuan Province (Figure 1).

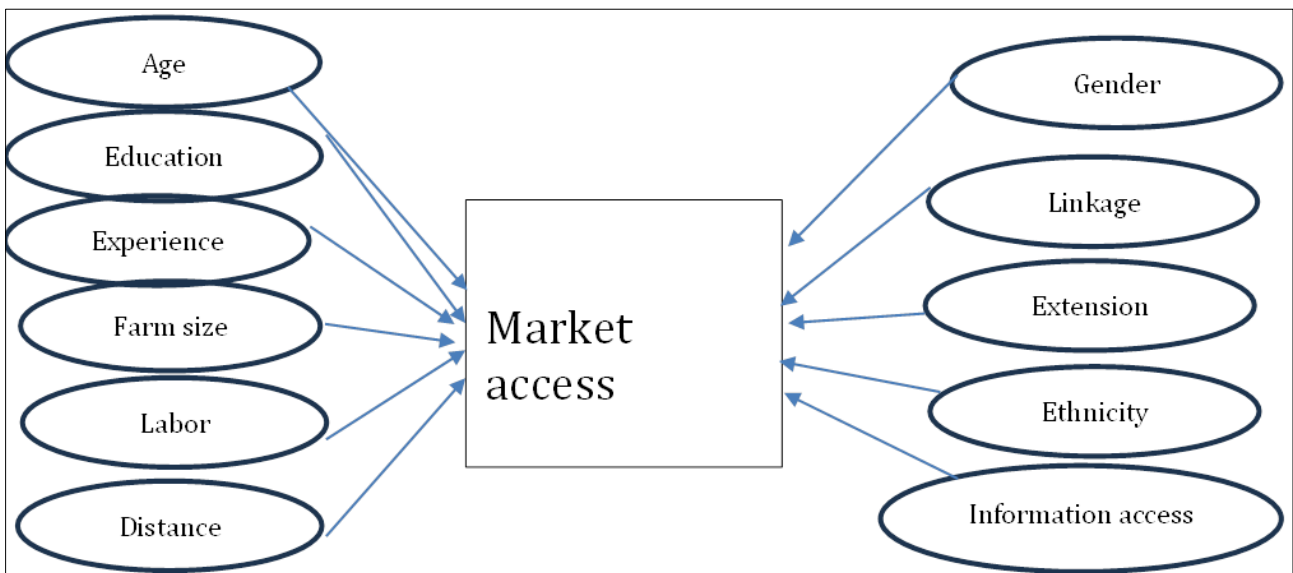


Figure 1 Research model

Logistic regression was used to estimate the above research model, and the equation is shown as follows:

$$ACCESS = \beta_0 + \beta_1 Age + \beta_2 Edu + \beta_3 Exp + \beta_4 Fsize + \beta_5 Lab + \beta_6 Gen + \beta_7 Lin + \beta_8 Ext + \beta_9 Inf + \beta_{10} Eth + \beta_{11} Dis$$

Where,

The dependent variable, ACCESS, represents farmers' ability to access input and output markets. The ACCESS variable is assigned a value of 1 if the farmer demonstrates a high capacity for market access, characterized by regularly updating market information and quickly capturing prices. Conversely, it is assigned the value of 0 if the farmers' market access is low. The explanatory variables are presented in Table 1.

Table 1 Description of explanatory variables in the empirical model

Variable	Description	Variable measurement	Expected sign
Age	Age of the household head	Years (number)	-
Edu	The education level of the household head	Not educated = 1, primary education = 2, secondary education = 3, high school = 4, and degree = 5	+
Exp	Farming experience of the household head	Number of years that the household head has been a farmer	+
Fsize	Farm size	Size of cultivated land for farming in 1000m ²	+
Lab	Family labor	Number of people participate in the family farm	+
Gen	Gender of the household head	1 = Male 0 = Female	+
Lin	Linkage in production of the household head	1 = Household joins in a cooperative, 0 = otherwise	+
Ext	Agricultural extension training participation of the household head	1 = Household participates in agricultural extension training, 0 = otherwise	+
Inf	Access to information through the Internet of household head	1 = Household knows to use the Internet to access information, 0 = otherwise	+
Eth	Ethnicity of the household head	1 = Household is Kinh ethnic, 0 = otherwise	+
Dis	The distance to the nearest market	Kilometre	-

3. Methodology

The study was conducted in Ninh Thuan Province, located on the South-Central Coast of Vietnam, approximately 350 kilometres from Ho Chi Minh City and 60 kilometres from Cam Ranh Airport in Nha Trang City (see Figure 2). Ninh Thuan Province comprises 111,294 households with a total area of 335,534 hectares. The main crops grown include apples, grapes, onion, asparagus, and aloe vera; however, onion, asparagus, and aloe vera provide farmers with monthly income. Therefore, the present study focuses on these three crops cultivated in the Ninh Hai district, Ninh Phuoc district, and Phan Rang-Tháp Chàm City.

