

Analysis of Driving Factors towards Becoming Smart Agricultural Entrepreneurs among New Generation Farmers: A Case Study of Chiang Mai Province

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Abstracts

This research aims to analyze the driving factors towards becoming smart agricultural entrepreneurs among new-generation farmers in Chiang Mai Province. A quantitative research methodology was used, with a sample population of 187 new-generation farmers registered with the Department of Agricultural Extension in Chiang Mai. Data was collected through questionnaires and analyzed using descriptive statistics such as percentages, means, standard deviations, and multiple regression analysis.

The study found that the factors promoting and driving new-generation farmers towards becoming smart agricultural entrepreneurs in the context of Chiang Mai can be categorized into two main dimensions: internal factors, including personal motivation, skills, knowledge, and specialized experience, and external factors, including government policies, community and network participation, and economic conditions. These two dimensions were found to significantly complement and reinforce each other. The analysis revealed that the perceived importance of external factors was particularly high, especially in terms of economic conditions, government policies, and community and network participation. These factors collectively reflect an environment conducive to the growth of smart agriculture among new-generation farmers in Chiang Mai.

Keywords: Driving Factors; Smart Agriculture; Young Farmers

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Introduction

Thailand is an agricultural country with a long-standing economic and social foundation deeply rooted in the agricultural sector. Although the share of agriculture in the country's Gross Domestic Product (GDP) has continuously declined over the past several decades, the agricultural sector remains crucial in terms of employment, food production, and the export of agricultural products that generate significant income for the country. In particular, Thailand continues to be one of the world's leading exporters of agricultural products such as rice, rubber, cassava, shrimp, and chicken (Bansri, et al., 2024). At the same time, changes in the economic, technological, and global climate contexts have led to new challenges for Thai agriculture, requiring urgent adaptation. These challenges include intense market competition from free trade, the adoption of digital technologies in production and distribution processes, and the impact of natural disasters such as droughts, floods, and changes in planting seasons. All of these factors create uncertainty and pressure farmers to find new strategies for survival and sustainable development (Siriphatrasophon, 2024).

The concept of Smart Farming has become a key strategy for elevating the agricultural sector into the 21st century, relying on the application of modern technologies such as the Internet of Things (IoT), drones, and Big Data analytics to improve production efficiency, reduce costs, and add value to agricultural products (Taikham, Julakanit & Krittathikarn, 2024). Research indicates that smart farming can increase productivity by 15–25% and significantly reduce costs related to fertilizers, water, and labor (Benchasri, 2010). This trend not only changes agricultural practices but also transforms the role of farmers, shifting them from small-scale producers to agricultural entrepreneurs with expertise in technology, marketing, and business management at an advanced level. Thus, Young Smart Farmers are becoming a key force in driving Thailand's agricultural sector into the digital era, with their ability to access and apply modern technologies such as smart sensor systems, agricultural drones, data management systems, and online market platforms, which help increase productivity, reduce costs, and improve the long-term quality of life for farmers (Taikham, et al., 2024). This is particularly evident in Chiang Mai, a region with high agricultural potential, suitable terrain for economic crops, being a hub for education and technology in Northern Thailand, and with continuous government policies supporting young farmers.

However, despite the favorable factors for the development of smart farming in Chiang Mai, the transition to becoming Smart Agricultural Entrepreneurs for young farmers still faces several challenges, such as limited funding, specialized knowledge, entrepreneurial attitudes, and access to technology in some areas. Therefore, studying the driving factors toward becoming a smart agricultural entrepreneur for young farmers is critically important, both academically and in terms of policy. This will help understand the mechanisms, processes, and key variables that influence the transition to modern agriculture. The case study of Chiang Mai will reflect the dynamics of local-level development that can be appropriately applied as a model in other contexts.

Research Objective

To study and analyze the driving factors toward becoming smart agricultural entrepreneurs among the new generation of farmers, with a case study in Chiang Mai Province

Research Methodology

This research is a quantitative study with the following research process:

1. Population and Sample

The target population for this study consists of Young Smart Farmers who have registered with the Department of Agricultural Extension in Chiang Mai Province between 2014 and 2023, totaling 353 individuals (Department of Agricultural Extension, 2023). These farmers play a critical role in driving agriculture toward sustainability, contributing through innovation in production, farm management systems, and market access via online channels. These elements are central to the concept of Smart Farming in the context of Chiang Mai, which possesses both economic and geographical potential for sustainable development.

