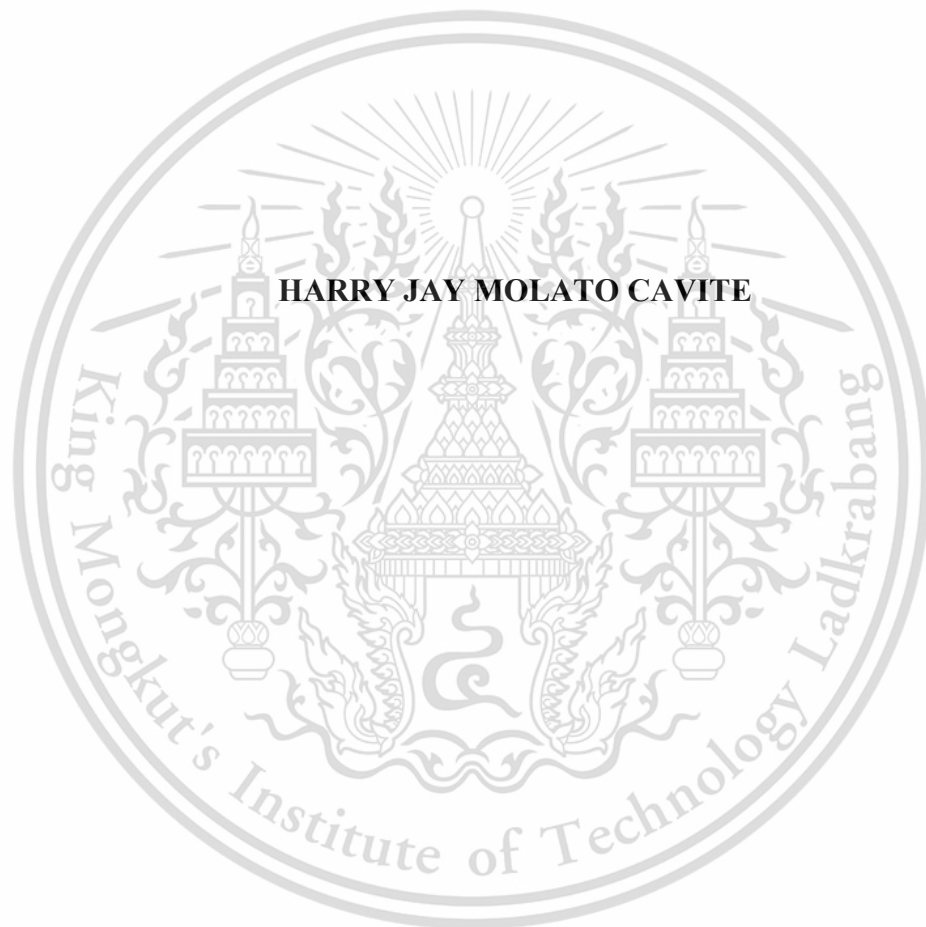


**RICE PRODUCTION COMMUNITY ENTERPRISE DEVELOPMENT:  
EXPLORING CONSUMERS' PURCHASE INTENTION  
AND FARMERS' ADOPTION MOTIVES**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY  
IN AGRICULTURE, SCHOOL OF AGRICULTURAL TECHNOLOGY,  
KING MONGKUT'S INSTITUTE OF TECHNOLOGY LADKRABANG**

**2022**

**KMITL 2022-AG-D-064-032**

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**Thesis Title:** Rice Production Community Enterprise Development:  
Exploring Consumers' Purchase Intention and Farmers'  
Adoption Motives

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**Degree:** Doctor of Philosophy

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**Year:** 2022

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## **ABSTRACT**

This study aimed to 1) assess the supply chain structure and formulate strategic guidelines for community enterprise development; 2) investigate consumers' purchase intention for traceable organic rice; and 3) determine farmers' adoption intention for organic rice farming in Ban Nong Saeng community enterprise in Sanam Chai Khet district, Chachoengsao province, Thailand.

Data were collected using both interviews (in-depth interviews and focus group discussion) and structured questionnaires (face-to-face surveys) with the sampled 201 community enterprise farmers, one leader, two committee members, and 299 consumers from June 2020 to February 2021. For the assessment of supply chain structure and problems, data were qualitatively analyzed using supply chain and content analysis. Meanwhile, consumer and farmer data were quantitatively analyzed using structural equation modelling and binary logistic regression analysis.

Assessment of the supply chain structure revealed five major channels through which the enterprise's rice moves from the farm to the consumers – farmers, primary

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and final processors, dealers, and local retailers. Three main problem categories were identified – membership and labour, production and milling operations, and product design and marketing. Strategic points were developed, and policy programmes were recommended for capacity building and product development.

Investigation of consumers' purchase intention for organic rice revealed that subjective norms ( $\beta = 0.213, p < 0.05$ ), health consciousness ( $\beta = 0.144, p < 0.05$ ) and product traceability knowledge ( $\beta = 0.344, p < 0.001$ ) have significant positive influence. This study also established the moderating role of product traceability knowledge in perceived behavioural control and purchase intention ( $\beta = 0.128, p < 0.100$ ), indicating that elaborated product information through traceability is essential for consumers who feel capable of buying the product. In addition, cost perception ( $\beta = 0.390, p < 0.001$ ) revealed that consumers consider price as an indicator of quality.

Determination of factors affecting farmers' organic rice farming adoption revealed that education level ( $\beta = 2.713, p < 0.05$ ), seed input source ( $\beta = 2.188, p < 0.05$ ), buying price ( $\beta = 1.066, p < 0.10$ ), training attendance ( $\beta = 1.849, p < 0.05$ ), and credit access ( $\beta = 0.987, p < 0.10$ ) significantly impacted farmers' adoption intention. Although farmers have a generally high level of agreement towards consumer information (mean = 3.58 to 4.04), this factor does not affect their adoption, revealing that it is not likely for farmers who have better knowledge of consumers' perceptions to adopt organic rice farming. Overall, this study will help community enterprises formulate more effective strategies based on the problems and guidelines, motivators of organic rice purchase intention, and drivers of organic rice farming adoption.

**Keywords:** Rice, community enterprise, purchase intention, adoption intention, community enterprise development, Thailand

## ACKNOWLEDGEMENTS

I would like to thank my advisor Assoc. Prof. Dr. Suneeporn Suwanmaneepong, and co-advisor Assoc. Prof. Dr. Panya Mankeb, for all the help, guidance, and encouragement they have given me in the past three years. Also, I would like to express my sincere gratitude to the members of my examination committee: Asst. Prof. Dr. Teerawat Sarutayophat, Assoc. Prof. Dr. Kamronwit Thipmanee, and Assoc. Prof. Sumeth Kaenmanee for their contributions, and for taking the time to comment on my manuscript. Further, I would like to thank my fellow graduate students: Christopher Llonas and Pheaktra Phal, and Thai research assistants: Nok Athiwat Joedsak, Kanink Nuttanan Direksri, and P'Jan Dr. Chanhathai Kerdsriserm for all their help.

This work would also not have been possible without the financial support of King Mongkut's Institute of Technology Ladkrabang (KMITL) Doctoral Scholarship, and research cooperation from the Program Management Unit on Area-Based Development (PMU-A), Thailand Science Research and Innovation (TSRI). Also, I would like to thank the leaders, committee members and farmers of Ban Nong Saeng community enterprise, Sanam Chai Khet district, Chachoengsao province, Thailand.

Nobody has been more important to me in the pursuit of my degree than the members of my family. I would like to thank my parents: Joselin Sr. and Imelda Cavite, whose love and guidance are with me in whatever I pursue. I would also like to thank my siblings: Fleur Angeli, Joselin Jr., France Allan, Leonel, and Neil Michael. I am also grateful to all the members of the Singles for Christ Thailand – Central Bangkok Chapter and Saint John Church choir for making my stay in Bangkok much more pleasurable. And most importantly, I would like to thank God for all the provisions, sustaining grace and unconditional love that He is continuously giving me.

Harry Jay Molato Cavite

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# CHAPTER 1. INTRODUCTION

## 1.1 Research Background

Thailand is the 6<sup>th</sup> largest rice producer in the world with an annual production of about 16 million tons (USDA, 2017). About 9.2 million ha (41%) of the country's total agricultural farmland is devoted to rice farming. Of this total, about 1% is produced from organic systems while majority is from conventional ones (Department of Internal Trade, 2018). For rice exports, Thailand is the 2<sup>nd</sup> largest in the world with national revenue valued at 155,912 million Thai Baht (THB) (Office of Agricultural Economics, 2016). Rice production is driven by programs from various farmer organisations through provision of farming materials and training farmers, among others (Kaufman, 2015).

Farmer organisations have been a common and distinctive feature of the rural economy in Thailand. They have been strongly supported by government policies, especially with the promotion of the concept of 'sufficiency economy' introduced by the late King Bhumibol and incorporated in national development plans (Cramb, 2020; Dana, 2014). It was since 1967 that the Thai government encouraged the formal establishment and registration of different farmer groups. In 2018, there were 3,971 active agricultural groups in Thailand, comprising 481,474 members (Cooperative Promotion Department, 2019). Rice farmer groups accounted for about 47% of the total. Through participation in farmer groups, members can have the opportunity to link up with other groups and to the government to obtain support, receive better prices of their products and strengthen social bonds. Farmer cooperatives and community enterprises (CEs) are the most common of these farmer groups.

CEs in Thailand formally started in 1997 through the National Economic Development Strategy by the Royal Thai Government (Economic and Social

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Development Council, 2018). They are initially recognised as micro-enterprises found in districts involved in selling products or services. During the creation of the Twelfth National Economic and Social Development Plan (2017-2021), CEs have been given stronger support. Part of this plan is the strengthening of communities to move toward self-sufficiency by supporting the establishment of CEs based on the potential of each area for development. This encourages new community entrepreneurs with business skills to adopt technology and innovation into production, management, and marketing (National Economic and Social Development Board, 2017)

The Royal Thai Government helps CEs sustain their operation through various programmes such as organising national exhibits and creating markets (Changwachai & Santipolvut, 2015). An example of this programme is the One-Tambon-One-Product (OTOP). It is a local stimulus programme established in 2001. Exhibitions are organised where CEs can promote their unique local products and meet clients from both public and private institutions (Laiprakobsup, 2018). The government also provides financial support through the Bank of Agriculture and Agricultural Cooperatives (BAAC).

In the rural areas, rice production community enterprises (RPCEs) help boost rice production in Thailand. In 2018, there were about 900 RPCEs, the highest number registered in the crop production sector according to the Community Enterprise Promotion Board (2012). Because of their dominance, RPCEs are among the beneficiaries of government programmes and rice-based farming policies to raise the income level of rice farmers in rural areas (Cramb, 2020). The recurring problems they experienced prompted leaders and policymakers to focus on CE development and supply chain improvement to set organisational goals. Supply chain analysis gives

insights into efficient management of goods, services and processes (Swaminathan, 2001).

In marketing, RPCEs access local and urban markets by offering organic rice because commercial rice is dominated by large rice mills and intermediaries (Petcho et al., 2019). This study focusses on organic rice as it forms the largest portion of the Thai organic food market. Given the importance of organic rice in both local and domestic markets, it is expected that consumers' purchase intention it will continue to increase. Organic rice targets specific consumer groups, such as high-income and health-conscious households, making it different from conventional rice (Wu et al., 2019).

In production, RPCEs also receives government supports in Thailand. The government has promoted the Large Agricultural Plot Scheme (LAPS) policy, which was aimed to increase rice production and enhance the competitiveness of small-scale rice farmers by encouraging them to establish neighbouring agricultural land groups, to share plans for cropping and marketing development (Jirarud & Suwanmaneepong, 2020; Petcho et al., 2019). Many paddy farmers formed RPCEs to benefit from this project in terms of inputs, training, machines, and micro-finance. The implementation of the 'CEs Promotion Act' in 2005 has helped improve these enterprises' chances of receiving recognition and various government support types, which include among others encouraging farmers to adopt organic rice cultivation (Petcho et al., 2019).

## **1.2 Problem Statement and Research Gap**

### **1.2.1 Problem statement**

Because of the dominance of RPCEs in the rice production sector, they are among the beneficiaries of government programmes and policies to raise the income level of rice farmers in rural areas (Cramb, 2020). However, despite the government's

support, farmers continue to face several problems that affect their production and

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marketing performance (Suebpongsang et al., 2020). Accordingly, to help these CEs solve their problems, there must be an in-depth investigation of their supply chain structure, and problems to formulate strategic guidelines for their development.

In addition, as RPCEs offer organic rice, they are not exempt from various consumer concerns on product safety and quality, the risk from pesticide residues, and the genuineness of some organic rice products, which has a negative impact on the community enterprise (Atthirawong, 2017). Because of its increasing popularity, organic rice marketers need to understand consumers' behaviour to address their concerns and tailor better marketing strategies relevant to organic rice product development and increasing purchase intentions.

Moreover, the implementation of the 'CEs Promotion Act of 2005' has not only upgraded the living standards of rural farmers but also improved their access to markets and available technologies (Petcho et al., 2019). However, despite these achievements, most notably in rice production, adoption towards organic farming continues to pose a significant challenge among enterprise leaders and policymakers, whose adoption level and membership status have been low over time (Suwanmaneepong et al., 2020a).

### 1.2.2 Research gap

There are a few studies that have qualitatively investigated CEs in Thailand. This has been one reason for CEs' underdevelopment because they were set up more than 20 years ago, and there is only a few latest information available that describes their current situation and areas that need further improvement. In a study by Somswasdi et al. (2015), RPCEs main problems were related to product designs and marketing. Most of the members lack the necessary knowledge and skills as they were already old and had low education levels (Maikaensarn & Chantharat, 2015). In a similar study by Naipinit et al. (2016), marketing-related problems were also identified.

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These problems seemed to be recurring in previous research and were not adequately addressed in previous government programmes and policies.

Moreover, in terms of consumers' purchase intention for organic foods, previous studies have investigated this aspect from different perspectives (Ahmed et al., 2021; Dorce et al., 2021; Nagaraj, 2021). Some studies highlight information asymmetry in organic food consumption and explore how food traceability systems can promote consumers' purchase intentions (Chen & Huang, 2013; Kim et al., 2016). These latest developments in organic food marketing, which integrate innovative Internet of Things (IoT) technologies, also convince sellers to design traceability systems (Li et al., 2019; Purwandoko et al., 2019). However, establishing traceability systems requires substantial investment (Zhu, 2017). As such, sellers have to decide whether to reduce costs or meet consumers' information needs to develop a food traceability system. Most importantly, organic food marketers need to understand consumers' knowledge of traceability information; however, no prior studies have explored or measured this specific construct in Thailand. Further research on this aspect will shed light on this emerging market.

Furthermore, as for farmers' adoption intention towards organic rice farming, it is essential to integrate external information as this would enable farmers to have an integrated decision-making towards organic farming adoption. Previous studies have recognised the value of external information (Gonzalvo et al., 2020; Tang et al., 2015). However, to our knowledge, no prior studies have tested the effect of this factor on organic farming adoption in a local enterprise context. As consumers need information about the products available in the market, farmers on the opposite side of the supply chain likewise need information from the consumers for their production and marketing decisions; since information flows in both directions of the supply chain (Boyd &

Spencer, 2021; Nakandala et al., 2017). Thus, supply chain improvement implies linking information between consumers and farmers (Routroy & Behera, 2017).

### **1.3 Research Questions**

In the study area, most of the above problems are present, particularly in the Ban Nong Saeng community enterprise. For instance, the farmers and the community enterprise itself still faced several problems that affect their production and marketing performance. In addition, Ban Nong Saeng community enterprise are also negatively affected by the various concerns from consumers about product safety and quality, and poor product packaging. And lastly, farmers' adoption towards organic rice farming is still a challenge for the community enterprise because most of its members are in the ageing population. The following research questions are proposed:

1. What strategic guidelines can be derived from the enterprise's supply chain structure, problems, and strengths, weaknesses, opportunities, and threats (SWOT)?
2. What determines community enterprise consumers' purchase intention for organic rice with traceability information? Does product traceability knowledge play a moderating role?
3. What factors drive farmers to adopt organic rice farming? How does consumer information affect farmers' adoption decision?

### **1.4 Objectives of the Study**

1. To formulate strategic guidelines for Ban Nong Saeng community enterprise development based on the supply chain structure, problems, and SWOT.
2. To investigate Ban Nong Saeng community enterprise's consumers' purchase intention towards traceable organic rice.

3. To explain Ban Nong Saeng community enterprise's farmers' intention to adopt organic rice farming.

## **1.5 Importance of the Study**

### **1.5.1 Community enterprise development**

Community enterprise development provides the foundation an organisation needs to improve its citizen's lives. Understanding the community enterprise's supply chain would assist leaders and farmer-members to look for competitive advantage that would help them formulate strategies to improve overall chain performance (Stadtler et al., 2014). Moreover, it is helpful to set strategic guidelines considering the community enterprise's vision and direction for the whole organisation. Effective strategy formulation requires recognising one's capabilities and problems to formulate sound alternatives to achieve the community's desired outcomes (Kabeyi, 2019). This study will help policymakers and concerned government agencies implement better programmes and policies for the development of RPCEs. Furthermore, this study will be a source for future qualitative literature that will provide useful information to other studies aiming to develop other forms of CEs in Thailand.

### **1.5.2 Consumers' purchase intention**

Investigating consumers' purchase intention assists community enterprises in identifying and developing more effective marketing strategies for organic rice marketing. This study aims to contribute to the mainstream literature on organic food consumption and purchase intention in four ways. First, using one model, this study explores several factors that affect consumers' purchase intention for organic food with traceability information. The extant literature that uses TPB as an underlying theory supports the efficacy of these factors in their models explaining purchase intention.

However, it should be noted that individuals across different cultures may have

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different motivations for purchasing organic food (Rana & Paul, 2019). Hence, this study is the first to investigate how these factors influence consumers' purchase intention towards organic food in Thailand, using one TPB-based model. It provides a more comprehensive analysis of how purchase intention is affected by various behavioural factors important in organic food consumption. Second, this study intends to be the first to analyse consumer behaviour for organic rice using an RPCE. Unlike many published studies on purchase intention and organic food, this study focuses on a sample of farmers' market consumers in Thailand, which contributes to the literature uniquely. Furthermore, organic rice has been scarcely studied, despite its significant contribution to Thailand's agricultural sector. This study would help RPCEs tailor better marketing strategies that are relevant to organic rice product development.

Third, this study is among the first to integrate the concept of product traceability in an organic food purchase-intention model. This is an important contribution, as previous studies have not considered organic food with traceability information (Konuk, 2018; Pandey et al., 2019; Wang et al., 2019b). The product traceability requirements for most organisations' supply chains to gain competitive advantage are increasing (George et al., 2019). The insights from this study would not only help improve organisations but also widely address consumer issues concerning food safety and quality (Aung & Chang, 2014). Finally, this study intends to contribute to the literature on organic rice marketing by investigating the moderating role of product traceability knowledge for the first time. Although the traceability of other products has been addressed (Wang et al., 2019a; Wu et al., 2021; Zhang et al., 2019), no prior studies have investigated this factor as a moderator. The moderating effect of product traceability knowledge might provide insights into the strength of the relationship between the factors and purchase intention. It is reasonable to assume that

the relationship between most of the factors and purchase intention will be stronger when consumers have product traceability knowledge.

### 1.5.3 Farmers' adoption intention

Understanding farmers' adoption intention helps the community enterprise itself identify motivators for widespread adoption of organic rice farming. This study offers a new contribution to the organic farming adoption literature as it develops and tests a multidimensional model and verifies whether or not consumer information can impact farmers' adoption intention. Traditionally, a large number of technology adoption research pay attention to farmers' socio-demographic characteristics (Barroga et al., 2019; Melodillar et al., 2018; Suwanmaneepong et al., 2020a), but there is not much studied on farmers' perception towards consumer information. Moreover, prior research on the agri-food supply chain involving rice farmers and its immediate consumers has not gained enough attention. Thus, this study focussed on this area and attempted to explain situations in the case of RPCEs alongside the most widely used predictors. This study may provide answers to gaps identified in prior studies, which could be utilized by RPCE leaders and policymakers to optimise better policies for widespread adoption of organic rice farming, particularly in the rural areas of Thailand.

## 1.6 Study Area

### 1.6.1 Chachoengsao province, Thailand

Chachoengsao province, Thailand was purposely chosen for this study. It is in the Central region, the country's major area for commercial rice production (Petcho et al., 2019). As of 2018, the province has a total population of 715,009, and most people rely on agriculture for their livelihood, particularly rice production (Department of Provincial Administration, 2020). The region contributes the largest share in Thailand

in terms of farm household income from rice production. Chachoengsao province is also a home of many CEs in Thailand. Several RPCEs in the area have received strong support and collaboration from various government and higher education institutions (Suwanmaneepong et al., 2020a).

### 1.6.2 Ban Nong Saeng community enterprise

Ban Nong Saeng RPCE was purposely chosen because of its evident network of connections with institutions in Sanam Chai Khet district (Cavite et al., 2021a). It is located in Lat Krating subdistrict, Sanam Chai Khet district, Chachoengsao province, Thailand (Figure 1.1). The enterprise has 46 members, 15 of which were organic rice growers under Organic Agriculture Certification Thailand (ACT) or popularly known as Organic Thailand, eight traditional organic rice growers, and 23 Good Agricultural Practices (GAP) rice farmers. The enterprise was established in the year 2000 and was strengthened through the ‘CEs Promotion Act of 2005’ and the efforts of its members. The enterprise’s main objective was to share and exchange common knowledge on rice production and management, seed selection, and production of fertilisers among members and non-members.

The enterprise’s total combined rice area is more than 600 rai (approximately 96 ha), with a total combined rice yield of 101,325 kg from all its farmer-members. There are two main rice varieties planted – the Jasmine Rice (KDML 105) and the Riceberry. The enterprise members receive rice seed allocation from the Chachoengsao Rice Research Centre (CRRC), a government institution. In return, members have to give back the same rice seed variety after cropping with a 10% increase from its original weight received. Aside from the provision of seeds, CRRC also provides technical skills on rice seed production and cost and return calculation to the enterprise members.



Figure 1.1. Map of Thailand showing the study area Sanam Chai Khet district, Chachoengsao province

The enterprise had its rice milling machine, which had a maximum milling capacity of 2,400 kg paddy rice per day. However, the enterprise only processed an average of 500 kg per day from available paddy rice from its members. The rice mill operated four days a week, eight hours per day with one machine operator. The enterprise allowed its members to use the rice mill without monetary charge but collected members' by-products from milling. These by-products included broken milled rice and rice husk. The revenue obtained from selling by-products were used for payment of maintenance and utility expenses. In addition, the enterprise had its farmers' market that showcased its own rice products under the brand name 'Khao

Insee Pa Somboon'. On top of these, the enterprise also catered to other consumers in various distribution outlets.

### 1.7 The Research Framework

This study is anchored on community enterprise development in the agri-food supply chain. Figure 1.2 shows the general framework for this study. Assessment of the supply chain structure gathered information of the Ban Nong Saeng RPCEs status, problems and proposed strategic guidelines for development. Consumers linked in the supply chain were investigated in terms of their purchase intention of the enterprise's organic rice product. This consumer information was communicated to the farmer-members to determine its impact on intention to adopt organic rice farming. Ultimately, these consumer and farmer information are useful for the community enterprise in improving its players' ability and overall performance.

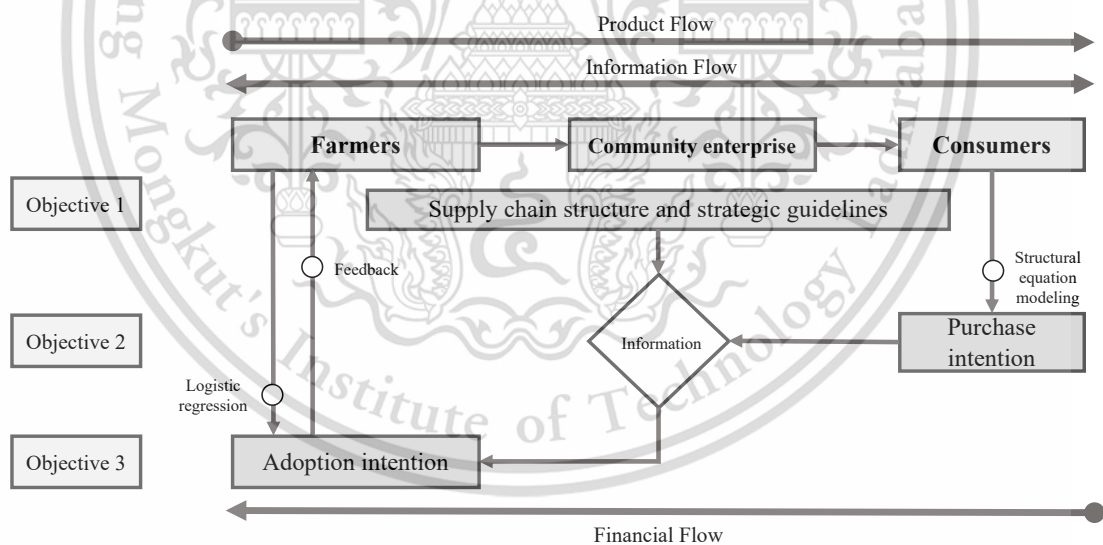


Figure 1.2. The research framework

**Keywords per objective:**

Objective 1: supply chain structure, strategic guideline, community development

Objective 2: purchase intention, organic rice, traceability, structural equation modelling

Objective 3: adoption intention, organic rice farming, binary logistic regression

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## 1.8 Scope of the Study

This study is limited to the assessment of supply chain structure and problems, investigation of consumers' purchase intention and explanation of factors affecting farmers' adoption intention. This study was conducted at Sanam Chai Khet District, Chachoengsao Province, Thailand which is identified as among the major rice production areas in the Central Region and where many rice community enterprises are located. The identified community enterprise was the Ban Nong Saeng. For the farmers' adoption intention part, Na Ngam community enterprise farmers were also included to reach the required number of participants. Nonetheless, the results still represent community enterprise farmers. This study was conducted from May 2020 to February 2021.

## 1.9 Definition of Research Terms

Table 1.1 below shows the definition of important terms used in the context of this study.

Table 1.1. Definition of research terms

Research term	Definition	Source
Community enterprise	Community-based business in Thailand where people invest and work collaboratively to create livelihood and sustainable products.	Naipinit et al. (2016)
Rice production community enterprise	Community enterprises engaged in rice production.	Petcho et al. (2019)
Supply chain structure	The supply chain configuration system consisting of players (i.e., producer and supplier, consumer) that provides and receives the materials for production.	Routroy & Behera (2017)
Strategic guidelines	Provides a structured way of how goals are to be achieved, drawing insights from experiences and problems encountered by the organisation and its members.	Jafari-Sadeghi et al. (2021)
SWOT analysis	A listing and analysis of an organisation's strengths, weaknesses, opportunities, and threats to assess its strategic viability.	Kozami (2002)

<b>Research term</b>	<b>Definition</b>	<b>Source</b>
TOWS matrix situational analysis	An internal-external analysis tool that helps an organisation look intelligently how to take advantage of existing opportunities and strengths, to minimise the impact of weaknesses and protect the operations against threats.	Koontz (2010)
Product traceability	The ability of the consumers to access product information in the packaging by means of recorded identifications.	Karlsen et al. (2010)
Quick response (QR) code	A two-dimensional barcode that can hold considerable information as it can embed advertisements, product information, among others.	Kim et al. (2016)
Latent construct	In survey research, this refers to an abstract idea, underlying theme, or subject matter that one wishes to measure using survey questions.	Garson (2014b)
Content analysis	An analytical research tool used to determine the presence of certain words, themes, or concepts within some given qualitative data.	Groenland & Dana (2019)
Triangulation technique	In qualitative research, this refers to the use of multiple methods or data sources to develop a comprehensive understanding of phenomena.	Denzin (2017)
Consumer information	For this study, this term refers to consumers' perception of the enterprise's organic rice product based on the consumer survey conducted.	Author's own definition

## CHAPTER 2. LITERATURE REVIEW

This study focused on community enterprise development in Sanam Chai Khet district, Chachoengsao province, Thailand. The following literature concepts were reviewed and used as guidelines for the study:

2.1 The Theory of Planned Behaviour

2.2 The Diffusion of Innovation Theory

2.3 Agricultural Supply Chain

2.4 The Organic Food Sector and Entrepreneurship in Thailand

2.5 Consumer Behaviour and Purchase Intention

2.6 Strategic Guidelines and Community Enterprise Development

2.7 Advanced Statistics

### 2.1 The Theory of Planned Behaviour

*Conceptual background of the theory of planned behaviour.* The theory of planned behaviour (TPB) is an individual model of human behaviour that emphasizes things external to the person that can influence their ability, readiness, and intention to make a behaviour change (Ajzen, 1991). The TPB has been widely used to understand human behaviours, based on their behavioural intentions (Kushwah et al., 2019a). The three main factors of the TPB framework are attitude, subjective norms, and perceived behavioural control (Ajzen, 1991). Attitude is defined as the degree of positive or negative appraisal of intention and behaviour. Subjective norms illustrate perceived social pressure from significant others to perform a behaviour. Perceived behavioural control refers to whether the performance of a behaviour is easy or difficult and whether it is under one's control. In this theory, intention becomes a weighted function of attitude, subjective norms, and perceived behavioural control. Additionally, both perceived behavioural control and intention explain adoption behaviour (Figure 2.1).

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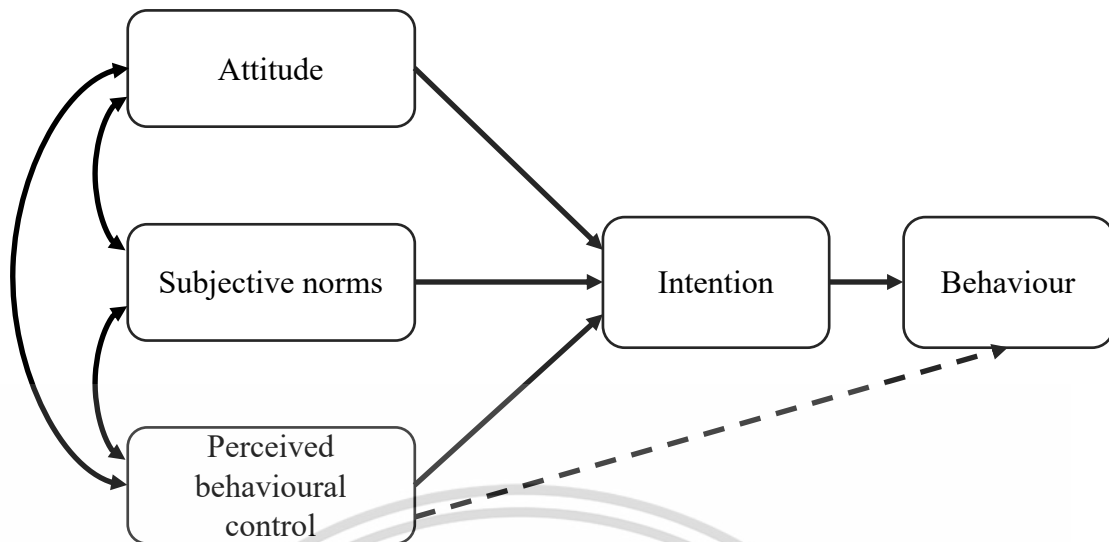


Figure 2.1. The theory of planned behaviour framework by Ajzen (1991)

**Hypothesis and framework development.** The purchase intention study deals with the key factors that determine consumers' purchase intention for organic food with traceability information, using the three main factors of the TPB framework: attitude, subjective norms, and perceived behavioural control (Ajzen, 1991). The extensive framework of the TPB provides a thorough explanation of the underlying factors affecting a particular behaviour. Thus, various researchers have modified this theory to gain a deeper understanding in the organic food consumption context. For instance, Wang et al. (2019b) added a health consciousness construct to predict consumers' intention to purchase organic food in developing countries. Yadav & Pathak (2016) added environmental concerns to investigate consumers' intentions to purchase organic food in India. Dorce et al. (2021) studied the relationship between perceived price and intention, which was not well defined in prior organic food consumption research. Finally, Wang et al. (2019b) used knowledge of organic products as a moderating variable to determine the factors that influence organic food purchase intention.

Hence, it seems necessary to incorporate the critical factors mentioned above to develop a more comprehensive model and better understand organic food purchase

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intentions. Four constructs were added: health consciousness, environmental concerns, cost perceptions, and knowledge of product traceability. Hypotheses are developed based on the TPB and four additional constructs in the context of organic rice purchases with traceability information. As the most significant predictor of actual buying behaviour, purchase intention is assigned as the dependent variable that determines consumers' final intentions (Fishbein & Ajzen, 1975). The conceptual model is shown in Figure 2.2.

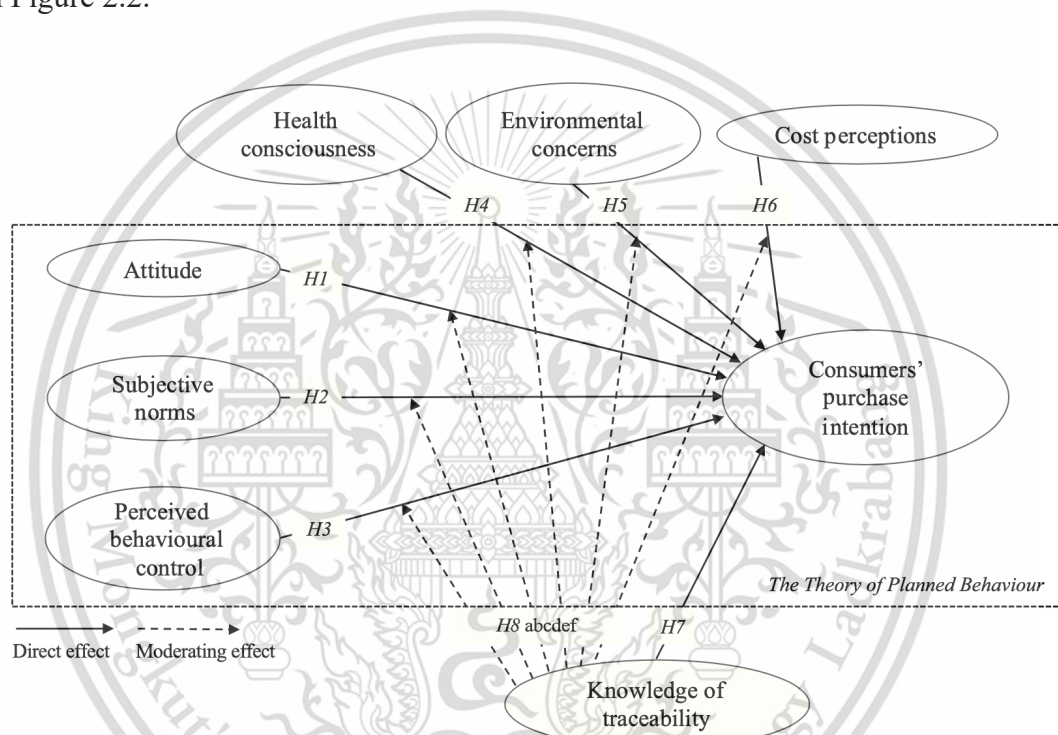


Figure 2.2. The conceptual model for the purchase intention study

**Attitude.** Attitude is described as a person's likelihood of responding either favourably or unfavourably towards a behaviour (Ajzen, 1991). A positive attitude towards organic food is an effective starting point for sustainable consumption (Ahmed et al., 2021; De Farias et al., 2020; Kushwah et al., 2019a). Previous research on organic foods has found a positive relationship between attitude and purchase intention. For instance, Santos et al. (2021) found that attitude is a significant factor that affects purchase intention in Portugal. Nagaraj (2021) found that attitude has a direct impact

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on intention to purchase organic products in India, which is a rising hub of organic food consumption. These findings suggest that consumers with positive attitudes towards organic foods will have a greater intention to purchase them. Hence, the following hypothesis is proposed:

**H1:** Attitude positively influences consumers' purchase intentions towards organic rice with traceability information.

