Development of an Application for Rice Cultivation: Weather Forecasting System and Crop Variety Selection

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Abstract

The primary objective of this research was to develop a mobile application aimed at supporting rice production planning, specifically in the areas of weather forecasting and selecting suitable rice varieties for cultivation. Additionally, the study assessed technology acceptance using the Technology Acceptance Model (TAM), which is a key framework for evaluating consumers' attitudes towards new technologies. The research employed the Extreme Programming (XP) approach in software development to connect data through an Application Programming Interface (API), allowing for the collection of weather forecasts and agricultural information from government organizations. The sample group comprises 50 rice farmers from Mueang District, Surin Province, in the Lower Northeastern Region of Thailand, selected using a purposive sampling technique. Participants were required to have a basic understanding of technology and the ability to access information online. The research team systematically gathered data using questionnaires to explore and process descriptive statistics. The findings indicated that the developed application successfully provided relevant information for rice cultivation decision-making, including weather forecasts, expected rainfall, appropriate rice varieties for the production area, agricultural market information, and contact information of agricultural agencies. The evaluation of technology acceptance among the sample group showed high levels of satisfaction regarding usability, with a mean score of 4.07 (S.D. = 0.80), and perceived usefulness, with a mean score of 4.16 (S.D. = 0.63). The result indicated that the farmers' technology acceptance was at a high level, which reflected the essential beginning of adaptation to a new form of data-driven agriculture for decision-making.

Keywords: Agricultural Mobile Application, Weather Forecasting, Crop Variety Selection, Farm Management Technology, Decision Support System

Introduction

Rice production, particularly in the Northeast, which has the largest rice-growing area in the country, is strategically important to Thailand's economy and food security (Rice Department, 2024). Rice functions not only as a key economic crop contributing to export revenue but also as a fundamental element shaping the cultural practices, livelihoods, and social structures of rural communities. Research by (Etuah et al., 2024) suggested that empowering smallholder farmers through appropriate digital networks and support systems was able to significantly increase their resilience to managing natural disaster risks and promote long-term incomes. Meanwhile, (Touch et al., 2024) reported that climate volatility, such as drought frequency, off-season rainfall, and seasonal changes, continued to impact rice yields across Southeast Asia. Consequently, timely access to real-time data, including weather forecasts and market dynamics, has emerged as a critical resource for farmers to enhance crop planning and reduce yield-related risks.

At present, various agricultural applications are available that offer comprehensive information on key areas such as weather conditions, crop varieties, and market prices for agricultural products. Nevertheless, these applications still face several limitations, particularly in terms of data source reliability, data latency, and presentation formats that are inconsistent with the usage behavior of smallholder farmers (Kerdsriserm et al., 2024). The research published by (Thamsuwan, 2024), indicated that farmers tended not to trust forecast information that unclearly stated its source or that deviates from the actual situation. In addition, delayed and outdated product price information hindered sales planning or crop selection (Chaiyana et al., 2024). Also found were limitations in presenting data in an comprehensible format, such as large tables of numbers or technical terms that were not translated to be relevant to the context of farmers who use those data (Lasdun et al., 2025). Numerous studies have therefore emphasized that an effective agricultural information system must not only be accurate and up-to-date but also be able to communicate with users in the context of individual areas and user groups (Addorisio et al., 2025; Raghunath et al., 2024; Singh & Dey, 2023).

To address the above limitations, the objective of this research was to develop applications on portable devices, such as smartphones, with rice-growing decision support functions for retail farmers, designed to comply with infrastructure constraints in rural areas and present critical information in an easy-to-understand and practical format. The application's core functionalities encompass presenting a 120-day extended weather forecast through graphical visualizations, recommending locally suitable rice varieties via a rule-based decision support system (DSS), providing real-time market price updates for agricultural products, and offering communication channels for inquiries with relevant authorities. In addition, the research assesses the technology acceptance of the target group based on the Technology Acceptance Model (TAM) framework, which covers the aspects of ease of use, satisfaction, and perceived usefulness of technology, to obtain insights that can be applied as guidelines for developing and promoting the use of information technology in the agricultural sector.

Theory and related research

Rice growth consists of the four major stages that are germination, leaf creation, blooming, and harvesting. Each phase is dependent on significant climatic elements such as the optimal temperature range of 25-35 °C, which influences growth rate, the amount of light necessary for photosynthesis, and humidity, which is vital throughout the plant growth period. Appropriate climate conditions are a key factor in facilitating efficient and high-quality production of rice (Charuwan et al., 2021; Goswami et al., 2022; Mahmood et al., 2022; Santanoo et al., 2023; Sanwong et al., 2023).

React-Native is a cross-platform mobile app development framework developed by Facebook based on the JavaScript language and the React library, allowing developers to create applications that can run on both the iOS and Android operating systems using a common code base, following the "write once, run anywhere" principle. React Native minimizes the time and resources needed to build applications. It supports native modules, which provide developers access to certain operating system functions. It also supports real-time testing and changes via the Hot Reloading function (Sahin et al., 2025).

