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RESEARCH ARTICLE

Young Farmers' Utilization of Internet for Agricultural Purposes: Evidence from Chiang Mai Province, Thailand

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Abstract: Despite Thailand ranking high among Asia-Pacific countries in The Network Readiness Index 2022 and the increasing Internet access, rural communities in Thailand still face significant barriers to fully utilizing the Internet for agriculture-related activities. This gap in effective digital connection hinders the transfer of crucial information and communication necessary to support and enhance agricultural practices. Hence, this paper's objective aims to explore utilization of the Internet by young farmers and the factors affecting this utilization. To achieve this, 369 young farmers in Mae Chaem district, Chiang Mai province, were surveyed. Data collected was analyzed using descriptive statistics (e.g., frequency and percentage) and relationships were analyzed using Ordered logistic regression analysis. Research results show that all farmers had Internet access and used it on their smartphones (100%). The participants used smartphone applications related to agriculture, with most utilizing LINE and Facebook to contact their fellow farmers (90.0% and 89.2%, respectively). Most participants search for agricultural information through YouTube (86.2%) and search engines (e.g., Google) (61.3%) to find information on plant and animal varieties and methods for crop planting and raising animals. Seven factors were found to influence Internet utilization for agricultural purposes: age, education, contact with agricultural extension officers, agricultural organization membership, use of home or cable Internet, and use of government-provided Internet were statistically significant in affecting Internet use ($p < 0.01$). Based on these results following policy recommendations are provided to encourage farmers to use the Internet for agricultural purposes: Relevant government agencies should set directional policies to create more contact channels for farmers, develop and disseminate educational materials online via social media platforms such as Facebook, LINE, and YouTube, and improve the Internet network and services.

Keywords: Internet utilization; Agriculture; Young farmer; Thailand

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1. Introduction

Digital technology is developing rapidly and reshaping the food and agriculture industry. In a world of nearly 8 billion people, food security is one of the greatest challenges, especially in rural areas in less developed and developing countries [1]. Farming and related activities form the basic fabric of rural life, contributing significantly to employment and occupations.

Africa and Asia have the highest number of people residing in rural areas. In Asia, Thailand is ranked 18th out of 47 countries in terms of the proportion of the population living in rural areas (47.1% of the country's population) [2]. Agriculture is the principal livelihood of this group and thus the cornerstone of the national economy. Development of the agricultural system is critical to ensure food security. However, in developing countries, small farmers frequently encounter challenges that prevent them from developing their own agricultural systems. One of these barriers includes information asymmetry, where one party, group, or community has more information than others. Small farmers, particularly rural farmers, are often not equally informed and equipped with advanced knowledge that can improve their farming skills [3]. Due to a lack of appropriate training and skills, they may not be able to adopt or use the latest equipment, such as digital technologies (e.g., mobile phones, Internet, and computers) and inputs (e.g., seeds, fertilizers, fungicides, and pesticides), or make effective use of existing agricultural inputs to increase productivity [4]. As a result, the crop yields and incomes of these farmers are low, which is detrimental to their livelihoods and rural development [5,6]. Therefore, advanced methods to reduce information asymmetry are worthwhile, especially the use of digital technology to improve farm performance and overall agricultural productivity.

Technological innovations are becoming increasingly crucial in agricultural development and productivity. The use of Internet technology can help reduce information asymmetry as it disseminates information quickly and at a low cost. Previous evidence has proven that the adoption and use of Internet technology can improve access to financial and agricultural services for smallholder farmers [4]. Due to the significant benefits both developing and developed countries have widely adopted Internet technologies. For example, The United States is vigorously promoting the spread of 5G technology in agriculture; the United Kingdom is currently working on a comprehensive 5G rural test-bed project; and India is developing e-commerce for agricultural products. Additionally, 24 European Union countries agreed to cooperate on digital agriculture in 2019 [7]. Thailand places importance on the application of digital technology for agriculture and rural development, guided by the policies of the Department of Agriculture Extension (DOAE) and the Ministry of Agriculture and Cooperatives (MOAC) [8]. The objective is to serve as a framework for the development of digital technology within the Ministry of Agriculture and Cooperatives. This is in line with the national plan for digital development for the economy and society [9]. The development issues of the Ministry of Agriculture and Cooperatives are as follows: (1) Develop countrywide high-efficiency digital infrastructure, (2) Drive the economy with digital technology, (3) Build an equitable and inclusive society through digital technology, (4) Transform the public sector into a digital government, (5) Develop workforce for the age of digital economy and society, and (6) Build trust and confidence in the use of digital technology [7]. New technologies may contribute to quality improvement and cost reduction for delivering services to rural communities. Digital technology and services are an inevitable trend in the development of agricultural modernization and have become the basis for the development of agriculture in the present era.

