

## FACTORS AFFECTING FARMERS' INFORMATION ACCESS BEHAVIOR IN PRODUCTION IN THE NORTHERN MIDLANDS AND MOUNTAINOUS AREAS, VIETNAM

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ARTICLE INFO		ABSTRACT
<b>Received:</b>	<b>23/7/2025</b>	In the context of Vietnam's digital transformation and agricultural modernization, this study investigates the factors influencing farmers' information access behavior in the Northern midland and mountainous regions. Using the Technology Acceptance Model, the data of 562 valid responses, and PLS-SEM method, we found some interesting results. The empirical results indicate that both perceived usefulness and perceived ease of use significantly affect farmers' information-seeking behavior, with perceived usefulness also acting as a mediator. These findings highlight the importance of accessible and practically relevant information systems in promoting informed agricultural decision-making. Based on the model outcomes, the study proposes targeted solutions including communication programs, farmer training, infrastructure enhancement, and local support networks to improve information access and foster sustainable agricultural development in disadvantaged rural areas.
<b>Revised:</b>	<b>23/8/2025</b>	
<b>Published:</b>	<b>23/8/2025</b>	
<b>KEYWORDS</b>		
Information access		
Farmers		
Vietnam		
Technology Acceptance Model		
PLS-SEM		

## CÁC YẾU TỐ ẢNH HƯỞNG TỚI HÀNH VI TIẾP CẬN THÔNG TIN TRONG SẢN XUẤT CỦA NÔNG DÂN TẠI VÙNG TRUNG DU VÀ MIỀN NÚI PHÍA BẮC, VIỆT NAM

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THÔNG TIN BÀI BÁO		TÓM TẮT
<b>Ngày nhận bài:</b>	<b>23/7/2025</b>	Trong bối cảnh chuyển đổi số và hiện đại hóa nông nghiệp tại Việt Nam, nghiên cứu này phân tích các yếu tố ảnh hưởng đến hành vi tiếp cận thông tin của nông dân tại khu vực trung du và miền núi phía Bắc. Dựa trên mô hình chấp nhận công nghệ, bộ dữ liệu gồm 562 mẫu hợp lệ và phương pháp PLS-SEM, nghiên cứu thu được một số kết quả đáng chú ý. Kết quả thực nghiệm cho thấy cả nhận thức về tính hữu ích và nhận thức về tính dễ sử dụng đều ảnh hưởng đáng kể đến hành vi tìm kiếm thông tin của nông dân, trong đó nhận thức về tính hữu ích còn đóng vai trò trung gian. Những phát hiện này nhấn mạnh tầm quan trọng của hệ thống thông tin dễ tiếp cận và có tính ứng dụng cao trong việc thúc đẩy ra quyết định hiệu quả trong sản xuất nông nghiệp. Trên cơ sở đó, nghiên cứu đề xuất các giải pháp trọng tâm như tăng cường truyền thông, đào tạo nông dân, cải thiện hạ tầng và xây dựng mạng lưới hỗ trợ tại địa phương nhằm nâng cao khả năng tiếp cận thông tin và thúc đẩy phát triển nông nghiệp bền vững ở các vùng nông thôn khó khăn.
<b>Ngày hoàn thiện:</b>	<b>23/8/2025</b>	
<b>Ngày đăng:</b>	<b>23/8/2025</b>	
<b>TỪ KHÓA</b>		
Tiếp cận thông tin		
Nông dân		
Việt Nam		
Mô hình chấp nhận công nghệ		
PLS-SEM		

DOI: <https://doi.org/10.34238/tnu-jst.13287>

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## 1. Introduction

In the context of deep economic integration and rapid digital transformation, information plays an increasingly critical role in the development of agricultural production. According to Wyckof [1] and Blanco Armas et al. [2], information is not only a supporting tool but also a strategic resource that directly affects productivity, innovation, and the competitiveness of producers. This is especially true in areas with geographic, infrastructure, and access limitations, such as the Northern midland and mountainous regions of Vietnam, where information serves as a vital bridge helping farmers improve production efficiency, access markets, and develop sustainable livelihoods [3].

From a theoretical perspective, there are two main approaches to understanding the role of information. On one hand, it is seen as an indirect enabler that facilitates access to resources such as capital, labor, land, and technology [4]. On the other hand, information is considered a crucial input on par with traditional means of production, capable of directly promoting growth, innovation, and competitiveness, particularly in the knowledge economy and digital age [2], [5].

Empirically, studies conducted in various countries have demonstrated a strong link between information access and production efficiency. In Uganda, farmers with better access to information achieved 33% higher productivity compared to others [3]. In Ethiopia, farmers' ability to forecast market prices improved significantly through access to information [4]. In Nigeria, market information increased agricultural profits by 20–25% [6].