API (Application Programming Interface) is a collection of protocols and technologies that enable the construction and communication of various software applications. It serves as a conduit for connecting and sharing data across applications or systems without needing the developer to comprehend the inner workings of the linked systems. APIs are critical in the creation of modern programs and applications because they enable developers to consume functionality or data from external services such as web services, databases, and operating systems (Kamruzzaman et al., 2024).

JSON (JavaScript Object Notation) is a text-based format for storing and transferring data that is intended to be simple for people to read and write, as well as for machines to interpret and generate rapidly. JSON's structure consists of Key-Value Pairs and Arrays, which may be used to express complicated data. JSON is commonly used in online applications to transport data between servers and clients due to its simplicity, lightweight nature, and compatibility with numerous computer languages, including JavaScript, Python, and Java (Garg et al., 2024; Kim, 2023).

Technology Acceptance Model: TAM is a conceptual framework which is applied to examine the variables that influence technology adoption, especially with regard to mobile applications in the field of agriculture. The primary components of this theory include Perceived Usefulness, which occurs when consumers are aware that technology or application may increase efficiency or results as well as Perceived Ease of Use relates to the user's view that the technology is simple to use. This theory allows for the analysis of factors influencing farmers' decisions to utilize an application, emphasizing the necessity of user-friendly and obviously helpful design in supporting agricultural decision-making (Thomas et al., 2023).

A study on the influence of providing basic weather forecast information on agricultural productivity among smallholder farmers in northern Benin was undertaken by (Yegbemey et al., 2023). A Randomized Controlled Trial (RCT) was carried out among 331 farmers from six different villages to investigate the feasibility and efficacy of sending 3-day advance rainfall forecasts via SMS during the rainy season. The results showed that the majority of farmers subscribed to weather forecasting services and this information significantly increased labor productivity in corn and cotton cultivation. By providing weather forecast information through mobile technology, farmers could allocate labor reasonably, reduce labor costs and improve productivity

A concept to use smart technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), blockchain, Decision Support Systems (DSS), was developed by (Gebresenbet et al., 2023). This included cloud and edge computing of integrated digital technologies in the future development of intelligent agricultural systems, with a particular emphasis on data collection, management, and sharing of agricultural and environmental information from multiple sources and sensors to improve agricultural productivity, sustainability, and efficiency. It was expected that this concept would help increase the value of data, improve agricultural productivity, enhance farm performance monitoring, and support innovative agricultural business models. It also had the potential to enhance the long-term sustainability and competitiveness of the agricultural sector.

A study on the impact of mobile applications in increasing the productivity of small farmers, published by (Kamal & Bablu, 2023), identified how these applications enabled farmers to access crucial agricultural information in real-time, such as weather forecasts, commodity pricing, pest control strategies, and best agricultural practices, allowing them to make more informed decisions that increased production and profitability. It also increased market transparency by linking farmers directly with buyers, minimizing the need for middlemen, and expanding access to financial services through mobile banking applications and digital payment systems. It enabled farmers to manage their resources with greater effectiveness. This study showed that mobile applications were able to promote sustainable agricultural growth and optimise the livelihoods of smallholder farmers in developing countries.

A study by (Ahmad et al., 2024) on farmers' experiences in the Eastern Ganges Basin utilizing mobile phones to receive agricultural information on Boro rice cultivation demonstrated that utilizing mobile phones to access agricultural information had a positive effect on rice production, increasing production by approximately 1.6-4.5%. As well, education level, household income, loan availability, and interaction with agricultural extension officers were shown to all be factors that influenced the use of mobile phones in agriculture. The usage of mobile phones also enabled farmers to experience easier access to market information, sophisticated manufacturing technologies, and online training. As a result, agricultural efficiency and output had dramatically improved.

The study by (Kerdsriserm et al., 2024) evaluated the acceptability, contentment, and use of mobile applications developed to assist farmers in Chachoengsao Province in Thailand in managing rice production costs and returns. This application contained a comprehensive database of planting area, variable cost, fixed cost, yield, selling price, revenue and break-even point. The results of this research indicated that farmers showed a high degree of acceptance of the application in terms of content, ease of use, and physical look, with the majority of farmers satisfied with the application's design, data presentation, and performance. Furthermore, the application featured the potential to assist farmers in planning production for the next season, as well as to promote the adoption of new innovative platforms in the agricultural sector.

Methods and Materials

1. Population and sample

The sample group for the current study comprised rice farmers in Mueang District, Surin Province, in the Lower Northeastern Region of Thailand (14.91525°N, 103.45356°E). who were equipped with basic mobile phone skills and could access information via the Internet. Purposive sampling was implemented to identify a group which fulfilled the required criteria and aligned with the study objectives. The sample size was chosen at 50 participants divided into 28 males and 22 females. Age distribution was 14 participants in the age group 20-29 years, 9 in the age group 30-39, 20 in the age group of 40-49 years, 4 aged 50 years and over, and 3 were less than 20 years old.