The Internet and Information and Communication Technology (ICT) are the basis for opportunities for rural communities to facilitate the transfer of information [10]. The Internet is widely recognized as a potentially transformative technology platform for developing nations [11]. Various studies have attributed numerous benefits to the Internet; for example, Internet usage has a significant positive effect on economic well-being. Research has shown that there is a bi-directional causality between Internet usage and economic well-being in both the short and long run, meaning that Internet usage plays a significant role in improving economic well-being over time [12]. Through the Internet, a farmer in a rural village can access up-to-date information regarding farming innovations. An agricultural extension worker can get updates on new technologies, commodity prices, and rainfall forecasts, and use that information to advise farmers in rural villages [13]. The Internet can promote agricultural information and further improve agricultural productivity [14]. Moreover, the Internet has increased many opportunities for communities. By using the Internet, farmers can obtain information about their products from various markets, including nearby cities and major markets in the country. They can also learn about new agricultural techniques and methods to increase their productivity. The Internet has become a crucial source for farmers to get the latest market information and is one of the most important resources for finding information about agriculture and related issues [15].

Thailand ranks high in Asia on the Network Readiness Index 2022, securing the 6th position in the region [16]. Internet use in Thailand is continuously expanding, with increases in Internet coverage, mobile devices, and social media usage across all regions of the country. In 2022, Thailand had 52.5 million Internet users, accounting for 79.3 percent of its population of 66.2 million people [17]. Despite this high ranking and increased Internet access, rural communities in Thailand still face significant barriers to fully utilizing the Internet for agriculture-related activities. This gap in effective digital engagement hinders the transfer of crucial information and communication needed to support and enhance agricultural practices. This article explores whether farmers use the Internet for their agricultural practices. A review of literature and research on the application of the Internet in agriculture within Thailand revealed a lack of empirical data. In general, Thai people use the Internet to facilitate their daily lives in two primary ways: (1) to communicate and (2) to receive information [17]. This study fills this gap by providing data and insights specific to the use of the Internet for agricultural purposes in rural areas. This empirical evidence is crucial for policymakers and development agencies to design targeted interventions.

The main theoretical framework for this study is the Theory of Diffusion of Innovation, which aims to explore the reasons that may influence an individual to adopt an innovation or new technology. This model explains how innovations are adopted by members of a social system over a specific period. An innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption, and diffusion is a type of social change that occurs when people adopt or reject the innovation [18]. This study is mainly based on Rogers' model of the Innovation-Decision Process. This model has five sequential stages: knowledge, persuasion, decision, implementation, and confirmation. An individual's characteristics that affect the knowledge stage at the beginning of the Innovation-Decision Process are socioeconomic characteristics, personality variables, and communication behaviors. Variables that influence a rate of innovation adoption include:

- Perceived attributes of innovation: How people evaluate an innovation based on various attributes.
- Type of innovation-decision: How the decision to adopt an innovation is made (e.g., optional or collective).
- Communication channels: How information about an innovation is spread.
- Social system: A social context in which an innovation is promoted.
- Level of promotion efforts made by persons tasked with the diffusion of an innovation.

From the literature review, it becomes evident that most rural people in Thailand have access to the Internet, supported by the government's initiatives to promote Internet access and install free Internet in rural areas [19]. The model of the Innovation-Decision Process helps us to identify patterns of Internet adoption among rural communities and suggests a new model to examine variables related to Internet adoption.