*Subjective norms.* Subjective norms refer to perceived social pressures to either perform a behaviour or not (Ajzen, 1991). These beliefs depend on what others think one should do or comply with. Thus, subjective norms can be influenced by other people's expectations regarding a specific behaviour, combined with the individual's personal motivation to comply with those expectations (Boobalan et al., 2021; Canova et al., 2020; Zerbini et al., 2019). In previous studies, Ahmed et al. (2021) demonstrated that subjective norms have the strongest relationship with purchase intention towards organic food among young consumers. Moreover, Santos et al. (2021) reported a significant impact of subjective norms on consumers' purchase intention for organic food in sustainable packaging. Based on these contexts, it is reasonable to believe that the purchase of organic food may be an expression of an individual's subjective norms. Thus, the following hypothesis is proposed:

**H2:** Subjective norms positively influence consumers' purchase intentions towards organic rice with traceability information.

*Perceived behavioural control.* Perceived behavioural control refers to whether performing a behaviour is easy or difficult and whether it is under one's control (Ajzen, 1991). In theory, people who have more control over a behaviour are more inclined to perform it. Previous studies have documented that perceived behavioural control is the latent variable with the strongest influence on organic food consumption, along with the other two items of TPB. For instance, Santos et al. (2021) reported that perceived

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behavioural control had the highest impact on consumers' intention to purchase organic food in Portugal. Likewise, Canova et al. (2020) and Ahmed et al. (2021) found that perceived behavioural control significantly predicted buying behaviour for organic products in Italy and China, respectively. These findings demonstrate the role of perceived behavioural control in enhancing the intention to purchase organic foods. Hence, the following hypothesis is proposed:

**H3:** Perceived behavioural control positively influences consumers' purchase intention towards organic rice with traceability information.

*Health consciousness and environmental concerns.* As consumers are more concerned about residues from synthetic inputs in agriculture, health consciousness is one of the main motives for purchasing organic food (Jitrawang & Krairit, 2019; Pattweekongka et al., 2019). A study by Nagaraj (2021) revealed that health consciousness plays a significant role in predicting consumers' purchase intention for organic food in an emerging market. In addition, Wang et al. (2019b) explored the effects of health consciousness in their research model and found it to be a strong antecedent of consumers' purchase intention for organic food in Kenya and Tanzania, which are developing countries. These findings illustrate that organic food purchases are also an expression of one's health consciousness.

However, Konuk (2018) found that health consciousness alone is not sufficient to predict purchase intention, and that another main factor driving consumers to purchase organic food is environmental concerns. Although some studies have reported that environmental concerns regarding organic foods do not significantly affect purchase intention (Santos et al., 2021; Zarei & Maleki, 2018), Ahmed et al. (2021) and De Farias et al. (2020) have shown that environmental concerns play a significant role in consumers' purchase intentions. These studies report an increasing trend in consumers who prioritise environmentally friendly products when buying organic

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foods. Based on above arguments, these two latent constructs were added as extensions to the TPB. Hence, the following hypotheses are proposed:

**H4:** Health consciousness positively influences consumers' purchase intentions towards organic rice with traceability information.

**H5:** Environmental concerns positively influence consumers' purchase intentions towards organic rice with traceability information.

*Cost perceptions.* Because organic products are generally more exclusive than conventional ones, their relatively small volume increases marketing and distribution costs, causing higher prices for consumers. Consumers' sensitivity to organic food prices is also an important factor affecting purchase intention. Bai et al. (2019) revealed that income is an important predictor of actual purchases. However, Dorce et al. (2021) found that the relationship between the cost of purchasing organic foods and consumers' intentions is not well defined in prior research. Some studies found that the relatively higher price of organic products is not a barrier (Ahangarkolae & Gorton, 2020; Jose & Kuriakose, 2021), while others report opposite findings (Chekima et al., 2019; Wu et al., 2019). As such, there are consumers who prefer to buy certified organic products but are deterred by the high costs. It can be inferred from these findings that a relatively higher cost of purchasing organic food, compared to conventional food, is an important barrier to consumers' purchase intention. Thus, the following hypothesis is proposed:

**H6:** Cost perceptions negatively influence consumers' purchase intentions towards organic rice with traceability information.

*Knowledge of product traceability.* Traceability in the food supply chain enhances food safety, product quality, and value added (Adam et al., 2016). Typically, traceability is part of quality management and acts as a quality control tool; however, it has become a new promising approach in food labelling. The integration of product

traceability in food labels allows consumers to access extensive and detailed product information in an understandable and trustworthy manner (Osburg et al., 2017). Moreover, it boosts consumer confidence by assisting in quality and safety assessments (Aung & Chang, 2014). Previous studies have shown that traceability information can influence consumers' purchase intentions towards organic food (Chen & Huang, 2013; Lee et al., 2015). Moreover, Wu et al. (2021) confirmed that if consumers' perceived quality of traceability information is high, they are likely to be more confident about such food, which eventually increases their purchase intention.

Furthermore, focussing on strengthening consumer attitudes creates an effective organic food-purchasing environment (Liang, 2016). Previous studies have demonstrated that traceability information, among other factors, can influence the impact of some antecedents on consumers' purchase intentions (Ghali-Zinoubi & Toukabri, 2019; Wu et al., 2021). These studies demonstrate how product traceability knowledge of organic foods helps in better understanding organic food consumption behaviour. Furthermore, the above findings imply that product traceability knowledge as a moderator could provide insights into how information needs and information seeking traits of consumers could strengthen consumers' purchase intention (Zhu et al., 2018). Based on this premise, this study determines the direct and moderating impact of the role of product traceability knowledge on consumers' purchase intention, and the following hypotheses are proposed:

**H7:** Knowledge of product traceability positively influences consumers' purchase intention towards organic rice with traceability information.

**H8a:** Knowledge of product traceability strengthens the positive relationship between attitude and purchase intention towards organic rice with traceability information.

**H8b:** Knowledge of product traceability strengthens the positive relationship between subjective norms and purchase intention towards organic rice with traceability information.

**H8c:** Knowledge of product traceability strengthens the positive relationship between perceived behavioural control and purchase intention towards organic rice with traceability information.

**H8d:** Knowledge of product traceability strengthens the positive relationship between health consciousness and purchase intention towards organic rice with traceability information.

**H8e:** Knowledge of product traceability strengthens the positive relationship between environmental concerns and purchase intention towards organic rice with traceability information.

**H8f:** Knowledge of product traceability weakens the negative relationship between cost perceptions and purchase intention towards organic rice with traceability information.

## 2.2 The Diffusion of Innovation Theory

*Conceptual background of the diffusion of innovation theory.* Diffusion of innovation (DOI) is a theory popularised by Rogers (1983) which seeks to explain how, why and what rate new ideas and technology spread. The DOI theory is one of the most prevalent theories that explain the diffusion of an idea or technology in society (Boz, 2016; Jere & Maharaj, 2017; Thapa & Rattanasuteerakul, 2011). This theory explains that different types of people adopt a technology at different times, and for different reasons. It further argues that potential users make decisions to adopt or reject an innovation based on beliefs that they form about the innovation (e.g. prior conditions, characteristics of the decision-making unit, and perceived characteristics of the innovation). Rogers (1983) also suggests that adopters of innovators can be categorised

as innovators, early majority, late majority and laggards, whose process of adoption over time is based on the classical normal distribution curve (Figure 2.3).

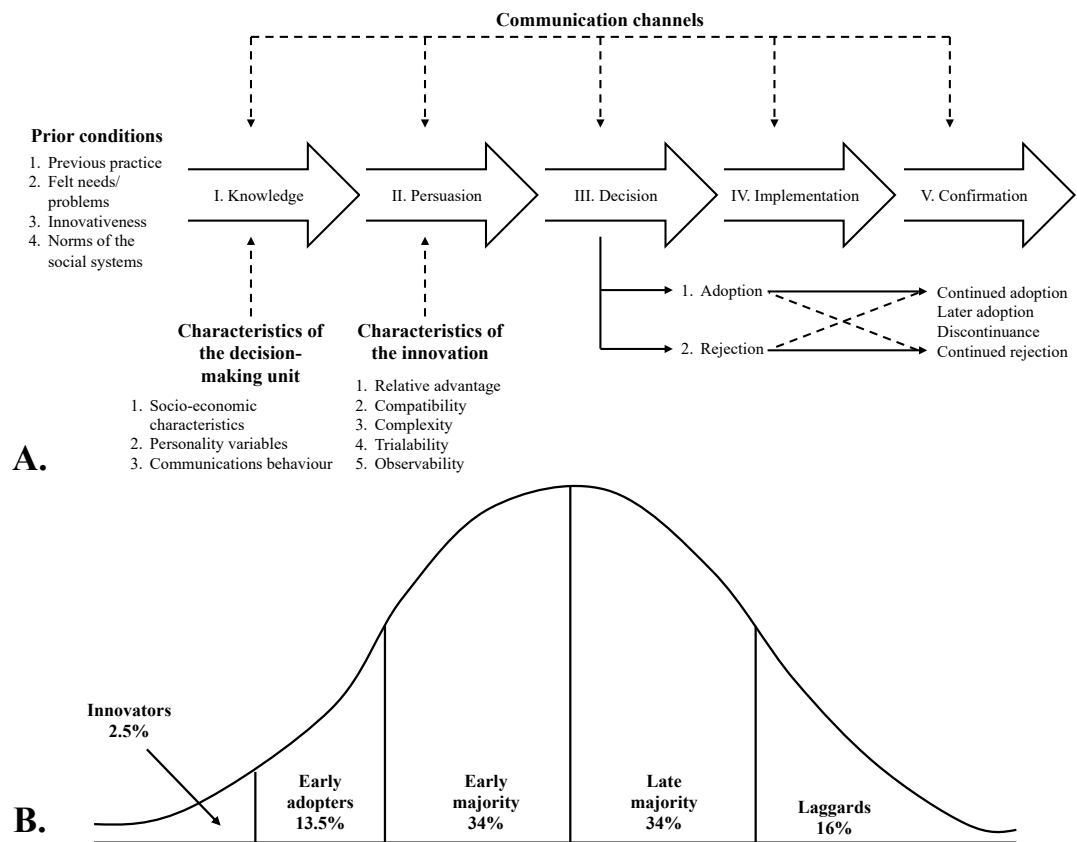


Figure 2.3. The diffusion of innovations theory by Rogers (1983): A) elements of the DOI model, and B) classification of adopters

**Hypothesis and framework development.** The production behaviour of farmers is complex and tends to be affected by several factors (Meijer et al., 2015). These factors may range from their characteristics, production environment, and behavioral aspects (Pilarova et al., 2018; Sapbamrer & Thammachai, 2021; Zhang et al., 2018). To account for these various factors, this chapter proposed a multidimensional framework to predict farmers’ adoption decision grounded on the diffusion of innovations (DOI) theory.

Prior studies have used the DOI theory in determining adoption intention. For instance, Hasin (2016) applied this theory to explain technology adoption among

farmers in the United States. Melodillar et al. (2018) analysed the adoption of corn-based technologies among farmer-scientists in the Philippines. It should be noted that farmers' production behaviour is complex and tends to be affected by several factors (Meijer et al., 2015). These factors may range from their characteristics, production environment, and behavioral aspects (Pilarova et al., 2018; Sapbamrer & Thammachai, 2021; Zhang et al., 2018). Anchored on the DOI theory, it is thus necessary to propose that farmers' adoption decision towards organic rice farming is affected by farm and farmer characteristics, production and management characteristics, and consumer information. The conceptual model is shown in Figure 2.4.

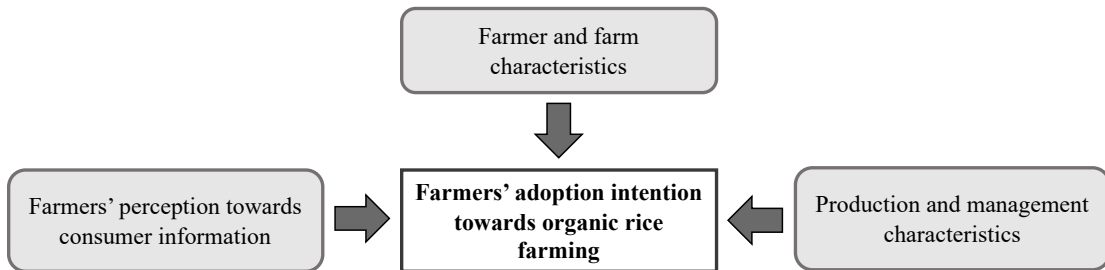


Figure 2.4. The conceptual framework for the adoption intention study

Farmer and farm characteristics (e.g., education, farming experience) can affect adoption intention. Previous studies have used this factor and found significant effects. For instance, Liu et al. (2019a) and Tiwari et al. (2008) revealed that farmer's characteristics were significant predictors of farmers' adoption of soil testing technologies. Furthermore, Digal & Placencia (2018) have shown that gender, education level, and farm size were among the significant factors affecting farmers' decision to adopt organic farming in the Philippines. Hence, farm and farmer characteristics were used to explain adoption intention.

Production and management characteristics (i.e., input source, access to training, and credit) likewise affect adoption intention, as shown in prior studies. For

example, Thapa & Rattanasuteerakul (2011) found out that attendance at training drives the adoption of organic vegetable production among farmers in Mahasarakham Province, Thailand. In addition, Pornpratansombat et al. (2011) have revealed that access to credit motivates farmers to adopt organic farming. Hence, production and management characteristics were used to explain farmers' adoption intention.

Consumer information also plays a vital role in technology adoption. The literature on farmers' adoption intention has focused mainly on socio-demographic and farm characteristics as predictors of intention. Linking consumers to farmers has not received much attention, especially in terms of how consumers view farmers' organic products. To account for this factor, this study links consumer information to farmers and explores their role in predicting farmers' adoption intention, as indicated by prior studies (Gerdoci et al., 2017; Zeweld et al., 2017). Hence, farmers' perception of consumer information was used as an added factor to explain adoption intention.

***Farmers' adoption and access to information.*** Through the years of implementation of the 'CEs Promotion Act of 2005', Thailand's agricultural industry has seen improved growth and development, particularly in the rural areas (Kramol et al., 2020; Prasertwattanakul & Ongkunaruk, 2015). This has not only upgraded the living standards of rural farmers but also improved their access to markets and available technologies, and increased farmers' income (Petcho et al., 2019). However, despite these achievements, most notably in rice production, adoption towards organic farming continues to pose a significant challenge among enterprise leaders and policymakers, whose adoption level and membership status have been low over time (Suwanmaneepong et al., 2020b). Possible problems contributing to this low adoption were ineffective policy programs, farmers' perceived uncertainties and risks, among others (Pilarova et al., 2018). Even though there were moves to encourage farmers to

adopt organic farming, these were still not enough as long as there is no research-based evidence that determines which specific factors significantly drive farmers to adopt such a farming system. Considering the important roles of rice production community enterprises (RPCEs) in Thailand's agricultural sustainability, it is thus necessary to develop an integrated and targeted approach that would encourage more organic rice farmers since they are at the forefront of this farming system in the rural areas of Thailand. Consumer information is an important aspect taking into account that RPCE farmers are not just involved in production but also marketing of their products. A distinctive way to address this concern would be to integrate external information to enable farmers have an integrated decision-making towards organic farming adoption.

Access to information is one of the key challenges of farmers (Barnes et al., 2021; Porcuna-Ferrer et al., 2020; Sathapatyanon et al., 2018). As consumers need information about the products available in the market, farmers on the opposite side of the supply chain likewise need information from the consumers for their production and marketing decisions; since information flows in both directions of the supply chain (Boyd & Spencer, 2021; Nakandala et al., 2017). Thus, supply chain improvement implies linking information between consumers and farmers (Routroy & Behera, 2017). Acknowledging the value of consumer information about organic products is a preliminary step to improving service and information delivery across the supply chain (Kurgat et al., 2018; Sangkumchaliang & Huang, 2012). As more consumers patronize organic products, it becomes increasingly important for farmers to better understand consumers' preference about organic products and use this knowledge to improve production and marketing plans. Previous studies have recognized the value of external information. For instance, Tang et al. (2015) studied whether farmers should use market information to improve their production plans; and results demonstrated that the

provision of market information could improve the farmers' total welfare. In addition, Gonzalvo et al. (2020) have demonstrated that external information sources can be factored into farmers' decision-making processes. In a farmer's organization context, Dimara & Skuras (2003) found that information acquisition is another important factor that affects farmers' willingness to adopt a technology.

Based on the above studies, it can be deduced that consumer information about organic products is deemed useful for effective organic farming adoption. Aside from it decreases uncertainty in adoption, such information will also guide farmers in their decision-making process (Gonzalvo et al., 2020; Tang et al., 2015). External information are also important to consider for most organizations, however, to our knowledge, no prior studies have tested the effect of this factor on organic farming adoption in a local enterprise context. Thus, in line with the studies mentioned, this study uses consumer information and incorporated the diffusion of innovations (DOI) theory to discuss factors affecting farmers to adopt organic farming. Furthermore, this study utilizes the case of RPCEs in the Central region of Thailand. It establishes a model of RPCEs' organic farming adoption by integrating farmers' perception towards consumer information, aside from the most widely used predictors of adoption. This study could be one of the ways to address information asymmetry between these two most important supply chain players.

### **2.3 The Agricultural Supply Chain and Value Chain**

Supply chain is a complex network made up of people, processes and technologies that is engineered and managed to deliver value to a customer (Reid & Sanders, 2019). Supply chain management (SCM) is the management of goods and services and includes all processes that transform raw materials into final products (Swaminathan, 2001). It involves active streamlining of a business's supply side

activities (from demand and supply planning to customer and order management) to maximise customer value and gain competitive advantage in the marketplace (Figure 2.5). There are three major flows within a supply chain that govern their optimal functioning – the product, information, and financial flow. The arrows in the figure represent their direction through the chain. Optimal chain functioning, likewise, hinges upon several factors that are external to the chain, and which constitute an enabling environment. These are the supporting processes such as information technology, finance, and performance management, among others (Sharangi & Datta, 2015).

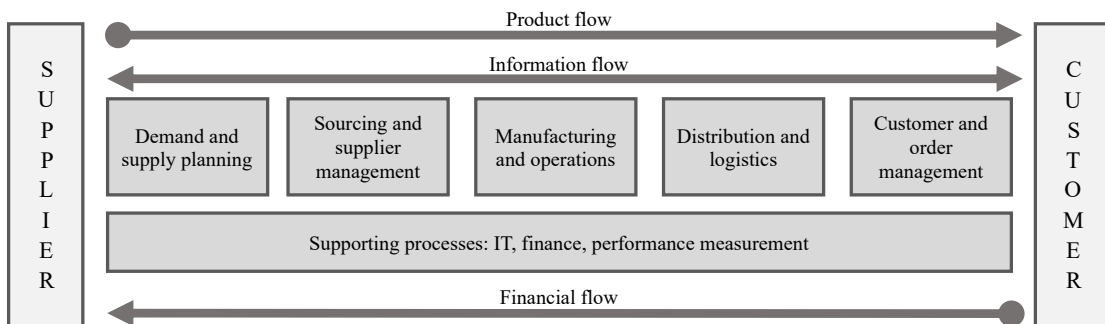


Figure 2.5. The supply chain process adapted from Swaminathan (2001)

In agriculture, supply chain is composed of a wide diversity due to many products, supply chain configurations, food safety issues, and transportation among others (Routroy & Behera, 2017). A typical agricultural supply chain includes processing or raw agricultural commodities, checking of consumer safety standards, packing, and transporting activities. These activities add value to the products before they are sold (Adam et al., 2016; Routroy & Behera, 2017; Stadtler et al., 2014). The structure of agricultural supply chain starts from suppliers (the upstream players). These are inbound materials and services for farm level operations. The supply chain ends with the goal of satisfying the customers (downstream players) through specific distribution channels. Good traceability systems will help minimise production and distribution concerns regarding unsafe or poor products (Routroy & Behera, 2017).

Traceability in the agricultural supply chain has become an integral component in these modern times and should be given utmost attention particularly in specific agri-food commodities (i.e., organic rice).

The agri-food value chain comprises several processes. These consist of the farmers' input supply, production, harvesting and post-harvest handling. The support side includes the stakeholders such as traders, food manufacturing companies, retailers, and consumers (Weerabahu et al., 2021). The value chain is defined as the horizontal and vertical linkages covering these various stakeholders. For example, stakeholders may involve farmer groups, private units, and trader and retailer alliances. Moreover, stakeholders comprise consumer unions, financial organisations, research and training organisations, international associations, and the government (Kawharu, 2019). Several factors are vital for the optimal functioning of the value chain. These include the vertical relationships between buyers and suppliers, and the flows of materials, resources, information and finance and knowledge across the value chain. As for the horizontal relationships, these can help minimise transaction costs, create economies of scale, and increase the efficiency and competitiveness of the value chain players (Weerabahu et al., 2021).

Previous studies have investigated the supply chain structure of rice community enterprises in Thailand using several methods. The latest one was by Suksanchananun et al. (2020), who studied the impact of supply chain management competencies and found five indicators: planning, procurement, production, delivery, and return. Suwanmaneepong et al. (2019) studied the value chain structure of organic rice mills by community enterprise, and findings provided insights for business model development for more value-added organic rice products. Moreover, Prasertwattanakul & Ongkunaruk (2015) explored the organic rice supply chain and analyzed its business

processes using the integrated definition function modelling (IDEF0) approach. Their findings provide important recommendations and opportunities for supply chain efficiency improvement. However, in recent years, various problems are affecting community enterprises (Naipinit et al., 2016; Somswasdi et al., 2015); and that the current supply chain of RPCEs has not been re-examined and updated to keep up with the emerging challenges in input sourcing, production, marketing, and product delivery to consumers. Recent studies have suggested investigating the relationship among chain members (Sahavacharin & Srinon, 2016) and the supply chain structure to maintain a consistent and viable supply chain (Cavite et al., 2021a).

#### **2.4 The Organic Food Sector and Entrepreneurship in Thailand**

*The organic food sector.* Organic agriculture is one of Thailand's emerging food chains (Becchetti et al., 2012). The increasing awareness of healthier foods and sustainable ways of producing them have driven organic product consumption and production (Pattweekongka et al., 2019; Sangkumchaliang & Huang, 2012). Industry data show that Thailand's total organic land area increased from 35,103 ha in 2011 to 45,587 ha in 2015 (about a 30% increase). However, this is equivalent to only about 0.21% of the country's total agricultural land (Panyakul, 2016). Since the introduction of the First National Organic Agricultural Development Strategic Plan in 2008 by the National Economic and Social Development Board (2008), programs have been implemented to support and uphold organic agriculture (Nunthasen & Nunthasen, 2019). One of these programs is the creation of community enterprises through the 'CEs Promotion Act of 2005'. This has enabled farmers to work in a collective action where they share resources, enhance their livelihood, and diversify income sources (Peredo & Chrisman, 2006); Petcho et al. (2019).

The organic food sector is the fastest growing sector in the food market globally, with outstanding performance in both production and sales (Liang, 2016). Similarly, in Thailand, organic products are becoming increasingly important. Over the past years, Thailand has experienced increased growth in organic food consumption, which is attributed to government policies, increase in consumer income, and changes in food consumption preferences (Yanakittkul & Aungvaravong, 2020). Approximately 300,000 rai (48,000 ha) of land in Thailand is currently under organic agriculture. In 2016, Thailand's organic consumption was valued at 15 million USD, with the organic rice sector, which is the largest sector, accounting for 65% of the total organic food market (Thailand Board of Investment, 2020).

***Entrepreneurship and community enterprises in Thailand.*** Thailand is the only country in Southeast Asia that has never been colonised (Dana, 2014; Harmon et al., 2009). The vibrant enthusiasm of Thai entrepreneurs results from the entrepreneurial freedom given to them and is strengthened by their Buddhist values (Dana, 1999; Liu et al., 2019b). The nation's objectives and priorities are specified in the economic development plan by the Office of the National Economic and Social Development Board (Morales-Gómez & Centre, 1999). In the early years (1961-1966), large multinational industries have been given much priorities (Dana, 2014). This entrepreneurial landscape had changed starting in 1966 when policymakers recognised small-scale enterprises, and the Small Industry Service Institute (SISI) was formed supported by the United Nations Development Program (UNDP). However, it was during the fifth economic development plan (1982-1986) that small-scale industries were given full support and promotion (Dana, 2014; Dunning & Lundan, 2008).

However, support to small industries stopped when the sixth development plan focussed on promoting exports. Thailand indeed became the world's fastest-growing

economy, but the strong dependence on imported raw materials became a significant problem that prompted giving back support to small industries (Dana, 2014; Studwell, 2013). In 1992-1996, priority programmes were focussed on the rural entrepreneurs during the seventh development plan through the collaborative efforts of The Board of Investment, Bank of Thailand, and the Industrial Finance Corporation. The succeeding development plans have also integrated the principle of sufficiency economy as a guiding philosophy and have become the fundamental principle of the Thai culture (Chansuchai, 2019; Dana, 2014). This philosophical system of Buddhism greatly contributes to the country's entrepreneurial landscape as its teachings and values encourage the entrepreneurial spirit (Dana, 2014; West, 2010). Thai entrepreneurs have a strong work ethic and initiative. The concept of efficiency is also important among entrepreneurs, which have taught them to optimise resource use to best serve the business (Dana, 2014).

CEs in Thailand started in 1997 as part of the National Economic Development Strategy of the Royal Thai government (National Economic and Social Development Board, 2017). This strategy aimed to promote the clustering of people to encourage families and communities to be self-sufficient and promote learning among members. The policy has helped people in the rural areas address problems, especially those not solved under cooperative systems (Naipinit et al., 2016). The policy was also aimed at mitigating inequality among rural farmers through increasing market channels and developing networks. Farmers share resources to promote socio-economic betterment and learning among members. The issuance of 'CEs Promotion Act of 2005' has made CEs become legal entities and encouraged more CE formation (Petcho et al., 2019).

In a CE, people set up their own business through utilising the community's resources and management skills. Among the main objectives of a CE are production,

marketing, and selling of locally produced goods at a more affordable price than big companies producing the same product (Somswasdi et al., 2015). Several types of CEs are present in Thailand, such as mushroom (Changwatchai & Santipolvut, 2015), textile (Distanont et al., 2017; Naipinit et al., 2016; Seenuankaew et al., 2018), curry paste (Seenuankaew et al., 2018), handicrafts, fishery, forestry, and wood products (Naipinit et al., 2016) and rice (Cavite et al., 2022; Prasertwattanakul & Ongkunaruk, 2015; Raungpaka & Savetpanuvong, 2017; Ruangarakul et al., 2019; Seenuankaew et al., 2018). The most common of them is the RPCE.

The Royal Thai Government helps CEs sustain their operation through various programmes such as organising national exhibits and creating markets (Changwatchai & Santipolvut, 2015). An example of this programme is the One-Tambon-One-Product (OTOP). It is a local stimulus programme established in 2001. Exhibitions are organised where CEs can promote their unique local products and meet clients from both public and private institutions (Laiprakobsup, 2018). The government also provides financial support through the Bank of Agriculture and Agricultural Cooperatives (BAAC).

***Rice production community enterprises.*** Seeing the importance of rice as a significant cash crop in the country, RPCEs have played a crucial role in sustaining rice production in Thailand. RPCEs are the highest registered number of CEs in the crop production sector (Petcho et al., 2019). In an RPCE, farmer-members cultivate rice based on their variety of choice and according to standards certified by the Rice Department. In a case study by Prasertwattanakul & Ongkunaruk (2015), farmers sell their harvested paddies to the CE and gain a higher price than prevailing in the market. Then, the CE stores it to members' barns and delivers it to a local rice mill. Vacuum

packing and labelling are the last steps where the organic logo is indicated upon compliance with organic farming, processing, and packaging requirements.

In marketing, RPCEs collect dried and fresh rice from members and participate in postharvest activities such as rice milling and packaging. Customers are both from local and urban markets (Petcho et al., 2019). Competition is present due to many enterprises offering the same product. Some RPCE members prefer cultivating organic rice because of its perceived high quality and popularity among health-conscious consumers (Suwanmaneepong et al., 2019). Modern packaging is now being prioritised by some CEs where rice packages can be used for household consumption and as gifts on various occasions (Chairidchai, 2019).

RPCEs get various government supports in Thailand. For instance, the government has promoted the Large Agricultural Plot Scheme (LAPS) policy, which was aimed to increase rice production and enhance the competitiveness of small-scale rice farmers by encouraging them to establish neighbouring agricultural land groups, to share plans for cropping and marketing development (Jirarud & Suwanmaneepong, 2020). Many paddy farmers formed RPCEs to benefit from this project in terms of inputs, training, machines, and micro-finance. The implementation of the 'CEs Promotion Act' in 2005 has helped improve these enterprises' chances of receiving recognition and various government support types (Petcho et al., 2019).

In literature, few studies have qualitatively investigated CEs in Thailand. This has been one reason for some CEs' underdevelopment because they were set up more than 20 years ago, and there are only a few latest information available that describes their current situation and areas that need further improvement. In a study by Somswasdi et al. (2015), RPCEs' main problems were related to product design and marketing. Most of the members lack the necessary knowledge and skills as they were

already old and had low education levels (Maikaensarn & Chantharat, 2015). In a similar study by Naipinit et al. (2016), marketing-related problems were also identified. These problems seemed to be recurring and were not adequately addressed in previous research and government policies.

## **2.5 Consumer Behaviour and Purchase Intention**

*Consumer behaviour for organic products.* Organic products from Thailand are exported and sold in many well-known global supermarket chains and organic-focused retailers. The country's exports of organic foods reached double-digit growth rates, with export markets such as the United States, the United Kingdom, Scandinavian countries, and Singapore (Pracharuengwit & Chiaravutth, 2015). Besides export markets, Thailand's organic producers also cater to local markets, resulting in a consistently expanding growth. To further boost the supply side, the government declared organic agriculture as one of the priorities in its national agenda (National Organic Farming Development Board, 2017).

However, recent reports show a significant information asymmetry between organic food marketers and consumers resulting from the lengthy production, processing, and distribution stages involved in bringing organic foods to market (You et al., 2020). Consequently, consumers have relatively low intentions to purchase organic foods, primarily attributed to their lack of trust in organic foods and in the reliability of their certification (Atthirawong, 2017; Pattweekongka et al., 2019). This lack of consumer trust is usually due to the lack of accessible information regarding organic products, which weakens consumers' purchase intentions (von Meyer-Höfer et al., 2015).

As for organic rice in Thailand, organic rice forms the largest portion of the Thai organic food market. Further, its demand has proliferated in recent years and will

continue to increase (Thailand Board of Investment, 2020). The continuous initiative from the Royal Government of Thailand for organic rice farmers drives this growth, especially in rural areas. Among these initiatives is the creation of rice production community enterprises (RPCEs), through the ‘CEs Promotion Act of 2005’, to mitigate inequality among organic farmers by increasing market channels and developing networks (Economic and Social Development Council, 2018). RPCEs constitute the highest number of registered enterprises in the crop production sector in Thailand (Secretariat of Community Enterprise Promotion Board, 2019). They access local and urban markets by offering organic rice because commercial rice is dominated by large rice mills and intermediaries (Petcho et al., 2019).

Since RPCEs offer organic rice, they are not exempt from various consumer concerns regarding product safety and quality, the risk from pesticide residues, and the genuineness of some organic rice products, which has a negative impact on the community enterprise (Atthirawong, 2017; Pattweekongka et al., 2019; Petcho et al., 2019). Moreover, given the importance of organic rice in both local and domestic markets, it is expected that consumers’ desire to purchase it will continue to increase. Organic rice targets specific consumer groups, such as high-income and health-conscious households, making it different from conventional rice (Wu et al., 2019). Because of its increasing popularity, organic rice marketers need to understand consumers’ behaviour to address their concerns and tailor better marketing strategies relevant to organic rice product development. This would support the government’s goal of improving the market competitiveness of RPCEs, as indicated in the ‘CEs Promotion Act of 2005’.

***Purchase intention and product traceability.*** Organic foods consumption has increased due to consumers’ improved awareness of more sustainable and healthy diets

(Kushwah et al., 2019b). Previous studies have investigated consumers' intention to purchase organic foods from different perspectives, such as health consciousness (Nagaraj, 2021; Wang et al., 2019b), environmental concerns (Ahmed et al., 2021; Santos et al., 2021), price perceptions (Dorce et al., 2021; Liang, 2016), and the theory of planned behaviour (TPB) (Canova et al., 2020; Rahman & Mohd Noor, 2016). Some studies highlight information asymmetry in organic food consumption and explore how food traceability systems can promote consumers' purchase intentions (Chen & Huang, 2013; Kim et al., 2016). More specifically, with the emergence of technological advancements, such as the IoT as well as the importance of traceability systems, few studies have explored how products with quick response (QR) codes enhance organic food consumption behaviours (Lin et al., 2018; Spence et al., 2018). These studies argue that information asymmetry can be reduced, and consumers can build confidence by knowing how food is produced, processed, and transported (Aung & Chang, 2014; Badia-Melis et al., 2015).