To calculate the sample size, the researcher applied Taro Yamane's (1973) formula, setting a confidence level of 95% and an acceptable margin of error of 0.05. The calculation resulted in a suitable sample size of 187 individuals, which adequately reflects the opinions and experiences of Young Smart Farmers in the area and is reliable enough for analyzing the factors driving the transition to becoming Smart Farming entrepreneurs in the specific context of Chiang Mai.

2. Research Instrument

In this quantitative research, the primary instrument utilized was a questionnaire designed to collect data from a sample of 187 young farmers in Chiang Mai Province. The questionnaire was divided into three main sections: Section 1 covered general information of the respondents, such as age, gender, education level, agricultural experience, and employment patterns; Section 2 focused on factors influencing the drive towards becoming a smart agricultural entrepreneur; and Section 3 consisted of open-ended questions that allowed respondents to express their views, opinions, and suggestions for appropriate development strategies.

The questionnaire employed a five-point Likert scale to systematically measure levels of opinions and behaviors in quantitative terms. It was carefully designed and underwent content validation by three experts to assess the appropriateness and comprehensiveness of each topic. Subsequently, the questionnaire was pilot-tested, and the internal consistency reliability (Cronbach's alpha coefficient) was analyzed to ensure the robustness of the measurement tool.

3. Data Collection

This research employed a quantitative methodology, with data collected through a systematically designed questionnaire aimed at examining the driving factors behind the emergence of smart agricultural entrepreneurs among the new generation of farmers. The data collection was conducted in collaboration with agricultural extension officers from the Chiang Mai Provincial Agricultural Office, who distributed the questionnaires to 187 registered young farmers under the Department of Agricultural Extension in Chiang Mai Province.

4. Data Analysis

The quantitative data analysis employed descriptive statistics such as frequency, percentage, mean, and standard deviation to describe the general characteristics of the sample group. Frequency and percentage were used to illustrate the proportion and distribution of the data. The mean summarized the central tendency of various variables, such as attitudes and satisfaction levels. The standard deviation measured the dispersion of the data from the mean, providing a clearer understanding of the diversity and variability within the sample group.

Results

The researcher conducted a study entitled “Analysis of Driving Factors towards Becoming Smart Agricultural Entrepreneurs among New Generation Farmers: A Case Study of Chiang Mai Province.” The research findings can be summarized as follows:

Part 1: General Information of Respondents, Based on a sample of 187 respondents, it was found that the majority of new-generation farmers in Chiang Mai Province were female (59.9%), reflecting the increasing role of women in the agricultural sector. Most respondents were aged between 31 and 35 years (55.1%), indicating a systematic generational transition in farming. In terms of educational background, 83.4% had attained a bachelor's degree or higher, suggesting a well-educated workforce equipped to embrace new innovations. Most agricultural operations were small-scale, with land holdings between 1 and 20 rai (approximately 0.16 to 3.2 hectares), accounting for 82.4% of the sample. Regarding marketing channels, online platforms were the most preferred (24.6%), followed by product processing (22.1%) and selling through their own stores (16.8%). These findings illustrate the adaptation of new-generation farmers to digital technology and their efforts to add value to agricultural products while maintaining traditional sales channels such as local markets and middlemen.

Part 1: Analysis of the Driving Factors Toward Becoming Smart Agricultural Entrepreneurs Among New-Generation Farmers: A Case Study of Chiang Mai Province, The study revealed that the key driving factors enabling new-generation farmers to become smart agricultural entrepreneurs can be categorized into two main groups: internal factors and external factors. Both dimensions significantly contribute to and reinforce each other, encompassing aspects such as personal motivation, skills, knowledge, and experience, as well as support from the government, private sector, and community. The means and standard deviations for each factor clearly reflect the overall perceptions regarding these driving forces. The essential findings for each aspect are summarized in the following table.