Therefore, this research aims to study farmers' utilization of the Internet for agriculture, using Mae Chaem district, in Chiang Mai province as the study area (90 percent of the area is rural area). This district is a main agricultural region as it has the largest agricultural land area and the largest number of agricultural households recorded in the province. Results from this study will help us to better understand the current situation and trends and how to promote diffusion of agricultural information in rural areas.

2. Materials and Methods

2.1 Description of the Study Area and Samples

This study used purposive sampling, conducted in Mae Chaem district, Chiang Mai province, northern Thailand, which lies between longitudes and latitudes of 18°29′56″N 98°21′43″E. It has a land mass of 2,686.571 sq. km. People in the northern region have the highest Internet usage time average in the country, especially Chiang Mai province [20]. Mae Chaem District is divided into seven sub-districts. In 2022, the district had the highest number of farming households and farming areas in the province; 12,901 households, and 216,443 *rai* (35,482 ha) of farmland [21]. As younger farmers tend to embrace the Internet [22], this research focused on those aged between 17 and 45 years old, who are defined as 'young' farmers in Thailand [23]. In 2022, Mae Chaem district had the second-highest number of farm households (4,647 households), with at least one member being a 'young' farmer in the province. Calculating a sample size using Yamane's formula [24] (at a confidence level of 95 percent and a tolerance of 5 percent) resulted in 369 'young' farmers being approached.

The equation (1):

$$n = \frac{\mathrm{N}}{1+\mathrm{N(e)}^2} \quad (1)$$

Where

N = Total farm households, in this case 4,647 households (with at least one member being a 'young' farmer).

n = Sample size of farm households.

e = Acceptable sampling error level of 0.05.

The sample size was distributed proportionately through all seven sub-districts in Mae Chaem district. As a complete name list of 'young' farmers in the district was not available, convenient sampling was employed to recruit individual 'young' farmers to the study. To achieve a certain level of representation, the samples were then selected from different villages located across the seven sub-districts.

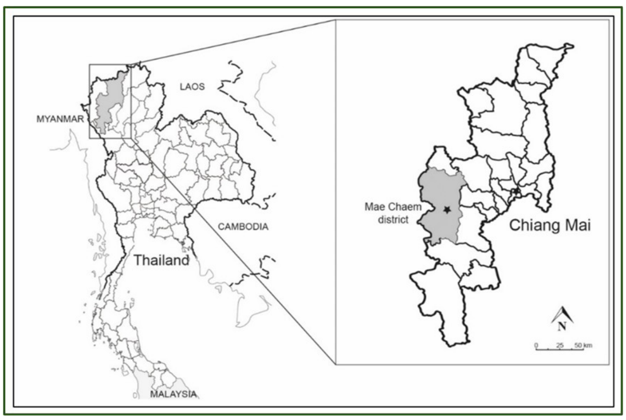

Figure 1. Location of Mae Chaem district, Chiang Mai, Thailand.

2.2 Data Collection and Analysis

A structured interview using a questionnaire was performed to gather data from the samples mentioned above. The questionnaire covered demographic and socioeconomic aspects, as well as the use of the Internet. The data collection period lasted from October to December 2022. Descriptive statistics including frequency, mean and percentage were applied to analyze the data gathered. In addition, an Ordered logistic regression analysis [25] was performed to determine factors influencing Internet utilization to support agriculture by 'young' farmers, using the equation stated below and the description of independent variables given in Table 1.

Given the measurement model for Ordinal variables, it is assumed that category 3 > 2 > 1, see equation (2):

$$Y = f(Y^*)$$
$$Y^* = \alpha_j + X\beta + \varepsilon \quad (2)$$

Where

Y = is an observed ordinal variable which is a function of Y^* = that is unobserved or unmeasured variable.

X = is the vector of independent variables.

β = is the vector of regression coefficients to be estimated.

ε = is the error term.

α_j = is the threshold or cut points.