These latest developments in organic food marketing, which integrate innovative IoT technologies, also convince sellers to design traceability systems (Li et al., 2019; Purwandoko et al., 2019). Food traceability systems record information regarding the critical stages in food production, processing, and distribution, from farms to retailers (Wu et al., 2021). However, establishing traceability systems requires substantial investment (Zhu, 2017). As such, sellers have to decide whether to reduce costs or meet consumers' information needs to develop a food traceability system. Most importantly, organic food marketers need to understand consumers' knowledge of traceability information; however, no prior studies have explored or measured this specific construct in Thailand. Further research on this aspect will shed light on this emerging market.

The above arguments imply the need to integrate the concept of product traceability and examines its direct and moderating impacts on consumers' purchase intentions. Furthermore, these studies suggests highlighting the role of product traceability knowledge, along with other important constructs, in the context of organic food consumption. Since organic food marketers develop traceability systems to reduce information asymmetry, and consumers use this information as an indicator of product safety and quality (Aiello et al., 2015), it is important to develop a multi-dimensional model based on the TPB by Ajzen (1991) based on the mainstream literature on consumers' purchase intentions and organic food. In this case, the mechanism through which product traceability knowledge influences consumers' purchase intention towards organic food will be fully understood, while considering the following factors: attitude, subjective norms, perceived behavioural control, health consciousness, environmental concerns, and cost perceptions.

## **2.6 Strategic Guidelines and Community Enterprise Development**

The development of community-based organisations is determined by their strategic guidelines (Dana et al., 2014). Guidelines set the path of an organisation to reach its goals. To clearly define the major courses of action to be taken, guidelines should be strategic to achieve the enterprise's long-term objectives. A good strategic guideline should provide a clear explanation of how goals are to be achieved, drawing insights from the experiences and problems encountered not only from the organisation itself but also from its members (Jafari-Sadeghi et al., 2021). This approach gives clearer and specific details of the internal strategies and programmes to be pursued to achieve the organisation's goals (Dana & Anderson, 2007). As strategies are long-term and forward-looking approaches, measures that concern aspects within the organisation

are essential for community-based enterprise development in order to achieve sustainable competitive advantage (Dana & Light, 2011; Dana & Wright, 2009).

In formulating strategic guidelines, an organisation's internal and external environments need to be evaluated through a list of its strengths, weaknesses, opportunities, and threats (SWOT). These items are analysed to assess the enterprise's strategic viability. In SWOT analysis, the enterprise can have a clearer overview of its business environment and can easily decide which opportunities to pursue, and which threats should be counterbalanced (Phuknoi et al., 2018). Assessment of the internal factors follows the principle of McKinsey 7-S Framework where Strategy, Structure, Systems, Shared values, Style, Staff and Skills are considered (Bhattacharyya, 2011). Meanwhile identifying external factors used the PESTEL analysis. This term stands for Political, Economic, Social, Technological, Environmental and Legal (Helmold & Samara, 2019). Moreover, further analysis is done through TOWS matrix situational analysis, one of the most widely used tools when considering an internal-external analysis of a business (Wilson and Gilligan, 2012). This situational analysis gives an intelligent look at how the enterprise can best take advantage of their existing opportunities, and at the same time, minimise the impact of weaknesses to protect their operations against threats (Koontz, 2010). Important themes within each SWOT category should be considered in formulating specific strategic options in the TOWS matrix (Suwanmaneepong et al., 2018). Ultimately, the TOWS matrix categorises the strategic options as aggressive, turnaround, diversification, and defensive.

RPCEs are among the community-based organisations that play essential roles in Thailand's rice production and rural sector development. Enhancement of their performance is necessary to remain relevant and competitive in the economy (Distanont et al., 2017). CE development guidelines could help achieve this goal as they provide

solid evidence of the areas needing improvement. Several government agencies have included community development agendas with the emergence of CEs (Laiprakobsup, 2018). These programmes have facilitated the ongoing evolution of rice production in the rural areas of Thailand. Rice production became the primary commercial activity of farmers, and various activities have focussed on improving farmers' yield and improving access to markets (Cramb, 2020).

Despite the support that RPCEs gained from various government and private initiatives, problems were identified, affecting their production and marketing performance. For example, Somswasdi et al. (2015) identified problems such as unattractive product designs and products that cannot compete in mass markets. In addition, Seenuankaew et al. (2018) pinpointed drawbacks such as information needs & information seeking, which are important to strengthen CEs capacity towards the operational level. Other problems include customer demand for new products, anticipated problems with suppliers and competitors' innovation, inability to maintain safety and quality of products, lack of paddy supply, inadequate communication between players, and rising supply chain costs (Naipinit et al., 2016; Petcho et al., 2019). Prior research suggested that CEs formulate strategic guidelines to improve their performance, increase their domestic competitiveness and prepare for international markets (Prasertwattanakul & Ongkunaruk, 2015).

## **2.7 Advanced Statistics**

***Structural equation modelling.*** Structural equation modelling (SEM) is a multivariate statistical analysis technique that is used to analyse structural relationships. This technique is the combination of factor analysis and multiple regression analysis, and it is used to analyse the structural relationship between measured variables and latent constructs or factors (Figure 2.6). This modelling technique is the commonly

used in understanding consumer behaviour. SEM may be used as a more powerful alternative to multiple regression, path analysis and factor analysis, among others (Fornell & Larcker, 1981).

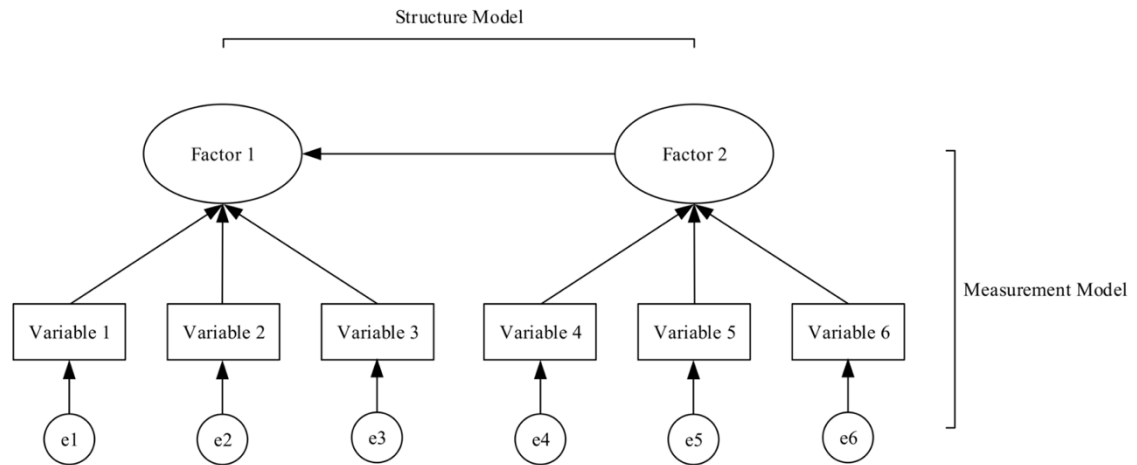


Figure 2.6. The structural equation modelling (SEM) structure adapted from Ye et al. (2018)

SEM has a lot of advantages compared to multiple regression. These include more flexible assumptions, allowing interpretation even in the face of multicollinearity, use of confirmatory factor analysis to reduce measurement error, among others. Moreover, where regression is highly susceptible to error of interpretation due to misspecification, the SEM strategy of comparing alternative models to assess relative model fit makes it more robust. In addition to all of these, there is the attraction of being able to create and test models using a graphical modelling interface (Garson, 2014b).

Use of SEM software for a model can be of path or factor analysis types. The two differs in terms of simple observed variables or where latent construct has multiple indicators. Usually, however, SEM refers to a hybrid model with both multiple indicators for each variable (latent variables of factors) and paths specified connecting the latent variables. SEM is also known as covariance structure analysis, covariance structure modelling and analysis of covariance structure (Kline, 2015).

**Binary logistic regression.** Binary logistic regression is a special type of regression where binary response variable is related to a set of predictor or explanatory variables, which can be discrete and/or continuous. The probability of odds of the response taking a particular value is modelled based on combination of values taken by predictors. Whereas in linear regression, the expected values of the response variable are modelled based on combination of values taken by the predictors. An explicit distinction between a response variable and one or more predictor variables is, therefore, made like the usual regression (Garson, 2014a).

To illustrate, the response can be represented by  $Y = 0$  or  $1$  with  $Y = 1$  denoting the occurrence of the event of interest. Often a dichotomous outcome can be studied by calculating certain proportions, for example, the proportion of deaths among females and the proportion among males. However, in many situations, there are multiple descriptors, or one or more of the descriptors are continuous. Without a statistical model, studying patterns such as the relationship between age and occurrence of a disease, for example, would require the creation of arbitrary age groups to allow estimation of disease prevalence as a function of age (Harrell, 2013).

As per Garson (2014a), letting  $X$  denote the vector of predictors  $\{X_1, X_2, \dots, X_k\}$ , a first attempt at modelling the response might use the ordinary linear regression below since the expectation of a binary variable  $Y$  is  $\text{Prob}\{Y=1\}$ .

$$E\{Y|X\} = X\beta,$$

However, such model by definition cannot fit the data over the whole range of the predictors since a purely linear model  $E\{Y|X\} = \text{Prob}\{Y=1|X\} = X\beta$  can allow  $\text{Prob}\{Y=1\}$  to exceed 1 or fall below 0. This makes the binary logistic regression model preferred for the analysis of such binary responses, stated in terms of the probability that  $Y=1$  given  $X$ , the values of the predictors:

$$\text{Prob}\{Y=1|X\} = \{1+\exp(-X\beta)\}^{-1}$$

As before,  $X\beta$  stands for  $\beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_kX_k$ . The regression parameters  $\beta$  are estimated by the method of maximum likelihood. The function  $P = \{1+\exp(-X\beta)\}^{-1}$  is called the logistic function and it has unlimited range for  $x$  while  $P$  is restricted to range 0 to 1. The inverse of the logistic function can be derived from this equation (Harrell, 2013).

## **CHAPTER 3. METHODOLOGY**

This chapter presents the research methodologies applied to assess the current supply chain of Ban Nong Saeng community enterprise, to formulate strategic guidelines for community enterprise development; to investigate consumers' purchase intention towards traceable organic rice; and to determine the factors affecting farmers' organic farming adoption. The study applied mixed methods (qualitative, and quantitative) and these are arranged as follows:

3.1 Assessment of Questionnaire Quality

3.2 Sampling Technique and Participants

3.3 Data Collection

3.4 Data Analysis

### **3.1 Assessment of Methodological Quality**

Initially, the questionnaires were designed and drafted in English language by the researcher and reviewed by the advisor. Content validity examination was done for all the questionnaire items using Item-Objective Congruence (IOC) method (Rovinelli & Hambleton, 1977). Meanwhile, reliability of items for the consumer survey (objective 2) and farmer survey (objective 3) were determined using Cronbach's alpha. The IOC method and Cronbach's alpha computation are explained below:

#### **3.1.1 Content validity**

Item Objective Congruence (IOC) was done to assess content validity of the items in the questionnaires (Rovinelli & Hambleton, 1977). Opinion of the three experts were solicited to ensure that each item in the questionnaire measures the intended objective. In the assessment, a value was assigned at each item depending upon its congruence (+1 if the item clearly measures the objective or construct, -1 if it does not clearly measure and 0 if the item is unclear). Experts' ratings were used to compute the

IOC using the formula by Martuza (1977) presented below. The limit of the index ranges from -1.00 to +1.00. Table 3.1 shows the IOC rating, interpretation, and decision as suggested by Rovinelli & Hambleton (1977). Questionnaires were improved based on the IOC rating. The IOC ratings are shown in Appendix Tables A.1 to A.4.

$$I_{ik} = \frac{N}{2N-2} (\mu_k - \mu)$$

Where:  $I_{ik}$  = index of item-objective congruence for item  $i$  on objective  $k$

$N$  = the number of objectives

$\mu_k$  = expert's mean rating of item  $i$  on objective  $k$

$\mu$  = expert's mean rating of item  $i$  on all objectives

Table 3.1. Interpretation and decision of obtained IOC values

IOC rating	Interpretation	Decision
$\geq 0.50$	Acceptable	Item to be retained
Less than 0.5	Not acceptable	Item should be reviewed or removed

### 3.1.2 Reliability

Cronbach's alpha ( $\alpha$ ) values were determined to measure the internal consistency or the degree to which responses are consistent across the items of a measure (Kline, 2015). Acceptable values are greater than or equal to 0.70 (Cronbach, 1951). It was computed using the formula:

$$\alpha = \left( \frac{k}{k-1} \right) \left[ 1 - \frac{\sum \sigma_i^2}{\sigma_x^2} \right]$$

Where:  $k$  is the total number of items for a given factor

$\sigma^2$  is the variance of item  $i$

$\sigma^2_x$  is the variance of the sum scores

### 3.1.3 Pre-testing

Approved questionnaires were translated to the respondents' common language (Thai) by native speakers to ensure semantic equivalence of the items. For the consumer survey questionnaire, pre-testing was done among 30 farmers' market consumers. For the farmers' survey questionnaire, pre-test was also done among 30 farmers. The pre-testing of questionnaires was done to help the researchers determine if respondents understand the questions well. Pre-testing also provides the most direct evidence for the validity of the questionnaire data for most items (Dana & Anderson, 2007). During the pre-test, the approved questionnaires were administered to the respective respondents. A few revisions were made based on the consumers' and farmers' responses to the pre-test questions.

## **3.2 Sampling Technique and Participants**

### 3.2.1 Purposive and convenience sampling for community enterprise

For the community enterprise study, purposive sampling and convenience sampling techniques were employed to gather informants from the study area. As this study focussed on a community enterprise, the key informants were community enterprise farmers, committee members, and the enterprise leader. As pointed out by Dana & Dana (2005), this is the ideal approach for a qualitative study to gain a richer understanding of the sampled entrepreneurs. For the in-depth interview, the two committee members and the enterprise leader were purposively sampled because they are the ones more experienced on how the enterprise run, its background, and motivations (Dana & Dana 2005). For the focus group discussion, eight community enterprise farmers were conveniently sampled because of easy accessibility, time effectiveness, and availability at a given time of farmers willing to participate (Hove-Sibanda et al., 2021).

### 3.2.2 Convenience sampling for consumers

For the consumer's purchase intention study, farmers' market consumers of Ban Nong Saeng community enterprise are the respondents. This study targeted a sample size of 240 respondents, which is 10 times the number of observed variables (Bentler & Chou, 1987) and is appropriate for structural equation modelling (SEM). A total of 299 questionnaires were completed. Ultimately, 243 valid responses (81% of the total) were considered after eliminating respondents with incomplete or unengaged responses to the measurement item questions. Hence, the minimum sample size was met. In data gathering, convenience sampling technique was done where consumer participants were approached after they had bought organic rice. Various 'purchase intention' studies have employed convenience sampling, which is the most suitable for this type of targeted group (Chang & Chang, 2017; Prakash & Pathak, 2017).

### 3.2.3 Purposive sampling for farmers

Meanwhile, for the adoption intention study, community enterprise farmers are the participants. In logistic regression the recommended sample size is 10 times the number of independent variables (Garson, 2014). As this study has a total of 16 independent variables, this study targeted a sample size of at least 160 farmer-respondents. In data gathering, purposive sampling was done by selecting the farmer-members of Ban Nong Saeng community enterprise. A total of 201 community enterprise farmers were sampled for this study.

## 3.3 Data Collection

### 3.3.1 In-depth interview and focus group discussion

For the community enterprise part, this study utilised a qualitative approach in understanding the supply chain structure and problems encountered by the enterprise and its farmer-members. As qualitative studies are interactive, community emersion

was done prior to the actual in-depth interviews and focus group discussion to observe the environment and establish the connection between the researchers and the community enterprise members (Dana & Anderson, 2007; Groenland & Dana, 2019) (Figure 3.1). This approach helped gather in-depth data since farmers and the enterprise leader became more open and relayed more information to the researchers. The whole data collection was conducted between June and September 2020.



Figure 3.1. Community immersion done prior to actual in-depth interviews and focus group discussion

***In-depth interviews.*** In-depth interviews were employed to acquire real insights from the community enterprise leader and two committee members, since they are the ones more experienced on how the enterprise run, its background, motivations, and problems encountered (Figure 3.2A). The interviews consist of open-ended questions carefully designed to extract detailed explanations of a specific situation (e.g., about the rice mill and its purpose of selling rice to consumers). The whole interview was structured and designed for a 45-minute run. As a best practice recommended by Groenland & Dana (2019), the problem and purpose were first clearly defined before

developing the interview questions. In this study, the questionnaire (Appendix B.1) was composed of six parts, which are as follows:

Part 1. Background of the rice community enterprise

Part 2. Buying paddy rice from farmers

Part 3. Converting paddy to milled rice

Part 4. Distributing milled rice to consumers

Part 5. Support activities

Part 6. Strengths, weaknesses, opportunities, and threats



Figure 3.2. Data collection: A) in-depth interview and B) focus group discussion

***Focus group discussion.*** For the FGD, a 60-minute conversation with eight farmer-members of the community enterprise was conducted to gain a broad inventory of their opinions and experiences (Figure 3.2B). The information derived from the discussion was detached from their individual experiences but instead derived from a group process. The interview themes focussed on the farmers' motivation and their experiences as community enterprise members, which enabled the researchers to draw out the problems and constraints they have encountered. Thus, the FGD provided focussed information expressed by farmers' own words and the interaction among farmers added richness to the data gathered, not obtained during the in-depth

interviews. The questionnaire for farmers' FGD (Appendix B.2) was composed of four parts, which are as follows:

Part 1. Source of rice farming inputs

Part 2. Production activities

Part 3. Delivering rice to buyers

Part 4. Support activities in rice farming

### 3.3.2 Face-to-face survey with consumers

For the consumer survey, a face-to-face survey was conducted in the CE's farmers' market in July 2020, following a convenience sampling approach (Figure 3.3). The purpose of the study and the concept of product traceability in organic rice were first explained to the participants. A visual aid was used to illustrate this concept using the enterprise's improved rice package (Figure 3.4) inspired by Spence et al. (2018)'s concept. Afterwards, the participants were compensated after participating the survey. The structured questionnaire (Appendix B.3) was divided into two parts, presented as below. The first part gathered the socio-economic and demographic profile of consumers. The second part of the questionnaire comprised four essential constructs, according to the TPB (attitude, subjective norms, perceived behavioural control, and purchase intention) and four additional constructs in the context of organic food consumption (health consciousness, environmental concern, cost perception, and knowledge of product traceability).

Part 1. Socio-economic and demographic profile of consumers

Part 2. Perception towards purchasing traceable organic rice



Figure 3.3. Face-to-face survey with consumers at the farmers' market of community enterprise



Figure 3.4. Visual aid shown to illustrate traceability in organic rice products using the enterprise's improved rice package

This study adapted the construct measurement items developed in prior studies. Attitude was measured using items from Nguyen et al. (2019) and Demirtas (2019). Subjective norms and perceived behavioural control were measured using the items developed by Spence et al. (2018), Ham et al. (2018) and Wang et al. (2018). Health

consciousness, environmental concerns, and cost perceptions were measured using the items from Voon et al. (2011) and Wang et al. (2019b). Knowledge of product traceability and purchase intention was measured using items developed by Asif et al. (2018) and Wang et al. (2019b). The items for each construct are listed in Table 3.2. All items were measured using a ‘five-point’ Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree) (Jitrawang & Krairit, 2019).

Table 3.2. Construct measures, reliability, and validity

Construct	Measurement item	Factor loading	Cronbach's alpha	CR	AVE	MSV
<b>Attitude (ATT)</b>						
ATT_1	Buying organic rice with traceability information is beneficial to me.	0.724	0.872	0.838	0.637	0.596
ATT_2	Buying organic rice with traceability information is a good idea.	0.708				
ATT_3	Buying organic rice with traceability information is interesting.	0.941				
<b>Subjective norms (SN)</b>						
SN_1	I will buy organic rice with traceability information because my family and friends are in favour of it.	0.902	0.940	0.941	0.841	0.596
SN_2	People close to me think I should buy organic rice with traceability information.	0.929				
SN_3	I will buy organic rice with traceability information because of the positive reviews by people who have already bought it.	0.920				
<b>Perceived behavioral control (PBC)</b>						
PBC_1	If I wanted to, I could buy traceable organic rice instead of regular-packed rice.	0.909	0.918	0.918	0.789	0.544
PBC_2	Buying organic rice with traceability information or not is mostly up to me.	0.873				
PBC_3	I can easily purchase traceable organic rice from different distribution channels.	0.882				
<b>Health consciousness (HEC)</b>						
HEC_1	I consider myself a health-conscious consumer.	0.701	0.833	0.839	0.636	0.315
HEC_2	I often think about health-related issues.	0.828				
HEC_3	I choose food carefully to stay healthy.	0.854				
<b>Environmental concerns (ENVI)</b>						
ENVI_1*	Organic rice with traceability information is more environmentally friendly and promotes sustainable consumption.	--	0.712	0.729	0.577	0.431
ENVI_2	I am greatly concerned about the negative impacts of inorganic rice farming.	0.659				
ENVI_3	I am concerned about the state of the world's environment.	0.848				
<b>Cost perceptions (COST)</b>						
COST_1	Organic rice with traceability information costs more than regular-packed rice.	0.817	0.839	0.838	0.633	0.476
COST_2	Only high-income consumers can afford to buy organic rice with traceability information.	0.789				
COST_3	Organic rice with traceability information is beyond my budget.	0.780				
<b>Knowledge of product traceability (KNOW)</b>						
KNOW_1	I am familiar with QR codes used in product traceability.	0.860	0.895	0.987	0.744	0.442
KNOW_2	I have already purchased a product with a QR code for traceability.	0.900				
KNOW_3	I am familiar with a rice package with a QR code for traceability information.	0.826				
<b>Purchase intention (PI)</b>						
PI_1	I am willing to buy organic rice with traceability information when available in the market.	0.894	0.940	0.941	0.843	0.476
PI_2	I intend to purchase organic rice with traceability information when it is available.	0.959				
PI_3	I plan to consume organic rice with traceability information when it is available for purchase.	0.899				

\*Item dropped due to low factor loading. CR = composite reliability, AVE = average variance extracted, MSV = maximum shared variance; Fit indices:  $\chi^2/df = 1.822$ ; CFI = 0.962; SRMR = 0.039; RMSEA = 0.058

### 3.3.3 Face-to-face survey with farmers

The face-to-face survey (Figure 3.5) involved farmers of Ban Nong Saeng and Na Ngam community enterprises. The final questionnaire (Appendix B.4) consisted of three major parts:

Part 1. Farmer and farm characteristics

Part 2. Production and management information

Part 3. Perception towards consumer information

Farmers were briefed that the consumer information items were based on a survey of the enterprise's organic rice consumers. The actual survey was done from February to March 2021. For the production and management characteristics, all items asked pertains to the farmers' previous cropping. Afterwards, the participants were compensated after participating the survey (Figure 3.6).



Figure 3.5. Face-to-face interview with a community enterprise farmer



Figure 3.6. Farmer-participants given compensation after completing the survey

This study used 16 explanatory variables with no collinearity issues and one dependent variable, as shown in Table 3.3. The dependent variable, farmers' adoption status, is a binary variable set equal to 0 if the farmer is a non-organic farmer and 1 if organic farmer. The independent variables were categorised into three groups: farmer and farm characteristics, production and management characteristics, and farmers' perception of consumer information. The first two categories of variables are primarily used in previous adoption intention studies (Digal & Placencia, 2018; Liu et al., 2019a).

As an extension to the extant literature, this study added perceptual items in one construct to determine their role in predicting farmers' adoption. These items were generated from the results of a consumer survey by the same authors, which explored CE consumers' intention to purchase organic rice (Cavite et al., 2022). These items were measured in terms of farmers' level of agreement based on a 5-point Likert scale.

Table 3.3. Variable names and descriptions for farmers' adoption intention

Variable	Description and measure
<b>Dependent variable</b>	
Farmers' adoption status (Y)	0 = non-organic farmer 1 = organic farmer
<b>Independent variable</b>	
<i>Farmer and farm characteristics</i>	
Gender (X <sub>1</sub> )	0 = Male, 1 = Female
Age (X <sub>2</sub> )	Age of farmer (years)
Education level (X <sub>3</sub> )	1 = Primary education, 2 = Secondary education, 3 = Vocational certificate, 4 = Bachelor's degree
Rice farming experience (X <sub>4</sub> )	Experience of the farmer (years)
Household size (X <sub>5</sub> )	Family members (count)
Family labour (X <sub>6</sub> )	Labour by family members (count)
Rice farm size (X <sub>7</sub> )	Rice farm area (rai)
Yield per rai (X <sub>8</sub> )	Yield (kg)
<i>Production and management information</i>	
Seed input source (X <sub>9</sub> )	1 = Own, 2 = Bought, 3 = Provided by group members, 4 = Provided by government
Soil quality assessment (X <sub>10</sub> )	1 = Low, 2 = Moderate, 3 = High
Infestation incidence (X <sub>11</sub> )	Overall assessment to weeds, pest, and disease infestation: 1 = Low, 2 = Moderate, 3 = High
Buying price (X <sub>12</sub> )	Whether farmer gets reasonable buying price or not: 0 = No, 1 = Yes
Training attendance (X <sub>13</sub> )	Attendance to training on organic rice production: 0 = No, 1 = Yes
Credit access (X <sub>14</sub> )	Farmer's access to credit facilities: 0 = No, 1 = Yes
Extension support (X <sub>15</sub> )	Availability of extension visits or supports: 0 = No, 1 = Yes
<i>Farmers' perception towards consumer information</i> <sup>a</sup> (X <sub>16</sub> )	1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

<sup>a</sup> Using a factor analysis, this construct was measured with six items related to farmer's perception on consumer preference for organic rice

### 3.4 Data Analysis

#### 3.4.1 Content analysis

Community enterprise data were qualitatively analysed primarily by content analysis. It involved 1) interview validation and transcription, 2) supply chain mapping, 3) SWOT and TOWS matrix situational analyses, and 4) strategic guideline formulation.

*Interview validation and transcription.* For the interview validation and transcription, triangulation was employed after the interviews to develop a more comprehensive understanding of the interview information gathered. This technique verified mentioned information such as farmer-members, enterprise's organisational structure, and the rice mill's capacity and description, among others. In this study, a visit to the actual rice mill and packing facilities was conducted. In addition, quantitative data and other information regarding farmers' and rice mill's performance were obtained from the enterprise's documents to verify and confirm the interview findings, with the consent of the enterprise leader. Denzin (2017) recommended triangulation to increase the credibility and validity of the research findings in qualitative research. Thereafter, all interview information gathered were transcribed into text, sorted, and organised. The themes and patterns that emerged in the data were determined. After the themes are developed, their categories were identified based on their connection with each other and with respect to the research questions (Groenland & Dana, 2019). Consequently, this study has identified three main problem categories encountered by the enterprise. These are in the areas of 1) membership and labour, 2) production and milling operations, and 3) product design and marketing. These categories served as the guide to clearly understand the challenges encountered by the

enterprise. Data interpretation was further supported through a review of theoretical literature (Siemens, 2019).

***Supply chain mapping.*** For the supply chain part, mapping and analysis of the supply chain activities was done using the grounded theory methodology (Groenland & Dana, 2019; Strauss & Corbin, 1990). Key players and activities from paddy rice purchasing, milling, and distribution to consumers were investigated. Moreover, external agencies supporting the supply chain were also noted.

***SWOT analysis.*** Apart from the categorised data, the information gathered from the farmers and enterprise leader was used to analyse the strengths, weaknesses, opportunities, and threats (SWOT). In the SWOT analysis, a listing of the enterprise's strengths, weaknesses, opportunities, and threats was made to assess the enterprise's strategic viability. This was done through examining the enterprise's internal and external environment (Kozami, 2002; Naipinit et al., 2016; Somswasdi et al., 2015). By analysing the SWOT, the enterprise can have a clearer overview of its business environment and more easily decide which opportunities to pursue and which threats should be counterbalanced (Phuknoi et al., 2018).

***TOWS matrix situational analysis.*** In developing strategic options, this study applied the TOWS matrix situational analysis, one of the most widely used tools when considering an internal-external analysis of a business enterprise (Wilson & Gilligan, 2012). This situational analysis enabled the researchers to look intelligently at how the enterprise can best take advantage of their existing opportunities, and at the same time, minimise the impact of weaknesses to protect their operations against threats (Koontz, 2010). Important themes within each SWOT category were considered in formulating the specific strategic options in the TOWS matrix supported by the methods employed

by Suwanmaneepong et al. (2018). The TOWS matrix categorised the strategic options as aggressive (S-O), turnaround (W-O), diversification (S-T), and defensive (W-T).

***Strategic guideline formulation.*** As strategic guideline formulation is both a collaborative and participatory approach (Alkhafaji, 2003), a final round of discussion was conducted with the enterprise members (farmers and leader) and the project's principal investigator (Figure 3.7). The group discussion was done to propose and deliberate the strategic options developed from the TOWS matrix situational analysis and devise sound strategic guidelines that align with the community enterprise's goals and objectives. Strategic options were plotted against the identified problem categories to serve as a guide for the enterprise in undertaking specific strategies at each problem category. Ultimately, the conceptual framework generated for this study is shown in Figure 3.8.



Figure 3.7. Group discussion with enterprise leader, members, and project principal investigator

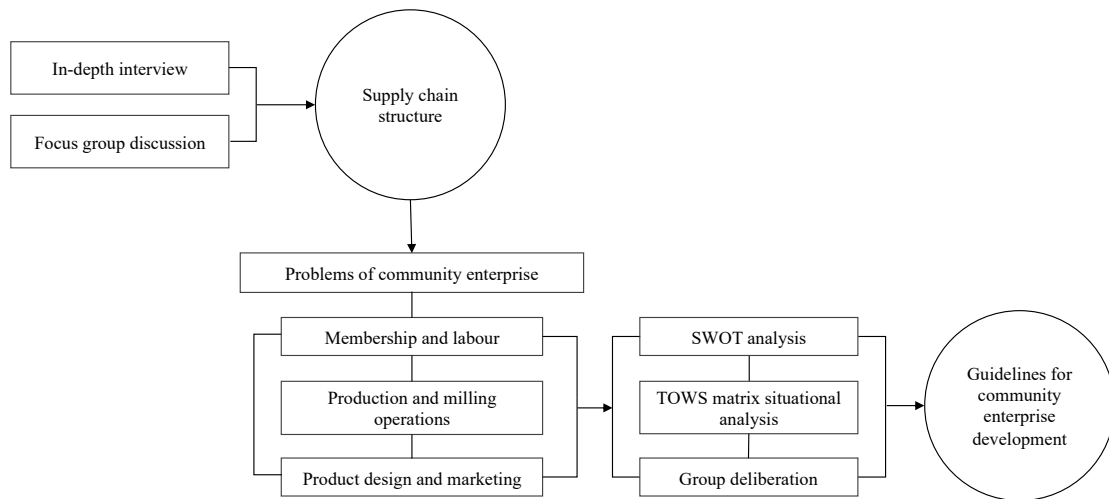


Figure 3.8. The conceptual framework for the community enterprise study

### 3.4.2 Structural equation modelling

Consumer data were analysed using SPSS and AMOS v. 26.0.0. As suggested by Hair et al. (1998), a two-step structural equation modelling was conducted to test the proposed hypotheses. The variables analysed in this model are attitude, subjective norms, perceived behavioural control, health consciousness, environmental concern, cost perception, knowledge of product traceability, and purchase intention. First, exploratory factor analysis was used to examine the scale items and identify poorly fitting items (Ham et al., 2018). No cross-loadings were identified; however, one item was dropped because of its low factor loading, which was less than the cut-off value of 0.50 (ENVI\_1). Subsequently, confirmatory factor analysis was performed to refine the scale items further (Wang et al., 2019b). The validity and reliability of the measurement model were assessed, based on the acceptable values of the following indicators: composite reliability (CR) and convergent and discriminant validity.

The moderating role of product traceability knowledge was explored by creating interaction terms; that is, multiplying the composite constructs of attitude, subjective norms, perceived behavioural control, health consciousness, environmental concerns, and cost perceptions by the composite construct of knowledge of product

traceability (Wang et al., 2019b). The adequacy of the measurement, structural, and path interaction models was tested using the most commonly used goodness-of-fit indices: the chi-square degree of freedom ratio ( $\chi^2/df$ ), comparative fit index (CFI), standardised root mean square residual (SRMR), and root mean square error of approximation (RMSEA) (Bagozzi & Yi, 2012).

### 3.4.3 Binary logistic regression analysis

Farmers' responses were thoroughly checked and coded for statistical analysis. Data were entered in SPSS version 26.0.0. The variables analysed in this model were farmer and farm characteristics (gender, age, education level, rice farming experience, household members, family labour, farm size, yield) production and management information (seed input source, soil quality assessment, infestation incidence, buying price, training attendance, credit access, extension support), and perception towards consumer information. To examine the reliability of the Likert scale data on farmers' perception, consistency analysis was done using Cronbach's alpha method (Cronbach, 1951). Since these items represent as one factor, a factor analysis was done using the maximum likelihood estimation method with Promax rotation. As expected, one factor emerged, and the factor score was saved for use in the binary logistic regression analysis. An independent sample t-test was done to determine any statistical differences in independent variables across organic and non-organic farmers groups.

For the logistic regression analysis, this study assumed that adoption or non-adoption decision is a function of the farm and farmer characteristics, production and management characteristics, and perception towards consumer information aspects (Pilarova et al., 2018; Sapbamrer & Thammachai, 2021; Zhang et al., 2018). Hence, each farmer's adoption decision is represented by a binary dependent variable ( $Y$ ) as follows (Garson, 2014a):

$$Y = \begin{cases} 0, & \text{if the farmer is a non – organic farmer} \\ 1, & \text{if the farmer is an organic farmer} \end{cases}$$

To model the relationship between the dependent variable,  $Y$ , and independent variables,  $X_i$ , the main binary choice model is shown in Equation 1. The  $P$  in the equation is represented by Equation 2 which calculates the probability of the outcome variable  $Y=1$  given the predictors in the model (Garson, 2014a).

$$\ln \left( \frac{P}{1-P} \right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_i X_i + \mu \quad (\text{Eq. 1})$$

$$P = F(Y = 1 | X_i) = \frac{1}{1 + e^{-Y}} \quad (\text{Eq. 2})$$

A linear combination of explanatory variables  $X_i$  ( $i = 1, 2, \dots, 16$ ) is presented in Equation 3.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{16} X_{16} + \mu \quad (\text{Eq. 3})$$

Where:  $\alpha$  is the intercept parameter  
 $\beta_i$  is the regression coefficient  
 $\mu$  is the random error term

The log odds,  $\ln \left( \frac{P}{1-P} \right)$ , represent the logarithm of the probability of adoption

( $p$ ) and the probability of non-adoption ( $1-p$ ) (Garson, 2014b). The main binary choice model demonstrates that if  $X_i$  changes by one unit, the odds ratio changes  $e^\beta$ , while other variables remain constant. Hence, a straightforward comparison can be obtained between the contribution of variables and farmers' adoption intention. Considering the possibility of high multicollinearity among predictors, this study uses the tolerance of statistical indicators to explain the multicollinearity problems between the variables upon model estimation. The results showed that the tolerance factor of all predictor variables is greater than 0.10, and the variance inflation factor (VIF) is below 10 (Garson, 2014a). Thus, the logit model does not have multicollinearity issues.