2. Application development process

2.1 Planning

The development team and farmers collaborated to identify system needs by creating User Stories, as seen in Fig. 1. This was a way to obtain requirements in an easy-to-follow style. User Stories (Daraghmi & Daraghmi, 2022; Mannari et al., 2025) described the application's functionality from the user's perspective to reflect the features that the application must have, such as displaying weather forecasts ahead of time, recommending environmentally friendly rice varieties, displaying real-time rice price information, and other information that farmers require. Once the prerequisites had been acquired, the developers selected features based on time, cost to develop, and resource restrictions, then planned iterations to create key features beforehand before iterating in response to user input. This helped to create flexibility and response to ever-changing requirements. At this point, the research team and farmers mostly exchanged ideas through focus group discussion (Marques & dos Santos, 2024; Maurer et al., 2024) to determine the requirements of the system.

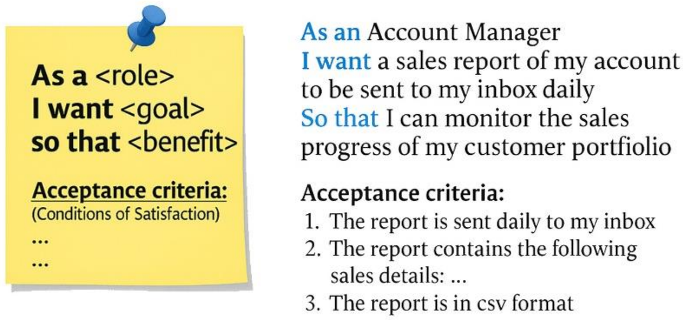


Figure 1 Examples of collecting requirements using User Storie (Mannari, 2025)

2.2 Designing

The system architecture design of this application emphasized the use of a Client-Server structure, with the front end being the part where farmers could interact with the system via a simple and easy-to-use interface that prioritized access to weather forecasting functions, rice variety recommendations, and rice market information. The functionalities are illustrated in Fig. 2.

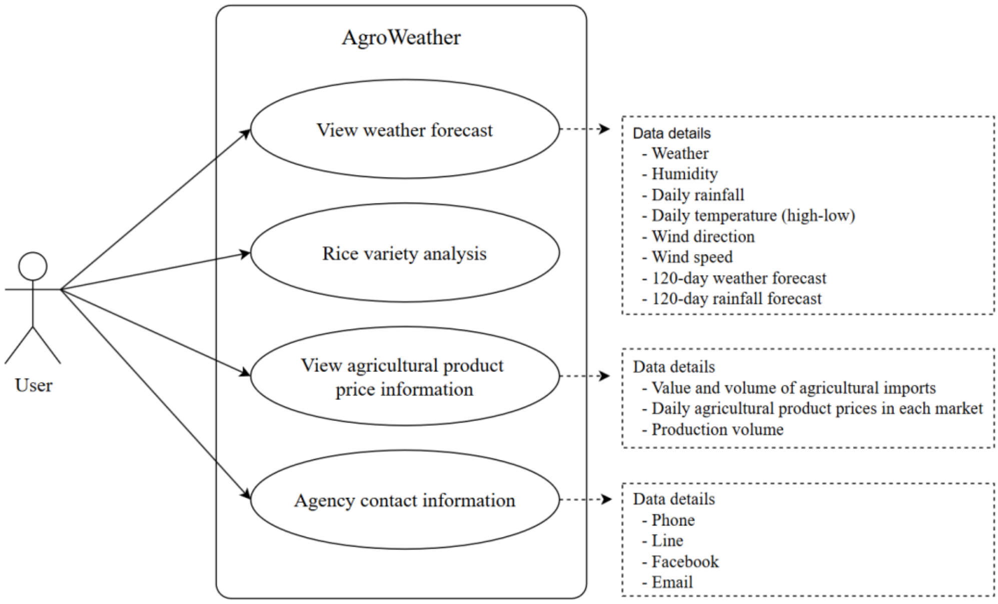


Figure 2 Use Case Diagram for Mobile application "AgroWeather"

The back end was designed to facilitate data processing and link to the database to obtain relevant data for display via external APIs, such as weather forecasting services and agricultural product price data, which could be retrieved in real-time. The back-end system was designed and implemented on Ubuntu Server, a robust operating system with the added benefit of being open-source software, allowing users to utilize and alter it as needed at no cost (Sahara et al., 2024). Fig. 3 demonstrates the general design of the system architecture. A wireframe was utilized in the User Interface (UI) design to show the structure of the application's main menus, which included the weather forecast page, rice variety recommendation page, and agricultural product pricing information page.