Since our Y^* is defined based on some cut points or thresholds α_1, α_2, α_3 with $\alpha_1 < \alpha_2 < \alpha_3$. Considering the observed utilization of the Internet for agriculture level as an ordinary outcome, Y ranging from 1 to 3 is the category in which each respondent falls, expressed as equation (3):

$$Y = \begin{Bmatrix} 1 & if\ Y^* \leq \alpha_1 \\ 2 & if\ \alpha_1 < Y^* \leq \alpha_2 \\ 3 & if\ \alpha_2 < Y^* \leq \infty \end{Bmatrix} \quad (3)$$

Where Y = 1, 2, 3 (1 = Low utilization of the Internet for agriculture, 2 = Medium utilization of the Internet for agriculture, and 3 = High utilization of the Internet for agriculture).

Therefore, the probability of a respondent being at a particular level of utilization of the Internet for agriculture can be expressed as equations (4) and (5):

$$Pr\,[Y \leq j / X_1 X_2 X_3] = \alpha_j + (-B_1 X_1 - B_2 X_2 - B_3 X_3) \quad (4)$$

$$\begin{aligned} Pr\,[y \leq j/_x] = {} & \beta_0 + \beta_1 X_{Gender} + \beta_2 X_{Age} + \beta_3 X_{Education} \\ & + \beta_4 X_{Farming\ area} + \beta_5 X_{Agricultural\ activities} \\ & + \beta_6 X_{Household\ income} \\ & + \beta_7 X_{Contacting\ agricultural\ extension\ Officers} \\ & + \beta_8 X_{Agricultural\ organization\ membership} \\ & + \beta_9 X_{Home\ or\ cable\ Internet} \\ & + \beta_{10} X_{Mobile\ Internet} \\ & + \beta_{11} X_{Government\ provided\ Internet} + e_i \end{aligned} \quad (5)$$

Table 1. Description of independent variables in the model.

Variables	Symbol	Descriptions
Dependent outcome		Group 1 (Low): Use 1 to 6 items on the Internet for agricultural purposes Group 2 (Medium): Use 7 to 12 items on the Internet for agricultural purposes Group 3 (High): Use 13 or more items on the Internet for agricultural purposes
Gender	Gen	Gender of respondent (1 is for male, 0 otherwise)
Age	Age	Age of respondent in years
Education	Edu	Education of respondent (years of schooling)
Farming area	Are	Farming area (number of *rai*)
Agricultural activities	Act	1 grew only maize and 0 grew maize, rice and other crops
Household income	Inc	Household income (*Baht p*er year)
Contacting agricultural extension Officers	Caeo	Number of meetings with agricultural extension officers (times/per month)
Agricultural organization membership	Aom	Agricultural organization membership (Number of memberships)
Home or cable Internet	Ihc	1 Use home or cable Internet and 0 not use
Mobile Internet	Im	1 Use mobile Internet and 0 not use
Government-provided Internet	Igp	1 Use government-provided Internet and 0 not used

3. Results and Discussion

3.1 Socio-Demographic Information of the Farmers

Regarding the socio-demographic information of the farmers, it was found that slightly over half of the respondents were female (51.8%). As 'young' farmers aged between 17 and 45 were targeted, the average age of the respondents was around 36 years. Many sampled farmers (43.6%) attained only primary education, and nearly 10% earned a bachelor's degree. The respondents owned farmland with an average size of 16.8 *rai* (approximately 2.75 ha). Farming was the main agricultural activity, of which 39.8% of the respondents grew maize, rice, and other crops such as red onion and cabbage, whilst 60.2% grew only maize. The respondents earned an average income of 106,857 *Baht* (around 3,050 US$) per year. The majority of participants (84.0%) had never contacted any government agency via an online system, and about one-third of the respondents (36.6%) did not register with any community group. Regarding Internet access, the majority of the respondents relied on mobile devices (93.0%), while some also used home or cable Internet services (24.7%) and government-provided Internet (12.5%) (Table 2). As all respondents had mobile phones, it was not surprising that most of them used mobile Internet.

Table 2. Socio-demographic information of the farmers.