Despite these clear benefits, information access in agricultural production remains limited in the Northern midland and mountainous regions of Vietnam [7]. Farmers still tend to rely on traditional experience rather than new information, which may hinder their ability to keep pace with the rapidly evolving market. In response to this reality, the current study aims to analyze the factors influencing farmers' information access behavior in these regions and propose practical solutions to enhance their capacity to access and utilize information in agricultural production.

## 2. Methodology

### 2.1. Conceptual framework

To examine information access behavior in agricultural production and business, this study employs the Technology Acceptance Model (TAM) along with related barrier factors (Figure 1).

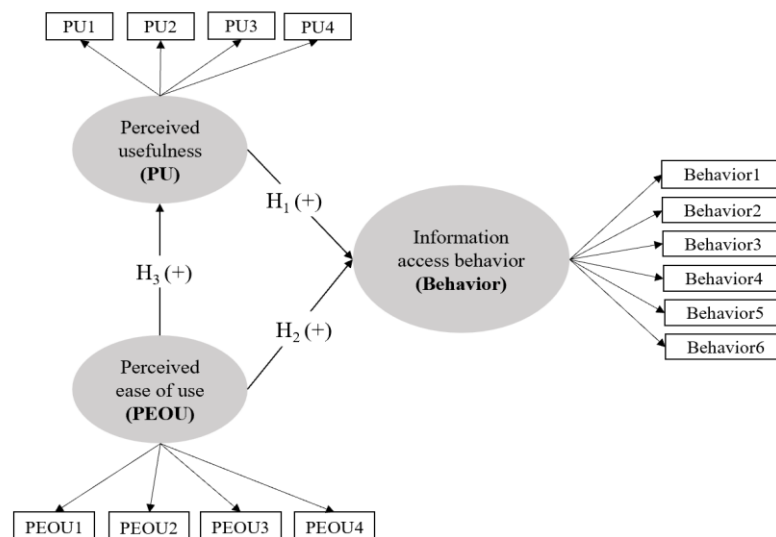


Figure 1. Conceptual framework

**Perceived Usefulness (PU)**

PU reflects the extent to which farmers believe that information can enhance the efficiency of their production and business activities [7], [8]. It is a key determinant influencing the adoption and use of new systems [7]. According to the TAM framework, PU is a critical factor that drives information usage behavior [8]. When farmers perceive information as helpful for planning, disease prevention, or market access, they are more likely to actively seek and apply it [7], [9].

**H1:** PU positively influences information access behavior.

**Perceived Ease of Use (PEOU)**

PEOU refers to the extent to which farmers believe that using an information system requires minimal effort [7]. In agriculture, it reflects how easily farmers can access information through apps, SMS, radio, or extension workers. When systems are user-friendly, farmers are more willing to engage with them. Duong et al. [7] indicates that PEOU not only directly influences access behavior but also indirectly enhances PU. Particularly in rural areas, user-friendly design, clear language, and responsive support increase information uptake [10].

**H2:** PEOU positively influences behavior.

**H3:** PEOU positively influences PU.

**2.2. Data collection**

Prior to conducting the quantitative survey, the author carried out in-depth interviews with selected stakeholders, including farming households, agricultural experts, representatives of local authorities, and leaders of agricultural cooperatives. The interviewees were selected using purposive sampling, based on their relevant experience, professional expertise, and active engagement in agricultural production and rural development. Most participants had over 10 years of working experience in the field and held managerial or advisory roles.

The purpose of these interviews was threefold: (i) to gain preliminary insights into the current landscape of information access in agricultural production; (ii) to identify key influencing factors that may affect access to such information; and (iii) to refine the structure and content of the questionnaire, including the measurement scales used. The qualitative findings served as the empirical foundation for model specification and item development in the quantitative phase.

Following the qualitative phase, a structured quantitative survey was conducted in three provinces representing the Northern midland and mountainous region of Vietnam, namely Thai Nguyen (covering Thai Nguyen and Bac Kan according to the planning prior to July 01, 2025) and Cao Bang. The questionnaire consisted of two main sections: (i) demographic and farm-related characteristics, (ii) factors that related to information access behavior. Measurement items were developed based on existing literature and insights from the interviews. A five-point Likert scale (ranging from 1 – strongly disagree to 5 - strongly agree) was employed to measure attitudinal variables and perceived impacts.

The survey was conducted from May to July, 2024. Since the total farming population was unknown, the study applied the 10-times rule [11] to determine a minimum required sample size. With 22 independent variables in the research model, at least 220 observations were needed. From the list of eligible farming households provided by local authorities, 600 individuals (200 from each province) were randomly selected. After data cleaning, 562 valid responses were retained for analysis. A total of 38 responses were excluded due to missing data (28) or failure to pass attention-check questions (10).