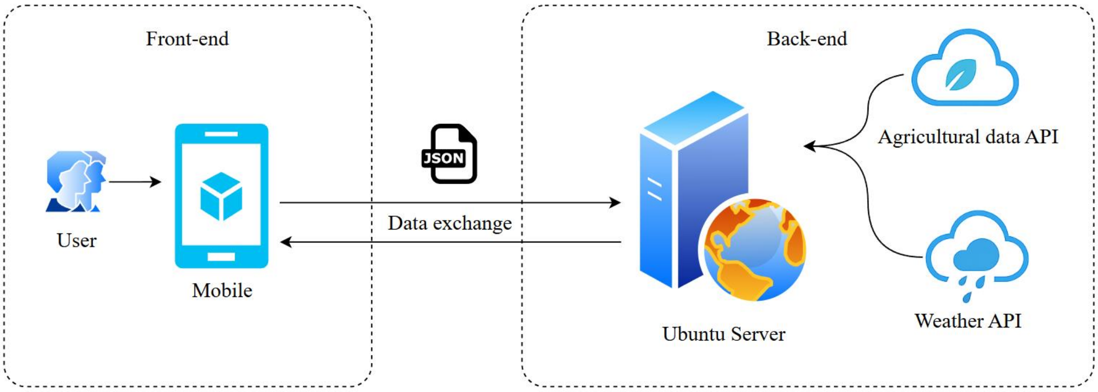


Figure 3 System architecture

The design of the logic utilized in the function of suitable rice varieties recommendation. The research team applied the concept of a Rule-based Decision Support System (DSS) (Pramono et al., 2024) with the database of 49 rice varieties from the research of the Rice Department, which has been grouped and examined by experts. Subsequently, an Information Logic Mapping framework was developed based on 3 primary input parameters: rice variety (glutinous rice or jasmine rice), cultivation period (April–July or December), and the specific characteristics of 9 distinct growing areas. These areas include: (1) regions previously affected by rice blast disease, (2) proximity to irrigation systems, (3) upland and paddy rice zones, (4) rain-fed cultivation areas, (5) flat terrains and regions not exceeding 1,000 meters above sea level, (6) the northeastern region, (7) areas with elevations between approximately 1,000–1,400 meters, (8) areas with elevations ranging from 800–1,250 meters above sea level, and (9) zones with rapid rainfall runoff. The system processes rice varieties with 4 logical steps: (1) filtering by rice type, (2) selecting varieties suitable for the season, (3) matching cultivation areas, and (4) sorting rice varieties by maximum predictable yield. The system then displayed the top 3 rice varieties that met the conditions, along with average yield data, as shown in Fig. 4.

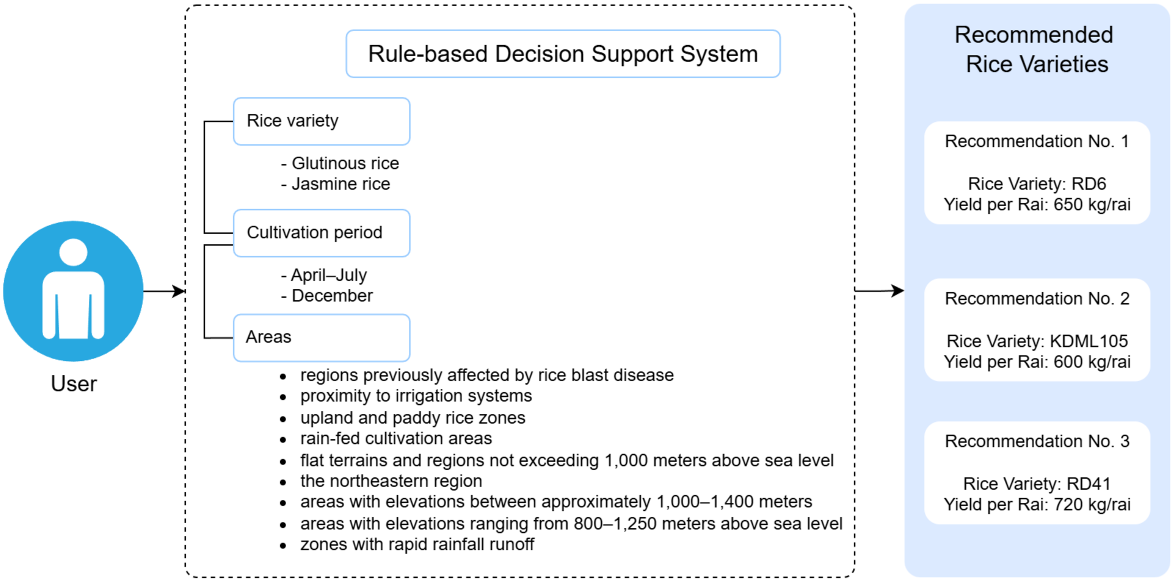


Figure 4 Rule-based Decision Support System (DSS) for Rice Variety Selection

2.3 Coding

The development work was divided into two parts, which included:

Part 1 Mobile Application Development React, Visual Studio Code, Android Studio, and MySQL were utilized as development tools. Development began with the creation of the user interface (UI) using React Native, a framework for developing mobile applications. It drew lessons from the concept of responsive design and used flexbox tools and dimensions API to automatically adjust the size of screen elements to adapt to each device type. (Sahin et al., 2025). The system code was written and managed using (Visual Studio Code, 2024). Android Studio was implemented to assess and develop Android applications (Koram & Garg, 2023). In the back- end system, the MySQL database was utilized as the primary database to hold various data, and phpMyAdmin served as a tool to administer the MySQL database via a web browser.