(n = 369)

Socio-demographic information of the farmers	Frequency	Percentage
Gender		
Male	178	48.2
Female	191	51.8
Age		
≤ 20 years	13	3.5
21–30 years	63	17.1
31–40 years	154	41.7
≥ 41 years	139	37.7
Mean = 36.61 S.D = 7.05 Min – Max = 18 – 45		
Education		
No education (0 = year)	25	6.8
Primary education (11 = years)	161	43.6
Lower secondary education (14 = years)	42	11.4

Table 2 continued

Socio-demographic information of the farmers	Frequency	Percentage
Upper secondary education or Vocational education (17 = years)	98	26.6
High vocational education (19 = years)	7	1.9
Bachelor's degrees (21 years)	36	9.7
Mean = 13.31 S.D = 4.94 Min – Max = 0 – 21		
Farming area		
1–10 *rai*	118	32.0
11–20 *rai*	150	40.6
≥ 21 *rai*	101	27.4
Mean = 16.81 S.D = 9.09 Min – Max = 2.50 – 40		
Agricultural activities		
Grew only maize	222	60.2
Grew maize, rice, and other crops	147	39.8
Household income		
< 100,000 *Baht*/year	211	57.2
100,000–150,000 *Baht*/year	91	24.6
150,001–200,000 *Baht*/year	28	7.6
200,001–250,000 *Baht*/year	21	5.7
250,001–300,000 *Baht*/year	8	2.2
> 300,000 *Baht*/year	10	2.7
Mean = 106,857 S.D = 80,207 Min – Max = 5000 – 600,000		
Contacting agricultural extension Officers		
Never	310	84.0
1 time per month	52	14.1
2 times per month	6	1.6
3 times per month	1	0.3
Mean = 0.18 S.D = 0.44 Min – Max = 0 – 3		
Agricultural organization membership		
No Membership	135	36.6
1 Membership	106	28.7
2 Memberships	102	27.6
3 Memberships	22	6.0
4 Memberships	4	1.1
Mean = 1.06 S.D = 0.98 Min – Max = 0 – 4		
Home or cable Internet		
Use home or cable Internet	91	24.7
Do not use home or cable Internet	278	75.3
Mobile Internet		
Use mobile Internet	343	93.0
Do not use mobile Internet	26	7.0
Government-provided Internet		
Use government-provided Internet	46	12.5
Do not use government-provided Internet	323	87.5

3.2 Utilization of the Internet for agricultural purposes by young farmers

All farmers use smartphones (100.00%) with an average experience of about five years. Only a few respondents used other devices: ten used laptop computers, one used a desktop computer, and one used a tablet. Research results showed that the respondents used smartphone applications for agricultural purposes. For example, most respondents utilized LINE (applications for messaging and communication) and Facebook to contact their fellow farmers (90.0% and 89.2%). These two applications are rather easy and convenient to use. They enabled the respondents to access and share information as shown by Darshan, et al. [26] This research revealed that most farmers in Haryana, India adopted social media applications such as Facebook and WhatsApp for communication as they were convenient compared to other applications. Furthermore, it was noted that participants in this research rarely communicated with agricultural officers via LINE or Facebook (5.7% and 6.0%, respectively). Most probably because the participants were only familiar with old communication channels for contacting government officials, including agricultural officers, through their village leaders. Even though they had good relationships with government officials and could contact them directly via social media applications, they preferred this path of communication.

Several participants also employed smartphone applications to search for agricultural information. For example, 86.2% and 61.3% of participants used YouTube and search engines (e.g., Google) to find information on plant and animal varieties and methods for cropping and raising livestock (Table 3). These findings are in line with Rahman, et al. [27], who reported that almost all farmers (98%) in their study area in Bintulu (Sarawak, Malaysia) also used smartphones for access to social media for various purposes, including contacting family and friends as well as accessing the latest news and searching for information. Similarly, Michels, et al. [28] reported that most German farmers (95%) in their online study adopted smartphones for use in agricultural purposes.

Table 4 describes the distribution of average Internet use by category for agricultural purposes. Utilization of the Internet for agricultural purposes is derived based from the 20 items in Table 3. It was found that a minimum of 1 item and a maximum of 20 items were indicated by the respondents with an average of 9 items used. By grouping the analysis process into three groups, Group 1 is defined as a low user (1–6 items are used), Group 2 as a medium user (7–12 items are used), and Group 3 as a high user (13 or more items are used). The groups were defined by calculating the width of the class ratio [29] using equation (6):

Table 3. Utilization of the Internet on smartphones for agricultural support by young farmers.