## CHAPTER 4. RESULTS

This chapter presents the results in the assessment of the current supply chain of Ban Nong Saeng community enterprise, formulation of strategic guidelines for community enterprise development; investigation of consumers' purchase intention towards traceable organic rice; and determination of the factors affecting farmers' organic farming adoption. These are arranged as follows:

4.1 Supply Chain Structure, Problems, and Strategic Guidelines for Community Enterprise Development

4.2 Community Enterprise Consumers' Intention to Purchase Organic Rice: The Moderating Role of Product Traceability Knowledge

4.3 Community Enterprise Farmers' Intention to Adopt Organic Rice Farming and The Role of Consumer Information

### **4.1 Supply Chain Structure, Problems, and Strategic Guidelines for Community Enterprise Development**

#### 4.1.1 Supply chain structure of Ban Nong Saeng community enterprise

The supply chain structure of Ban Nong Saeng community enterprise is shown in Figure 4.1. The enterprise's supply chain comprises three main parts – upstream, midstream, and downstream. The following description is presented according to the three main flows of a supply chain – product, information, and financial flow.

**Product flow.** The input suppliers and the farmers comprise the upstream part of the community enterprise's supply chain. The enterprise has its fertiliser and seed bank facilities available for use by its members. As for membership, the enterprise has a total of 46 farmers: 23 of which were GAP certified rice producers, 15 of which were under Organic Thailand certification, and eight of which produced organic rice under the traditional system (uncertified). The farmers' primary role is to produce rice

according to standards. Jasmine rice and riceberry are the two main rice varieties. The paddy rice produced by farmers goes to the collector. The collector then forwards the aggregated paddy rice to the two processors – the primary and final processors. The primary processor mills the collected rice using the enterprise’s rice mill. The primary processor has to ensure that the paddy rice is processed according to the enterprises’ quality standards. The processing output in this stage is polished rice.

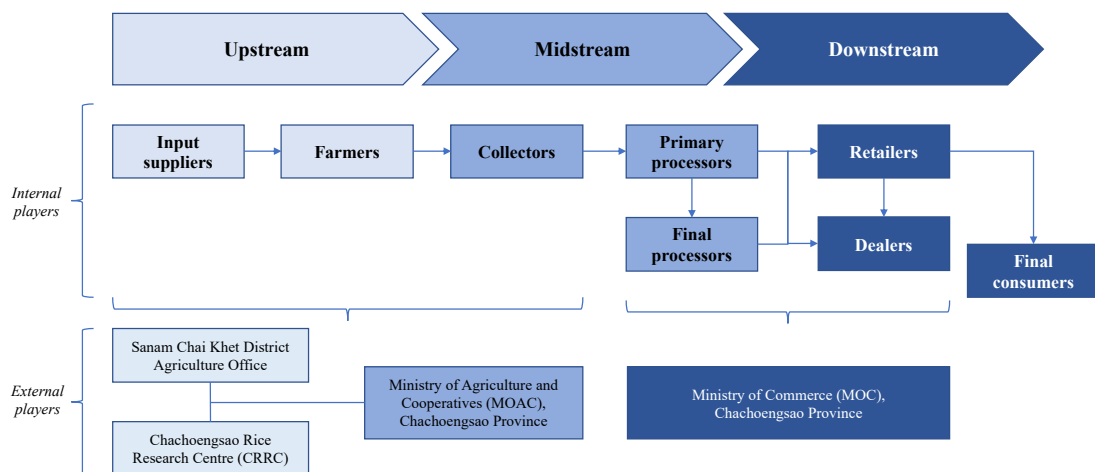


Figure 4.1. Simplified supply chain structure of Ban Nong Saeng community enterprise, Sanam Chai Khet district, Chachoengsao province, Thailand

Primary processed or polished rice goes to the final processor. The final processor is responsible for adding value to the polished rice through vacuum-packing and branded packaging. The final processor has to ensure that the packaging facilitates transportation and handling of rice to the distributors and dealers. There are four types of value-added rice products by the community enterprise under the brand ‘Pin Phet Farm’. These are the polished Jasmine rice for scoop, vacuum-packed Jasmine rice, vacuum-packed riceberry rice, and polished Jasmine brown rice for scoop.

Moving forward the supply chain are the retailers and dealers. Retailers sell both vacuum-packed and scooped rice to consumers within and outside the community enterprise. On the other hand, the dealers sell rice in large volumes at different shops. In the interviews, it was revealed that the enterprise distributes rice to different markets

situated in PTT Phanom Sarakham, Sanam Chai Khet Hospital, Wat Phra That Wayo and the community enterprise's farmers' market. Final consumers buy community enterprise's rice products from these markets. These distribution outlets reduce the burden of farmers in finding markets for their rice products. In addition, they help in marketing communication and encourages more consumers to purchase community enterprise's rice products. Figure 4.2 shows the vacuum-packed rice products of Ban Nong Saeng community enterprise.



Figure 4.2. Vacuum-packed rice products of Ban Nong Saeng community enterprise

Like most businesses' supply chain, external players also play important roles. This study has found four key players outside of the community enterprise supply chain. First, the Sanam Chai Khet District agriculture office supports the community enterprise farmers through sharing technical knowledge on rice production and organising exhibits to support the marketing of enterprise's products. This enables the enterprise to sell their rice products to other consumers such as visitors and tourists aside from the local consumers within their immediate market reach. Second, the Chachoengsao Rice Research Centre provides the enterprise with open-pollinated varieties (OPV) of quality rice seeds that are used by farmers, which can also be used in the next growing season. Third, the Ministry of Agriculture and Cooperatives

(MOAC) also supports the enterprise in terms of farm record keeping and capacity development. These programs by the ministry are part of their mission in transforming traditional farming into smart farming system. Finally, the Ministry of Commerce (MOC) provides access to convenient product distribution through opening various channels which allows farmers to have more outlets for their products. The ministry also supports in the development of community enterprise's products.

**Information flow.** As for the supply chain's information flow, farmers major source of all information (technical, input price, selling price) were their co-farmers. Other farmers also reported to have obtained information from the community enterprise group itself. Social media and television are least considered by farmers as sources of information. Meanwhile, farmers also get other information from players outside of the community enterprise, namely from the district's agriculture office for input and production-related information, and the MOAC and MOC for marketing-related information. Moreover, to the consumers, Ban Nong Saeng community enterprise provides information about their different rice products such as variety-specific information, cooking instructions (i.e., rice to water ratio), among others. The community enterprise also receives feedback from its consumers and considers this feedback for future product and service development.

**Financial flow.** Payment flow of the enterprise's rice (i.e., paddy and milled) was also investigated (Figure 4.3). It was found that paddy rice products are sold by farmers at an average of 13 THB/kg to collectors. These collectors hand over aggregated rice to processors at the same price. At this stage, the price range of both milled and vacuum-packed rice ranges from 18-36 THB/kg, sold by processors to retailers and dealers. Ultimately, consumers purchase the community enterprise's rice

products from various distribution outlets. Rice sold per scoop are priced at 40 THB/kg while vacuum-packed rice products ranged from 60-80 THB/kg.

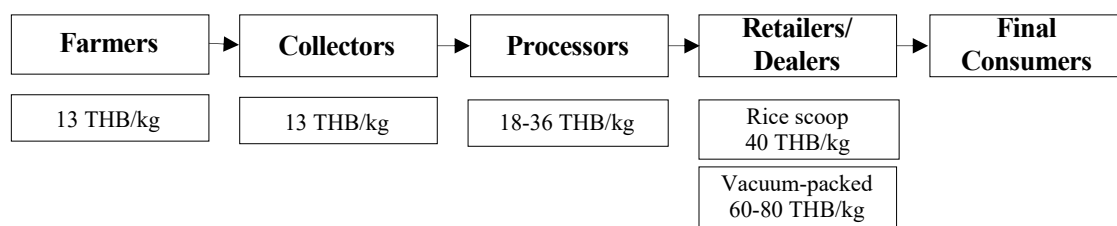


Figure 4.3. Selling price of rice as it passed through the supply chain  
(Note: 10 THB = 0.30 USD, September 2021)

As for the cost structure of Ban Nong Saeng community enterprise's 1-kg vacuum packed Riceberry and Jasmine Rice 105, total variable cost was computed at 55.18 THB/kg and 45.18 THB/kg, respectively (Table 4.1). This amount included the costs of rice, vacuum bag, and stickers, among others. The total fixed cost amounted to 1.10 THB/kg for both 1-kg vacuum packed Riceberry and Jasmine Rice 105. The total product cost was computed at 56.28 THB/kg and 46.28 THB/kg, respectively. Given the product price of 80.00 THB/kg and 60.00 THB/kg, results revealed that Ban Nong

Table 4.1. Cost structure of Ban Nong Saeng community enterprise's 1-kg vacuum packed Riceberry and Jasmine Rice 105

Cost items	Amount (THB/kg)	
	Riceberry	Jasmine Rice 105
<i>Variable cost</i>		
Rice	45.00	35.00
Vacuum bag	3.50	3.50
Sticker	5.00	5.00
Vacuum compression	1.00	1.00
Wages	0.33	0.33
Utilities	0.35	0.35
<b>Total variable cost</b>	<b>55.18</b>	<b>45.18</b>
<i>Fixed cost</i>		
Vacuum sealer depreciation	0.77	0.77
Sales representative	0.33	0.33
<b>Total fixed cost</b>	<b>1.10</b>	<b>1.10</b>
<b>Total product cost</b>	<b>56.28</b>	<b>46.28</b>
<b>Product price</b>	<b>80.00</b>	<b>60.00</b>
<b>Profit</b>	<b>23.72</b>	<b>13.72</b>

Saeng community enterprise had profit of 23.72 THB/kg and 13.72 THB/kg for both 1-kg vacuum packed Riceberry and Jasmine Rice 105. Meanwhile, Figure 4.4 shows the computed value added for vacuum packed Jasmine Rice 105 as it passed through the supply chain.

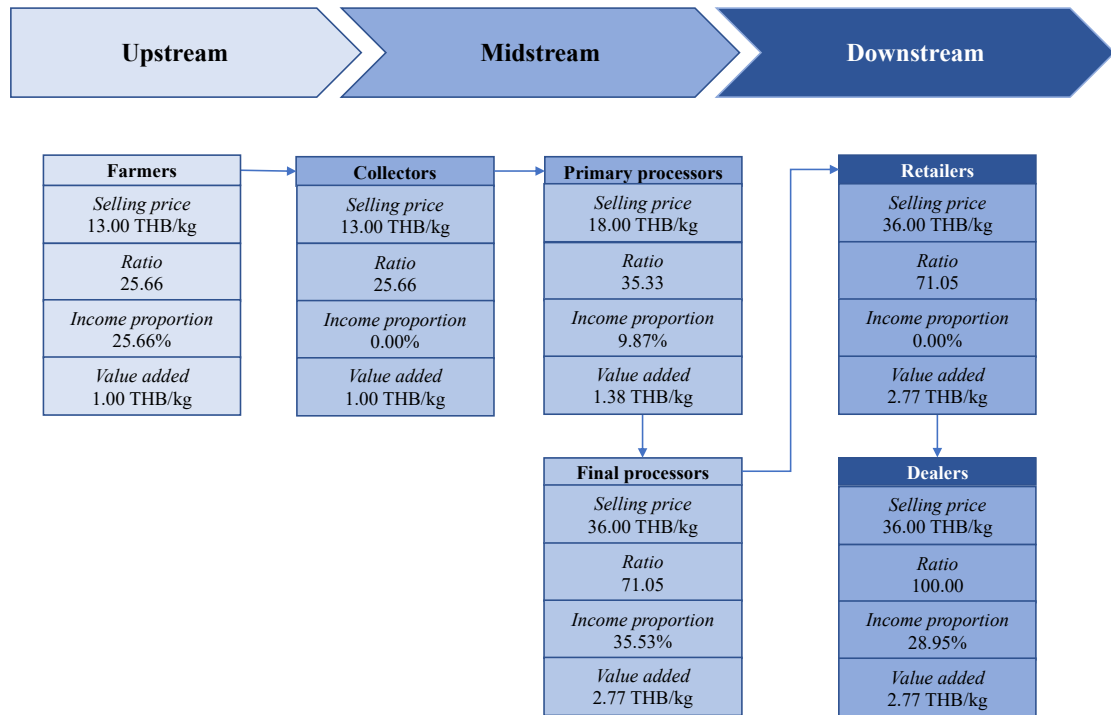


Figure 4.4. Value added for vacuum packed Jasmine Rice 105 as it passed through the supply chain

#### 4.1.2 Problems encountered by the community enterprise

Table 4.2 shows the problems faced by the RPCE. The qualitative investigation found several issues in the areas of 1) membership and labour, 2) production and milling operations, and 3) product design and marketing. A description of each problem is given in the following sections. The highest number of problems found in the enterprise were related to product design and marketing. It was revealed that the enterprise had no distinct brand since it had undergone frequent brand changes in the past, which made consumers find it difficult to recognise their product. Apart from this, the current packaging design lacked attractiveness and popularity to the consumers.

The enterprise would like to improve this aspect, but they had inadequate technical knowledge and skills to develop attractive brands. They also lacked analysis of the marketing environment and consumer behaviour that would give insights into improving their organic rice products' marketing system. These aspects needed consumer information to analyse, improve and develop their existing products. In line with the emerging trends in product marketing today, the enterprise currently had no traceability system to assure consumers of product safety and quality. The enterprise also revealed that the frequent changes in the rice marketing environment made them unable to adopt some of it. For them, the rice product business was highly competitive. For place-related concerns, most consumers today prefer to buy through online platforms or delivery services. The skill to operate in this type of marketing channel was missing in the CE. The enterprise still followed the traditional marketing system, which did not target specific market segments.

Table 4.2. Main problems encountered by Ban Nong Saeng community enterprise

<b>Problem category</b>	<b>Problems</b>
Membership and labour	<ul style="list-style-type: none"> <li>• Ageing population of famer-members, slow to adopt new farming techniques</li> <li>• Absence of new generation farmers</li> <li>• Inadequate postharvest management skills of farmers</li> </ul>
Production and milling operations	<ul style="list-style-type: none"> <li>• High rice production costs by farmers</li> <li>• Negative impacts of drought stress on rice yield quality and aroma</li> <li>• Low rice mill capacity-utilisation</li> <li>• Absence of rice mill certification</li> <li>• Low quality of some milled rice</li> </ul>
Product design and marketing	<ul style="list-style-type: none"> <li>• Absence of distinct brand; had undergone frequent brand changes in the past</li> <li>• Lack of attractiveness and popularity of the current packaging design</li> <li>• Inadequate knowledge of marketing environment and consumer behaviour analyses</li> <li>• Absence of traceability system to give consumers assurance of product safety and quality</li> <li>• Frequent changes in the rice marketing environment</li> </ul>

Production and milling operations concerns comprise the second most-reported problem the enterprise faced. In the production aspect, farmers had highlighted the high costs incurred in rice farming. As most of them have no access to irrigation, the negative impact of drought stress has also affected farmers' rice yield and aroma. The actual volume processed is less than its processing capacity in the milling aspect, leading to the rice mill's low-capacity utilisation. The rice mill's maximum capacity was 2,400 kg per day. However, it was found that it only processed an average of 500 kg per day from available paddy rice from its members. Also, the enterprise's rice mill had yet undergone certification, and reportedly, milled rice were of low quality. In the membership and labour aspect, there was an ageing population of farmer-members. This made them slow to adopt new farming techniques. Moreover, some of them lacked postharvest management skills, affecting the quality of their yield.

#### 4.1.3 SWOT analysis of Ban Nong Saeng community enterprise

The enterprise had faced several problems based on a general scan of its external and internal environments. The symptoms were identified and linked to areas of potential matches (strengths and opportunities) or mismatches (weaknesses and threats) between the RPCE and its changing environment (Nijssen & Frambach, 2001). These internal and external factors were analysed and presented in Table 4.3 to assist in strategy formulation to develop the enterprise.

*Strengths and weaknesses.* The enterprise produced rice under the GAP and organic system certified by the Organic Agriculture Certification Thailand (ACT). The enterprise also had the available fund to support and manage the group. In terms of capacity building and information sharing, the enterprise had regularly conducted meetings, training, and knowledge transfers for its group members. It was also one of

the enterprise's strengths to have had a chairman with competent leadership able to handle the immediate challenges they faced.

Table 4.3. Strengths, weaknesses, opportunities, and threats (SWOT) of Ban Nong Saeng community enterprise

<b>Strengths</b>	<b>Weaknesses</b>
<b>S1.</b> Rice production under good agricultural practices (GAP) and organic system certified by organic Thailand	<b>W1.</b> Farmers' slow adoption of modern rice farming techniques
<b>S2.</b> Availability of funds to support and manage the CE group	<b>W2.</b> Lack of postharvest management skills
<b>S3.</b> Conduct of regular meetings, training, and knowledge transfers to group members	<b>W3.</b> Absence of distinct product brand
<b>S4.</b> Competent leadership skills of the chairman	<b>W4.</b> Lack of attractiveness and popularity of the current packaging design
	<b>W5.</b> Absence of traceability system to give consumers assurance of product safety and quality
	<b>W6.</b> Inadequate knowledge of marketing environment and consumer behaviour analyses
	<b>W7.</b> Inadequate technical knowledge and skills to develop and create attractive brands
<b>Opportunities</b>	<b>Threats</b>
<b>O1.</b> Availability of support from the district agricultural office	<b>T1.</b> High costs of rice production, 3,150 THB/rai (approximately 625 USD/ha)
<b>O2.</b> Provision of quality rice seeds by the Chachoengsao Rice Research Centre	<b>T2.</b> Negative impacts of drought to rice yield quality and aroma
<b>O3.</b> Availability of support from MOAC in terms of farm record keeping and capacity development for Smart Farmer	<b>T3.</b> Frequent changes in the rice marketing environment
<b>O4.</b> Health-conscious consumers who prefer to purchase organic rice	<b>T4.</b> Changes in consumer buying preference (online or delivery)
<b>O5.</b> Enterprise location being near tourist-visited areas (who prefer to buy local products)	<b>T5.</b> Competition with other rice marketing businesses

However, even with these strengths, various weaknesses were noted. On the farmer side, it has been a concern that farmers were slow to adopt modern farming techniques because of their ageing population. This explains why they lack knowledge of postharvest management skills. On the product side, it was found that the enterprise had no distinct brand since it had undergone frequent brand changes in the past, which

made the consumers unable to recognise their product. Besides, the current packaging design lacked attractiveness and popularity to the consumers. Inasmuch as the enterprise would like to improve their current packaging, they had insufficient knowledge and skills to develop and create attractive brands. They had inadequate knowledge of marketing environment and consumer behaviour analyses that would help them develop engaging brands. The enterprise also lacked the traceability feature in their rice package to assure consumers product safety and quality. This feature has become a new trend in product packages nowadays.

***Opportunities and threats.*** Assessment of the external environment revealed that various agencies had extensively supported the enterprise. Sanam Chai Khet district's agriculture office had been very supportive to the enterprise in terms of technical knowledge on rice production and organising exhibits to support marketing their products. This enables them to sell their rice to other consumers such as visitors and tourists, aside from local consumers in the CE market. In terms of farm-related assistance, the Chachoengsao Rice Research Centre provides quality seeds for their production and can also be used in their next growing season. The Ministry of Agriculture and Cooperatives (MOAC) has also supported the enterprise in terms of farm record keeping and capacity development as part of their activities of transforming traditional farming into a smart farming system. Apart from these, the growing population of health-conscious consumers is also an opportunity for the enterprise. It is known that Sanam Chai Khet district, Chachoengsao province is just two hours away from Bangkok and strategically located near tourist-visited areas.

However, even with these opportunities, threats were also noted, including the high rice production costs. Drought also negatively affects their rice yield quality and aroma. In the marketing aspect, the rice marketing environment's frequent changes

make them unable to adopt, particularly changes in consumer behaviour. As observed, there has been an increasing trend in consumers buying through online channels or delivery. The enterprise lacks the skill to operate in this type of marketing channel. The competition with other businesses also adds up to this threat.

#### 4.1.4 Strategic options using TOWS matrix

This study has identified key strategic options for the enterprise using the TOWS matrix situational analysis, presented in Table 4.4. The TOWS matrix categorised the strategic options as aggressive (S-O), turnaround (W-O), diversification (S-T), and defensive (W-T). Important strategic options for the enterprise are described in the following section.

***Aggressive and turnaround strategies.*** For aggressive strategies, the enterprise should consider establishing new markets and developing new product packaging that enables consumers to trace product information. This approach would best utilise the enterprise strengths and make optimum use of its opportunities. Designing products in collaboration with academic institutions could also be a great move. Meanwhile, as turnaround strategies, the enterprise can minimise its weakness and maximise its opportunities (e.g., such supportive local institutions) in considering strategies such as conducting intensive training programmes on new farming techniques and postharvest management skills. It would also be wise for the enterprise's rice mill to be certified to correct such weakness.

Table 4.4. Strategic options for Ban Nong Saeng community enterprise development

The community enterprise	Internal factors	
	Strengths (S)	Weaknesses (W)
External factors	<p><i>S-O strategies</i></p> <p>Opportunities (O)</p> <ul style="list-style-type: none"> <li>• Establish new markets near areas highly visited by tourists (S2,4 &amp; O5).</li> <li>• Give opportunities to youth residents to work as part-time workers on the farm (S3,4 &amp; O3,1).</li> <li>• Develop a packaging that enables consumers to trace product information and assure safety and quality (S1 &amp; O4).</li> <li>• Design products in collaboration with academic institutions (S2,4 &amp; O4).</li> </ul>	<p><i>W-O strategies</i></p> <ul style="list-style-type: none"> <li>• Conduct intensive training programs about new farming techniques (W1 &amp; O3,1).</li> <li>• Train rice farmers about postharvest management skills and capacity development (W2 &amp; O3,1).</li> <li>• Apply for rice mill certification (W2,3 &amp; O1).</li> <li>• Improve machine utilisation through increasing paddy rice supply (W2 &amp; O1).</li> <li>• Develop brand and packaging designs distinct to the CE (W3 &amp; O4,5).</li> </ul>
	<p><i>S-T strategies</i></p> <p>Threats (T)</p> <ul style="list-style-type: none"> <li>• Develop community markets and young social entrepreneurs to promote CE products (S2,4 &amp; T3,5).</li> <li>• Build social media presence, promote, and venture into selling products online (S4 &amp; T3,4).</li> <li>• Use drought-tolerant rice varieties during the dry season (S1,2 &amp; T2).</li> <li>• Apply for other organic rice product certifications (S2 &amp; T5).</li> </ul>	<p><i>W-T strategies</i></p> <ul style="list-style-type: none"> <li>• Analyse factors determining consumers' purchase intention for organic rice (W4,6 &amp; T4,5).</li> <li>• Employ research-based strategies and technologies on improving rice production and milling efficiency and quality (W1,2 &amp; T1,2).</li> <li>• Assess farmers' intention to adopt new farming technologies (W1 &amp; T1).</li> <li>• Improvement of postharvest management techniques (W2 &amp; T1).</li> <li>• Use modern farm techniques and more efficient farm planning (W1 &amp; T1).</li> </ul>

***Diversification and defensive.*** As for the diversification strategies, the enterprise should consider taking advantage of its strengths, such as the availability of support funds and competent leadership skills through developing community markets and young social entrepreneurs, among others. In this way, its threats (e.g., competition with peers and changing consumer behaviour) in the rice marketing business can be countered by this strategy. Finally, as defensive strategies, research-based approaches to improving rice production and milling efficiency, consumers' purchase intention, and farmers' technology adoption intention could minimise the enterprise's weaknesses

and avoid threats. Utilising modern farm and postharvest techniques could also be an important consideration.

#### 4.1.5 Guidelines for community enterprise development

Key strategic options were discussed and plotted against each of the problem categories identified to serve as a guide for the enterprise in undertaking specific strategies. Table 4.5 presents these enterprise-level guidelines. On the membership and labour category, it was also a major concern among farmers the low adoption of modern farming technologies.

Table 4.5. Strategic guidelines for Ban Nong Saeng community enterprise development

<b>Problem category</b>	<b>Strategic guideline</b>
Membership and labour	<ul style="list-style-type: none"> <li>• Conduct intensive training programs on new farming techniques</li> <li>• Train rice farmers about postharvest management skills and capacity development</li> <li>• Assess farmers' intention to adopt new farming technologies</li> <li>• Give opportunities for youth residents to work as part-time workers on the farm</li> </ul>
Production and milling operations	<ul style="list-style-type: none"> <li>• Employ research-based strategies and technologies on improving rice production and milling efficiency and quality</li> <li>• Improvement of postharvest management techniques (e.g., field drying, threshing, and cleaning)</li> <li>• Use modern farm techniques (e.g., nutrient management, and pest and disease control) and more efficient farm planning</li> <li>• Use drought-tolerant rice varieties during the dry season</li> <li>• Apply for rice mill certification</li> <li>• Improve machine utilisation through increasing paddy rice supply</li> </ul>
Product design and marketing	<ul style="list-style-type: none"> <li>• Apply for other organic rice product certifications</li> <li>• Develop distinct brand and packaging designs</li> <li>• Analyse factors determining consumers' purchase intention for organic rice</li> <li>• Design products in collaboration with academic institutions</li> <li>• Develop a packaging that enables consumers to trace product information and assure safety and quality</li> <li>• Build social media presence, promote, and venture into selling products online</li> <li>• Develop community markets and young social entrepreneurs to promote CE products</li> <li>• Establish new markets near areas highly visited by tourists</li> </ul>

It is suggested to conduct intensive training programmes about new farming techniques, such as nutrient management, and pest and disease control, to encourage them to adopt new technologies. It is also important to train rice farmers about postharvest management skills (e.g., field drying, threshing, and cleaning) and develop their capacity on these aspects by participating in training programmes from the government and other concerned agencies. As the ageing farmers' population is evident in the area, it is also suggested to give youth residents opportunities to work as part-time employees on the farm. In this way, they can appreciate the importance of rice farming and be more inclined to adopt to latest farming technologies.

On the production aspect, it is recommended for farmers to employ research-based strategies to improve rice production and milling efficiency by following recommendations based on research results. The use of modern farm techniques (e.g., nutrient management, and pest and disease control) and more efficient farm planning would help reduce farmers' high production costs. It was also highlighted that the drought had greatly affected the farmers' yield. Therefore, farmers are advised to adopt drought-tolerant rice varieties during the dry season. The enterprise should also subject their rice mill to certification (i.e., Good Manufacturing Practices or GMP, and Hazard Analysis Critical Control Point or HACCP) to compete with other rice businesses and ensure that its rice quality is regulated and ensured. As for the rice mill operating below its capacity, increasing the rice paddy supply would improve its capacity utilisation. The enterprise should outsource paddy from other farmer groups to meet the machine's volume requirement and operate near its maximum capacity. It is also recommended to assess farmers' intention to adopt new farming technologies to determine what significant factors drive their intention to adopt. In this way, the approach is more targeted to improve farmers' adoption intention.

On the product design and marketing aspect, although organic rice has been certified in Organic Thailand and GAP, the enterprise should also apply for other product certifications such as HACCP and GMP, especially that they are into milled rice processing. This is to ensure consumers that their products have passed specific performance and quality assurance tests. It would also be a strategic move to establish their brand and packaging designs distinct to the CE. This can be more effectively done by analysing factors determining consumers' purchase intention for their rice products, especially organic rice. The enterprise can also collaborate with academic institutions. Furthermore, in line with the increasing food safety concerns today, the enterprise should adopt the traceability feature for their products to enable consumers to trace product information and assure safety and quality. Another aspect that the enterprise should focus on is building its social media presence since purchasing products online has become a growing consumer trend. In this way, the enterprise can promote and venture into selling products online. Locally, the enterprise can develop community markets and young social entrepreneurs to promote CE products. Lastly, the enterprise can also establish new markets in areas that tourists highly visit.

## **4.2 Community Enterprise Consumers' Intention to Purchase Organic Rice: The Moderating Role of Product Traceability Knowledge**

### **4.2.1 Socio-economic and demographic profile of consumers**

The socio-economic and demographic characteristics of consumers were analyzed, and the summary is presented in Table 4.6. The results indicate that most consumers (74.1%) were females, while 25.9% were males. The majority of the respondents were 51 years old and older; this accounts for 34.2% of sampled respondents. Most of the respondents were married (56%). As with education level, many of the consumers (36.6%) were bachelor's degree holders, followed by primary

school (18.5%) and vocational high school (15.6%) levels. The sample analysis results also show that most of the respondents had an income in the 10,001 to 20,000 THB bracket, and the highest proportion of respondents (85.2%) lived in one to five-person households. As with occupation, most of the respondents (22.9%) are business owners.

Table 4.6. Socio-economic and demographic profile of consumers

<b>Sample characteristics</b>	<b>n</b>	<b>%</b>
<b>Gender</b>		
Male	63	25.9
Female	180	74.1
<b>Age group (years)</b>		
18-21	3	1.2
22-26	14	5.8
27-35	45	18.5
36-45	64	26.3
46-50	34	14.0
51 and older	83	34.2
<b>Marital status</b>		
Single	85	35.0
Married	136	56.0
Divorced	13	5.3
Widowed	9	3.7
<b>Educational level</b>		
Lower than primary school	4	1.6
Primary school	45	18.5
Junior high school	27	11.1
Vocational high school	38	15.6
Diploma or vocational certificate	16	6.6
Bachelor's degree	89	36.6
Postgraduate	24	9.9
<b>Household size</b>		
1-5	207	85.2
6-10	36	14.8
<b>Monthly household income</b>		
Less than or equal to 10,000 THB	46	18.9
10,001 to 20,000 THB	87	35.8
20,001 to 30,000 THB	61	25.1
30,001 to 40,000 THB	29	11.9
40,001 THB and above	20	8.2
<b>Occupation</b>		
Farmer	40	16.5
Business owner	71	22.9
Government employee	43	17.7
Private company employee	40	16.5
Freelancer or daily wage earner	44	18.1
Student	5	2.1

#### 4.2.2 Confirmatory factor analysis

After assessing the measurement model, no reliability and validity issues were found, as all values obtained were within acceptable thresholds. Construct reliability was demonstrated by CR values greater than 0.70 (Fornell & Larcker, 1981). Convergent validity was also established for each construct, as demonstrated by average variance extracted (AVE) values greater than 0.50. The discriminant validity of each construct was assessed using the values of the maximum shared variance (MSV) and the square root of the AVE. In this study, the MSV was less than the AVE, and the square root of the AVE was greater than the inter-construct correlations, ensuring discriminant validity (Chin et al., 1997). Thus, the measurement model is acceptable, as the reliability and validity test results are satisfactory (Table 4.7). The fit indices presented also suggest that the data fit the measurement model well. Following Bagozzi & Yi (2012), all fit index values were above the recommended thresholds (i.e.  $\chi^2/df < 3.0$ ,  $CFI \geq 0.9$ ,  $SRMR < 0.07$ , and  $RMSEA < 0.07$ ).

Table 4.7. Correlations, means and standard deviations of the constructs

	ATT	SN	PBC	HEC	ENVI	COST	KNOW	PI
ATT	<b>0.798</b>							
SN	0.772***	<b>0.917</b>						
PBC	0.669***	0.738***	<b>0.888</b>					
HEC	0.538***	0.482***	0.562***	<b>0.797</b>				
ENVI	0.506***	0.512***	0.477***	0.492***	<b>0.760</b>			
COST	0.649***	0.612***	0.685***	0.503***	0.657***	<b>0.795</b>		
KNOW	0.449***	0.514***	0.595***	0.314***	0.399***	0.566***	<b>0.863</b>	
PI	0.510***	0.597***	0.645***	0.473***	0.455***	0.690***	0.665***	<b>0.918</b>
Mean	3.96	3.66	3.70	4.21	3.78	3.77	3.33	3.80
S.D.	0.71	0.87	0.91	0.71	0.78	0.77	0.98	0.89

Diagonal values in bold represent the square root of the AVE. ATT – attitude, SN – subjective norms, PBC – perceived behavioral control, HEC – health consciousness, ENVI – environmental concerns, COST – cost perceptions, KNOW – knowledge of product traceability, PI – purchase intention.

Significance: \*\*\*  $p < 0.001$ , \*\*  $p < 0.010$ , \*  $p < 0.050$ .

#### 4.2.3 Assessment of common method bias and multicollinearity

Common method bias (CMB) was tested using Harman's single-factor test, one of the most widely used approaches, to assess any biases in how the respondents evaluated the predictors and standard variables (Fuller et al., 2016). The test revealed that CMB was not a problem in this study, as indicated by the covariance explained by one factor, which, after unrotated factor analysis, was only 44.39%. Hence, a single factor does not account for the majority of the variance. Additionally, the variance inflation factor values of each construct were all less than 5.00, confirming that no multicollinearity issues were presented (O'brien, 2007).

#### 4.2.4 Structural equation modelling

The structural equation modelling results indicated that the model had a good fit, as the overall fit measures indicated excellent values ( $\chi^2/df = 1.822$ , CFI = 0.962, SRMR = 0.039, RMSEA = 0.058). These values were all above the recommended thresholds ( $\chi^2/df < 3.0$ , CFI  $\geq 0.9$ , SRMR  $< 0.07$ , and RMSEA  $< 0.07$ ) suggested by Bagozzi & Yi (2012).