After completing the application development, the APK file was launched on the Google Play Store, marking the initial phase of the application's release. This process started with setting up a developer account on the Google Play Console, followed by generating the APK file and digitally signing it with KeyStore using Android Studio to verify the application's authenticity. Under the App Releases area, the APK file was then uploaded and the application's description, screenshots, icon, and privacy policy were filled in. After establishing the distribution requirements, such as whether it serves as a free or paid application, it underwent initial testing via Internal Testing before Google reviewed the security and published the app on the Google Play Store for customers to download and utilize. A Google Play Developer Account was required for storing data or publishing applications on the Google Play Store. The charge was a one-time payment of USD$25.

Part 2 API Deployment Axios was installed. This is a library that connects to the React Native API and assists in processing HTTP requests (Kamruzzaman et al., 2024). The programming process began with the creation of a function called the API Endpoint using the GET method. To request data, this method used a URL that included the API Key and Location parameters. When the data was returned in JSON format, the data was parsed and processed according to the requirements. Because there were numerous API attributes available to choose from, the developer had to select only the necessary data which was then shown using UI Components in both text and graph forms. This information could potentially be updated in real-time utilizing polling techniques (Lv et al., 2024) to keep the application's data up-to-date. The final step was to verify the status of the HTTP Response and notify the user if there was a connection issue. API data was connected from 2 parts: Part 1: Weather data was connected from the Meteorological Department and Part 2: Agricultural product data was connected from the Office of Agricultural Economics.

2.4 Testing

The study employed three information specialists for the analysis, and the testing was conducted in a Black Box Testing methodology, that concentrated on evaluating functionality without knowing the internal structure of the code (Yunhasnawa et al., 2024). Testing started with creating Test Cases based on Input and Expected Output. The expert determined if the tested function or module performed as expected by examining the outcomes of its execution.

After evaluating the system within the specified scope, the research team ran further tests to compare the weather forecasting performance of the built application to applications available on the Google Play Store, as indicated in the following data: Number 1: the application developed by the research team was "Agroweather"; Number 2: the application was called "Weather Forecast"; Number 3: the application was called "Weather

Forecast Thailand XL PRO"; Number 4: the application was called "RainViewer: Weather Radar"and; Number 5: the application was called "Clime: Live Weather Forecast & Radar". The test and comparison results are shown in Table 1.

Table 1 Comparison of Application Performance

No	Topics \ Mobile Apps	1	2	3	4	5
1.	Forecast Location	Mueang, Surin	Mueang, Surin	Mueang, Surin	Mueang, Surin	Mueang, Surin
2.	Forecast (Days)	120	15day	10 day	7 day	14 day
3.	Current Temperature (°C)	27 °C	29 °C	28 °C	27 °C	28 °C
4.	Max-Min Temperature (°C)	23-31	24-31	23-33	23-31	24-33
5.	Humidity (%)	79 %	77 %	84 %	-	81 %
6.	Rainfall (mm.)	0.00 mm.	-	2.60 mm.	-	0.15 mm.
7.	Wind Direction (Degrees)	138	-	-	-	-
8.	Wind Speed (km/h)	10.8	11	10	-	10

3. Data Collection

The instrument used for data collection was a questionnaire developed by using a systematic process to be consistent with the research objectives, starting from the study of literature related to the use of agricultural information technology and farmers' acceptance of technology to analyze and determine the main issues that were required to be assessed, such as perceived benefits, ease of use, information needs, and decision-making behavior. The questionnaire was divided into 3 parts: (1) general information of the respondents, (2) the level of technology acceptance measured by a 5-point Likert scale (Chadaga & Sampathila, 2025), and (3) additional suggestions. A preliminary questionnaire was developed and opinions were sought from 3 experts in the fields of agriculture and information technology to consider the clarity, consistency, and appropriateness of the content by using the analysis method of Index of Item-Objective Congruence: IOC (Kiaokrai et al., 2025; Sukkamart et al., 2024). After adjustments based on suggestions, it was tested with a group of 10 rice farmers (not included in the main sample group) to verify the understanding and accuracy of the instrument before it was actually used in the sample group.

The data collection process for the sample group started with a meeting, where participants were divided into two groups of 25, making a total of 50 users for the training session. The mobile phones used by farmers for testing were connected to the wireless internet network in the village service area, which was installed by the government. Subsequently, the application was installed through the Google Play Store because the developed application only supports Android operating systems. During the testing phase, the research team gave a detailed explanation of how to use the application and allowed users the opportunity to ask questions. After the training, the sample group was given a one-month trial on the application. After the trial period, the research team administered a questionnaire to users to assess their acceptability of the technology for future data analysis.

Along with gathering quantitative data through questionnaires, the research team enhanced the qualitative data collection by using the In-depth Interview method. This technique enables the collection of detailed and comprehensive insights into users' opinions, experiences, and attitudes regarding the application's usage.
The purpose of the in-depth interviews was to investigate factors affecting technology acceptance that could not be measured solely with a Likert scale. The interview format was designed to encourage users to share their

opinions freely. This approach facilitated the gathering of authentic data, which would be used to analyze and enhance understanding of technological adoption among farmers using the application.