**Figure 2** Map of Ninh Thuan Province

The sample size for the survey was determined using the formula proposed by Cochran (1977) [11]:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where,

n is the sample size (number of farming households) to be interviewed.

N is the total number of households about 111,294.

n_0 is calculated using the formula: $n_0 = \frac{Z^2 \times p \times (1-p)}{d^2}$, where Z represents the distribution value corresponding to 95% confidence level, p is the assumed proportion accuracy at 95%, and d is the error at 5%. Based on these values, $n_0 = 385$.

According to the sample formula, the minimum sample size is 384 households. Therefore, the study collected 450 households. After removing unsuitable samples, the final data of this research is 433 households. Data was collected through stratified random sampling and direct interviews with farmers using structured questionnaires.

4. Results and Discussions

4.1. Characteristics of Respondents

The respondents in this study were small-scale farmers and heads of farming households. The characteristics of the 433 farmers surveyed are detailed in Table 2. Results demonstrate that male-headed households have a higher percentage than female-headed ones, at 63.05% and 36.95%, respectively. Most respondents were still of working age, with 90.53% between 30 and 60 years old. The level of farmers' education was relatively low, with approximately 67.89% having only a secondary education or less. Additionally, about 67.20% of growers had 10 to 20 years of farming experience. This suggests that farmers have considerable production experience though their production scale is generally smaller than 5,000 m².

Table 2 General information about the interviewees (N=433)

Characteristic	Frequency (people)	Percentage (%)
Gender		
Male	273	63.05
Female	160	36.95
Age		
<= 30	13	3.00
30 - 40	58	13.39
40 - 50	211	48.73
50 - 60	123	28.41
> 60	28	6.47
Education		
No school	14	3.23
Elementary school	82	18.94
Secondary school	198	45.72
High school	92	21.24
Degree	47	10.85

Experience		
<= 5	37	8.55
5 – 10	66	15.24
10 – 15	131	30.25
15 – 20	160	36.95
> 20	39	9.00
Production scale		
<= 5.000 m ²	395	91.22
5.000 m ² – 10.000m ²	35	8.08
10.000 m ² – 15.000 m ²	1	0.23
> 15.000 m ²	2	0.46

Source: Survey data, 2023

4.2. Information exchange in market access

Information exchange among farmers promotes collective growth, reduces individual vulnerabilities, and enhances access to both local and larger markets. Results in Table 3 indicate that the primary information exchanged among farmers comprises market fluctuations, production techniques, inputs, and crop-related data. Among these categories, farmers exhibit great interest in market information, with 300 households (69.28%) participating in such exchanges, highlighting that farmers are considerably attentive to product pricing, consumption output, and distribution channels. However, information sharing regarding input factors, production techniques, and seasonal cues is comparatively low.

Table 3 Farmers' information exchange

	Without exchange		With exchange	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Market information	133	30.72	300	69.28
Production technical information	223	51.50	210	48.49
Seed information	227	52.42	206	47.57
Fertilizers and Pesticides information	243	56.12	190	43.88
Crops information	238	54.97	195	45.05

Source: Survey data, 2023

Additionally, farmers also identified the media they use to access such information. Results from Table 4 reveal that 63.28% of respondents rely on smartphones to gather information, with 65.13% using internet-connected smartphones. This posits that internet usage among farmers for accessing information is relatively high.

Table 4 Media usage for access information

	Frequency	Percentage (%)
Media		
Radio	83	19.17
Smartphone	274	63.28
Newspapers	12	0.03
Television	64	14.78
Smartphone usage		
With Internet connection	282	65.13
Without internet connection	151	34.87

Source: Survey data, 2023

4.3. Factors affecting farmers' market access in Ninh Thuan Province

Table 5 presents the results of the logit regression model, showing both the regression coefficients and marginal effects of factors influencing the probability of market access for farmers in Ninh Thuan province. The model results delineate a McFadden R^2 value of 0.3498, suggesting that the explanatory variables explain 34.98% of the variation in market access. A p-value of 0.000 and a log-likelihood of -357.298 confirm the statistical appropriateness of the logit regression model.