Regarding the hypothesised relationships, the results revealed that among the TPB variables, subjective norms ( $\beta = 0.213$ ,  $p < 0.05$ ) was the only significant factor determining purchase intention. Attitude ( $\beta = -0.148$ ,  $p > 0.05$ ) and perceived behavioural control ( $\beta = 0.071$ ,  $p > 0.05$ ) failed to show a significant influence on purchase intention towards traceable organic rice. Hence, H2 was accepted, while H1 and H3 were rejected. Among the additional variables, health consciousness ( $\beta = 0.144$ ,  $p < 0.05$ ) and knowledge of product traceability ( $\beta = 0.344$ ,  $p < 0.001$ ) emerged as the two significant determinants of purchase intention towards organic rice. Environmental concerns ( $\beta = -0.078$ ,  $p > 0.05$ ) failed to show a significant influence on purchase intention. Cost perceptions ( $\beta = 0.390$ ,  $p < 0.001$ ) showed a significant effect; however,

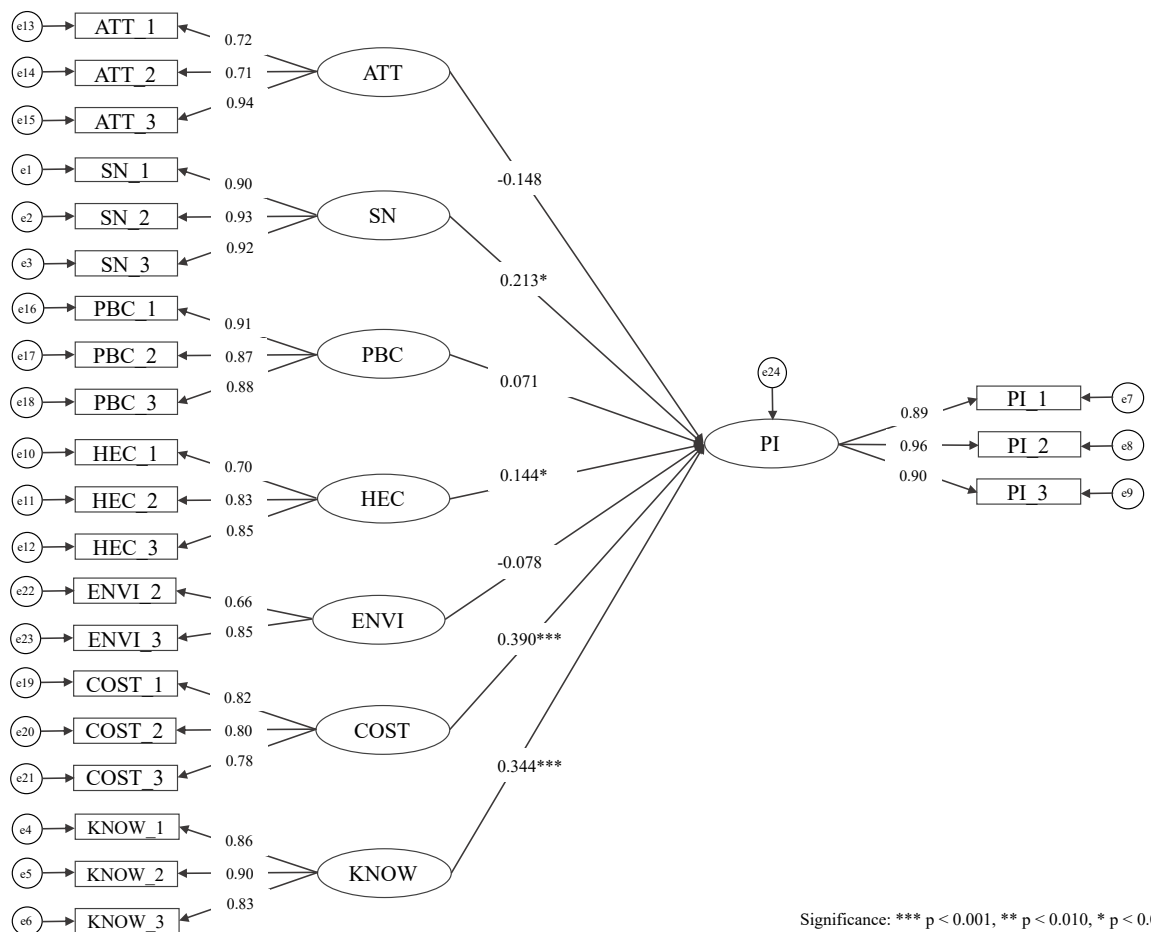
it was contrary to the proposed hypothesis. For these reasons, H4 and H7 were accepted, while H5 and H6 were rejected (Table 4.8; Figure 4.5). The structural model explained 62.8% of the variance, which is considered favourable.

Table 4.8. Results of the hypothesis testing on the direct effects

Hypothesis	Path coefficients	Estimate ( $\beta$ )	Proposed effect	Decision
H1	ATT $\rightarrow$ PI	-0.148	Positive	Rejected
H2	SN $\rightarrow$ PI	0.213*	Positive	Accepted
H3	PBC $\rightarrow$ PI	0.071	Positive	Rejected
H4	HEC $\rightarrow$ PI	0.144*	Positive	Accepted
H5	ENVI $\rightarrow$ PI	-0.078	Positive	Rejected
H6	COST $\rightarrow$ PI	0.390***	Negative	Rejected
H7	KNOW $\rightarrow$ PI	0.344***	Positive	Accepted

ATT – attitude, SN – subjective norms, PBC – perceived behavioural control, HEC – health consciousness, ENVI – environmental concerns, COST – cost perceptions, KNOW – knowledge of product traceability, PI – purchase intention.

Significance: \*\*\*  $p < 0.001$ , \*\*  $p < 0.010$ , \*  $p < 0.050$ .



Significance: \*\*\*  $p < 0.001$ , \*\*  $p < 0.010$ , \*  $p < 0.050$

Figure 4.5. Results of the structural equation modelling of the direct effects

#### 4.2.5 Moderating role of knowledge of product traceability

The moderating role of product traceability knowledge was explored to investigate whether this factor can strengthen the positive relationships observed among the independent variables and purchase intention. The path interaction model showed a good fit ( $\chi^2/df = 1.152$ , CFI = 1.000, SRMR = 0.004, RMSEA = 0.025), with values above the recommended thresholds. The interaction term of perceived behavioural control ( $\beta = 0.128$ ,  $p < 0.100$ ) was the only significant, indicating the moderating role of product traceability knowledge. All other interaction terms of attitude ( $\beta = 0.094$ ,  $p > 0.05$ ), health consciousness ( $\beta = 0.070$ ,  $p > 0.050$ ), environmental concerns ( $\beta = 0.039$ ,  $p > 0.05$ ), and cost perceptions ( $\beta = -0.097$ ,  $p > 0.05$ ) were not significant, indicating that product traceability knowledge lacked a moderating role. Subjective norms ( $\beta = -0.178$ ,  $p < 0.01$ ) showed a significant effect; however, this was contrary to the proposed hypothesis. For these reasons, among the moderation hypotheses, only H8c was accepted (Table 4.9). The path interaction model explained 71.9% of the variance, which is considered good.

Table 4.9. Results of the moderation analysis

Hypothesis	Statement	Estimate ( $\beta$ )	Decision
H8a	KNOW strengthens the positive relationship between ATT and PI.	0.094	Rejected
H8b	KNOW strengthens the positive relationship between SN and PI.	-0.178**	Rejected
H8c	KNOW strengthens the positive relationship between PBC and PI.	0.128 †	Accepted
H8d	KNOW strengthens the positive relationship between HEC and PI.	-0.070	Rejected
H8e	KNOW strengthens the positive relationship between ENVI and PI.	0.039	Rejected
H8f	KNOW dampens the negative relationship between COST and PI.	-0.097	Rejected

ATT – attitude, SN – subjective norms, PBC – perceived behavioral control, HEC – health consciousness, ENVI – environmental concerns, COST – cost perceptions, KNOW – knowledge of product traceability, PI – purchase intention. Significance: \*\*\*  $p < 0.001$ , \*\*  $p < 0.010$ , \*  $p < 0.050$ , †  $p < 0.100$ .

### 4.3 Community Enterprise Farmers' Intention to Adopt Organic Rice Farming and the Role of Consumer Information

#### 4.3.1 Socio-economic and demographic profile of farmers

Table 4.10 shows the socio-economic and demographic profile of community enterprise farmer members. The majority of the farmers were female (58.2%), and their average age was 57 years old. Most of the respondents only finished primary education (75.6%). As for farm experience, farmers had an average experience of 30 years. They had a mean household size of 4, and the majority of the farmers (70.6%) had off-farm employment. In terms of farm ownership and size, most farms are owned (76.6%) with an average size of 14.54 rai per farmer. The sample analysis results also showed that community enterprise farmers had an average rice yield of 384.03 kg/rai.

Table 4.10. Socio-economic and demographic profile of farmers

Characteristics	Category	Frequency	%
Gender	Male	84	41.8
	Female	117	58.2
Age (years)	Mean	57	
Education level	Primary education	152	75.6
	Secondary education	35	17.4
	Vocational certificate	2	1.0
	High vocational certificate	9	4.5
	Bachelor's degree	3	1.5
	Postgraduate	-	-
Farm experience (years)	Mean	30	
Household size (heads)	Mean	4	
Has off-farm employment	Yes	142	70.6
	No	59	29.4
Farm size (rai)	Mean	14.54	
Farm ownership	Owned	154	76.6
	Rented	23	11.4
	Both	24	11.9
Yield per rai (kg/rai)	Mean	384.03	

#### 4.3.2 Differences in mean characteristics of farmers

Table 4.11 presents the differences in the characteristics of organic and non-organic farmers with their t-values. Results show that only a few variables are significant. These variables are education level ( $t = -2.048, p < 0.05$ ), buying price ( $t = -2.242, p < 0.05$ ), training attendance ( $t = -6.304, p < 0.01$ ), credit access ( $t = -2.897, p < 0.01$ ), and extension support ( $t = -3.546, p < 0.01$ ). These differences in the mean characteristics between the two groups indicate that these factors may impact farmers' intention to adopt organic farming.

#### 4.3.3 Farmers' perception towards consumer information

Farmers generally have a high level of agreement towards consumer information (mean = 3.58 to 4.04) (Table 4.12). The results indicate that farmers agree with the idea that knowing product information is important among organic rice consumers (mean = 4.04), and those health-conscious consumers are the ones that usually prefer to purchase organic rice (mean = 4.03). Overall, these consumer information items had a Cronbach's alpha ( $\alpha$ ) of 0.911, greater than the threshold value of 0.70, ensuring the scale reliability (Cronbach, 1951).

Table 4.11. Variable differences between organic and non-organic farmers

Variables	Unit	Non-organic farmer (n = 157)		Organic farmer (n = 44)		t-Test
		Mean	SE	Mean	SE	
X <sub>1</sub> Gender	categorical	0.57	0.04	0.61	0.074	-0.478
X <sub>2</sub> Age	years	57.04	0.797	57.43	1.697	-0.225
X <sub>3</sub> Education level	--	1.27	0.046	1.55	0.128	-2.048 **
X <sub>4</sub> Rice farming experience	years	29.88	1.3	30.7	2.399	-0.299
X <sub>5</sub> Household members	person	4.19	0.153	4.34	0.313	-0.449
X <sub>6</sub> Family labour	person	2.22	0.111	2.1	0.155	0.535
X <sub>7</sub> Rice farm size	rai	14.86	0.839	13.39	1.093	1.072
X <sub>8</sub> Yield per rai	kg	395.39	8.193	389.2	13.56	0.362
X <sub>9</sub> Seed input source	categorical	1.76	0.078	2.05	0.162	-1.561
X <sub>10</sub> Soil quality	--	1.99	0.022	2	0.073	-0.168
X <sub>11</sub> Infestation incidence	--	1.828	0.0426	1.795	0.0895	0.349
X <sub>12</sub> Buying price	--	0.17	0.03	0.34	0.072	-2.242 **
X <sub>13</sub> Training attendance	--	0.49	0.04	0.89	0.048	-6.304 ***
X <sub>14</sub> Credit access	--	0.24	0.034	0.48	0.076	-2.897 ***
X <sub>15</sub> Extension support	--	0.85	0.029	0.98	0.023	-3.546 ***
X <sub>16</sub> Perception	categorical	3.82	0.055	4	0.084	-1.546

Note: \*\*\* and \*\* denotes significance at 1% and 5% levels, respectively; SE is standard error.

Table 4.12. Consumer information items and their rating

Consumer information items	Mean	Std. Dev.	$\alpha$
Organic rice consumers are positively influenced by their family and close friends' positive opinions and product usage.	3.58	0.738	0.911
Organic rice consumers are positively influenced by the positive reviews about the product.	3.69	0.857	
Consumers purchase organic rice that has product information that can easily be traced by themselves.	3.89	0.838	
Knowing the product information is important among organic rice consumers.	4.04	0.802	
Higher costs of organic rice products do not hinder consumers from buying.	3.92	0.767	
Health-conscious consumers prefer to purchase organic rice.	4.03	0.809	

Note:  $\alpha$  is Cronbach's alpha

#### 4.3.4 Empirical results of the model

The empirical model revealed that farmers' education level, seed input source, soil quality assessment, buying price, training attendance, and credit access are significant determinants influencing farmers' adoption intention (Table 4.13). Education level ( $\beta = 2.713$ ), seed input source ( $\beta = 2.188$ ), and training attendance ( $\beta = 1.849$ ) are significant at 1% level while buying price ( $\beta = 1.066$ ), and credit access ( $\beta = 0.987$ ) are significant at 10% level. These factors are positively related, implying that an increase in these variables will lead to higher adoption of organic rice farming.

In contrast, soil quality ( $\beta = -1.991$ ) is negatively related to farmers' adoption intention at 5% level, implying that farmers who assessed the soil fertility condition of their farm as moderate are less likely to adopt organic farming than those with low soil quality assessment. Other variables are not significant, suggesting that they have only a marginal or no effect on farmers' adoption. Both Nagelkerke and Cox and Snell R-square values are 0.334 and 0.513, respectively, which are considered favourable (Garson, 2014a).

Moreover, interpreting the significant results based on the odds ratio revealed that farmers with higher educational attainment (i.e., vocational certificate) are 15.068 times more likely to adopt organic farming than those with primary education only, other variables remain constant. The same effects were seen with regards to seed input source, where farmers who were able to source seeds from their co-members are 8.913 times more likely to adopt organic farming relative to farmers who use their own seeds.

Table 4.13. Empirical results of the logit model

Variable	$\beta$	Odds ratio	Std. Error
X <sub>1</sub> Gender	0.44	1.553	0.507
X <sub>2</sub> Age	0.006	1.006	0.031
X <sub>3</sub> Education level			
Primary	-	-	-
Secondary	0.69	1.995	0.709
Vocational	2.713 ***	15.068	0.933
Bachelor	2.893	18.041	2.573
X <sub>4</sub> Rice farming experience	0.015	1.015	0.02
X <sub>5</sub> Household members	0.162	1.176	0.127
X <sub>6</sub> Family labour	-0.158	0.854	0.213
X <sub>7</sub> Rice farm size	-0.034	0.967	0.028
X <sub>8</sub> Yield per rai	0.002	1.002	0.002
X <sub>9</sub> Seed input source			
Own	-	-	-
Bought	-0.38	0.684	0.65
Group members	2.188 ***	8.913	0.724
Government	0.462	1.587	0.753
X <sub>10</sub> Soil quality assessment			
Low	-	-	-
Moderate	-1.991 **	0.137	0.913
High	-0.075	0.928	1.256
X <sub>11</sub> Infestation incidence			
Low	-	-	-
Moderate	0.213	1.237	0.573
High	-0.315	0.73	0.979
X <sub>12</sub> Buying price	1.066 *	2.904	0.576
X <sub>13</sub> Training attendance	1.849 ***	6.352	0.66
X <sub>14</sub> Credit access	0.987 *	2.684	0.528
X <sub>15</sub> Extension support	1.824	6.196	1.231
X <sub>16</sub> Perception	0.194	1.215	0.268
Constant	-5.872	0.003	2.469

Note: \*\*\*, \*\*, and \* denotes significance at 1%, 5%, and 10%, respectively. Log likelihood = 134.132, LR chi-square (df) = 4.672 (8), Pseudo R-squares = 0.319 and 0.490, overall correct prediction = 85.6%

Furthermore, in terms of buying price, farmers who get a reasonable buying price in selling rice are 2.904 times more inclined to adopt organic rice farming. As for training attendance and credit access, farmers who have attended training on organic farming and have access to credit facilities in the area are 6.352 and 2.684 times, respectively, more likely to adopt organic rice farming relative to those who were not. On the other hand, the significant negative effect of soil quality indicates that farmers who perceived moderate soil quality in their rice farm are 0.137 less likely to adopt organic rice farming than those with low soil quality perception.

## **CHAPTER 5. DISCUSSION**

This chapter presents the discussion of the assessment of the current supply chain of Ban Nong Saeng community enterprise, formulation of strategic guidelines for community enterprise development; investigation of consumers' purchase intention towards traceable organic rice; and determination of the factors affecting farmers' organic farming adoption. This discussion section is arranged as follows:

5.1 Supply Chain Structure, Problems, and Strategic Guidelines for Community Enterprise Development

5.2 Community Enterprise Consumers' Intention to Purchase Organic Rice: The Moderating Role of Product Traceability Knowledge

5.3 Community Enterprise Farmers' Intention to Adopt Organic Rice Farming and The Role of Consumer Information

### **5.1 Supply Chain Structure, Problems, and Strategic Guidelines for Community Enterprise Development**

#### 5.1.1 Supply chain structure of Ban Nong Saeng community enterprise

For the supply chain structure, two key findings were revealed. First, Ban Nong Saeng community enterprise's supply chain has its unique and distinctive features compared to reported chain structures in prior studies (Phuknoi et al., 2018; Prasertwattanakul & Ongkunaruk, 2015). This can be seen by the presence of two types of processors, and two downstream players that deliver rice to final consumers. In addition, vertical coordination and information sharing are present in the current supply chain. This gave opportunity for the community enterprise to sell their rice products extensively (i.e., local, and outside markets). This is a common characteristic of most community-based organisations (Kramol et al., 2020; Prasertwattanakul & Ongkunaruk, 2018). Vertical coordination in the agri-food supply chain is essential for

organisational success as it allows chain players to capture all value additions and improve their financial position (Mataia et al., 2020; Sathapatyanon et al., 2018) . Moreover, the presence of external players also enables actors to access production, processing and marketing supports. This network played significant roles in facilitating the small farmers in the past years.

Second, although the current supply chain of Ban Nong Saeng community enterprise shows some resemblance of the common enterprise chain structure, there are some notable features that needs to be highlighted. This includes the presence of own fertiliser and seed banks, evident support from various ministries and offices, and organised flow of paddy and milled rice from farm to consumers. Such observations are indicative of the enterprise's effective efforts in utilising its external opportunities and internal strengths. These are important strategic moves in any business organisation. Collaboration with external players allows the enterprise to utilise other institutions' expertise and gain access to resources not within their current structure (Thitinunsomboon et al., 2008). This strategic option has been recommended in a published research paper by the same authors (Cavite et al., 2021a).

#### 5.1.2 Guidelines for community enterprise development

***Membership and labour.*** Member participation is an important aspect of an organisation because its maintenance depends upon the members sustaining the activity system (Aldrich, 2008). In the current study, the slow adoption of farming technologies of farmers in Ban Nong Saeng community enterprise is common among farmers (Pornpratansombat et al., 2011; Supaporn et al., 2013). This mostly happens to farmers of the ageing population, similar to the findings of the study. The decision to adopt new practices or technologies is due to farmers' perceived risks. Farmers are more vulnerable to several risks due to natural uncertainties, making it challenging to shift

from conventional to any introduced agricultural practices (Kasem & Thapa, 2011). Adding to this are the farmers' skills and scientific knowledge on soil, crops, and machine, which also influence their decision to adopt (Marie et al., 2020). This study has found that some farmers lack postharvest management skills. The conduct of intensive training programmes would help create more awareness. Previous studies reported that farmers who interact more with other farmer groups and technology disseminators are more likely to adopt technology (Kasem & Thapa, 2011; Suwanmaneepong et al., 2020a). Also, re-engaging youth in agriculture can address ageing farmers that are less likely to adopt new farming technologies. These are seen to sustainably support the goal to increase agricultural productivity (FAO, 2014).

***Production and milling operations.*** The efficiency and effectiveness of business operations are highly affected by production costs and natural uncertainties. Higher production costs reduce net farm income if keeping commodity prices constant (Pakdeenarong & Hengsaddeekul, 2020). The higher cost of farm inputs found in this study is one of the major limitations for small farmers. This problem is common among farmers in developing countries such as Thailand and the Philippines (Digal & Placencia, 2018; Thitinunsomboon et al., 2008). In some case studies, machinery maintenance and fuel costs (Doi & Mizoguchi, 2013), and farm labour (Kasem & Thapa, 2011) are among those inputs reported to be significantly higher. As for natural uncertainties, drought stress affects rice growth and development and its quality (Moonmoon & Islam, 2017). The employment of research-based strategies has proven to be effective in alleviating the adverse effects of these problems. Prior studies have also considered employing research-based strategies to cope with the changing rice production environment (Cavite et al., 2021b; Cavite et al., 2021c; Fanadzo et al., 2021; Marie et al., 2020).

In another aspect, assurance of food safety and quality is an important consideration for consumers nowadays (Violino et al., 2019). Obtaining certifications for the enterprise's rice mill and their rice products is an important enhancement for their food safety management systems (Wang et al., 2020). GMP should serve as a foundation of the enterprise's food safety and quality management system. From this, other certifications such as HACCP and ISO may also be obtained to compete with already established brands. However, this requires government support since certification programmes are expensive for small farmers (My et al., 2018). Consequently, these strategies could increase consumer confidence in the enterprise's goal and commitment to produce and deliver safe and high-quality rice. Lastly, low-capacity utilisation affects product and profit. A low-capacity utilisation rate will decrease price due to excess capacity and insufficient demand for the output produced (Adeyemi et al., 2017). This problem has been reported in other rice mills in Thailand (Phuknoi et al., 2018). Increasing paddy supply through collaboration with supply chain partners is encouraged to increase the quantity of paddy for the rice mill (Aggarwal & Srivastava, 2016).

***Product design and marketing.*** Good product design attracts more consumers, thereby giving an organisation an edge over its competitors in the market (Bruce & Roy, 1991). In the current study, concerns on product design and marketing are the most reported problem of the RPCE. This finding is similar to Naipinit et al. (2016) and Somswasdi et al. (2015). The development of a community enterprise is not only through improved internal operations but also through improved access to markets. Improvement of market access entails developing products that meet the consumers' needs (Wills et al., 1990). The suggested guidelines in this study illustrate the connection between the enterprise and the consumer. Due to health-related concerns

and fear of chemical residues, consumers choose organic foods over conventional ones (Sriwaranun et al., 2015). Product certifications ensure reliable consumer service in the long run, and it also marks a business' commitment to the market in offering safe products (Wu et al., 2019). Improved packaging designs will also enable consumers differentiate CE's rice products from their competitors. Collaboration with academic institutions can also utilise researchers' expertise and gain access to resources not within the enterprise (Thitinunsomboon et al., 2008). Most importantly, investigating consumer buying behaviour is a relevant strategic guideline for the CE. This can make them understand consumers' intentions on purchasing organic rice and design better marketing techniques. This approach has been widely applied in most organic food products (Jitrawang & Krairit, 2019; Pandey et al., 2019). Several studies have also started to explore the role of product traceability (Cavite et al., 2022; Chen et al., 2020; Spence et al., 2018; Wang & Tsai, 2019). This can be applied to CE's organic rice products considering consumers' concern for safer and healthier foods. Ultimately, building their social media presence can be a powerful tool to establish their brand since social media is found to have a partially significant impact on consumers' buying behaviour (Palalic et al., 2020).

## **5.2 Community Enterprise Consumers' Intention to Purchase Organic Rice: The Moderating Role of Product Traceability Knowledge**

The increase in demand for organic foods is due to consumers' improved awareness of more sustainable healthy diets (Kushwah et al., 2019b). However, based on recent reports, consumers have a relatively low purchase intention towards organic foods, primarily because they do not trust the products' reliability and authenticity (Li et al., 2021; Vega-Zamora et al., 2019). With the emerging importance of product traceability systems and the latest developments in IoT technologies, recent studies explore how products with traceability information (e.g., QR codes) provide opportunities to accelerate food consumption (Corallo et al., 2021; Spence et al., 2018). However, this technology requires substantial investment, and no prior studies have measured the impact of consumers' knowledge of product traceability information on purchase intention (Zhu, 2017). This research explores this gap and further offers comprehensive findings, which suggest that the community enterprise consumers' intentions to purchase organic rice are influenced by their perceptions.

### **5.2.1 Consumers' purchase intention for traceable organic rice**

First, main original results indicate that consumers' purchase intentions for organic food may be affected by other factors, not only those in the TPB model, supporting previous studies (Ahmed et al., 2021; Boobalan et al., 2021). While prior research on this topic is fragmented, this study simultaneously proposed seven factors that may shape purchase intention towards organic rice. These factors include consumers' attitudes, subjective norms, perceived behavioural control, health consciousness, environmental awareness, and knowledge of product traceability. This study finds evidence of the significant positive roles of subjective norms, health consciousness, and knowledge of product traceability.

Second, specifically for TPB, the subjective norms factor was the only significant factor found to influence consumers' purchase intentions. This finding contradicts previous studies that used TPB as the underlying theory, in which all predictors were consistently found to influence intention (Boobalan et al., 2021; Qi & Ploeger, 2019). By contrast, this study reveals that organic rice purchase was already established as a social norm among consumers. Previous studies have also reported that subjective norms play a significant role in organic food purchases (Al-Swidi et al., 2014; Bai et al., 2019). As for attitude and perceived behavioural control, no significant relationship was found between these factors and purchase intention, supporting Bai et al. (2019). This finding also seems inconsistent with previous research that explores the determinants of organic food choices using TPB. However, this can be explained by the existing external barriers to purchasing organic foods, such as lack of availability (Zagata, 2012), and people may have a negative attitude towards organic products.

The third key finding is that, among the added variables in the model, health consciousness and product traceability knowledge are the only significant factors affecting purchase intention. The finding on health consciousness is consistent with those in previous studies (Asif et al., 2018; Yadav & Pathak, 2016). Health consciousness reflects consumers' awareness of healthy living and interest in healthy consumption (Shin et al., 2019). In other words, community enterprise consumers may avoid buying conventional rice because they may question the healthiness aspect of these products. This finding implies that organic rice belongs to a niche market primarily targeted by health-conscious consumers (Petcho et al., 2019; Roitner-Schobesberger et al., 2008). Meanwhile, product traceability knowledge has the strongest direct impact among all variables, indicating its leading role in predicting purchase intention. This is consistent with the findings by Chang et al. (2013), and

Appelhanz et al. (2016) that traceability information can influence consumers' purchase intention towards organic food. The current findings suggest the important role of product traceability knowledge as a motivator, because consumers who can trace the origin and features of organic foods have greater purchase intentions (Osburg et al., 2019). Overall, the results suggest that perceived health consciousness and knowledge of product traceability should be included as background factors in TPB models because their influence on purchase intention is positive and significant.

Finally, regarding cost perceptions, this study found no significant negative effect on consumers' purchase intention. This is contrary to the proposed hypothesis and previous findings (Liang, 2016; Wu et al., 2019), which consider that most organic products are expensive and may deter some people from purchasing. A possible explanation for this incongruence is that consumers consider buying organic products because of their perceived high quality, which justifies the high cost (Ahmed et al., 2021). In fact, Lee et al. (2015) found that consumers are willing to pay a premium for organic coffee, citing reasons related to health and environmental protection. This finding is also consistent in the context of food traceability, where consumers link traceability to food quality and safety; as such, they willingly pay high prices for this product attribute (My et al., 2018).

### 5.2.2 The moderating role of product traceability knowledge

This study had shown that product traceability knowledge significantly moderated the effect of perceived behavioural control on purchase intention. More specifically, the outcome of perceived behavioural control was intensified, revealing that elaborated information on product traceability is essential for consumers who may be capable in buying the product. This finding may be explained by the fact that, since consumers pay more for organic products than conventional ones, they are more eager

to seek information on how these products directly relate to their health (Zarei & Maleki, 2018). Thus, consumers who have product traceability knowledge exhibit high information needs and information-seeking traits due to risk perceptions about the product (Zhu et al., 2018). A recent study by Sadiq et al. (2021) supports this claim, confirming that information-seeking traits were found to strengthen the relationship between perceived behavioural control and intention.

Moreover, because of risk perceptions about organic foods, people look for information through product traceability, and they process this information systematically, leading to increased purchase intention (Guo et al., 2020). In addition, product traceability information provides consumers with the safety characteristics of the food to increase their confidence, which is beneficial to them. Thus, people with product traceability knowledge have high benefit perceptions about organic products. As previously reported, benefit perceptions play a significant role in determining people's intention to purchase genetically modified foods (Guo et al., 2020). These findings support this study's results. In contrast, the other interactions failed to achieve significance, indicating that traceability information must be provided to consumers, when the target is to improve their attitude, subjective norms, health and environmental concerns, and cost perceptions regarding organic food products.

### **5.3 Community Enterprise Farmers' Intention to Adopt Organic Rice Farming and the Role of Consumer Information**

This study's main objective is to examine CE farmers' intention to adopt organic rice farming and aims to verify the role of consumer information along with other widely used factors using a multidimensional model. This framework modification was seen as a unique approach to explaining farmers' adoption since consumers are also part of farmers' information sources, affecting their adoption behaviour. The theoretical and policy implications of the key findings of this study are explained in the following sections.

#### **5.3.1 Farmer and farm characteristics**

Results reveal that farmers' educational level is positively associated with organic farming adoption intention, where farmers with vocational certificates show a higher likelihood of adoption than farmers with primary education. Specifically, farmers with vocational certificates tend to adopt organic rice farming more than farmers with primary education only. Many previous adoption studies have likewise reported a positive impact of education level to farmers. In Thailand, Suwanmaneepong et al. (2020a) and Pattanapant & Shivakoti (2014) also found that farmers with more years of schooling are more likely to adopt organic farming. Moreover, the study of Digal & Placencia (2018) in the southern Philippines similarly revealed the positive and significant influence of farmers' education level in the adoption of organic farming.

These results could be explained by the fact that longer education leads to a better understanding of the new technology (Tiwari et al., 2008). Farmers' education enables them to assess information better and strengthen their technical capabilities on organic farming. Moreover, organic farming adoption also requires risk evaluation

where knowledge is greatly required (Issa & Hamm, 2017). This indicates that more knowledgeable farmers tend to be adopters because of their prior knowledge of the benefits and importance of organic farming, apart from their technical skills, which influenced their decision-making. However, it should be emphasised here that skill-intensive activities have higher likelihood to influence adoption because of their focus on more practical work. This further explains why education higher than vocational level (bachelor's degree) was non-significant in this case.

### 5.3.2 Production and management characteristics

This study has found four important findings in this aspect. First, concern for seed input is among the considerations. It was revealed that farmers who can source seed inputs from their co-farmers are more inclined to organic rice production than those farmers who use their seed supply. Sharing farm resources, such as seed and other farm inputs, has already become a practice among community enterprise farmers (Porcuna-Ferrer et al., 2020). This practice has also become a cost-saving strategy among farmers given the nature of high input costs required in production. This explains why farmers are more inclined to adopt given the availability of seed inputs from their co-farmers. Input considerations have also been reported as significant adoption motivators in previous studies (Jierwiryapant et al., 2012; Sriwichailamphan & Sucharidtham, 2014).

Second, farmers consider buying price as an important factor if to undertake organic rice production. This finding is supported by previous studies in Thailand who found that guaranteed buying price motivates farmers to grow organic rice (Jierwiryapant et al., 2012), and that price satisfaction makes farmers more inclined to organic production (Thapa & Rattanasuteerakul, 2011). Price is the primary means of generating income for farmers (Nijssen & Frambach, 2001). This study further

validates the significance of organic product price in farmers' adoption. As organic farming yields lower than conventional one, price premiums often compensate for this lower produce, and has become an important indicator for profitable organic farming (Gaurana & Ratilla, 2020). That is why higher prices are likely in organic agriculture particularly in developing countries (Meemken & Qaim, 2018). In fact, in Pakistan, farmers adopt growing organic crops because of higher profits (Husnain et al., 2017). Digal & Placencia (2017) also found out that incentives in price premiums can spur the adoption of sustainable practices in the Southern Philippines.

Third, farmers' participation in training on organic rice farming is also a significant determinant. This finding is in line with previous adoption studies. For instance, Yanakittkul & Aungvaravong (2020) have found that farmers' attendance at training enables them to acquire new and innovative knowledge useful in adding value to their organic products. This, as well, makes them more credible to offer organic products at higher prices. Moreover, organic vegetable farmers in Mahasarakham province see training attendance as beneficial, as they gain information and procedures in organic fertiliser and biopesticide preparation (Thapa & Rattanasuteerakul, 2011). Training enables farmers to gain new knowledge of organic farming techniques, where these techniques are also adopted by their co-farmers. This supports the DOI theory, which explains that innovation or technology is communicated to farmers' network over time and can consequently influence adoption (Rogers, 1983).

Lastly, credit access is also an equally important motivator of organic farming adoption. Similar findings were also reported by Pornpratansombat et al. (2011) and Bullock et al. (2014) in previous studies. This could be explained by the fact that the provision of loans to farmers enabled them to expand farming operations, thereby encouraging more farming activities (Pilarova et al., 2018). This, in turn, increases their

opportunity to earn more and diversify income sources. Low-interest loans, likewise, help farmers finance other activities such as certifications for organic standards and input acquisition, among others. This scenario has also been observed across organic rice (Yanakittkul & Aungvaravong, 2020) and vegetable farmers (Rattanasuteerakul & Thapa, 2010; Thapa & Rattanasuteerakul, 2011) in other areas in Thailand.

### 5.3.3 Farmers' perception of consumer information

Meanwhile, farmers' perception towards consumer information was positive but not significant. Had it been significant, that finding would indicate that consumer information about organic rice impacts farmers' adoption. However, this present study reveals that, regardless of their high level of agreement to consumer information, their adoption intention towards organic farming is not affected. That is to say, it is not likely that farmers who have better knowledge about consumers' views would adopt organic farming. Although this is contrary to what was expected, this study gives clear evidence that perceptual factors (i.e., consumer information) do not impact farmers' adoption intention. Community enterprise farmers may have been more focused on improving on-farm and personal characteristics, that they had failed to recognise the relative importance of consumer information, hence, insignificant to them.

Although insignificant, this has implications that more access to consumer information must be developed among farmers when targeting to improve organic farming adoption. It should also be noted that the adoption of a particular technology is affected by various factors (Azam & Shaheen, 2019; Barroga et al., 2019), and so there may be other important adoption factors that were not included in the model. Moreover, this finding should not undermine the importance of consumer information to farmers' adoption decisions, as evidenced in prior studies (Gonzalvo et al., 2020; Muoni et al., 2019; Tang et al., 2015). Future studies can still investigate this factor and

other important behavioral factors in the context of organic farming. As Manalo et al. (2021) have pointed out, it is inadequate to focus on the technology only, but to a greater extent on various social elements that may affect adoption.