4. Data analysis

The Descriptive Statistics concept to synthesize and exhibit the data gathered from the assessment of technology acceptance in each problem was applied. The Mean was utilized to determine the average score from the assessment in various aspects such as satisfaction, ease of use, and application efficiency. This average represented the trend in the sample group's attitudes toward numerous problems. Standard deviation was also utilized to examine the data's dispersion. The standard deviation measure was useful in determining how widely the scores in the sample were distributed, which is an indicator of the sample's diversity of opinions. The conversion of assessment scores using the 5-level Likert Scale was employed to facilitate score interpretation by dividing the mean score range using the formula for computing class width, as stated in equation 3.1 The computed score ranges for each class are shown below:

$$Class\ Width = \frac{Highest\ Score - Lowest\ Score}{Number\ of\ Classes} \qquad (1)$$

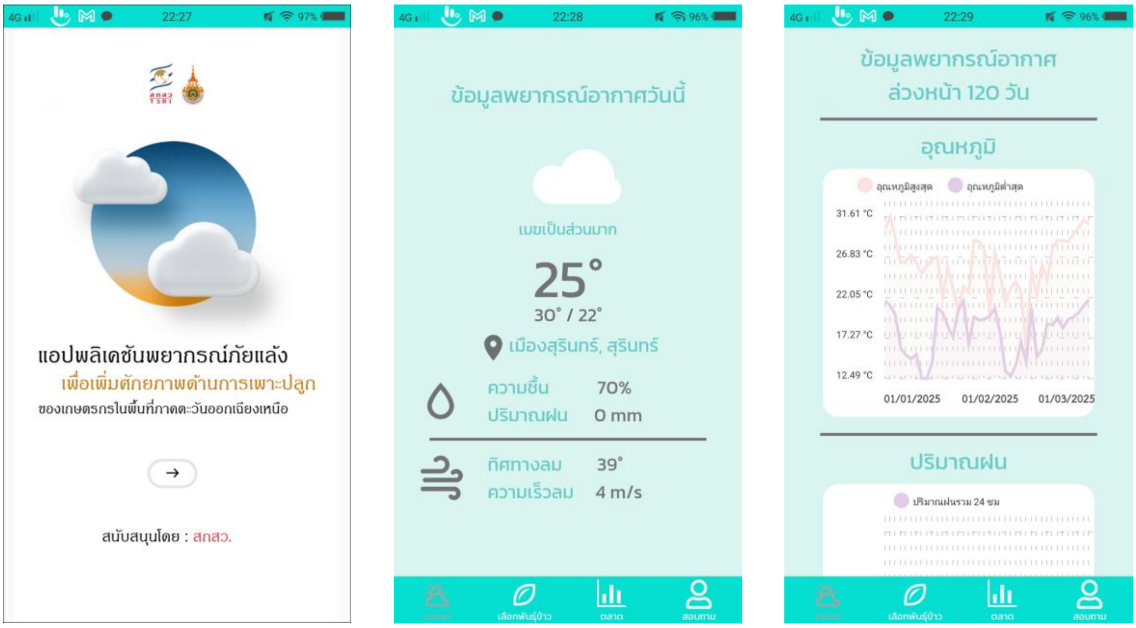
Level 5: 4.21 to 5.00, meaning Very High
Level 4: 3.41 to 4.20, meaning High
Level 3: 2.61 to 3.40, meaning Moderate
Level 2: 1.81 to 2.60, meaning Low
Level 1: 1.00 to 1.80, meaning Very Low

The Content Analysis Method (Kleinheksel et al., 2020) was applied to analyze the feedback data from the questionnaire, beginning with the collection of all data. The data was read and thoroughly reviewed to obtain a comprehensive understanding of its content. The data was further organized by categorizing the content, such as satisfaction, ideas for development, or experienced issues. After categorizing the data, the frequency of recurrence of each topic was analyzed and the data was evaluated to determine its significance. For example, if "complex" usability difficulties were noted in several complaints, it may be assumed that the program was excessively complex for users. The investigation enabled the concepts and insights gathered from feedback to be applied to further develop the application.