External Factors	$\bar{X}$	S.D.	Interpretation of Results
1. Government Policies	4.39	0.760	highest
2. Participation of Networks and Communities	4.30	0.784	highest
3. Economic Conditions	4.41	0.730	highest
Total	4.37	0.758	highest

Table 1 Analysis of External Factors Overview

From the perspective of new-generation farmers regarding the internal driving factors that influence their progression towards becoming smart agricultural entrepreneurs, the study highlights key elements that reflect the potential, preparedness, and internal motivation of modern farmers. The details are as follows:

Internal Factors	$\bar{X}$	S.D.	Interpretation of Results
1. Readiness for Entrepreneurship	4.06	0.713	high
2. Readiness for Product Production	4.03	0.698	high
3. Readiness for Budget Allocation	3.68	0.840	high
Total	4.12	0.730	high

Table 2 Analysis Results of Internal Factors Overview

Furthermore, the variables that are important to the internal driving factors influencing the progression toward becoming an intelligent agricultural entrepreneur are highlighted. The study results indicate key elements that reflect the potential, readiness, and intrinsic motivation of the new generation of farmers, as detailed below.

variable	Unstandardized coefficients		Standardized coefficients		Sig.	Tolerance	VIF
	B	Std.	Beta	t			
Constant	2.027	0.191		10.628	0.000		
Government Policy (X1)	0.562	0.047	0.516	2.008*	0.000	0.562	1.780
Community and Network Participation (X2)	0.014	0.037	0.052	0.896	0.700	0.622	1.607

variable	Unstandardized coefficients		Standardized coefficients		Sig.	Tolerance	VIF
	B	Std.	Beta	t			
Economic Condition (X3)	0.115	0.045	0.520	2.560*	0.000	0.591	1.693
R = 0.474 R Square = 0.224 Adjusted R Square = 0.210 Durbin-Watson = 1.842							

The dependent variable is the desire for the development of the potential to become an entrepreneur among new-generation farmers.

*P ≤ 0.05

Table 3 Factors Affecting the Development of New-Generation Farmers toward Intelligent Agricultural Entrepreneurship

From the table, when tested, the external factors, including government policy and economic conditions, have a Tolerance value greater than 0.1, indicating that the independent variables are not correlated with each other. Furthermore, the Variance Inflation Factor (VIF) values are less than 10, showing no multicollinearity among the independent variables. The F-statistic test results show a significance value (Sig.) of 0.000, which is below the 0.05 significance level, indicating that at least one independent variable can predict the change in the dependent variable, which is the potential development needs of new-generation farmers to become smart agricultural entrepreneurs.

The test results show the correlation coefficient (R) between the independent variables external factors and the dependent variable the need for capacity development to become a smart farmer entrepreneur is 0.474. It was found that the external factors, including government policy and economic conditions, are significantly related. The coefficient of determination (R square) is 0.224, which means that 22.4% of the change in the need for capacity development to become a smart farmer entrepreneur is explained by external factors such as government policy, community and network participation, and economic conditions. The adjusted R square coefficient is 0.210.

Discussion

Based on the findings from the research study titled Analysis of Driving Factors towards Becoming Smart Agricultural Entrepreneurs among New Generation Farmers:

A Case Study of Chiang Mai Province, the following key points are presented for discussion.

The study found that factors promoting young farmers in Chiang Mai to become smart agricultural entrepreneurs can be categorized into two main dimensions: internal factors (motivation, skills, knowledge, and specialized experience) and external factors (government policies, community networks, and economic context). Notably, external factors have the highest level of awareness and importance, reflecting the role of the surrounding environment in facilitating the growth of young farmers. Both factors work synergistically to drive the effective transformation into smart agricultural entrepreneurs. This aligns with Srisawat (2023), Trirabaib, et al., (2024). who found that clear government policies, such as the large-scale farming project and support from the Ministry of Agriculture, are key drivers encouraging farmers to adopt technology and data to improve production efficiency. This is also consistent with Nantasarn (2021), who studied the role of the local economy and found that regional economic conditions impact the attitudes and investments of young farmers, with stable economic conditions boosting confidence in business expansion. Furthermore, Wassana, Tanamool, Saengsanga & Viriya (2024) emphasize that community involvement, particularly farmer networks and cooperatives, plays a crucial role in the dissemination of smart agricultural technology and knowledge. Additionally, Poopunsri (2023) underscores that digital infrastructure, such as internet access in rural areas, is another external factor that facilitates access to information, news, and modern agricultural learning.