Variable	Frequency	Percentage
Use LINE to contact fellow farmers	332	90.0
Use Facebook to connect with fellow farmers	329	89.2
Use to access weather forecast information	324	87.8
Use YouTube to search for agricultural knowledge information	318	86.2
Use to access agricultural information by viewing satellite maps	248	67.2
Use to search for information on selecting plant or animal species	226	61.3
Use to search for information on methods of cultivation or methods of raising	226	61.3
Use to search for information on how to care for diseases in plants or animals	223	60.4
Use to search for information on harvesting methods	222	60.2
Use Facebook to receive or search for agricultural knowledge information	217	58.8
Use to search for information on how to propagate plants or animals	216	58.5
Use LINE to receive or search for agricultural knowledge information	137	37.1
Use Facebook to contact sellers of production inputs	133	36.0
Use Facebook to connect with produce buyers	129	35.0
Use LINE to contact buyers of produce	97	26.3
Use LINE to contact sellers of production inputs	96	26.0
Use Facebook to contact government extension officers	22	6.0
Use LINE to contact government extension officers	21	5.7
Use Facebook to connect with private sector promotion officials	13	3.5
Use LINE to contact private sector promotion officials	13	3.5

Source: Survey data, 2022.

$$\text{Width of class interval} = \frac{\text{Highest numbers of items used (20)}}{\text{Number of intervals (3)}} - \frac{\text{Lowest number of items used (1)}}{\text{Number of intervals (3)}} = 6.33 \quad (6)$$

The range based on the number of items used is calculated as follows:

Number of items used ≥ 13: Indicates 'High'.

Number of items used between 7 and 12: Indicates 'Medium'.

Number of items used between 1 and 6: Indicates 'Low'.

Table 4. Number of users by level of Internet utilization.

Level of Internet utilization	Number of users (persons)	Percent
Low	120	32.52
Medium	129	34.96
High	120	32.52
Total	369	100.00

3.3 Correlation Analysis of Independent Variables

Correlation analysis of independent variables was carried out to study the relationship between independent variables and to avoid multicollinearity, violating the precondition in Ordered logistic regression analysis that every pair of independent variables must not have a correlation coefficient greater than 0.70 [30] .

The result shows that none of the pairs of independent variables had a correlation coefficient greater than 0.70. (Table 5).

3.4 Ordered Logistic Regression Analysis Results

The results of the ordered logistic regression model are provided in Table 6. The log likelihood ratio chi-square test (LR χ2) is a statistical test to assess the overall fit of a model in logistic regression. The results found that LR χ2 = 155.44 with a p-value of 0.000 indicating that the combined effect of all the variables in the model is significantly different from zero. This means that at least one of the predictor variables has a statistically significant relationship with the outcome variable. As we defined three categories in the Internet utilization for agriculture: low utilization, medium utilization, and high utilization, two cutoff point categories are calculated with the first cutoff for low utilization, the second cutoff for medium utilization with the standard comparison as the high utilization level. Assuming all other things being equal (1) the probability of utilization of Internet for agriculture level (low utilization): Pr low ≤ 1.393; (2) the probability of utilization of the Internet for agriculture level (medium utilization): Pr < 1.393 medium utilization ≤ 3.437; and probability of utilization of Internet for agriculture (high utilization): Pr (high utilization > 3.437).

Based on the results of the P> |z| statistics, it was found that the first factor that is significantly and positively related to the utilization of the Internet for agriculture at a significant level of p > 0.01 level is agricultural organization membership (β = 3.55, p = 0.004) with an odds ratio of 1.427 greater than one (> 1). This means that all other things equal, the respondents with more group memberships had 1.42 times more probability of using the Internet for agricultural purposes than those with fewer memberships. Indeed, if the respondents had one more group membership, they were more likely to use the Internet for agricultural purposes with a marginal value of = 0.069. This is possible because membership in agricultural organizations allows farmers to access information

Table 5. Correlation coefficient matrix between independent variables.