#### 5.3.4 Contrasting findings

Contrary to this study's expectations, other known farmer and farm characteristics, and production factors (e.g., gender, age, and farm experience, farm size, and yield) that were seen to influence organic farming adoption in prior studies, have no significant influence on farmers' adoption. The effects of these factors have been variable in previous adoption studies. For instance, some studies suggested that gender and age were significant predictors (Sapbamrer & Thammachai, 2021; Soltani et al., 2014), while other studies found no significant influence of these factors (Digal & Placencia, 2018; Thapa & Rattanasuteerakul, 2011). As for farm size and yield, previous studies have reported these factors as significant (Digal & Placencia, 2018; Soltani et al., 2014; Tiwari et al., 2008), while others have reported opposite findings (Baba et al., 2019; Dhraief et al., 2019). Similarly, in terms of extension support, there was no significant influence observed on adoption intention implying that farmers were not motivated by extension activities. This contradicts the findings of Digal & Placencia (2018). The result of the current study explains that these factors may have little or no influence on farmers' adoption.

To emphasise farm experience, results show that more years of rice farming does not impact their adoption. Farmers have recognised the benefits and importance of organic rice farming. However, this situation can be explained from a behavioral standpoint. Owing to the reason that some farmers were already accustomed to conventional farming for years, shifting to organic system may not be favourable for them, considering the new techniques and skills they need to learn. This may be one of

the reasons why some organic programs failed to motivate more farmers in the past years particularly for small-scale farmers (Derpsch et al., 2016). This explanation is supported by Baba et al. (2019) in Indonesia that explored farmers' adoption, as well. Overall, the different results for the influence of these variables are common since these factors may vary across organisation type and behaviour among farmers in the organisation where they belong (Digal & Placencia, 2017).

## **CHAPTER 6. CONCLUSION, IMPLICATION, AND RECOMMENDATION**

This study 1) assessed the current supply chain of Ban Nong Saeng community enterprise and formulated strategic guidelines for community enterprise development, 2) investigated consumers' purchase intention towards traceable organic rice; and 3) determined the factors affecting farmers' organic farming adoption. The outcomes of the research suggest that community enterprise development should be a holistic approach involving other key players of the supply chain. This study offers important contributions to community enterprises or other rural small farmer organisations, policymakers and academics aiming to formulate more effective development strategies based on the problems and guidelines identified, motivators of organic rice purchase intention, and drivers of farmers' organic farming adoption, presented in the following sections:

6.1 Conclusions

6.2 Implication for Academics

6.3 Implication for RPCEs and Related Organisations

6.4 Recommendation for Future Research

### **6.1 Conclusions**

Assessment of the current supply chain of Ban Nong Saeng community enterprise revealed five major channels through which the enterprise's rice moves from the farm to the consumers. These are the farmers, primary and final processors, dealers, and local retailers. The enterprise's supply chain has its unique and distinctive features (presence of two types of processors, and two downstream players that deliver rice to final consumers) compared to reported chain structures in prior studies. Vertical coordination and information sharing are also present in the current supply chain. The

presence of external players also enables actors to access production, processing and marketing supports. This network played significant roles in facilitating the small farmers in the past years. Moreover, three main problem categories were identified, and these were in the aspects of membership and labour, production and milling operations, and product design and marketing. The enterprise's main strengths and opportunities include its product certifications and support from external organisations. Strategic points were developed, and policy support programmes are recommended for capacity building and product development as most problems identified relate to these aspects.

Investigation of consumers' purchase intention revealed the following findings: First, consumers' purchase intentions for organic food may be affected by other factors, not only those in the TPB model. These are health consciousness ( $\beta = 0.144, p < 0.05$ ), and knowledge of product traceability ( $\beta = 0.344, p < 0.001$ ). Second, the subjective norms factor ( $\beta = 0.213, p < 0.05$ ) was the only significant in the TPB model found to influence consumers' purchase intentions, revealing that organic rice purchase was already established as a social norm among consumers. As for attitude ( $\beta = -0.148, p > 0.05$ ) and perceived behavioural control ( $\beta = 0.071, p > 0.05$ ), no significant relationship was found between these factors and purchase intention which can be explained by the existing external barriers to purchasing organic foods, such as lack of availability, and people may have a negative attitude towards organic products. Third, among the added variables in the model, health consciousness and product traceability knowledge are the only significant factors affecting purchase intention, implying that organic rice belongs to a niche market primarily targeted by health-conscious consumers. Meanwhile, product traceability knowledge has the strongest direct impact among all variables, indicating its leading role in predicting purchase intention suggesting the important role of product traceability knowledge as a motivator. Lastly,

product traceability knowledge significantly moderated the effect of perceived behavioural control on purchase intention ( $\beta = 0.128, p < 0.100$ ), revealing that elaborated information on product traceability is essential for consumers who may be interested in buying the product.

Determination of factors affecting farmers' organic farming adoption revealed that certain farm and farmer characteristics, and production and management attributes significantly impacted farmers' adoption intention. As for farmer and farm characteristics, results reveal that farmers' educational level ( $\beta = 2.713, p < 0.05$ ) is positively associated with organic farming adoption intention, where farmers with vocational certificates show a higher likelihood of adoption than farmers with primary education, explaining that longer education leads to a better understanding of the new technology. As for the production and management characteristics, farmers who can source seed inputs ( $\beta = 2.188, p < 0.05$ ) from their co-farmers are more inclined to organic rice production than those farmers who use their seed supply. Farmers also consider buying price ( $\beta = 1.066, p < 0.10$ ) as an important factor if to undertake organic rice production. In addition, farmers' participation in training on organic rice farming ( $\beta = 1.849, p < 0.05$ ), and access to credit facilities ( $\beta = 0.987, p < 0.10$ ) are significant determinants of adoption. Meanwhile, farmers' perception towards consumer information was positive but not significant ( $\beta = 0.194, p > 0.10$ ), revealing that regardless of their high level of agreement to consumer information, their adoption intention towards organic farming is not affected.

## **6.2 Implication for Academics**

For Ban Nong Saeng community enterprise development, this study contributes to the literature on rice farming organisations in Thailand by providing a more comprehensive qualitative analysis of this important form of organisation in threefold.

1. This study is one of the latest attempts to investigate the current supply chain structure of RPCEs in Thailand. RPCEs dominate the rice production sector in the rural areas, assisting farmers in their livelihood and income. Understanding the modern supply chain would assist leaders and farmer-members to look for competitive advantages.
2. This study qualitatively investigates an RPCE in Thailand which contributes to the literature uniquely. Moreover, this study extends previous qualitative research findings on small farmer organisations, thereby contributing to research possibilities that will further enhance rural farmers' livelihood and income.
3. This study developed a qualitative conceptual framework to assess rice production issues and constraints. Therefore, it is possible that this framework development allows this study to obtain a new and more focussed understanding of how community enterprises behave in rural areas. Most importantly, this study will guide future research in formulating key evaluation questions, highlighting the outcomes to be examined, and framing policies to be recommended to concerned agencies.

As for the purchase intention study, this study contributes to the literature on food and purchase intention of organic foods by providing a more comprehensive analysis of this mainstream research.

1. This study is the first attempt to identifying important consumer motives for purchasing organic food with traceability information, using several factors in one model. This study examined all the relationships between organic rice purchase motives and the three main TPB variables. This study extends previous findings related to the influence of several variables on purchase

intention for organic food, thereby contributing to research possibilities that will assist in further developing the rapidly growing organic rice marketing business by community enterprises in Thailand.

2. This study extends the concept of product traceability to organic food and provides additional insights into how this factor predicts consumers' purchase intentions. Therefore, this study develops a research framework with product traceability knowledge as an added predictor and finds a significant positive relationship between this variable and purchase intention.
3. This is the first study to investigate the moderating role of product traceability knowledge on TPB, along with other widely used predictors in the context of organic food consumption. Investigating product traceability knowledge as a moderator is crucial as it provides information on how consumers' knowledge of product information can influence the relationship between various factors and purchase intention, which helps in understanding better organic food consumption behaviour.
4. This framework modification incorporating the moderating role of product traceability knowledge allows this study to obtain a new and more focused understanding of how this factor affects consumers' purchase intention, when specifically applied to organic food. This study also reveals a new research domain on the "moderating role of product traceability knowledge" on consumers' purchase intention for organic food.

As for the adoption intention study, this chapter offers a new contribution to the organic farming adoption literature as it develops and tests a multidimensional model and verifies whether consumer information can impact farmers' adoption intention.

1. Traditionally, much technology adoption research pay attention to farmers' socio-demographic characteristics but there is not much studied about farmers' perception towards consumer information. Moreover, prior research on the agri-food supply chain involving rice farmers and its immediate consumers has not gained enough attention. Thus, this study focused on this area and attempted to explain related situations in the case of RPCEs alongside the most widely used adoption predictors.
2. This study provided answers to knowledge gaps identified in prior studies, which could be utilised by RPCE leaders and policymakers to optimise better policies that would promote widespread adoption of organic rice farming, particularly in the rural areas of Thailand.

### **6.3 Implication for RPCEs and Related Organisations**

#### **6.3.1 Ban Nong Saeng community enterprise development**

For Ban Nong Saeng community enterprise development, results have laid out the following implications for the community enterprise and policymakers particularly to the Ministry of Agriculture and Cooperatives (MOAC).

##### ***For the community enterprise:***

1. The focus should be on addressing product design and marketing related issues.
2. Consumer information and product development skills would help them cope in this changing rice marketing environment.
3. The use of modern farm techniques and more efficient farm planning are recommended to address problems of high production costs and drought (e.g., nutrient management, and pest and disease control).

4. With its strong support from the local government, suggested guidelines were geared towards conducting intensive training programmes on new farming techniques to encourage farmers and youth to adopt new technologies.

***For the policymakers:***

1. Stronger policy support for capacity building and product development.
2. Integration of smart packaging (e.g., product traceability) to rice certification systems in Thailand.
3. Encourage and support farmers in various product certification schemes as costs might be expensive for some small farmers.
4. Design and implement programmes for youth to re-engage in the agriculture sector.
5. Expansion of small-scale irrigation in the rural areas to address drought problems.

### 6.3.2 Consumers' purchase intention

As for the purchase intention study, this study provides several practical implications for community enterprises and policymakers, based on the identified motivators of organic rice purchases.

***For the community enterprise:***

1. An aggressive promotional campaign highlighting the perceived value of organic rice on consumers' health and lifestyle would be an important strategy for creating product awareness.
2. Product traceability information introduced through a QR code is most likely a new promising feature that would increase consumers' purchase intention, particularly for consumers with high PBC.

3. Community enterprises should develop specific strategies to make purchasing organic rice easy for most consumers, by either establishing an online outlet or setting up more nearby organic shops.
4. Given the strong influence of subjective norms, a word-of-mouth strategy could be a useful marketing effort to increase consumers' purchase intentions.

***For the policymakers:***

1. This study also encourages policymakers to continue and strengthen their support for organic rice farming, as the purchase intention of consumers coincides with community enterprises' organic rice products.
2. The government and private institutions should focus on increasing consumers' awareness of organic rice through the development of educational materials to widen their knowledge, focusing on its health benefits.
3. The development of standardised food labels with traceability features, as part of the organic product certification system, would help to provide greater transparency of activities, from organic production to distribution, and address issues of consumer trust.
4. For some, this traceability feature on organic rice products may be new; thus, educational campaigns that inform consumers about food labels and, most importantly, the importance of product traceability should be developed.

### 6.3.3 Farmers' adoption intention

Meanwhile, for the adoption intention study, results suggest the following. Although these implications might apply only to RPCE farmers, these can also be used as a basis for other small farmer groups in the formulation of related programs.

1. Providing more vocational courses and training, focusing on organic farming techniques, would encourage more farmers to adopt organic rice production.
2. A step-by-step organic adoption program is recommended as opposed to abrupt implementation, considering that some farmers were already accustomed to conventional farming for years. Training courses are recommended to be offered so that farmers may not be overwhelmed by the adoption process.
3. RPCE leaders are encouraged to promote seed-sharing behaviour among co-farmers. A seed-sharing network can be established where farmers will manage their own seed resources in a seed bank, rather than depend on external sources.
4. Providing more access to credit facilities and ensuring a reasonable buying price for organic rice products should be strengthened by the government among RPCE farmers.
5. Access to consumer information among RPCE and small farmers should be developed by concerned agencies since previous programs have mostly focused on improving on-farm and farmer characteristics.

***Benefits obtained by Ban Nong Saeng community enterprise:***

The output and outcomes of this study are part of a research project headed by the principal investigator Assoc. Prof. Dr. Suneeporn Suwanmaneepong. Ban Nong Saeng community enterprise is one of the beneficiaries of this research activity and the following list presents the benefits obtained by Ban Nong Saeng community enterprise.

1. *Packaging development.* A meeting and knowledge transfer activities with researchers and community enterprise representatives were conducted. Product design was developed through joint efforts of community enterprise representatives and researchers. This rice package improvement was based on the results of the consumer survey, considering that organic rice by the community enterprise was produced for the niche market and based on consumers' needs. The adopted packaging design is presented in Figure 6.1.



Original packaging



Improved packaging

Figure 6.1. Comparison of original and improved packaging of Ban Nong Saeng community enterprise's rice product

2. *Traceability system development.* Product traceability system was developed based on the guidelines for traceability in the rice supply chain. Guidelines were created through field visits and needs assessment of the community enterprise in terms of their readiness in developing prototypes

for traceability with QR code. The product traceability system with QR code is shown in Figure 6.2.



Figure 6.2. QR code product information in the rice packaging of Ban Nong Saeng community enterprise

3. *Marketing channel expansion.* New marketing channels were developed through market survey and group meetings to respond to the needs of the target group. The implementation of the marketing strategy led to the expansion of six new distribution channels (Figure 6.3) for Ban Nong Saeng and other community enterprises that are part of this research activity. These distribution channels are:

- a. Community enterprise shop
- b. Sanam Chai Khet district agricultural office
- c. Farm Chao Khun by KMITL
- d. Provincial commercial office
- e. Safety Rice CE network Facebook page
- f. Sanam Chai Khet community green market



Figure 6.3. New marketing channels for Ban Nong Saeng community enterprise

#### 6.4 Recommendation for Future Research

For the community enterprise development study, the following are its limitations. First, this study focusses on a limited geographical area in Chachoengsao province, Thailand, with a small group of rural CE farmers. Therefore, the results may not be generalisable to other contexts. Had this been conducted in a larger community enterprise, the findings might be different due to diverse operations and distinctive external circumstances. Finally, this study did not consider the impact of the COVID-19 pandemic in the study area, which started during the conduct of interviews and discussions. Further research should consider the impact of this pandemic on small businesses such as CEs to develop well-designed and sustained economic measures to support these enterprises. Although this study focusses only on an RPCE in Thailand, the framework generated can be broadened to other CEs or farmer groups.

As for the purchase intention study, the following limitations need to be addressed in future research. First, this study was limited to measuring the purchase intention towards organic rice with product traceability information, and there was no

measurement of actual buying behaviour. Future studies should incorporate actual buying behaviour along with intention to purchase. Second, convenience sampling was performed, which imposes limitations in terms of generalisation of the results to the target population. Future studies may target a specific age range, such as middle-aged consumers who are more capable of buying organic products. Moreover, further research should be conducted to determine which specific product information should be given in the traceability label. Finally, it would also be interesting to replicate this study in other community enterprises, which are at the forefront of organic agriculture implementation in Thailand.

As for the adoption intention study, although consumer information does not seem to impact farmers' adoption intention, further research should be conducted by adding other behavioral factors (i.e., environmental concerns, health consciousness) that were not explored in this study, as they may have an underlying effect on farmers' adoption. The framework of this study can also be adopted by other farmer groups to explore the adoption of a particular technology.

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## **APPENDICES**

A. Appendix Tables

B. Questionnaires

C. Publications

D. Conference papers

## **A. Appendix Tables**

A.1 IOC values and interpretation for the questionnaire items for the community enterprise (in-depth interview)

A.2 IOC values and interpretation for the questionnaire items for the community enterprise farmers (focus group discussion)

A.3 IOC values and interpretation for the questionnaire items for the community enterprise consumers (face-to-face survey)

A.4 IOC values and interpretation for the questionnaire items for the community enterprise farmers (face-to-face survey)

A.1 IOC values and interpretation for the questionnaire items for the community enterprise (in-depth interview)

Assessment item	Objective 1			Objective 2			Objective 3			Objective 4			Objective 5			Objective 6			IOC	Meaning
	E1	E2	E3	E1	E2	E3	E1	E2	E3	E1	E2	E3	E1	E2	E3	E1	E2	E3		
<b>1. Background of the rice community enterprise</b>																				
1.1 What year was the community enterprise established?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.2 How many farmer-members do you have?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.3 Can you provide us information about your rice mill operation?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.4 Can you provide us information about the machines and equipment available?	-1	1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0.60	Acceptable
1.5 Can you please explain the rice mill and its purpose of selling rice to consumers?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
<b>2. Buying paddy rice from farmers</b>																				
2.1 Can you describe the details about the activities during buying of paddy rice from farmers (i.e., receiving raw material, handling, warehousing, etc.)?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
2.2 Can you provide information about your paddy rice supply?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
2.3 Can you provide information about the price of your paddy supply?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
2.4 Do you encounter problems in buying paddy from farmers?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
<b>3. Converting paddy to milled rice</b>																				
3.1 Can you describe the detailed activities during the rice milling process (i.e., milling, packaging, etc.)?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable

3.2	How many percent is the milling recovery (estimated average) for all milled paddies?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
3.3	Do you encounter problems in converting paddy to milled rice?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
3.4	Can you tell us about the by-products in processing?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
4. Distributing milled rice to consumers																					
4.1	Can you describe us the detailed activities when you distribute the milled/packed rice to consumers (i.e., order processing, transportation, selling, etc.)?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
4.2	Can you provide information about the rice package the enterprise is selling?	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	0.60	Acceptable
4.3	Can you provide information about your customers?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	0.20	Not acceptable*
4.4	Do you encounter problems in distributing milled rice to consumers?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
4.5	Have you seen evidence that consumers are concerned about the chemical residues in rice; or have you seen customers who are actively seeking “safe and healthier rice”?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
5. Support activities																					
5.1	Can you describe us the support activities that helped achieve the rice mill’s goals (i.e., customer service, management & communication, purchasing & maintenance, etc.)?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	1.00	Acceptable

5.2 Do you encounter problems in doing the above support activities in past year?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	1.00	Acceptable
5.3 What are the agencies that support the enterprise and farmer-members?	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	1	1	-1	-1	-1	0.60	Acceptable
5.4 What other support activities do you think are needed for your rice mill to improve its performance?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	1.00	Acceptable
5.5 How is the rice industry in your province changing, if it is?	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	-1	-1	-1	0.60	Acceptable
6. Strengths, weaknesses, opportunities, and threats																					
6.1 What enabled your rice mill to be successful in the past years?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	1	-1	1	0.60	Acceptable
6.2 What are the things that your rice mill wants to improve to perform better in the future, in terms procurement, milling, and distributing activities?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
6.3 What do you think are the favorable factors that could give your rice mill competitive advantage in the future?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	1	-1	1	-1	1	0.53	Acceptable	
6.4 What do you think are the factors that could negatively affect your rice mill performance?	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	1	-1	1	0.60	Acceptable	

A.2 IOC values and interpretation for the questionnaire items for the community enterprise farmers (focus group discussion)

Assessment item	Objective 1			Objective 2			Objective 3			Objective 4			IOC	Meaning	
	E1	E2	E3	E1	E2	E3	E1	E2	E3	E1	E2	E3			
<b>1. Source of rice farming inputs</b>															
1.1 Can you provide information about your input supply?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.2 Can you provide information about your input suppliers (material, labor, etc.)?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.3 Can you provide information about the price of your farm inputs (material, labor, etc.)?	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.4 Do you encounter problems in sourcing farm inputs?	1	1	1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	0.89	Acceptable
<b>2. Production activities and critical costs</b>															
2.1 Can you describe in detail the activities you normally do in rice farming (i.e., land preparation, crop establishment, care and maintenance, harvest, and post-harvest)?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
2.2 How do you communicate or get production information related to rice farming?	1	-1	-1	-1	0	1	-1	-1	-1	-1	-1	-1	-1	0.39	Not acceptable*
2.3 How many times do you produce rice in a year?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
2.4 What were the rice varieties you planted in the last cropping?	1	-1	-1	1	1	1	-1	-1	-1	1	-1	-1	-1	0.78	Acceptable
2.5 What is your average volume (kg) of rice produced per cropping per rai?	-1	-1	-1	1	1	1	1	-1	-1	-1	-1	-1	-1	0.89	Acceptable
2.6 Do you encounter post-harvest losses in the past cropping?	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	0.56	Acceptable
2.7 Do you encounter problems in producing rice during the previous cropping?	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
<b>3. Delivering rice to buyers</b>															
3.1 Can you describe in detail the activities when you deliver rice to the community enterprise (i.e., order processing, transporting, selling, others)?	1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	0.89	Acceptable
3.2 Can you provide information about your buyers?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	1.00	Acceptable
3.3 Can you provide information about the price of paddy you are selling?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	1.00	Acceptable
3.4 Do you encounter problems in selling your paddy to your buyers during the previous cropping?	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	1.00	Acceptable
<b>4. Support activities in rice farming</b>															

4.1 Can you describe us the support activities that helped achieved your rice farming goals (e.g., certification, trainings, credit, etc.)?	-1	-1	-1	1	-1	-1	-1	-1	-1	1	1	1	0.89	Acceptable
4.2 In the past year, what were the agencies that support your rice production activities?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
4.3 Do you encounter problems in doing the above support activities?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
4.4 What other support activities do you think are needed to improve your rice production performance?	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
4.5 How is the rice production industry in your province changing, if it is?	-1	-1	-1	1	-1	-1	-1	-1	-1	1	1	1	0.89	Acceptable

### A.3 IOC values and interpretation for the questionnaire items for the community

enterprise consumers (face-to-face survey)

Assessment item	Objective 1			Objective 2			IOC	Meaning
	E1	E2	E3	E1	E2	E3		
1. Socio-demographic profile of consumers								
1.1 Gender	1	1	1	-1	-1	-1	1.00	Acceptable
1.2 Age	1	1	1	-1	-1	-1	1.00	Acceptable
1.3 Address	1	1	1	-1	-1	-1	1.00	Acceptable
1.4 Marital status	1	1	1	-1	-1	-1	1.00	Acceptable
1.5 Education level	1	1	1	-1	-1	-1	1.00	Acceptable
1.6 Household size	1	1	1	-1	-1	-1	1.00	Acceptable
1.7 Monthly household income	1	1	1	-1	-1	-1	1.00	Acceptable
1.8 Occupation	1	1	1	-1	-1	-1	1.00	Acceptable
2. Perception towards purchasing traceable organic rice								
<i>Attitude</i>								
2.1 Buying organic rice with traceability information is beneficial to me.	-1	-1	-1	1	1	1	1.00	Acceptable
2.2 Buying organic rice with traceability information is a good idea.	-1	-1	-1	1	1	1	1.00	Acceptable
2.3 Buying organic rice with traceability information is interesting.	-1	-1	-1	1	1	1	1.00	Acceptable
<i>Subjective norms</i>								
2.4 I would buy organic rice with traceability information because my family and friends are in favour of it.	-1	-1	-1	1	-1	1	0.50	Acceptable
2.5 People close to me think I should buy organic rice with traceability information.	-1	-1	-1	-1	1	1	0.33	Not acceptable*
2.6 I will buy organic rice with traceability information because of positive reviews from people who have already bought it.	-1	-1	-1	1	-1	1	0.50	Acceptable
<i>Perceived behavioural control</i>								
2.7 If I wanted to, I could buy traceable organic rice instead of regular-packed rice.	-1	-1	-1	-1	-1	1	0.00	Not acceptable*
2.8 Buying organic rice with traceability information or not is mostly up to me.	-1	-1	-1	-1	-1	1	0.00	Not acceptable*
2.9 I can easily purchase traceable organic rice in different distribution channels.	-1	-1	-1	-1	1	-1	-0.17	Not acceptable*
<i>Health consciousness</i>								
2.10 I consider myself as a health-conscious consumer.	-1	1	-1	1	-1	1	1.00	Acceptable
2.11 I often think about health-related issues.	-1	1	-1	1	-1	1	0.50	Acceptable
2.12 I choose food carefully to stay healthy.	-1	1	-1	1	-1	1	0.50	Acceptable
<i>Environmental concerns</i>								
2.13 Organic rice with traceability information is more environment-friendly and promote sustainable consumption.	-1	-1	-1	1	1	1	1.00	Acceptable
2.14 I am greatly concerned about the negative impacts of inorganic rice farming.	-1	-1	-1	1	-1	1	0.50	Acceptable

2.15	I am concerned about the state of the world's environment.	-1	1	-1	1	-1	1	0.50	Acceptable
<i>Cost perceptions</i>									
2.16	Organic rice with traceability information costs more than regular-packed rice.	-1	-1	-1	1	1	1	0.83	Acceptable
2.17	Only high-income consumers can afford to buy organic rice with traceability information.	-1	-1	-1	1	1	1	0.83	Acceptable
2.18	Organic rice with traceability information is beyond my budget.	-1	1	-1	-1	-1	1	0.00	Not acceptable*
<i>Product traceability knowledge</i>									
2.19	I am familiar with QR codes used in organic rice traceability.	-1	-1	-1	1	1	1	1.00	Acceptable
2.20	I have already purchased an organic rice with a QR code for traceability.	-1	-1	-1	-1	-1	-1	-0.50	Not acceptable*
2.21	I am familiar with rice package with a QR code for traceability information.	-1	-1	-1	-1	-1	-1	-0.50	Not acceptable*
<i>Purchase intention</i>									
2.22	I am willing to buy organic rice with traceability information if available in the market.	-1	-1	-1	-1	-1	1	0.00	Not acceptable*
2.23	I intend to purchase organic rice with traceability information if it is available.	-1	-1	-1	-1	-1	1	0.00	Not acceptable*
2.24	I plan to consume organic rice with traceability information if it is available for purchase.	-1	-1	-1	-1	1	1	0.50	Acceptable

#### A.4 IOC values and interpretation for the questionnaire items for the community enterprise farmers (face-to-face survey)

Assessment item	Objective 1			Objective 2			Objective 3			IOC	Meaning
	E1	E2	E3	E1	E2	E3	E1	E2	E3		
<b>1. Farm and farmer characteristics</b>											
1.1 Gender	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.2 Age	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.3 Education level	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.4 Experience in rice farming	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.5 Household members	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.6 Number of family labor	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.7 Farm ownership and size	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
1.8 Average yield	1	-1	1	-1	1	-1	-1	-1	-1	0.50	Acceptable
1.9 Are you an organic farmer?	1	1	1	-1	-1	-1	-1	-1	-1	1.00	Acceptable
<b>2. Production and management information</b>											
2.1 Where did you source the rice seeds you used in rice farming during the previous cropping?	1	1	1	-1	-1	-1	-1	-1	-1	-0.50	Not acceptable*
2.2 How will you assess the general soil fertility level of your rice field?	1	1	1	-1	-1	-1	-1	-1	-1	-0.50	Not acceptable*
2.3 How will you assess the general level of infestation of weeds, pests, and disease in your rice farm?	1	1	-1	-1	-1	1	-1	-1	-1	0.00	Not acceptable*
2.4 Do you get reasonable price in selling your paddy rice to your buyers?	1	1	-1	-1	-1	1	-1	-1	-1	0.00	Not acceptable*
2.5 Have you attended trainings on organic rice production in the past year?	-1	-1	-1	1	1	1	-1	-1	-1	1.00	Acceptable
2.6 Do you have access to credit facilities in your area in the past year?	-1	-1	-1	1	1	1	-1	-1	-1	1.00	Acceptable
2.7 Were you assisted or visited by extension workers in your area in the past year?	-1	-1	-1	1	1	1	-1	-1	-1	1.00	Acceptable
<b>3. Perception towards consumer information</b>											
3.1 Organic rice consumers are positively influenced by their family and close friends' positive opinion and usage of the product.	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
3.2 Organic rice consumers are positively influenced by the positive reviews about the product.	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
3.3 Consumers purchase organic rice that have product information that can easily be traced by themselves.	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
3.4 Knowing the product information is important among organic rice consumers.	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
3.5 Higher costs of organic rice products do not hinder consumers to buy.	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable
3.6 Health-conscious consumers prefer to purchase organic rice.	-1	-1	-1	-1	-1	-1	1	1	1	1.00	Acceptable

## **B. Questionnaires**

B.1 Questionnaire for the community enterprise (in-depth interview)

B.2 Questionnaire for the community enterprise farmers (FGD)

B.3 Questionnaire for community enterprise consumers

B.4 Questionnaire for community enterprise farmers

## B.1 Questionnaire for the community enterprise (in-depth interview)

1

Questionnaire ID: \_\_\_\_\_  
Date of interview: \_\_\_\_\_  
Interviewer: \_\_\_\_\_



**Questionnaire**  
**Community enterprise development:**  
**Exploring consumers' purchase intention and farmers' adoption motives**  
(#1a In-depth interview guide for the enterprise leader and two committee members)

Rationale: This questionnaire is intended to gather data for the research of Mr. Harry Jay Cavite, a PhD in Agriculture student at Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang. Your knowledge in rice mill management will be of great help in this research. May I request to please answer these questions to the best of your knowledge. Be assured that all your answers will be kept in the strictest confidentiality and will only be used for research purposes. This questionnaire has 6 parts which are:

- Part 1 Background of rice community enterprise
- Part 2 Buying paddy from farmers
- Part 3 Converting paddy to milled rice
- Part 4 Distributing milled rice to consumers
- Part 5 Support activities
- Part 6 Strengths, weaknesses, opportunities, and threats (SWOT)

Name of community enterprise leader and contact number: \_\_\_\_\_

### Part 1 Background of Rice Community Enterprise

- 1.1 What year was the community enterprise established?
- 1.2 How many farmer-members do you have?
- 1.3 Can you provide us information about your rice mill operation?
  - 1.3.1 Milling service charge (THB/kg)
  - 1.3.2 Average volume of paddy milled (kg/day)
  - 1.3.3 Milling capacity of rice mill (kg/day)
  - 1.3.4 Rice varieties milled

--

- 1.4 Can you provide us information about the machines and equipment available?

Name of Machine	Purpose and description
Rice mill	
Others:	

- 1.5 Can you please explain the rice mill and its purpose of selling rice to consumers?

--

### Part 2 Buying Paddy Rice from Farmers

- 2.1 Can you describe the details about the activities during buying of paddy rice from farmers (i.e., receiving raw material, handling, storing, etc.)?

Activity	Description
Receiving raw material	
Material handling	
Storing	

- 2.2 Can you provide information about your paddy rice supply?

Source of Rice Paddy and number	Paddy supply information
1. Farmer-members (n= )	
2. Outside farmers (n= )	
3. Others (if any) (n= )	
TOTAL	

2.3 Can you provide information about the price of your paddy supply?

Source of Rice Paddy and number	Paddy supply information
1. Farmer-members (n= )	
2. Outside farmers (n= )	
3. Others (if any) (n= )	
TOTAL	

2.4 Do you encounter problems in buying paddy from farmers?

2.4.1 How were you able to manage these problems in the past year?

2.4.2 What are your recommendations to better address these problems in the future?

Activity	Problems encountered	How they managed to solve the problem in the past year?	Suggested solutions to better address these problems in the future
Buying of paddy from farmers			

### Part 3 Converting Paddy to Milled Rice

3.1 Can you describe the detailed activities during the rice milling process (i.e., milling, packaging, etc.)?

Activity	Description
Milling	
Packaging	

3.2 How many percent is the milling recovery (estimated average) for all milled paddies?

3.3 Do you encounter problems in converting paddy to milled rice?

3.3.1 How were you able to manage these problems in the past year?

3.3.2 What are your recommendations to solve those problem?

Activity	Problems encountered	How they managed to solve the problem in the past year?	Suggested solutions to better address these problems in the future
Converting paddy to milled rice			

3.4 Can you tell us about the by-products in processing?

--

### Part 4 Distributing Milled Rice to Consumers

4.1 Can you describe us the detailed activities when you distribute the milled/packed rice to consumers (i.e., order processing, transportation, selling, etc.)?

Activity	Description
Order processing	
Transportation and selling	

4.2 Can you provide information about the rice package the enterprise is selling?

4.2.1 How much is the selling price of each rice package?

4.2.2 Do you get product specification from your customers?

4.2.3 How do you obtain product requirements from your consumers?

Type of rice package	Selling price (THB/kg)	How do you obtain product information from consumers?
Vacuum packed		
Scoop		
Others:		

4.3 Do you encounter problems in distributing milled rice to consumers?

4.3.1 How were you able to manage these problems in the past year?

4.3.2 What are your recommendations to solve those problem?

Activity	Problems encountered	How they managed to solve the problem in the past year?	Suggested solutions to better address these problems in the future
Distributing milled rice to consumers			

4.5 Have you seen evidence that consumers are concerned about the chemical residues in rice; or have you seen customers who are actively seeking "safe and healthier rice"?

--

#### Part 5 Support Activities

5.1 Can you describe us the support activities (if any) that helped achieve the rice mill's goals (i.e., customer service, management & communication, purchasing & maintenance, etc.)?

Activity	Description
Customer service	

5.2 Do you encounter problems in doing the above support activities in past year?

5.2.1 How were you able to manage these problems in the past year?

5.2.2 What are your suggested solutions to better address these problems in the future?

Activity	Problems encountered	How they managed to solve the problem in the past year?	Suggested solutions to better address these problems in the future
Supporting activities in rice milling			

5.3 What are the agencies that support the enterprise and farmer-members?

Agency	Support information
Ministry of Agriculture and Cooperatives	
Others:	

5.4 What other support activities do you think are needed for your rice mill to improve its performance?

5.5 How is the rice industry in your province changing, if it is?

#### Part 6 Strengths, Weaknesses, Opportunities and Threats (SWOT)

6.1 What enabled your rice mill to be successful in the past years?

6.2 What are the things that your rice mill wants to improve to perform better in the future, in terms procurement, milling, and distributing activities?

6.3 What do you think are the favorable factors that could give your rice mill competitive advantage in the future?

6.3.1 Aside from milled rice, are there any other rice products requested by your customers?

6.3.2 Are you planning to offer other products aside from your existing product lines?

6.4 What do you think are the factors that could negatively affect your rice mill performance?

Strengths	Weakness
Opportunities	Threats

Thank you for your time and information given.