Moreover, internal factors, such as personal motivation, skills, knowledge, and experience, serve as crucial mechanisms driving young farmers to effectively apply technology, innovation, and business strategies. This corresponds with the findings of Setthajit & Lattipongpun (2024), Lorvixay, et al., (2024). who note that personal motivation, especially the desire to improve quality of life and seize new business opportunities, is a key factor in choosing modern agriculture as a career. Kumkrua, et al., (2022) found that having an IT background or training in agricultural technology increases confidence and the ability to manage farms systematically. Thatrak (2021) shows that even limited experience in agriculture or business management can become cognitive capital, helping young farmers establish stable businesses. Chuckpaiwong & Virunraj (2020) highlight that learning agility is a common trait among successful young farmers, particularly those who have worked outside the agricultural

sector and then returned to develop their hometowns. Moreover, Setthajit & Lattipongpun (2024) report that young people who return to farming see a new value in agriculture within the context of a creative economy and a sufficiency economy.

Based on a comparative and logical analysis, it can be observed that external factors, particularly government policies, economic conditions, and community networks, play a crucial role in risk reduction and opportunity creation for young farmers. Meanwhile, internal factors such as knowledge and skills serve as key mechanisms for enhancing competitive potential. These two factors work in tandem, meaning that without external support structures, even farmers with high knowledge and skills may not be able to achieve sustainable growth. Therefore, the government and relevant agencies should prioritize the development of systemic support policies alongside enhancing the internal capacity of young farmers to accelerate the transition to smart agriculture at the local level effectively and sustainably.

New Knowledge

The study on “Analysis of Driving Factors towards Becoming Smart Agricultural Entrepreneurs among New Generation Farmers: A Case Study of Chiang Mai Province” has led to the emergence of the following important new knowledge:

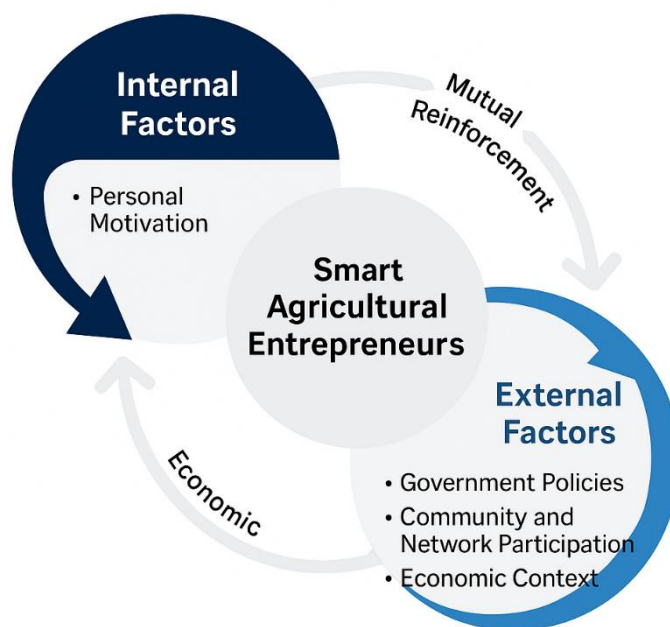


Figure 1 New Knowledge

Diagram Explanation:

The diagram illustrates the Driving Factors Toward Becoming Smart Agricultural Entrepreneurs among New-Generation Farmers in Chiang Mai Province. It is structured using interconnected circular nodes with arrows indicating the flow and relationships among the components.

Core Components:

1. Internal Factors

1.1 Represented in the first circle, internal factors include Personal Motivation, Skills, Knowledge, and Specialized Experience.

1.2 These elements highlight the intrinsic capacities and individual preparedness of the farmers.

2. External Factors

2.1 Shown in the second circle, external factors encompass Government Policies, Community and Network Participation, and Economic Context.

2.2 These emphasize the supportive external environment necessary for entrepreneurship.

Flow and Interaction:

1. Bidirectional Arrows between internal and external factors signify their mutual reinforcement. Internal readiness enhances the ability to capitalize on external opportunities, while external support strengthens internal capacities.

2. The convergence of both factors leads to the Emergence of Smart Agricultural Entrepreneurs, represented by a larger central node. This symbolizes the ultimate goal where individuals integrate internal strength and external support to succeed in smart agriculture.