Table 5 Result of the Logit Regression Model

Variables	Coefficient	Marginal effect
Constant (C)	-4.822 (0.000)	
Age	0.015 ^{ns} (0.107)	0.0038
Edu	0.060 ^{**} (0.034)	0.0150
Exp	-0.027 ^{**} (0.050)	-0.0068
Fsize	0.001 [*] (0.095)	0.0002
Lab	0.104 ^{ns} (0.459)	0.2591
Gen	-0.199 ^{ns} (0.308)	-0.0496
Lin	0.390 ^{**} (0.028)	0.0955
Ext	2.929 ^{***} (0.000)	0.5588
Inf	2.496 ^{***} (0.000)	0.5103
Eth	0.360 ^{ns} (0.325)	0.0897
Dis	- 1.969 ^{***} (0.000)	-0.4431
Log-likelihood	-357.298	
McFadden R-squared	0.3498	
Probability(LR stat)	0.0000	

Source: Derivation from the output generated by Stata 17 software; Note: The figures enclosed in parentheses represent P-values; ***, **, * denote significance at 1, 5, and 10%, respectively.

As presented in Table 5, out of the 11 variables specified in the model, market access for farmers in Ninh Thuan Province is influenced by seven factors: education level, experience, farm size, linkages, agricultural extension training, information access, and distance to markets. Most of these factors positively affect farmers' market access, except for experience and distance.

The marginal effect analysis highlights that agricultural extension training, linkages, and information access strongly impact farmers' market accessibility. Among these, agricultural extension training demonstrates the strongest effect, with a marginal value of 0.5588. This indicates that participation in agricultural extension training programs increases the farmers' likelihood of accessing markets by 55.88%. This finding is consistent with the results of Nghi et al. (2021) and Ssajakambwe et al. (2020), who found increased market access through participation in agricultural extension programs. These programs provide market information to guide farmers in choosing the most appropriate production seasons and are frequently implemented by local authorities. Therefore, the findings of this study align with local practices.

Table 6 delineates that the model's predictive accuracy is relatively high at 81.53%, suggesting that the model coefficients effectively explain farmers' market access. Among the 195 households lacking market access, the model accurately predicted 154 (78.97%). Similarly, of the 238 households with high market accessibility, the model correctly predicted 198 (83.19%).

Table 6 Prediction results of the model

	Household	Model prediction	
		Y =0	Y=1
Y=0	195(45.03%)	154 (78.97%)	41 (21.03%)
Y=1	238 (54.97%)	40 (16.18%)	198 (83.19%)
Total	433	81.53%	

Source: Derivation based on the output generated by Stata 17 software

5. Conclusion and policy implications

Market access is essential for farmers to achieve higher profits and serves as a cornerstone of sustainable agricultural development. However, in Ninh Thuan Province, limited market access poses a significant challenge for farmers. This study identifies seven factors influencing farmers' market access: education level, experience, farm size, linkages, agricultural extension, information access, and distance. The findings reveal that participation in agricultural extension training is the most significant factor affecting farmers' market access. In addition, production linkages and access to information are crucial in enhancing farmers' likelihood of accessing markets.

Based on these findings, several policy recommendations are proposed to enhance market access. First, the local government should facilitate agricultural extension programs to educate farmers on advanced farming techniques and effective market approaches. These programs not only provide smallholder farmers with the necessary knowledge to improve farming practices and add value to their products but also disseminate crucial input and output market information to minimize production and consumption risks. Besides, digital extension services should be implemented by leveraging websites and social media platforms to share agricultural market information and provide advisory support to farmers.

Second, governments and policymakers should prioritize expanding internet coverage, especially in remote villages. Collaboration between the public and private sectors can help develop a robust digital infrastructure and ensure that digital services are affordable. With reliable internet access, farmers can quickly obtain market information and price trends, as well as sell their products directly to consumers or retailers through social media platforms such as Facebook and Zalo.

Third, farmers should actively engage in supply chain networks, focusing on both horizontal and vertical connections. Horizontal linkages, such as participating in cooperatives, enable farmers to share knowledge and experiences, access a broader range of market information, and protect themselves from price manipulation. Meanwhile, vertical linkages allow farmers to establish commercial agreements for raw material supply, ensuring consistent and stable output.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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