Variable	Gen	Age	Edu	Are	Act	Inc	Caeo	Aom	Ihc	Im	Igp
Gen	1										
Age	0.12	1									
Edu	0.41	−0.359	1								
Are	0.035	0.108	0.123	1							
Act	−0.034	0.178	−0.033	0.326	1						
Inc	−0.028	0.020	0.267	0.424	−0.066	1					
Caeo	0.045	0.059	0.100	0.062	−0.116	0.059	1				
Aom	−0.231	0.322	0.060	0.139	0.085	0.085	0.246	1			
Ihc	−0.162	−0.004	0.234	0.065	−0.010	0.223	0.106	0.072	1		
Im	0.075	−0.047	0.003	0.064	−0.073	0.034	−0.007	−0.068	−0.358	1	
Igp	0.030	−0.078	0.105	−0.135	−0.078	0.018	0.030	−0.016	−0.026	−0.026	1

Note: "–" indicates an opposite relationship.

Table 6. Ordered logistic regression analysis results.

Variable	Coefficient	SE	z	P > |z|	Odds Ratio	Marginal effects
Gender	0.168	0.223	0.75	0.451	1.183	0.0326
Age	–0.056	0.018	–3.07	0.002	0.945	–0.0109
Education	0.157	0.029	5.25	0.000	1.170	0.0304
Farming area	0.015	0.014	1.08	0.281	1.016	0.0030
Agricultural activities	–0.196	0.243	–0.80	0.421	0.821	–0.0384
Household income	5.97e-07	1.49e-06	0.40	0.689	1.001	1.16e-07
Contacting agricultural extension Officers	1.208	0.286	4.21	0.000	3.349	0.0234
Agricultural organization membership	0.355	0.124	2.87	0.004	1.427	0.0690
Home or cable Internet	1.196	0.299	3.99	0.000	3.307	0.2578
Mobile Internet	1.156	0.467	2.47	0.013	3.177	0.1706
Government-provided Internet	0.978	0.346	2.82	0.005	2.659	0.2165
Cut1	1.393	0.951				
Cut2	3.437	0.965				
LR Chi2	155.44					
Prob. > Chi2	0.000					
Pseudo R2	0.1918					

through the websites of these organizations. These organizations promote and exchange information about interesting issues among members. Some agricultural organizations also provide technical support and training to members. Similarly, Sebatta, et al. [31] found that belonging to a farmer group significantly influenced the extent of farmers' participation. The main reason for this was that working in a group creates synergy among the farmers and enables them to access market information as well as to share experiences and improve access to technology.

Education is a second factor positively influencing the use of the Internet for agricultural purposes at a significant level of $p > 0.01$ (β=0.157, $p = 0.000$) with an odds ratio of 1.170 (> 1), given that all other variables in the model are held constant. This finding implies that respondents with a higher education use the Internet for agricultural purposes more than those with a lower one with a marginal value of 0.0304 for each extra year of education. It is argued that education enables farmers in various aspects, including better decision-making, improved access to information, and faster adoption of new technologies [32]. This research's finding is consistent with a study by Mehta, et al. [33], which found that farmers with higher education tended to use ICT-based information services for agricultural decision-making.

More contacts with agricultural extension officers also positively increased the use of the Internet for agricultural purposes at a significant level of $p > 0.01$ (β = 1.208, $p = 0.000$), with an odds ratio of 3.349 (> 1) and a marginal value of 0.0234. The contact with agricultural extension officers variable indicates that farmers with more contact with agricultural extension officers are more likely to use agricultural support sites than those with fewer contact options, given that all other variables in the model are held constant. The argument is probably that agricultural extension officers are essential in promoting knowledge and providing access to up-to-date information. These officers may teach farmers how to access information and learn new techniques. They act as intermediaries in introducing suitable and highly efficient information sources to farmers. This development helps reduce the difficulty in finding information and selecting information suitable for agricultural production for local farmers in remote areas. The finding is consistent with the study of Mehta, et al. [34], where contacting agricultural extension officers was an essential predictor of farmers' adoption of crop protection applications.