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E-mail: ksuneeporn@gmail.com

## B.2 Questionnaire for the community enterprise farmers (FGD)

1

Questionnaire ID: \_\_\_\_\_  
 Date of interview: \_\_\_\_\_  
 Interviewer: \_\_\_\_\_



**Questionnaire**  
**Community enterprise development:**  
**Exploring consumers' purchase intention and farmers' adoption motives**  
 (#1b Focus group discussion guide for community enterprise farmers)

Rationale: This questionnaire is intended to gather data for the research of Mr. Harry Jay Cavite, a PhD in Agriculture student at Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang. Your collective knowledge in rice production is important to draw out the common issues experienced by farmer-members in the rice community enterprise supply chain. May I request to please answer these questions to the best of your knowledge. Be assured that all your answers will be kept in the strictest confidentiality and will only be used for research purposes. This questionnaire has 4 parts which are:

- Part 1 Source of rice farming inputs
- Part 2 Production activities
- Part 3 Delivering rice to buyers
- Part 4 Support activities in rice farming

Name of community enterprise farmers and contact number:

1 _____	5 _____
2 _____	6 _____
3 _____	7 _____
4 _____	8 _____

### Part 1 Source of rice farming inputs

1.1 Can you provide information about your input supply?

Type of farm input	Input information
Rice seeds (variety: _____)	
Organic fertilizer	
Chemical fertilizer	
Pesticides/ Insecticides	
Machinery	
Labor	
Others	

1.2 Can you provide information about your input suppliers (material, labor, etc.)?

Type of farm input	Supplier information
Rice seeds (variety: _____)	
Organic fertilizer	
Chemical fertilizer	
Pesticides/ Insecticides	
Machinery	
Labor	
Others	

1.3 Can you provide information about the price of your farm inputs (material, labor, etc.)?

Type of farm input	Price information
Rice seeds (variety: _____)	
Organic fertilizer	
Chemical fertilizer	
Pesticides/ Insecticides	
Machinery	

Labor	
Others	

1.4 Do you encounter problems in sourcing farm inputs?

1.4.1 How were you able to manage these problems in the past year?

1.4.2 What are your recommendations to better address these problems in the future?

	Problems encountered	How were you able to manage in the past year?	What are your recommendations?
Sourcing of rice farming inputs			

### Part 2 Production activities

2.1 Can you describe in detail the activities you normally do in rice farming (i.e. land preparation, crop establishment, care and maintenance, harvest and post-harvest)?

Production activities (whichever applicable)	Description
Land preparation	
Crop establishment	
Care and maintenance	
Harvest and post-harvest	

2.2 How do you communicate or get production information related to rice farming?

2.2.1 What kind of information do you usually get?

--

2.3 How many times do you produce rice in a year?

2.4 What were the rice varieties you planted in the last cropping?

2.5 What is your average volume (kg) of rice produced per cropping per rai?

--

2.6 Do you encounter post-harvest losses in the past cropping?

--

2.7 Do you encounter problems in producing rice during the previous cropping?

2.7.1 How were you able to manage these problems based on this experience?

2.7.2 What are your recommendations to better address these problems in the future?

Activity	Problems encountered	How were you able to manage in the past year?	What are your recommendations?
Rice production			

### Part 3 Delivering rice to buyers

3.1 Can you describe in detail the activities when you deliver rice to the community enterprise (i.e. order processing, transporting, selling, others)?

Distribution activities (whichever applicable)	Description
Order processing	
Transporting	
Selling	
Others	

3.2 Can you provide information about your buyers?

Buyers	Buyer information
Ban Nong Saeng Community enterprise	
Others:	

3.3 Can you provide information about the price of paddy you are selling?

Buyers	Price information
Community enterprise	
Others:	

3.4 Do you encounter problems in selling your paddy to your buyers during the previous cropping?

3.4.1 How were you able to manage these problems in the past year?

3.4.2 What are your recommendations to better address these problems in the future?

	Problems encountered	How were you able to manage in the past year?	What are your recommendations?
Selling of rice paddy			

#### Part 4 Support activities in rice farming

4.1 Can you describe us the support activities that helped achieved your rice farming goals (e.g., certification, trainings, credit, etc.)?

Support Activities	Description
Certification	
Trainings	
Credit	
Others	

4.2 In the past year, what were the agencies that support your rice production activities?

Name of agency	Support information
Ministry of commerce	
Others:	

4.3 Do you encounter problems in doing the above support activities?

4.3.1 How were you able to manage these problems in the past year?

4.3.2 What are your suggested solutions to better address these problems in the future?

	Problems encountered	How were you able to manage in the past year?	What are your recommendations?
Supporting activities			

4.4 What other support activities do you think are needed to improve your rice production performance?

4.5 How is the rice production industry in your province changing, if it is?

--

Thank you for your time and information given.

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## B.3 Questionnaire for community enterprise consumers

1

Questionnaire ID: \_\_\_\_\_  
Date of interview: \_\_\_\_\_  
Interviewer: \_\_\_\_\_



**Questionnaire**  
**Community enterprise development:**  
**Exploring consumers' purchase intention and farmers' adoption motives**  
(#2 Face-to-face interview questionnaire for organic rice consumers)

Rationale: This questionnaire is intended to gather data for the research of Mr. Harry Jay Cavite, a PhD in Agriculture student at Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang. Your knowledge about purchasing organic rice will be of great help in this study. We integrate the concept of traceability wherein it is the capability to trace and verify product information by means of QR code (see visual aid). May I request to please answer these questions to the best of your knowledge. Be assured that all your answers will be kept in the strictest confidentiality and will only be used for research purposes. This questionnaire has 2 parts which are:

Part 1 Socio-demographic Profile of Consumers

Part 2 Perceptions Towards Purchasing Organic Rice

Name of consumer and contact number (optional): \_\_\_\_\_

### Part 1 Socio-demographic Profile of Consumers

**Instruction:** Please mark ✓ on the box that describes yourself and/or fill in the space provided.

- 1.1 Gender       Male                       Female
- 1.2 Age              \_\_\_ years old
- 1.3 Address              \_\_\_\_\_
- 1.4 Marital status     Single               Married               Widowed     Divorced
- 1.5 Education level    Lower than primary school       Primary school  
 Junior high school                       Vocational high school  
 Diploma or vocational certificate       Bachelor's degree  
 Postgraduate
- 1.6 Household size    \_\_\_ heads
- 1.7 Monthly household income       ≤10,000 THB                       10,001 to 20,000 THB  
 20,001 to 30,000 THB                       30,001 to 40,000 THB  
 40,001 THB and above
- 1.8 Occupation       Farmer                       Business owner               Government employee  
 Private company employee                       Freelance or daily wage earner               Student

### Part 2 Perceptions Towards Purchasing Traceable Organic Rice

**Instruction:** Please mark ✓ on the box that best matches your level of agreement or disagreement. With 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree.

Item	Level of agreement/ disagreement				
	1	2	3	4	5
2.1 Buying organic rice with traceability information is beneficial to me.					
2.2 Buying organic rice with traceability information is a good idea.					
2.3 Buying organic rice with traceability information is interesting.					
2.4 I would buy organic rice with traceability information because my family and friends are in favor of it.					
2.5 People close to me think I should buy organic rice with traceability information.					
2.6 I will buy organic rice with traceability information because of positive reviews from people who have already bought it.					
2.7 If I wanted to, I could buy traceable organic rice instead of regular-packed rice.					
2.8 Buying organic rice with traceability information or not is mostly up to me.					
2.9 I can easily purchase traceable organic rice in different distribution channels.					
2.10 I consider myself as a health-conscious consumer.					
2.11 I often think about health-related issues.					

Item	Level of agreement/ disagreement				
	1	2	3	4	5
2.12 I choose food carefully to stay healthy.					
2.13 Organic rice with traceability information is more environment-friendly and promote sustainable consumption.					
2.14 I am greatly concerned about the negative impacts of inorganic rice farming.					
2.15 I am concerned about the state of the world's environment.					
2.16 Organic rice with traceability information costs more than regular-packed rice.					
2.17 Only high-income consumers can afford to buy organic rice with traceability information.					
2.18 Organic rice with traceability information is beyond my budget.					
2.19 I am familiar with QR codes used in organic rice traceability.					
2.20 I have already purchased an organic rice with a QR code for traceability.					
2.21 I am familiar with rice package with a QR code for traceability information.					
2.22 I am willing to buy organic rice with traceability information if available in the market.					
2.23 I intend to purchase organic rice with traceability information if it is available.					
2.24 I plan to consume organic rice with traceability information if it is available for purchase.					

Visual aid to be shown to illustrate how a traceable organic rice looks like



Thank you for your time and information given.

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## B.4 Questionnaire for community enterprise farmers

1

Questionnaire ID: \_\_\_\_\_  
Date of interview: \_\_\_\_\_  
Interviewer: \_\_\_\_\_



### Questionnaire

#### Community enterprise development:

#### Exploring consumers' purchase intention and farmers' adoption motives

(#3 Face-to-face interview questionnaire for the community enterprise farmer-members)

Rationale: This questionnaire is intended to gather data for the research of Mr. Harry Jay Cavite, a PhD in Agriculture student at Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang. Your personal knowledge in rice farming will be of great help in this research. May I request to please answer these questions to the best of your knowledge. Be assured that all your answers will be kept in the strictest confidentiality and will only be used for research purposes. This questionnaire has 3 parts which are:

Part 1 Farm and Farmer Characteristics

Part 2 Production and Management Information

Part 3 Perception Towards Consumer Information

Name of farmer and contact number (optional): \_\_\_\_\_

#### Part 1 Farm and Farmer Characteristics

**Instruction:** Please mark ✓ on the box that describes yourself and/or fill in the space provided.

- 1.1 Gender  Male  Female
- 1.2 Age \_\_\_\_\_ years old
- 1.3 Education level  Primary school  High school  
 College  Graduate school or more
- 1.4 Experience in rice farming \_\_\_\_\_ years
- 1.5 Household members \_\_\_\_\_ heads
- 1.6 Number of family labor \_\_\_\_\_ heads
- 1.7 Farm ownership and size  Owned, \_\_\_\_\_ rai  
 Rented, \_\_\_\_\_ rai \_\_\_\_\_ rental fee (THB/rai)
- 1.8 Average yield \_\_\_\_\_ kg per rai
- 1.9 Are you an organic farmer:  Yes  No

#### Part 2 Production and Management Information

**Instruction:** Please mark ✓ on the box that best describes your production and management characteristics and/or fill in the space provided.

- 2.1 Where did you source the rice seeds you used in rice farming during the previous cropping?  
 Own  Bought  CE  Government
- 2.2 How will you assess the general soil fertility level of your rice field?  
 Low  Moderate  High
- 2.3 How will you assess the general level of infestation of weeds, pests, and disease in your rice farm?  
 Low  Moderate  High
- 2.4 Do you get reasonable price in selling your paddy rice to your buyers?  
 Yes  No
- 2.5 Have you attended trainings on organic rice production in the past year?  
 Yes  No

2.6 Do you have access to credit facilities in your area in the past year?

Yes  No

2.7 Were you assisted or visited by extension workers in your area in the past year?

Yes  No

### Part 3 Perception Towards Consumer Information

**Instruction:** Please rate your level of agreement or disagreement on the following consumer information. Please mark ✓ on the box opposite to the item.

With 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree

Item	Level of agreement/ disagreement				
	1	2	3	4	5
3.1 Organic rice consumers are positively influenced by their family and close friends' positive opinion and usage of the product.					
3.2 Organic rice consumers are positively influenced by the positive reviews about the product.					
3.3 Consumers purchase organic rice that have product information that can easily be traced by themselves.					
3.4 Knowing the product information is important among organic rice consumers.					
3.5 Higher costs of organic rice products does not hinder consumers to buy.					
3.6 Health-conscious consumers prefer to purchase organic rice.					

Thank you for your time and information given.

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## C. Publications

- C.1 Cavite, H. J., Mankeb, P., & Suwanmaneepong, S. (2021). Community enterprise consumers' intention to purchase organic rice in Thailand: The moderating role of product traceability knowledge. *British Food Journal*, Vol. 124 No. 4, pp. 1124-1148. <https://doi.org/10.1108/BFJ-02-2021-0148> (Web of Science, Q2)
- C.2 Cavite, H. J. M., Kerdsriserm, C., & Suwanmaneepong, S. (2021). Strategic guidelines for community enterprise development: a case in rural Thailand. *Journal of Enterprising Communities: People and Places in the Global Economy*, ahead-of-print, 1-20. <https://doi.org/10.1108/JEC-05-2021-0062> (SJR, Q2)
- C.3 Cavite, H. J. M., Mankeb, P., Kerdsriserm, C., Joedsak, A., Direksri, N., & Suwanmaneepong, S. (2022). Do behavioral and socio-demographic factors determine consumers' purchase intention towards traceable organic rice? Evidence from Thailand. *Organic Agriculture*, ahead-of-print, 1-16. <https://doi.org/10.1007/s13165-022-00387-1> (SJR, Q2)

Note: Publications attached in this section are only the first page since the copyright of the articles are already transferred to the journal.

## C.1 Community enterprise consumers' intention to purchase organic rice in Thailand: The moderating role of product traceability knowledge

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The current issue and full text archive of this journal is available on Emerald Insight at:  
<https://www.emerald.com/insight/0007-070X.htm>

BFJ  
124,4

1124

Received 12 February 2021  
Revised 26 May 2021  
30 June 2021  
Accepted 12 July 2021

# Community enterprise consumers' intention to purchase organic rice in Thailand: the moderating role of product traceability knowledge

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## Abstract

**Purpose** – Organic rice forms the largest portion of the Thai organic food market. Because of its increasing popularity, marketers need to better understand consumer behaviour to address emerging concerns regarding product safety and quality and to tailor better marketing strategies relevant to the development of organic rice. As such, this study aims to examine consumers' purchase intention towards organic rice, using traceability information, and to investigate the direct and moderating roles of product traceability knowledge, using the theory of planned behaviour.

**Design/methodology/approach** – Responses were collected from 243 organic rice consumers in a farmers' market in Chachoengsao Province, Thailand, following a convenience sampling approach. The gathered data were analysed using structural equation modelling to evaluate the strength of the relationship between the constructs.

**Findings** – The findings reveal that subjective norms, health consciousness and product traceability knowledge have a significant positive influence on consumers' intention to purchase organic rice. This study also establishes the moderating role of product traceability knowledge in perceived behavioural control and purchase intention, indicating that elaborated product information through traceability is essential for consumers who feel capable of buying the product. However, the direct effects of attitude and perceived behavioural control are insignificant, indicating the presence of external barriers to the purchase of organic rice, and that people may have a negative attitude towards the product. In addition, the cost perception result reveals that consumers consider price as an indicator of organic product quality, thereby increasing their desirability.

**Social implications** – The findings of this study will help community enterprises in Thailand develop a more effective marketing strategy based on the identified motivators of organic rice purchase intention.

**Originality/value** – This study develops a model that integrates important factors related to organic food consumption to generate a more comprehensive analysis of this mainstream research. To the best of the authors' knowledge, this is also the first study to investigate the moderating role of product traceability knowledge to obtain a new and more focused understanding of how this factor influences purchase intention when applied explicitly to organic food. Finally, the findings provide theoretical contributions and implications for both the community enterprise and policymakers on developing strategies for organic rice marketing among community enterprises in Thailand.

**Keywords** Organic rice, Purchase intention, Product traceability, Theory of planned behaviour, Structural equation modelling

**Paper type** Research paper

## 1. Introduction

The organic food sector is the fastest growing sector in the food market globally, with outstanding performance in both production and sales (Liang, 2016). Similarly, in Thailand, organic products are becoming increasingly important. Over the past years, Thailand has experienced increased growth in organic food consumption, which is attributed to government policies, increase in consumer income and changes in food consumption preferences

This project was supported by the research fund of King Mongkut's Institute of Technology Ladkrabang (KMITL) Doctoral scholarship, Bangkok, Thailand, under Grant KDS2019/026. The authors would like to thank the organic rice consumers in the study area for their time in participating the survey and to the community enterprise leaders for their cooperation and coordination efforts.



British Food Journal  
Vol. 124 No. 4, 2022  
pp. 1124-1148  
© Emerald Publishing Limited  
0007-070X  
DOI 10.1108/BFJ-02-2021-0148

## C.2 Strategic guidelines for community enterprise development: a case in rural Thailand

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# Strategic guidelines for community enterprise development: a case in rural Thailand

Community  
enterprise  
development

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Received 4 May 2021  
Revised 15 August 2021  
Accepted 15 August 2021

### Abstract

**Purpose** – In spite of the government's support for small-scale rice farmers in rural areas of Thailand, several problems still affect their production and marketing performance. This study aims to assess a rice production community enterprise (RPCE) through an in-depth investigation of its problems and capabilities; and formulate internal strategic guidelines for enterprise development.

**Design/methodology/approach** – This study used a qualitative approach through in-depth interviews with the community enterprise leader and committee members, and focus group discussion with eight farmer-members, purposively selected in Chachoengsao, Thailand. Data were transcribed, sorted and organised to determine themes and patterns. Strengths, weaknesses, opportunities and threats (SWOT) and threats, opportunities, weaknesses and strengths (TOWS) matrix situational analyses were done to develop strategic options. Strategic guidelines were formulated through a final deliberation with all members to ensure strategies aligned with the enterprise's goals and objectives.

**Findings** – The results have identified three main problem categories encountered by the community enterprise in the areas of membership and labour; production and milling operations; and product design and marketing. The enterprise's main strengths and opportunities include its product certifications and support from external organisations. Strategic points were developed, and policy support programmes are recommended for capacity building and product development as most problems identified relate to these aspects.

**Originality/value** – The utility of this study is its focus on an RPCE. The findings will help policymakers and concerned government agencies implement better programmes and policies to develop RPCEs. Furthermore, this study will be a source for future qualitative literature that will provide helpful information to other studies aiming to develop other types of community enterprises (CEs).

**Keywords** Strategic guidelines, Community enterprise, Community development, SWOT analysis, Rice production

**Paper type** Research paper

### 1. Introduction

Organisations are essential in a community because of their focus on members' specific needs aside from the social, economic and political benefits they can get (Sathapatyanon *et al.*, 2018).

This work was supported by King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand Doctoral Scholarship. Grant KDS2019/026. The data collection and results deliberation also received grants from the Program Management Unit on Area-Based Development (PMU-A), Office of the Higher Education Policy, Science, Research and Innovation, Thailand Science Research and Innovation (TSRI). The authors would like to thank the farmers, CE leader and committee members for their time and participation in this study.



Journal of Enterprising  
Communities: People and Places in  
the Global Economy  
© Emerald Publishing Limited  
1750-6204  
DOI 10.1108/JEC-05-2021-0062

### C.3 Do behavioral and socio-demographic factors determine consumers' purchase intention towards traceable organic rice? Evidence from Thailand

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Org. Agr.  
<https://doi.org/10.1007/s13165-022-00387-1>

ORIGINAL RESEARCH PAPER



## Do behavioral and socio-demographic factors determine consumers' purchase intention towards traceable organic rice? Evidence from Thailand

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Received: 27 May 2021 / Accepted: 8 February 2022  
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**Abstract** Despite the increased popularity of organic rice in Thailand's domestic market, little is known about how consumers' behavioral and socio-demographic factors predict their purchase intention. Grounded on the theory of planned behavior (TPB), this research investigates consumers' purchase intention for traceable organic rice. Responses were collected from 243 organic rice consumers in a farmers' market in Chachoengsao Province, Thailand, following a convenience sampling approach. Data were analyzed using factor analysis, multiple linear regression, and one-way ANOVA to determine the factors predicting consumers' purchase intention and identify any differences with respect to socio-demographic variables. Results reveal that subjective norms, perceived behavioral control, health consciousness, and knowledge of product traceability significantly predict consumers' intention to purchase traceable organic rice. However, socio-demographic variables — age, income, and education, were found to have no impact on purchase intention. This study's findings offer theoretical and managerial insights to community enterprises and policymakers to fully understand consumer behavior for organic rice and implement effective marketing strategies and policies.

**Keywords** Organic rice · Purchase intention · Community enterprise · Socio-demographic factors · Thailand

### Introduction

Organic foods have been gaining popularity among consumers globally, with demand reaching more than 100 billion USD in 2018 (Willer and Lernoud 2020). Similar to the global trend, organic foods have also earned increased attention among consumers in Thailand, where a market value of 2311 million Thai Baht (THB) was reported, equivalent to 76 million US dollars (USD) (National Organic Farming Development Board 2017). In terms of land area, there are approximately 300,000 rai or about 48,000 ha devoted to organic agriculture, according to the Thailand Board of Investment (2020). Thailand has seen a 209% increase in organic agricultural land in the latest 10-year data (2008–2018) by the Research Institute of Organic Agriculture FiBL and IFOAM Organics International (Willer and Lernoud 2020). The trends in market value and land area seemed to be increasing through the past years due to consumers' preference for healthier and safer diets (Jitrawang and Krairit 2019).

Domestically, Thailand's consumption share of organic packaged food products was about 0.3% of the total health and wellness products consumption value. Demand for organic foods in Thailand represents

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## **D. Conference Papers**

- D.1 Cavite, H. J., Mankeb, P., & Suwanmaneepong, S. (2021). Investigating the influence of behavioral and socio-demographic factors on Thai consumers' purchase intention towards traceable organic rice product. *23<sup>rd</sup> International Conference on Economic Competitiveness and Sustainability*, 25-26 March 2021.
- D.2 Cavite, H. J., & Suwanmaneepong, S. (2021). Farmers' perception of rice production community enterprise's roles: evidence from Chachoengsao Province, Thailand. *IOP Conference Series: Earth and Environmental Science*, 892(1), 1-5. <https://doi.org/10.1088/1755-1315/892/1/012020>, 27-28 July 2021.
- D.3 Cavite, H. J., & Suwanmaneepong, S. (2021). Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand. *9<sup>th</sup> International Conference on the Integration of Science and Technology for Sustainable Development*. 19 November 2021.

## D.1 Investigating the influence of behavioral and socio-demographic factors on Thai consumers' purchase intention towards traceable organic rice product

**Citation:** Cavite, H. J., Mankeb, P., & Suwanmaneepong, S. (2021). Investigating the influence of behavioral and socio-demographic factors on Thai consumers' purchase intention towards traceable organic rice product. *23<sup>rd</sup> International Conference on Economic Competitiveness and Sustainability*, 25-26 March 2021.

### **Investigating the influence of behavioral and socio-demographic factors on Thai consumers' purchase intention towards traceable organic rice product**

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#### **ABSTRACT**

Despite the increased popularity of organic rice in Thailand's domestic market, little is known about how consumers' behavioral and socio-demographic factors influence their purchase intention. Grounded on the theory of planned behavior, this research investigates consumers' purchase intention for traceable organic rice. Responses were collected from 243 organic rice consumers in a farmers' market in Chachoengsao Province, Thailand, following a convenience sampling approach. Data were analyzed using factor analysis, multiple linear regression, and one-way ANOVA to determine the factors predicting consumers' purchase intention and identify any differences with respect to socio-demographic variables. Results reveal that subjective norms, perceived behavioral control, health consciousness, and knowledge of product traceability have a significant positive influence on consumers' intention to purchase traceable organic rice. However, socio-demographic variables – age, income, and education, were found to have no impact on purchase intention. This study's findings offer theoretical and managerial insights to community enterprises and policymakers to fully understand consumer behavior for organic rice and implement effective marketing strategies and policies.

#### **Keywords**

Organic rice, purchase intention, community enterprise, socio-demographic factors, Thailand

#### **1 Introduction**

In recent years, organic food consumption has gained popularity worldwide (Somasundram *et al.* 2016). The global demand for organic foods reached more than 100 billion USD in 2018 (Willer and Lernoud 2020). The majority of organic foods are consumed in developed countries, and growing evidence is also seen among developing countries (Wang *et al.* 2019). Thailand is among this list of developing countries, with organic food products gaining acceptance in the domestic market. Organic rice, in particular, has gained increased attention due to its perceived health benefits and its potential to address sustainable production.

However, despite this trend, its market size remains relatively small (Willer and Lernoud 2020). Additionally, there have been reports of consumers' lack of trust in organic rice products' authenticity and quality (Atthirawong 2017). A better knowledge of consumers' purchase intention is essential for devising effective marketing strategies to develop Thailand's domestic organic rice market.

Previous studies have explored consumers' purchase intention for organic products. For instance, Teng and Lu (2016) examined the effect of consumption motives on behavioral intent related to organic food consumption; and found out that health consciousness, food safety concern, and ecological motives positively impact consumers' willingness to purchase organic foods. Demirtas (2019) determined the effects of knowledge on consumers' purchasing behavior for organic foods and showed that consumers' knowledge about organic food products has a positive and significant impact on their intention. Although these studies demonstrated consumers' purchase intention, most of them generally focused on organic products, and not much has been investigated specifically for organic rice. Besides, prior researches have not explored the impact of socio-demographic factors on consumers' intention to purchase.

Hence, this study explores this research gap by investigating consumers' behavioral and socio-demographic factors influencing traceable organic rice purchase intention. This research adopts the theory of planned behavior (TPB) framework (Ajzen 1991) and integrates health consciousness and traceability knowledge constructs in the context of organic food consumption. This study is a case of rice production community enterprise (RPCE) consumers in Chachoengsao Province, Thailand. The findings of this study will provide important insights for the community enterprise and policymakers on how marketing strategies and policies will be better implemented, which will drive greater purchase intentions for organic rice.

## **2 Theoretical background and hypothesis**

This paper aims to understand the behavioral and socio-demographic factors influencing consumers' intention to purchase traceable organic. A traceable organic rice enables consumers to identify and trace the history, distribution, and location of products to ensure reliability claims by means of recorded identifications (i.e., a barcode, radio-frequency identification (RFID), or quick response (QR) code) (Aung and Chang 2014; FAO 2020). This study used the theory of planned behavior (TPB) which was developed by Ajzen (1991) with three main factors – attitude, subjective norms, and perceived behavioral control. The TPB is widely used in understanding consumer purchase intentions as it gives a thorough explanation of the underlying behavioral factor (Boobalan *et al.* 2021; Lee *et al.* 2015). Various scholars, as well, have modified this theory in the context of organic food consumption. This study adds health consciousness and knowledge of traceability with support from prior studies (Kim and Woo 2016; Wang *et al.* 2019) to better explain consumers' purchase intention. The following factors are described below:

## 2.1 Attitude

Attitude refers to the individual's character to respond either favorably or unfavorably towards a behavior (Ajzen 1991). In theory, the intention to perform a specific action is predicted by an individual's attitude towards that behavior. Recent empirical findings have shown that attitude towards organic foods significantly influences consumers' purchase intention. For instance, Boobalan *et al.* (2021) found that attitude can significantly drive behavioral intentions for organic food purchases. Asif *et al.* (2018) found attitude as a significant predictor of organic food purchase intention. Hence, it is hypothesized that:

**H1.** Attitude has a positive influence on consumers' purchase intention towards traceable organic rice products.

## 2.2 Subjective norms

Subjective norms are the individual's social pressures regarding performing or not performing a behavior (Ajzen 1991). Previous empirical works have found out that subjective norms significantly influence consumers' intention to buy organic food. For instance, Chu (2018) revealed that subjective norms positively influence Chinese consumers' intention to purchase organic foods. Teng (2015) found out that subjective norms significantly influence consumers' organic food purchase. Thus, it is hypothesized that:

**H2.** Subjective norms have a positive influence on consumers' purchase intention towards traceable organic rice products.

## 2.3 Perceived behavioral control

Perceived behavioral control is the individual's perception of the difficulty or easiness of performing a behavior (Ajzen 1991). Individuals with more control over the action are more likely to perform such behavior. A study by Maichum *et al.* (2016) found out that consumers' perceived behavioral control positively influences their purchase intention for organic products. Likewise, Demirtas (2019) have shown that consumers' intention to buy organic food is significantly affected by their perceived behavioral control. Hence, the hypothesis has been proposed that:

**H3.** Perceived behavioral control has a positive influence on consumers' purchase intention towards traceable organic rice products.

## 2.4 Health consciousness

Health consciousness is the extent to which an individual is undertaking greater concerns to health and health-related information in his everyday actions (Jayanti and Burns 1998). Various studies have reported that health consciousness is one of the most important factors influencing organic food purchase. For instance, Yadav and Pathak (2016) added health consciousness to investigate organic food purchase intention among young adults and found significant influence. Wang *et al.* (2019) investigated organic food purchase intention in

developing countries and likewise seen the significant influence of health consciousness among consumers as a significant predictor. Hence, the hypothesis is proposed that:

**H4.** Health consciousness has a positive influence on consumers' purchase intention towards traceable organic rice products.

#### 2.5 Knowledge of product traceability

Product traceability is defined as the ability to trace and follow food through all stages of production. A product traceability system provides detailed information on food production, processing, transfer, distribution, and other supply chain information (Chang *et al.* 2013). Recent studies show that traceability information can impact consumers' purchase intention to buy organic foods. For instance, Lu *et al.* (2016) found out that consumers attached the greatest importance to traceability information in purchasing pork. Wang and Tsai (2019) revealed that consumers' perception of traceability in fresh foods is positively related to their purchase intention. Based on this information, the following hypothesis below can be proposed.

**H5.** Knowledge of product traceability has a positive influence on consumers' purchase intention towards traceable organic rice products.

#### 2.6 Socio-demographic factors

Prior studies have reported that consumers' intention to purchase may not convert into actual purchase of organic foods. Singh and Verma (2017) found that socio-demographic variables can influence buying behavior towards organic food products. In particular, previous studies have reported that age, income, and education levels influence purchase behavior towards organic food products (Aryal *et al.* 2009; Govindnasamy and Italia 1990; Van Doorn and Verhoef 2011). It is essential to examine the influence of these demographic factors on consumers' purchase intention. Hence, the following hypotheses are proposed.

**H6a.** There is a significant difference between age levels of consumers towards purchase intention for traceable organic rice products.

**H6b.** There is a significant difference between income levels of consumers towards purchase intention for traceable organic rice products.

**H6a.** There is a significant difference between education levels of consumers towards purchase intention for traceable organic rice products.

A conceptual model in Figure 1 formally presents the hypotheses mentioned above. This model depicts attitude, subjective norms, perceived behavioral control, health consciousness, and knowledge of traceability as factors influencing consumers' purchase intention towards traceable organic rice. The model also demonstrates that socio-demographic factors influence purchase intention.

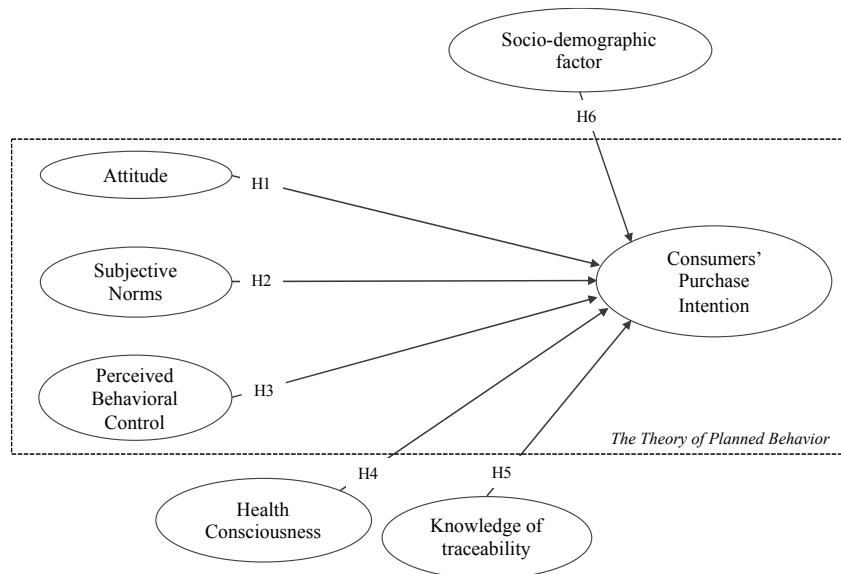


Figure 1. Conceptual model

### 3 Methodology

#### 3.1 Study area

This study focuses on the organic rice consumers of an RPCE in Sanam Chai Khet District, Chachoengsao Province, Thailand. RPCEs are formed through the “CEs Promotion Act of 2005” by the Royal Government of Thailand to enhance the production and market competitiveness of small-scale rice farmers in the rural provinces (Petcho et al. 2019).

#### 3.2 Data source and measurement scale

To test the proposed hypotheses, empirical data has been collected through a structured questionnaire. The items in the questionnaire were adapted from previous studies (Ayyub *et al.* 2018; Nguyen *et al.* 2019; Spence *et al.* 2018; Voon *et al.* 2011). Questions asked in the questionnaire were anchored on the 5-point Likert scale. The respondents' socio-demographic profiles were also recorded on the parameters such as gender, age, education level, occupation, and household income. Initially, questionnaire pretesting was performed among 30 consumers in a farmers' market by community enterprise. Similar to Wang *et al.* (2019), the questionnaire was drafted in English and translated into the respondents' common language (Thai) to ensure semantic equivalence of the items. A few revisions were made based on the consumers' responses to the pretest questions.

### 3.3 Sample and data collection procedure

A face-to-face survey was conducted in the community enterprise's farmers' market in the study area. Convenience sampling technique was done similar to various purchase intention studies (Chang and Chang 2017; Lee *et al.* 2015; Prakash and Pathak 2017). Consumers were intercepted as they left after they bought organic rice. The idea of a traceable organic rice was explained. A total of 299 questionnaires were completed. There were 243 usable responses, or 81% of the total, considered after eliminating respondents with incomplete or unengaged responses to the measurement item questions. The sample size gathered was more than the minimum required for this study, which is ten times the number of observed variables.

### 3.4 Data analysis

The responses were thoroughly checked and coded for the purpose of statistical analysis. The data was entered in Statistical Package for Social Sciences (SPSS) version 26. To examine the reliability of the empirical data, consistency analysis was done using Cronbach's alpha method. Cronbach's alpha is the measure of internal consistency, i.e., how closely items are related in the construct. Factor analysis was done using principal component analysis (PCA) method with Varimax rotation to ascertain the factors predicting consumer purchase intention towards traceable organic rice. The hypotheses (H1 to H5) were tested using multiple linear regression (MLR) analysis. The regression model predicts the influence of attitude, subjective norms, perceived behavioral control, health consciousness, and knowledge of product traceability on consumer's purchase intention. One-way analysis of variance (ANOVA) was done to determine whether there are any statistical differences in purchase intention according to age, income, and education level (H6a to H6c).