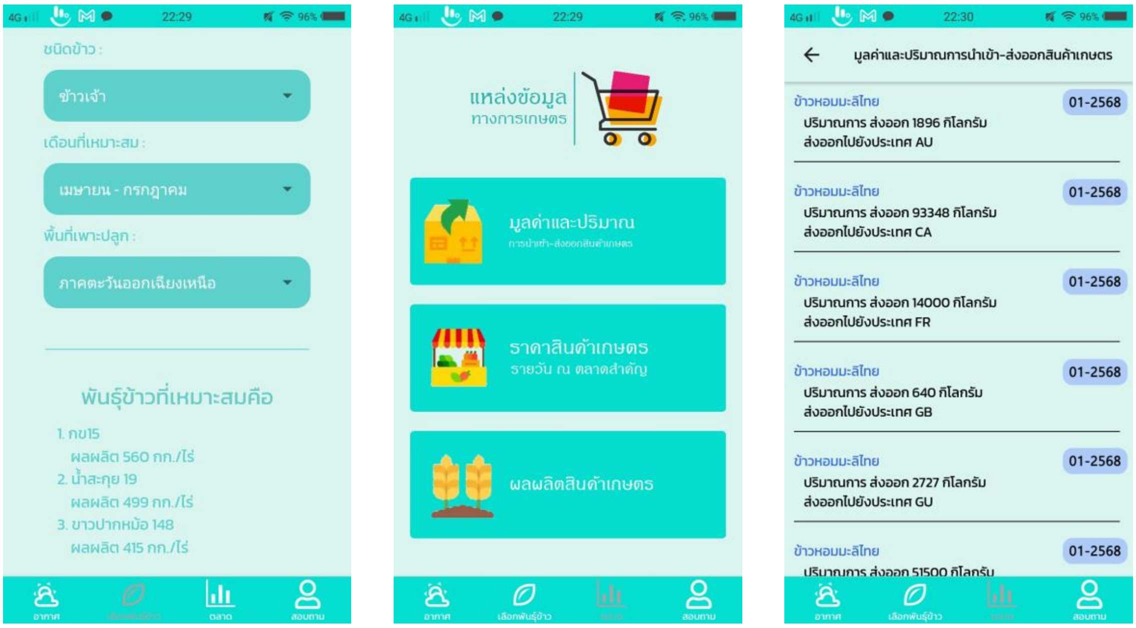
Results

1. Results of Mobile Application Development

The results of application development showed that the system was able to be used on the Android platform and distributed via the Google Play Store, having passed the verification of work correctness by 3 experts. The application was tested using Black Box Testing techniques and found that it was able to work as designed, especially in terms of linking data from external APIs from the Meteorological Department and the Office of Agricultural Economics. This included 4 key functions aimed at supporting agriculture. The first function was weather forecasting, which provided daily weather details like current temperature, rainfall, and wind speed (Fig. 5 b), along with a 120-day forecast and a 10-day rainfall graph (Fig. 5 c). The second function focused on selecting suitable rice varieties for specific growing areas by analyzing different rice types, growth durations, and regional characteristics, as well as offering insights on three optimal rice varieties ranked by yield (Fig.5 d). The third function provided market information, featuring data on the value and volume of agricultural imports and exports, daily prices of agricultural products, and output figures from various sources (Fig. 5 e). The final function was an inquiry feature that allowed users to contact officials through telephone, Line, Facebook, and email (Fig. 5 f). This application development equipped farmers with essential information for planning their cultivation and making marketing choices. The outcomes of the application development are illustrated in Fig. 5.



(a) application (b) weather forecasting (c) a 120-day forecast and a 10-day rainfall graph



(d) rice varieties and growing areas (e) market information (f) an inquiry feature

Figure 5 Results of Application Development

2. Results of Acceptance Testing

Table 2 Results of Technology Acceptance Testing Regarding Usability (N=50)

Topics	$\bar{X}$	S.D.	Results
1. Use of Color and Illustrations	3.94	0.95	High
2. The Presentation of Weather Forecast Data in Graphical Form Facilitates Easy Understanding of Information	4.14	0.74	High
3. This Application Enables Users to Quickly and Easily Access Desired Information	4.14	0.72	High
Average	4.07	0.80	High

Table 3 Results of Technology Acceptance Testing Regarding Perceived Usefulness (N=50)

Topics	$\bar{X}$	S.D.	Results
1. The Weather Forecast Data (Temperature, Rainfall, Wind Speed, Wind Direction, Humidity) is Sufficient for Use in Crop Planning	4.12	0.63	High
2. The Duration of Weather Forecasting is Long Enough to Predict the Period During Which Rice Will Grow (Forecasting Up to 120 Days in Advance)	4.12	0.65	High
3. The System Accurately Identifies the Location of Weather Forecasts	4.14	0.65	High
4. The Rice Variety Selection System Suitable for the Cultivation Area Supports Decision-Making	4.19	0.61	High
5. The Agricultural Information Reporting System Aids in Product Sales Planning	4.14	0.61	High
6. The Agricultural Data is Current and Reliable	4.20	0.63	High
7. The Channels for Contacting Officials are Convenient and Prompt	4.18	0.61	High
8. The Application Can Predict Drought Conditions and is Beneficial for Planning Rice Cultivation in the Area	4.22	0.63	Very High
Average	4.16	0.63	High

As shown in Table 2, the results of the technology acceptance test from the sample group were found to be highly satisfied with the ease of use of the application overall, with an average score of 4.07. The issues of presenting weather forecast data in graph form and the issues of ability to access the desired data quickly and easily had the same evaluation results, which were at a high level, with an average score of 4.14.