Table 1 presents the demographic and professional characteristics of the 562 valid respondents. The majority were between 36 and 55 years old (73.13%), indicating a predominantly middle-aged farming population. In terms of ethnicity, 55.16% were Kinh and 44.84% belonged to ethnic minority groups, reflecting the diverse cultural composition of the Northern midland and mountainous regions. Female respondents accounted for a larger proportion (59.43%) compared to males (40.57%). Regarding education, most participants had

completed 10-12 years of schooling (65.84%), with only 5.52% having less than 5 years of formal education. In terms of primary occupation, 54.45% engaged in agriculture, 33.81% in livestock, and 11.74% in forestry, indicating a strong emphasis on crop and animal production within the study areas.

**Table 1.** *The responds' information*

Variable	Frequency	Percent
<b>Age</b>		
26–35 age	38	6.76
Above 36–45 age	199	35.41
Above 46–55 age	212	37.72
Above 55 age	113	20.11
<b>Culture</b>		
Kinh	310	55.16
Others	252	44.84
<b>Gender</b>		
Male	228	40.57
Female	334	59.43
<b>Educational level</b>		
0–5 years	31	5.52
6–9 years	95	16.90
10–12 years	370	65.84
Above 12 years	66	11.74
<b>Field</b>		
Agriculture	306	54.45
Livestock	190	33.81
Forestry	66	11.74

### 2.3. Method of estimating

In this study, Partial Least Squares Structural Equation Modeling (PLS-SEM) was chosen for model estimation due to its notable advantages over Covariance-Based SEM (CB-SEM). These include fewer assumptions regarding data distribution, suitability for small sample sizes, flexibility in handling both reflective and formative measurement models, and the ability to maximize the explained variance of dependent variables, thereby improving predictive accuracy. Additionally, PLS-SEM helps minimize model identification issues, making it particularly effective for analyzing complex model structures [12], [13].

The measurement model was evaluated using several criteria: factor loadings ( $> 0.7$ ), composite reliability ( $CR > 0.7$ ), convergent validity through average variance extracted ( $AVE > 0.5$ ), and discriminant validity using the Fornell–Larcker criterion and HTMT ratio ( $< 0.85$ ) as suggested by Munir et al. [14] and Nowiński et al. [15]. Subsequently, the structural model was tested by examining the statistical significance of path coefficients using bootstrapping with 5,000 subsamples [16].

## 3. Results and Discussion

### 3.1. Measurement model

Table 2 presents the results of the measurement model, showing that all constructs demonstrate acceptable reliability and convergent validity. The Cronbach's Alpha ( $\alpha$ ) values for PEOU, PU, and Behavior are all above 0.7, indicating strong internal consistency. Similarly, rho\_A and Composite Reliability (CR) values are consistently above the recommended threshold of 0.7. In addition, factor loadings ( $\beta$ ) range from 0.837 to 0.884, suggesting that all observed variables are well-correlated with their respective latent constructs. The Average Variance

Extracted (AVE) values for PEOU (0.767), PU (0.754), and Behavior (0.714) are above 0.5, confirming good convergent validity. These results confirm that the measurement model is appropriate for further analysis.

**Table 2.** *The results of measurement model*

Variables	Question	$\beta$	$\alpha$	rho_A	CR	AVE
PEOU1	Accessing agricultural information enables me to easily adopt new farming methods.	0.880	0.899	0.900	0.929	0.767
PEOU2	Accessing agricultural information helps me respond more effectively to weather changes and climate variability.	0.882				
PEOU3	Accessing agricultural information allows me to better cope with crops and livestock diseases during the production process.	0.866				
PEOU4	Accessing agricultural information makes it easier for me to apply modern technologies in agricultural production.	0.874				
PU1	My interaction with the agricultural information system is clear and easy to understand.	0.863	0.891	0.891	0.924	0.754
PU2	Interacting with information during the production process does not require much mental effort.	0.845				
PU3	I find information related to the production process easy to use.	0.879				
PU4	I find it easy to access information related to the production process.	0.884				
Behavior1	I actively seek information from various sources (e.g., the internet, technical staff, acquaintances) for production purposes.	0.856	0.920	0.924	0.937	0.714
Behavior2	I have looked up or consulted experts/technicians to better understand technical information related to production.	0.842				
Behavior3	I often use my phone, the internet, or meet people directly to search for information that supports my production activities.	0.847				
Behavior4	I frequently check and compare information from multiple sources before applying it in my production process.	0.838				
Behavior5	I have successfully applied the information I obtained to specific steps in my production process.	0.849				
Behavior6	Throughout the production cycle (from preparation to harvest), I regularly update myself with new and relevant information.	0.837				

Table 3 reports the results of discriminant validity using the Fornell–Larcker criterion. The square roots of the AVE for each construct are shown on the diagonal and are higher than the correlations with other constructs in the same column and row. Specifically, the square root of AVE for PEOU, PU and Behavior are exceeding its correlations. These results indicate that all constructs exhibit good discriminant validity, confirming that each construct is empirically distinct from the others.