This diagram underscores that neither internal readiness nor external support alone suffices; rather, their dynamic and synergistic interplay drives the new generation of farmers toward becoming successful smart agricultural entrepreneurs.

Conclusion and Suggestion

This study aimed to analyze the factors driving the transformation of young farmers in Chiang Mai into smart agriculture entrepreneurs. The findings revealed that the majority of young farmers are female (59.9%), aged between 31-35 years (55.1%),

and hold a bachelor's degree or higher (83.4%). Most of their agricultural activities remain small-scale (1-20 rai), and the most commonly used marketing channel is online platforms (24.6%), followed by product processing (22.1%). These findings reflect their adaptation to the digital age and efforts to increase product value, while still utilizing traditional marketing channels such as fresh markets and middlemen.

The key factors driving the development of smart agriculture entrepreneurship include both internal and external factors. The analysis showed that government policies and economic conditions play significant roles in supporting the development of young farmers. Statistical tests revealed a positive correlation between government policies and economic conditions with the enhancement of young farmers' potential to become smart agriculture entrepreneurs, with an R value of 0.474 and an R Square value of 0.224. This indicates that these external factors account for 22.4% of the changes in the development of entrepreneurial potential among young farmers.

The researcher has provided recommendations based on the study, which are divided into three main areas: policy recommendations, practical applications of the research findings, and suggestions for future research.

1. Policy Recommendations

1.1 Establish a policy framework to promote Smart Agriculture at the provincial level. Creating a policy framework to encourage new-generation farmers to become smart agricultural entrepreneurs at the provincial level will help guide development and connect with government sectors at all levels. Provinces should have plans focusing on the use of technology to increase productivity, reduce costs, and add value to agriculture, such as utilizing IoT systems to monitor soil and water quality, and using Big Data to analyze crop yields from individual farming plots.

1.2 Increase budget allocation for agricultural research and technology development. Increasing the budget to support the research and development of new technologies for farmers, such as automation systems for planting or using modern tools for farm management, will enable farmers to access more advanced tools. Additionally, fostering collaboration between the public and private sectors in developing practical technologies for farmers nationwide is crucial.

1.3 Develop training curricula for farmers. Revising training curricula to enhance farmers' knowledge of modern technologies, such as farm management applications or using sensors to measure soil and water conditions, is important. The

training should be hands-on and field-based, enabling farmers to apply the knowledge immediately after completion.

2. Practical Applications of the Research Findings

2.1 Organize hands-on workshops. Organizing workshops where farmers can experiment with technologies suitable for their own farms, such as soil quality measurement tools or sensor setups, is vital. The workshops should emphasize experiential learning through collaboration with experts and hands-on practice in real farm settings. Furthermore, instructional manuals should be provided so farmers can use them later.

2.2 Establish Pilot Groups. Selecting farmers who have the potential to adopt new technologies and tracking the long-term results will create pilot groups. These groups will serve as testing grounds for technology in real environments and play an essential role in sharing experiences with other farmers. This approach will help the widespread adoption of technology smoothly and successfully.

2.3 Improve agricultural extension services. Agricultural extension services should be enhanced to meet the needs of farmers in the digital age, such as providing consultations on technology usage on farms, online access to information, and creating platforms to connect farmers with online agricultural markets. This improvement will help farmers access modern and effective resources and information more efficiently.

3. Suggestions for Future Research

3.1 Conduct comparative studies at the regional level. Studying the adoption of technology by new-generation farmers in various provinces will provide diverse data and help understand regional differences. Comparative research results will allow for the adjustment of development strategies to fit each area, considering geographic factors, culture, or limitations in technology access.

3.2 Conduct longitudinal studies. Long-term studies on the impacts of technology adoption by new-generation farmers will provide insights into changes in various aspects, such as productivity, income, or sustainability in agriculture. Longitudinal research results will help stakeholders assess and adjust strategies accordingly.

3.3 Perform cost-benefit analysis. Researching the costs and benefits of investing in smart agricultural technologies, such as using sensors or automation systems for farm management, will help farmers and policymakers clearly evaluate

the cost-effectiveness of these investments. Additionally, it will provide farmers with clear information to help them decide on adopting the most suitable technology for their farms.

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