Table 3 shows that the average evaluation results were at a high level, with an average score = 4.16. The issue which was at the highest evaluation result was Issue 8 which was the application that could predict drought conditions and was useful for planning rice cultivation in the area, with an average score = 4.22. Followed by Issue 6 which was agricultural data that was current and reliable was with an average score = 4.20. Subsequently, Issue 4 which was the system for selecting rice varieties suitable for the cultivation area helped support decision-making with an average score = 4.19.

The findings of the qualitative data analysis in Part 3 of the proposal questionnaire were able to categorize research recommendations from the sample group into three issues: Issue 1: more functionality; Issue 2: ongoing agency assistance; and Issue 3: application efficiency in terms of speed.

Discussion

The development of a mobile application to support rice cultivation in this study aims to enable farmers to access necessary information for decision-making in crop cultivation quickly and accurately. The application includes a weather forecasting feature that provides forecasts up to 120 days in advance, which helps farmers plan their cultivation based on accurate and reliable data from government agencies, thereby reducing the uncertainty associated with traditional data sources. This aligns with the findings of (Kamal & Bablu, 2023), who analyzed the impact of mobile applications designed for farmers and found that providing accurate and reliable information enhances decision-making efficiency in crop cultivation. Furthermore, the application presents data in graphical form, which facilitates easy access and interpretation of information. This is consistent with the research by (Yegbemey et al., 2023), who analyzed weather data and agricultural outcomes, utilizing graphs as a tool to communicate critical information. Additionally, the application includes a rice variety recommendation feature, which is tailored to specific cultivation areas, addressing the unique needs of farmers who require practical and actionable information. Although the development of the application proved effective in supporting rice cultivation planning, several limitations were identified. These included its dependence on a stable Internet connection, which may hinder usability in rural areas with unreliable network coverage; its compatibility exclusively with the Android operating system, thereby excluding iOS users; and the absence of an automated notification system to provide alerts regarding weather conditions or critical stages in the planting process. This is consistent with the research of Salazar-Del-Pozo et al. (2025) who studied the development of SumAppGeo apps for remote areas in the Ecuadorian Amazon, which found that Internet connectivity issues and Android-only support were major limitations in accessing information, and recommended an offline version to address these issues.

The evaluation of technology acceptance for the mobile application among the sample group of farmers showed high levels of satisfaction regarding ease of use and perceived usefulness. The average score indicates that farmers were able to use the application without difficulties and found the information provided to be valuable for improving their cultivation practices. The convenience of accessing accurate and reliable data helped reduce reliance on traditional methods that could carry higher risks. These findings align with the Technology Acceptance Model (TAM), which emphasizes that perceived ease of use and perceived usefulness influence decisions to adopt new technologies. The application's ability to meet farmers' needs and its operational efficiency are critical factors contributing to its acceptance among farmers. This is consistent with the research by Cao et al. (2025), who found that perceived ease of use not only directly influenced adoption intention but also positively affected perceived usefulness, reinforcing that functional benefits and usability are key drivers of digital technology adoption in agricultural organizations. The evaluation results showed that males had a higher average satisfaction score than females (4.17 > 4.10), which may reflect greater confidence in using technology among males. Factors related to experience in using digital devices or the role in decision-making in agricultural households may have an effect. This is consistent with research by Schnack et al. (2024) that indicated that technology adoption in the agricultural sector differs by gender, with men more likely to be open to new technologies. The results also found that the 40-49 year age group had the highest level of satisfaction with application use (mean 4.29), followed by the 50 years and over of age group (4.22), reflecting that older farmers with experience in agriculture tended to accept and value technology more than younger groups. Awareness of the benefits of the application, such as planting planning and risk management, motivates its serious use. This trend is consistent with research by Shen et al. (2024), who reported that middle-aged farmers have higher digital competence and use technological tools more effectively in farm management. This is also consistent with the findings of Gemtou et al. (2024) who indicated that those with longer agricultural experience had clear motivation and goals in applying technologies to improve agricultural production efficiency.

Conclusion and Suggestions

The results demonstrated that the developed application was able to meet the needs of rice farmers in the target area, especially in terms of accessing information related to weather conditions, market conditions, and selecting rice varieties suitable for the growing area, which enhanced production planning capabilities. In addition, the technology acceptance assessment results from the sample group indicated a high level of acceptance, both in terms of ease of use and perceived usefulness of the technology, especially among experienced farmers aged 40 years or older, indicating a positive trend towards the application of technology in the agricultural sector. The findings in this study showed that this was a successful case study reflecting the technology use and behavior among small-scale farmers in the target area. Therefore, it is necessary to repeat the study in other areas to confirm the consistency and increase the comprehensiveness of the policy recommendations.

The development guidelines of further research are required to consider adding some offline functionality to support users in areas with limited Internet infrastructure and expand the development to the iOS platform to increase the coverage of the user group. Furthermore, the development of an automated data recording system is necessary to alleviate the users' burden of manual input. Additionally, the implementation of a notification system is essential to promote consistent adherence to recommended practices. Future research should also examine the long-term impact of the application on agricultural productivity.

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Conflict of Interests

All authors declare that they have no conflicts of interest.

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