Based on the results of the P > |z| statistics, it was found that the following factors are significantly and positively related to the utilization of the Internet for agriculture at $p > 0.01$ level: use of home or cable Internet (β = 1.196, $p = 0.000$), and use of government-provided Internet (β = 0.978, $p = 0.005$). The use of the mobile Internet (β = 1.156, $p = 0.013$) is significantly and positively related to the utilization of the Internet for agriculture at $p > 0.05$ level. The odds ratio for using home or cable Internet is 3.307, indicating that respondents who use this type of Internet are more likely to increase their level of Internet use. Similarly, the odds ratio for using government-provided Internet is 2.659, and for using mobile Internet, it is 3.177, both showing a greater likelihood of increased Internet usage. These odds ratios suggest that as the type of Internet access changes, the likelihood of using the Internet more frequently increases, assuming all other variables in the model are constant. The study also indicates that respondents who use home or cable Internet, mobile Internet, and government-provided Internet are more likely to use the Internet for agricultural purposes. For example, respondents who use the Internet at home or through cable are 3.30 times more likely to use the Internet for agricultural purposes compared to those who do not. Indeed, if respondents use home Internet or cable Internet, they are more likely to use the Internet for agricultural purposes (marginal value = 0.2578). Similarly, those who use mobile Internet are 3.17 times more likely to use the Internet for agricultural purposes compared to those who do not. In fact, respondents using mobile Internet show a higher likelihood of using the Internet for agricultural purposes (marginal value = 0.1706). Furthermore, respondents using government-provided Internet are also 2.65 times more likely to use the Internet for agricultural purposes compared to those who do not (marginal value = 0.2165). The study demonstrates that improving Internet access through various means significantly enhances the likelihood of Internet use for agricultural purposes. This relationship underscores the transformative potential of digital technologies in agriculture, particularly in improving access to vital information and resources. Policymakers and stakeholders should consider these insights to design and implement strategies that promote better Internet access and utilization in the agricultural sector. Similarly, Internet access can contribute to the diffusion of innovation and rural development. To promote the diffusion of innovation and rural development, local policy measures should aim to ensure "Internet for all" by identifying actions to make the Internet accessible and affordable in all rural areas. [35]

Based on the results of P > |z| statistics we found a significant but negative relationship with utilization of the Internet for agriculture for age ($\beta = -0.056$ $p = 0.002$). This finding indicates that the older farmers among our respondents tend to use the Internet less than the younger ones did, provided that all other variables in the model are held constant. The marginal value of −0.0109 indicates that the use of the Internet decreases with each year of the respondents. So younger farmers were more likely to use it for agricultural support than older ones. Similarly, Orisakwe, et al. [36] found that farmers age is negatively correlated to adoption of improved agroforestry technologies among contact farmers in Imo State, Nigeria, and that younger farmers adopted the technologies more than the older farmers.

4. Conclusions

The study identifies key factors influencing Internet use in agriculture among young farmers in the Mae Chaem district in Thailand, highlighting positive influences of membership in agricultural organizations, education, contact with extension officers, and access to various Internet types. Although all respondents belong to the younger farmers category, age negatively impacts intensity of usage. These findings suggest the need to improve Internet access, educational outreach, and support for agricultural organizations and extension services to boost digital technology adoption in agriculture. To promote Internet use among farmers, policymakers should develop directional policies to create more contact channels through social media, provide more information and advice on modern agricultural technologies, and follow up on activities and advice given. Educational materials should be disseminated online via popular social media platforms. Collaboration with the private sector seems essential to enhancing Internet networks and services in rural areas, as a robust Internet infrastructure is crucial for modern technology adoption. Policy recommendations therefore include encouraging Internet use for agriculture, broadcasting easy-to-understand content, and providing necessary software and hardware support. Government agencies should utilize social media platforms like Facebook, LINE, and YouTube to reach farmers and work with the private sector to improve Internet services, thereby facilitating greater adoption of digital technologies in agriculture.

Author Contributions

Taveechai Khamtavee contributed to designing the study and analyzed the statistical data from the study and participated in the literature searches. Juthathip Chalermphol contributed to designing the study and supervised the entire study. Sukit Kanjina contributed to the data analysis and participated in the literature searches. Ruth Sirisunyaluck contributed to analyzing the statistical data from the study.

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Data Availability

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that there is no conflict of interest concerning the publication of this manuscript.

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