**Table 3.** *The results of Discriminant Validity - Fornell-Larcker*

	PEOU	PU	Behavior
PEOU	0.876		
PU	0.426	0.868	
Behavior	0.257	0.234	0.845

### 3.2. Structural equation model

Table 4 presents the results of the structural equation model and confirms that all proposed hypotheses are statistically significant. The path from PEOU to PU shows a strong and significant relationship ( $\beta = 0.426$ ,  $t = 8.490$ ,  $p < 0.000$ ), indicating that higher ease of use enhances the perceived usefulness of information systems. The direct effect of PEOU on Behavior is also significant ( $\beta = 0.257$ ,  $t = 5.828$ ,  $p < 0.000$ ), though the coefficient is relatively smaller, suggesting a weaker but still meaningful influence. Lastly, PU significantly affects

Behavior ( $\beta = 0.153$ ,  $t = 2.475$ ,  $p < 0.000$ ), reinforcing that when farmers perceive information as useful, they are more likely to engage in information-seeking behavior. Overall, the model supports the mediating role of PU and confirms that both ease of use and usefulness are critical factors influencing information access behavior among farmers.

**Table 4.** *The results of structural equation model*

Path	Original Sample (O)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
PEOU -> PU	0.426	0.050	8.490	0.000
PEOU -> Behavior	0.257	0.044	5.828	0.000
PU -> Behavior	0.153	0.062	2.475	0.013

During the production stage, the structural model results indicate that both PU and PEOU significantly influence farmers' information access behavior. Specifically, the path from PEOU to PU yields a coefficient of 0.426, suggesting that when farmers find information sources simple and accessible, they are more likely to recognize the practical value of the information in their farming activities.

Moreover, the path coefficient from PU to information access behavior is 0.153, reinforcing the theoretical premise that farmers are more inclined to seek and apply information when they perceive it as beneficial. In the context of agricultural production, information related to cultivation techniques, pest and disease management, fertilizer application, and short-term weather forecasts is particularly vital for timely decision-making, improving productivity, and reducing risks.

Additionally, the direct impact of PEOU on information access behavior is statistically significant with a coefficient of 0.257. This indicates that user-friendly, low-effort access to agricultural information encourages farmers to actively search for and apply relevant knowledge in their daily operations. Therefore, in the production phase, simplifying content, enhancing user interface design, and emphasizing the practical relevance of information are essential strategies for improving the effectiveness of information access among farmers in the Northern midland and mountainous regions of Vietnam.

### 3.3. *The solution to encourage farmers to access information*

Based on the structural model results, which confirm that both PU and PEOU significantly influence farmers' behavior in accessing information during the production stage, several key solutions are proposed to improve information accessibility in the Northern midland and mountainous regions of Vietnam.

First, communication programs should be strengthened to enhance farmers' understanding of the value of information in agricultural production. These programs need to highlight concrete benefits such as increased productivity, better pest and disease management, timely decision-making, and cost optimization. Information should be communicated through clear, practical formats and delivered via familiar, locally accessible channels, using both Vietnamese and ethnic minority languages when necessary.

Second, training initiatives should focus on equipping farmers with basic skills in searching for, evaluating, and applying agricultural information. Practical, community-based formats such as local clubs or small group learning sessions should be adopted to increase participation and effectiveness.

Third, improving infrastructure is essential, including internet coverage expansion in remote areas and providing public digital access points with equipment and on-site technical support. Finally, an intermediary support network composed of agricultural extension workers, local youth with digital knowledge, and experienced farmers should be established to help bridge the gap between complex technical information and practical application in daily farming activities. This approach ensures farmers can access and utilize information easily and effectively, leading to more informed and productive agricultural practices.

#### 4. Conclusion

This study confirms that both perceived usefulness and perceived ease of use significantly influence farmers' behavior in accessing information during the production stage. The findings validate the applicability of the TAM model in the agricultural context, particularly in the Northern midland and mountainous regions of Vietnam. Therefore, to enhance farmers' engagement with agricultural information, solutions should focus on improving the clarity, relevance, and accessibility of information, strengthening digital infrastructure, offering practical training, and building local support networks. These strategies are essential to narrow the information gap, promote informed decision-making, and support more efficient and sustainable agricultural practices.

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