## 4 Results

### 4.1 Description of the sample

The demographic characteristics of consumers were analyzed, and the summary is presented in Table 1. The results indicate that most consumers (74%) were females, while 26% were males. The majority of the respondents were between 41 and 50 years of age; this accounts for 30% of sampled respondents. As with education level, the majority of the consumers (37%) were bachelor's degree holders, followed by high school and vocational certificate holders (33%), primary and school and lower (20%), and post-graduate degree holders (10%). The sample analysis results also show that most of the respondents had an income in the 10,001 to 20,000 THB bracket, and the highest proportion of respondents (85%) are living in one to five-person households. As with occupation, most of the respondents (23%) are business owners.

Table 1. Demographic details and descriptive statistics of respondents (N=243)

Sample characteristics	n	%
Gender		
Male	63	25.9
Female	180	74.1
Age group		
18-30	32	13.2
31-40	55	22.6
41-50	73	30.0
51-60	36	14.8
Above 60	47	19.3
Educational level		
Primary school and lower	49	20.2
High school and vocational certificate	81	33.3
Bachelor's degree	89	36.6
Postgraduate degree	24	9.9
Household size		
1-5	207	85.2
6-10	36	14.8
Monthly household income		
Less than or equal to 10,000 THB	46	18.9
10,001 to 20,000 THB	87	35.8
20,001 to 30,000 THB	61	25.1
30,001 to 40,000 THB	29	11.9
Above 40,000 THB	20	8.2
Occupation		
Farmer	40	16.5
Business owner	71	22.9
Government employee	43	17.7
Private company employee	40	16.5
Freelancer or daily wage earner	44	18.1
Student	5	2.1

#### 4.2 Reasons for purchasing organic rice

Respondents were asked about their purchasing habits. About 63% buy organic rice products once a month, 24% only for some months, 11% every week, and 3% only twice or thrice a month. Most respondents marked organic rice's safety standards as the main reason for purchase. Other reasons such as reasonable price (24%), aroma (18%), texture (16%), and availability (13%) are also supported by the respondents (Figure 2).

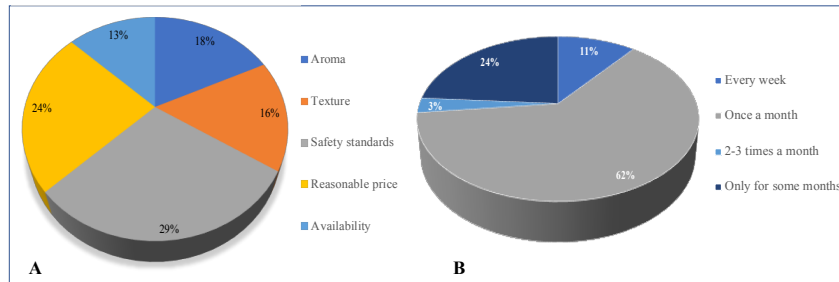


Figure 2. (A) Reasons for purchasing organic rice, and (B) Frequency of purchase organic rice.

#### 4.3 Factors predicting purchase intention towards traceable organic rice

Factor analysis results revealed the factorability of the data (Table 2). The Kaiser-Meyer-Olin (KMO) measure of sampling adequacy was 0.912, which is above the suggested cut-off value of 0.60, and Bartlett's test of sphericity was significant ( $\chi^2 = 3709$ ,  $df = 153$ ,  $p = 0.000$ ). Such results indicate the suitability of the data and that the inter-item correlations were sufficiently large and acceptable (Tabachnick and Fidell 2001). All the items' factor loadings are greater than 0.50 and load correspondingly to their expected factor. All constructs had a Cronbach's alpha ( $\alpha$ ) greater than the threshold value of 0.70, ensuring the scale reliability (Cronbach 1951).

Results of the regression analysis revealed that these five factors account for 53% of explained variances for consumers' intention towards traceable organic rice;  $F(5, 237) = 53.08$ ,  $p < 0.010$ ,  $R^2 = 0.53$  (Table 3). Results confirm the expected direction of subjective norms ( $\beta = 0.24$ ,  $p = 0.001$ ), perceived behavioral control ( $\beta = 0.20$ ,  $p = 0.004$ ), health consciousness ( $\beta = 0.16$ ,  $p = 0.003$ ), and knowledge of traceability ( $\beta = 0.39$ ,  $p = 0.000$ ). Therefore H2, H3, H4, and H5 are supported. Attitude was the only factor that is not significant and in the opposite direction ( $\beta = -0.10$ ,  $p = 0.120$ ). Therefore H1 is not supported. These results implied that consumers' purchase intention towards traceable organic rice is influenced by subjective norms, perceived behavioral control, health consciousness, and knowledge of traceability. The attitude factor does not influence consumers' purchase intention towards traceable organic rice.

Table 2. Constructs, measurement items, and factor loadings

Construct	Measurement Item	Indicator	Factor Loading ( $\lambda$ )	Cronbach's $\alpha$
Attitude (ATT)	Buying organic rice with traceability information is beneficial to me.	ATT_1	0.860	0.872
	Buying organic rice with traceability information is a good idea.	ATT_2	0.849	
	Buying organic rice with traceability information is interesting.	ATT_3	0.641	
Subjective Norms (SN)	I will buy organic rice with traceability information because my family and friends are in favor of it.	SN_1	0.802	0.941
	People close to me think I should buy organic rice with traceability information.	SN_2	0.819	
	I will buy organic rice with traceability information because of the positive reviews by people who have already bought it.	SN_3	0.800	
Perceived Behavioral Control (PBC)	If I wanted to, I could buy traceable organic rice instead of regular-packed rice.	PBC_1	0.720	0.918
	Buying organic rice with traceability information or not is mostly up to me.	PBC_2	0.798	
	I can easily purchase traceable organic rice from different distribution channels.	PBC_3	0.760	
Health Consciousness (HEC)	I consider myself a health-conscious consumer.	HEC_1	0.773	0.833
	I often think about health-related issues.	HEC_2	0.821	
	I choose food carefully to stay healthy.	HEC_3	0.852	
Knowledge of Traceability	I am familiar with QR codes used in product traceability.	KNOW_1	0.804	0.895
	I have already purchased a product with a QR code for traceability.	KNOW_2	0.868	
	I am familiar with a rice package with a QR code for traceability information.	KNOW_3	0.823	
Purchase Intention	I am willing to buy organic rice with traceability information if available in the market.	PI_1	0.820	0.940
	I intend to purchase organic rice with traceability information if it is available.	PI_2	0.840	
	I plan to consume organic rice with traceability information if it is available for purchase.	PI_3	0.823	

**Table 3. Multiple regression analysis predicting purchase intention towards organic rice**

Predictor	Min	Max	Mean	SD	$\beta$	Regression Analysis			Collinearity	
						SE	t	Sig.	TOL	VIF
ATT	1	5	3.96	0.71	-0.10	0.08	-1.56	0.120	0.52	1.94
SN	1	5	3.66	0.87	0.24	0.07	3.40	0.001	0.42	2.40
PBC	1	5	3.70	0.91	0.20	0.07	2.90	0.004	0.42	2.38
HEC	1	5	4.21	0.71	0.16	0.07	3.02	0.003	0.70	1.43
KNOW	1	5	3.33	0.98	0.39	0.05	7.29	0.000	0.68	1.47

Notes:  $R^2 = 0.53$ ,  $F(5, 237) = 53.08$

#### 4.4. Differences in purchase intention with respect to demographic variables

One-way ANOVA results show that respondent's age ( $F = 1.278$ ;  $p = 0.279$ ), income ( $F = 1.524$ ;  $p = 0.196$ ), and education level ( $F = 1.116$ ;  $p = 0.343$ ) had all no significant effect on consumers' purchase intention for traceable organic rice. Therefore, H6a, H6b, and H6c are all not supported (Table 4; Table 5; Table 6). These findings mean that the three socio-demographic factors have no significant influence on consumers' purchase intention.

**Table 4. ANOVA Test for respondents' age group**

Purchase Intention	Sum of Squares	df	Mean Square	F	Sig
Between Groups	4.045	4	1.011	1.278	0.279
Within Groups	188.359	238	0.791		
Total	192.404	242			

**Table 5. ANOVA Test for respondents' income group**

Purchase Intention	Sum of Squares	df	Mean Square	F	Sig
Between Groups	4.806	4	1.201	1.524	0.196
Within Groups	187.598	238	0.788		
Total	192.404	242			

**Table 6. ANOVA Test for respondents' education level**

Purchase Intention	Sum of Squares	df	Mean Square	F	Sig
Between Groups	2.659	3	0.886	1.116	0.343
Within Groups	189.745	239	0.794		
Total	192.404	242			

## 5 Discussion and Conclusion

This study's main objective is to examine the behavioral and socio-demographic factors predicting consumers' purchase intention towards traceable organic rice. Prior studies have reported that consumers' intention to purchase may not convert into actual purchase of organic foods (Singh and Verma 2017). Therefore, the effect of socio-demographic factors on purchase intention was also explored. This study focused on an organic rice community enterprise in Chachoengsao Province, Thailand, formed through the "CEs Promotion Act of 2005" by the Royal Government of Thailand to enhance the production and market competitiveness of small-scale rice farmers in the rural provinces (Petcho *et al.* 2019). The results of this study indicated that subjective norms, perceived behavioral control, health consciousness, and

knowledge of product traceability have a significant positive influence on consumers' intention to buy organic rice. The following sections discuss the theoretical and managerial implications.

The findings of this study support prior works of TPB and consumers' purchase intention. The positive value of subjective norms means that the purchase of organic rice among community enterprise consumers was already established as a social norm where consumers tend to rely on their family and friends' opinions to make purchasing decisions. This finding lends support to previous studies (Asif *et al.* 2018; Wang *et al.* 2019), which have established the relationship between subjective norms and purchase intention for organic food. The positive perceived behavioral control indicates that the consumers' ability to purchase organic rice easily significantly drove their purchase intention. This finding is in line with the prior works of Boobalan *et al.* (2021) which found a positive relationship between perceived behavioral control and organic food purchase intention. This study further reveals that health consciousness positively affects consumers' purchase intention towards organic rice. Similar findings have been derived from the works of Singh and Verma (2017) and Asif *et al.* (2018) who found health consciousness to be a positive predictor of organic food purchase intention. This finding specifies the importance of health benefits of organic rice consumption in influencing consumers' perception. This study also provides new evidence that knowledge of product traceability positively influences purchase intention. This result complements Bradu *et al.* (2014) who found traceability information can impact consumers' purchase intention towards organic food. The effects of socio-demographic factors on consumers' purchase intention were not significant, implying that there are no differences in purchase intention with respect to age, income, and education levels of respondents. This finding contradicts the results of Jahn *et al.* (2005), where it has been argued that consumers' age, income, and education levels have a significant influence on consumers' purchase intention. It may be concluded that organic rice consumers in the community enterprise farmers' market do not come in any age, income, or education group.

## **6 Implications**

This study's results have several managerial implications for the community enterprise and policymakers to identify effective strategies to position organic rice in the market. Firstly, considering consumers' health consciousness, the strategy should focus on increasing consumers awareness and knowledge of organic rice's health benefits. Secondly, knowledge of organic rice traceability seems to be an effective driver of purchase intention. Therefore, providing consumers relevant traceable information on the label will help build the trust of consumers for organic rice products. Organic rice products are among those credence goods, and consumers may not know whether the product is produced organically or not unless they are informed. Therefore, consumers' awareness of its safety and healthy features and ability to trace this relevant product information play a significant role in making purchase-related decisions. With the positive influence of subjective norms, people who are knowledgeable of organic rice products can easily influence others. Policymakers can also play an important role in promoting standardized food labels among organic rice products, highlighting their health benefits and traceability features. The insignificant influence of socio-demographic factors

indicates that the enterprise need not focus on specific consumer segments, as these have no significant impact on purchase intention. Instead, the enterprise should emphasize the factors discussed above to cater to consumers' demand for healthier foods and access to product traceability. Concerned government agencies should communicate with the public by establishing organic rice purchases as a social norm and increasing the availability of organic rice products through an online outlet or setting up more nearby organic shops.

## 7 Limitation

Although this research focuses only on a community enterprise in Thailand, the framework can be broadened to other community enterprises or farmer groups. Moreover, there is a need to incorporate actual buying behavior along with purchase intention in future studies.

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## D.2 Farmers' perception of rice production community enterprise's roles: evidence from Chachoengsao Province, Thailand

**Citation:** Cavite, H. J., & Suwanmaneepong, S. (2021). Farmers' perception of rice production community enterprise's roles: evidence from Chachoengsao Province, Thailand. *IOP Conference Series: Earth and Environmental Science*, 892(1), 1-5. <https://doi.org/10.1088/1755-1315/892/1/012020>

IOP Conference Series: Earth and Environmental Science

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To cite this article: H J Cavite and S Suwanmaneepong 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **892** 012020

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## Farmers' perception of rice production community enterprise's roles: evidence from Chachoengsao Province, Thailand

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**Abstract.** Rice production community enterprises (RPCEs) have emerged in Thailand as a group initiative supported by the government to help address the challenges of rice farmers in rural areas. However, farmers still faced problems due to a lack of targeted programs and policies to improve the enterprise's roles in the community. This study investigated farmer-members' perception of an RPCE's specific roles. Primary data were collected through a structured questionnaire administered to 201 farmers in Sanam Chai Khet District, Chachoengsao Province, Thailand. Data were analyzed using the weighted average index (WAI) method to assess the farmers' perception of the RPCE's roles. Results reveal that RPCE members have a strong perception of the enterprise's role in increasing their income. Other roles such as knowledge and skills improvement, supplying inputs at a fair price, increasing social network, product competition with rivals, and provision of credit facilities, were rated as medium, demonstrating the considerable efforts exerted by RPCEs to improving its members. Moreover, a weak rating was given by members for the enterprise's role as a saving source implying that government should further intensify its support for RPCEs in terms of promoting the saving behavior among members. This study suggests that stronger policy support should be given to upgrade RPCEs based on how members perceived them. This would encourage more member participation and secure more benefits and income for members of the community enterprise.

### 1. Introduction

Rice production community enterprises (RPCEs) have emerged in Thailand as a group initiative supported by the government to help address the challenges of rice farmers in rural areas [1]. The issuance of the 'CEs Promotion Act of 2005' has made RPCEs and other farmer groups become legal entities [2]. Initially recognized as micro-enterprises, RPCEs' main role focuses on selling products mainly for the community and its members. Later on, these RPCEs have expanded their reach through linkages with neighboring farmers, which also opened the opportunity for them to deliver products to customers outside of their area. They also gained more access to supports from the government and private organizations [3]. These roles of RPCEs have supported farmers raise their income level and improve their livelihood.

As small farmer organizations, they are not exempt from various problems. Previous studies have shown that most problems faced by the community enterprises are management-related such as lack of organizational skills of leaders [4], no clear member benefits, and inadequate technical skills of members [5]. These problems put a negative image on the community enterprises, making other farmers hesitant



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to join and unable to access membership benefits. This could be avoided if there is a good understanding of farmers' behavior towards the community enterprise. Farmers' behaviors are based on their perception, and a lack of understanding of farmers' perception results in gaps of how they will be served better [6,7]. However, only a few studies have assessed farmers' perceptions of RPCEs [2]. A research on this area can provide important information for policymakers and enterprise managers on how they can provide better benefits to its members, consequently improving farmers' livelihoods.

Hence, this study aims to investigate farmers' perceptions of RPCE's role. This is based on a face-to-face survey of farmer-members in Chachoengsao Province, Thailand. This study's findings will guide policymakers and enterprise leaders in developing targeted programs and policies aimed at upgrading the enterprise's role in the community. This would encourage more member participation and secure more benefits and income for members of the community enterprise.

## 2. Materials and methods

### 2.1. Study area

Chachoengsao Province was chosen for this study. It is located in the central region of Thailand, the country's major area for commercial rice production [2]. This region has the largest share in farm household income from rice production and also one of the homes of many community enterprises in Thailand.

### 2.2. Population and sample size

Purposive sampling was employed to select the farmer-respondents for data collection. This study focused on two RPCEs in the study area. A face-to-face survey was conducted in February to March 2021 among farmers of the selected community enterprise. A total of 201 farmers were interviewed using a structured questionnaire.

### 2.3 Data collection

The survey questionnaire was structured into two parts. The first part gathered the socio-demographic profile of farmers. The second part consisted of items that measured their perception about their membership in the RPCE (i.e., source of savings, supplying farm inputs, knowledge and skills improvement, increasing social network, increasing income, product competition, provision of credit). These items were adopted from the recent study of Petcho, et al. [2]. Each of these items was rated by farmers using a five-point scaling system from 1 (very weak) to 5 (very strong) [2].

### 2.4. Data analysis and interpretation

Data analysis was done using SPSS v.26.0.0 software. Descriptive statistics (means and percentages) were used to analyze the socio-demographic profile of farmers. To assess the perception of farmers towards the RPCE's roles, this study employed the weighted average index method (WAI). This method has been widely used in several studies in examining farmers' perceptions and their associated decision-making [2, 8, 9]. The formula is presented below:

$$WAI = \frac{\sum F_i S_i}{N}$$

In the formula,  $F_i$  is the frequency of responses of each scale rating, while the  $S_i$  is the assigned value or weight of each scale rating. This study adapted the weight values assigned by Petcho, et al. [2], 1.00 for very strong, 0.75 for strong, 0.50 for medium, 0.25 for weak, 0.00 for very weak. Results were interpreted according to their computed WAI value.

## 3. Results and discussion

### 3.1. Farmers' socio-demographic profile

The socio-demographic profile of farmers is shown in Table 1. Farmers' mean age was 57 years, and most of them are female. In terms of educational attainment, most of the farmers are educated to primary level (75%), while only a few of them have bachelor's degrees (1.5%) and vocational certificates (1%). The average rice farming experience is 30 years. Farmers had a mean farm size of 14.54 rai (or 2.33 ha),

where a majority of them are owned (76.6%). The average rice yield was at 384.03 kg/rai (or 2,400.19kg/ha)

**Table 1.** Socio-demographic profile of farmers.

Socio-demographic characteristic	Category	Frequency	%
Gender	Male	84	41.8
	Female	117	58.2
Age (mean = 57 years)			
Education level	Primary education	152	75.6
	Secondary education	35	17.4
	Vocational certificate	2	1.0
	High vocational certificate	9	4.5
	Bachelor's degree	3	1.5
Rice farming experience (30 years)			
Rice farm size (mean = 14.54 rai) <sup>a</sup>			
Rice farm ownership	Owned	154	76.6
	Rented	23	11.5
	Both	24	11.9
Rice yield (mean = 384.03 kg/rai)			

<sup>a</sup> 1 rai = 0.16 ha

### 3.2. Farmers' perception of RPCE's roles

Table 2 shows farmers' perception of the roles of the community enterprise they belong to. Members perceived RPCE mainly as a venue for increasing their income, having a strong rating (WAI = 0.76). Meanwhile, the enterprise's role in supplying farm inputs at fair price, knowledge and skill improvement, increasing social network, product competition with rivals, and provision of credit service were all rated as medium (WAI = 0.50-0.74). Lastly, farmers see the RPCE's role as a saving source as weak (WAI = 0.45).

Members play a crucial role in enterprise development. Likewise, the knowledge gained from farmers' perception keeps the farmers, and the leaders connected, bringing the organization into a livelier manner [7]. In the current study, RPCE's role as a way of increasing farmers' income is in line with the findings of Laiprakobsup [10] and the goal of the 'RPCEs Act of 2005' [1]. This means that the government has achieved its goal throughout the years in supporting small-scale farmers in this aspect. The study of Petcho, et al. [2] also found positive perceptions of farmers for this role, which received a medium rating. The ability of farmers to secure inputs at a lower and fair price because of the enterprise's efforts have contributed to the increase in income. Moreover, some members cultivate and sell organic rice, which is for the niche market [5]. This has allowed them to gain more income from organic price premiums. However, the RPCE's role as a saving source has been perceived as weak, indicating that most farmers did not promote the saving behavior among members. Since they are small farmers, most of their income is plowed back into the investment instead of allotting it to savings [11].

**Table 2.** Farmers' perception about rice community enterprise's role.

RPCE's role	WAI	Interpretation
Source of savings	0.45	Weak
Supplying farm inputs at fair price	0.71	Medium
Knowledge and skills improvement	0.69	Medium
Increasing social network	0.58	Medium
Increasing income	0.76	Strong
Product competition with rivals	0.64	Medium
Provision of credit service	0.63	Medium

RPCE's roles in helping its members gain new knowledge and skills and building networks with other organizations were rated medium by farmers. This reflects the considerable efforts exerted by RPCEs in providing trainings and other knowledge transfer services to farmers. These are important to create more awareness of technical skills and the latest scientific advances useful in farming [12]. These efforts would also not be possible without the support of various government agencies and non-profit organizations. Moreover, this finding also reflects the RPCEs' role in developing linkages with other farmer cooperatives and farmer groups, which are vital for improved information and resource sharing [13]. Networking among farmer groups is a common practice in Thailand. This enables farmers to connect with farmers from other provinces and gain access to resources and knowledge that are not within the enterprise [14]. Networking also benefits farmers offering organic rice through direct communication with sure consumers, thereby reducing transaction costs. This has been observed by Petcho et al. [2] in Central region of Thailand.

RPCE members see competition with rivals as medium. This is a healthy indicator since agricultural products are competitive in nature. The presence of competition enables them to offer products with more value for money relative to their competitors [15]. Competition in an RPCE is also not uncommon since they offer a variety of rice products to be at pace with the changing consumer demand. The most popular among these is organic rice. Many RPCEs cultivate organic rice due to its perceived high quality, mainly preferred by health-conscious consumers [16,17]. Meanwhile, provision of credit was also perceived by farmers as a medium role by the RPCE. This finding demonstrates the high capacity of RPCE in lending money to its members. Credit is one of the essential supports that an organization can provide to its members. Previous studies have reported the important role of credit facilities to farmers [18,19]. The provision of loans to farmers enabled them to expand farming operations, thereby encouraging more farming activities. This, in turn, increases their opportunity to earn more and diversify income sources. Low-interest loans, likewise, help farmers finance other activities such as certifications for organic standards and input acquisition, among others [20, 21]. Although some studies have pointed out that credit is not that necessary as it increases farmers' debt [2], this study reveals the positive perception of members to this role by RPCEs and the favorable perception of leaders to this important facility for farmers.

#### **4. Conclusions**

This study reveals farmers' perceptions of the RPCE's roles. Farmers have a strong perception of the RPCE as a venue for increasing their income, while medium perception towards knowledge and skills improvement, supplying inputs at a fair price, increasing social network, product competition with rivals, and provision of credit facilities. Although these are favorable, demonstrating the considerable efforts exerted by RPCEs to improving its members, these areas can still be enhanced for greater member benefits. The enterprise is encouraged to focus on enhancing these roles to improve member perception and attract other farmers to join.

As a policy recommendation, the government should further intensify its support for RPCEs in terms of promoting saving behavior among members, as this was rated as weak. This will encourage more member participation in the RPCE, and more farmers can access information and organizational benefits, consequently improving the lives of farmers in the study area. These all boil down to the government's ultimate goal of improving the market access and competitiveness of these small farmers. Future studies should also assess members' and non-members' intention to join community enterprises to set specific strategies to encourage greater farmer participation.

#### **Acknowledgement**

This short study is a part of the first author's dissertation, supported by the research fund of King Mongkut's Institute of Technology Ladkrabang (KMUTL) Doctoral scholarship, Bangkok, Thailand, under Grant KDS2019/026. The authors would like to thank the farmers and community enterprise leader for their time and participation in this study.

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### D.3 Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand.

**Citation:** Cavite, H. J., & Suwanmaneepong, S. (2021). Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand. *9<sup>th</sup> International Conference on the Integration of Science and Technology for Sustainable Development*. 19 November 2021.

International Journal of Agricultural Technology XXXX Vol. X(X): XXXX-XXXX  
Available online <http://www.ijat-aatsea.com>  
ISSN 2630-0192 (Online)

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#### Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand

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Cavite, H. J. M. and Suwanmaneepong, S. (2021). Supply chain structure and constraints of a rice production community enterprise: Evidence from rural Thailand. *International Journal of Agricultural Technology X(X): XX-XX*

**Abstract:** Supply chain involves actively streamlining a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace. In rice production, the concept of supply chain has been explored in several studies across Thailand; however, its current supply chain structure has not been updated to keep up with the emerging constraints in production and marketing, particularly at the level of community enterprises. This paper aims to examine the supply chain structure and constraints of Baan Nong Saeng community enterprise in Chachoengsao province, Thailand. This study applied a qualitative approach through in-depth interviews and focus group discussion (FGD) with the enterprise leader, committee members and farmers, respectively. The supply chain structure was drawn from the interview results, and constraints were identified at each level of the supply chain. Results revealed a chain of five major channels through which the Ban Nong Saeng community enterprise's rice moves from the farm to final consumers – farmers, primary and final processors, dealers, and local retailers. Farmers produced rice according to Organic Thailand standards. Processors create added value to rice products through product handling, packaging, and branding. Meanwhile, distributors supply packed rice to various local outlets such as Sanam Chai Khet hospital market, Wat Phra That Wayo market, and community farmers' market. However, among the identified constraints were inadequate postharvest management skills at the farmers' level, lack of rice mill certification at the processor's level, and poor product packaging, and inadequate consumer information at the marketers' level. This paper provides insights into how the supply chain of a rice production community enterprise works and what improvements are needed to address existing constraints. Future studies are recommended to formulate strategic guidelines to address each of the problems identified. This will guide future programs and policies by the government and private sectors.

**Keywords:** Community enterprise, supply chain structure, rice production, rural Thailand

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## Introduction

Community enterprises are a distinctive feature of the rural economy of Thailand, supported by the government through various programs and policies (Cramb, 2020). As rice is a key agricultural product, rice production community enterprises (RPCEs) have become the most common form of organization in the crop production sector, constituting the highest number among registered enterprises (Petcho *et al.*, 2019). RPCEs dominate the rural areas of Thailand by offering various types of rice products in rural and urban markets. However, because of the complexity of the rice supply chain (Sahavacharin and Srinon, 2016), community enterprises continue to face challenges at present, which limits players' competitive ability (Suksanchananun *et al.*, 2020, Suwanmaneepong *et al.*, 2019). These issues can be better addressed by looking holistically at its present structure using the lens of supply chain analysis.

Supply chain analysis is considered a key competitive strategy to help improve organizations (Stadtler *et al.*, 2014). A supply chain is a complex network of people, processes, and technologies engineered and managed to deliver value to a customer (Reid and Sanders, 2019). Supply chain analysis gives insights into efficient management of goods and services, including all processes that transform raw materials into final products (Swaminathan, 2001). Furthermore, it involves actively streamlining a business's supply-side activities (from demand and supply planning to customer and order management) to maximize customer value and gain a competitive advantage in the marketplace. Three major flows within a supply chain govern its optimal functioning – the product, information, and financial flow. Likewise, optimal chain functioning hinges upon several external factors and constitutes an enabling environment (Albastroiu and Felea, 2013).

Understanding the community enterprise's supply chain would assist leaders and farmer-members to look for competitive advantage that would help them formulate strategies to improve overall chain performance (Stadtler, *et al.*, 2014, Suksanchananun, *et al.*, 2020). It should be noted that the flows of rice (i.e., paddy or milled), services, and information are affected by the quality and nature of relationships among chain players. Additionally, supply chain performance is governed by external players' policies and programs. Understanding these elements would provide insights into the current forms of linkages and how these facilitate or hinder community enterprises' growth and performance (Kawharu, 2019).

Previous studies have investigated the supply chain structure of rice community enterprises in Thailand using several methods. The latest one was

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by Suksanchananun, *et al.* (2020), who studied the impact of supply chain management competencies and found five indicators: planning, procurement, production, delivery, and return. Suwanmaneepong, *et al.* (2019) studied the value chain structure of organic rice mills by community enterprise, and findings provided insights for business model development for more value-added organic rice products. Moreover, Prasertwattanakul and Ongkunaruk (2015) explored the organic rice supply chain and analyzed its business processes using the integrated definition function modeling (IDEF0) approach. Their findings provide important recommendations and opportunities for supply chain efficiency improvement. However, in recent years, various problems are affecting community enterprises (Naipinit *et al.*, 2016, Somswasdi *et al.*, 2015); and that the current supply chain of RPCEs has not been re-examined and updated to keep up with the emerging challenges in input sourcing, production, marketing, and product delivery to consumers. Recent studies have suggested investigating the relationship among chain members (Sahavacharin and Srinon, 2016) and the supply chain structure to maintain a consistent and viable supply chain (Cavite *et al.*, 2021a).

Hence, given the innate complication of the rice supply chain, this study aims to examine the supply chain structure and constraints of an RPCE. This study uses the case of Baan Nong Saeng community enterprise in Sanam Chai Khet district, Chachoengsao province, Thailand. Guided by qualitative techniques, the following research questions (RQ) were formulated and answered.

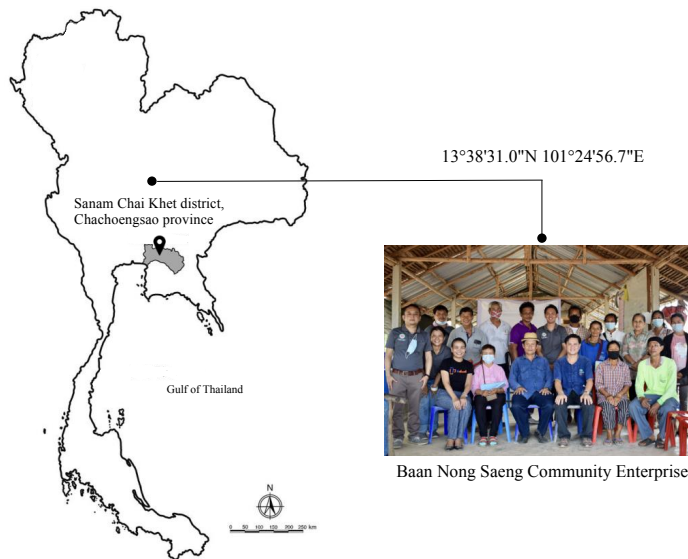
- RQ1. What is the background of Baan Nong Saeng community enterprise?
- RQ2. What is the current supply chain structure of the community enterprise?
- RQ3. What are the emerging constraints of the community enterprise?

This study's findings will guide future qualitative research aiming to improve rice community enterprises and formulate strategic options for development. Most importantly, this study gives policymakers an overview of the current supply chain structure and will help them fine-tune future programs and policies to help rural farmers adjust and cope with the changing landscape of rice production and marketing in Thailand.

## Materials and Methods

### *Study area and sample selection*

This study purposely selected Chachoengsao province, Thailand, a hub of community enterprises in the Central region (Petcho, *et al.*, 2019). Moreover, several community enterprises in the area have received strong support and collaboration from various government and higher education institutions (Suwanmaneepong *et al.*, 2020). Baan Nong Saeng community enterprise was purposely chosen because of its evident network of connections with such institutions in Sanam Chai Khet district (Cavite, *et al.*, 2021a). Purposive and convenience sampling techniques were used to gather key informants (CE leader, committee members, and farmers) for interviews and discussions conducted from June to September 2020. The map of the study area is shown in Figure 1.



**Figure 1.** Map of Thailand showing the study area Sanam Chai Khet district, Chachoengsao province and the community enterprise members

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### ***Data gathering procedure***

**In-depth interview.** This study employed in-depth interviews with the community enterprise leader and two committee members to gather actual insights from the community enterprise. The interview gathered information on the community enterprise's background, motivation, and management (Groenland and Dana, 2019). The open-ended questions were formulated to gain information about the enterprise's operation, from buying paddy rice from farmers to distributing milled rice to final consumers. Details about the enterprise's support activities and enabling environment were also gathered. Each interview was done for approximately 45 minutes.

**Focus group discussion.** For the focus group discussion (FGD), eight farmers were conveniently sampled for a 60-minute group conversation. This method was employed to gain first-hand information of the farmers' experiences as enterprise members. Furthermore, during the interview, the interaction among farmer-participants added more authenticity and richness to the gathered data, allowing the researchers to gain more detailed insights from the participants (Dana and Dana, 2005).

### ***Data analysis***

**Interview validation and transcription:** Interview data were validated first prior to transcription. Validation was done using triangulation. This approach is the most recommended to increase the credibility and validity of research findings (Denzin, 2017). In this technique, the researchers visited the actual rice mill and packing facilities of the enterprise. Supporting quantitative information was also obtained with the consent of the enterprise leader. All interview data gathered were then transcribed into text, sorted, and organized (Groenland and Dana, 2019). Themes and patterns emerged in the data were determined, and categories were developed based on the research questions.

**Supply chain mapping and constraints identification:** Mapping and analysis of the supply chain activities was done using the grounded theory methodology (Groenland and Dana, 2019, Strauss and Corbin, 1990). Key players and activities from paddy rice purchasing, milling, and distribution to consumers were investigated. Moreover, external agencies supporting the supply chain were also noted. Meanwhile, supply chain constraints were identified through themes that emerged in the data. Results interpretation was

supported by a literature review of previous supply chain studies involving community enterprises, primarily in Thailand.

## **Results**

### ***Overview of the community enterprise***

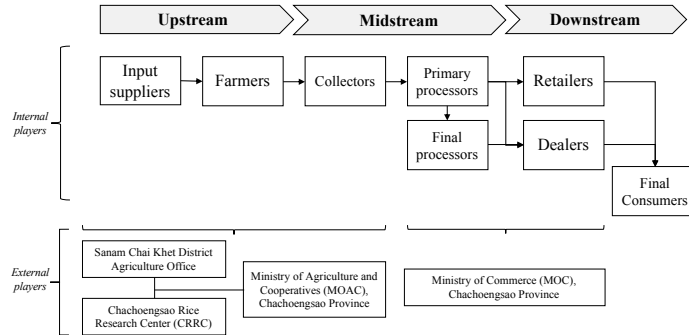
Baan Nong Saeng community enterprise is located in Lat Krating subdistrict, Sanam Chai Keht district, Chachoengsao province, Thailand. The enterprise has 46 members, 15 of which were organic rice growers under Organic Agriculture Certification Thailand (ACT) or popularly known as Organic Thailand, eight traditional organic rice growers, and 23 Good Agricultural Practices (GAP) rice farmers. The enterprise was established in the year 2000 and was strengthened through the 'CEs Promotion Act of 2005' and the efforts of its members. The enterprise's main objective was to share and exchange common knowledge on rice production and management, seed selection, and production of fertilizers among members and non-members of the community.

The enterprise's total combined rice area is more than 600 rai (approximate 96 ha), with a total combined rice yield of 101,325 kg from all its farmer-members. There are two main rice varieties planted – the Jasmine Rice (KDML 105) and the riceberry. The enterprise members receive rice seed allocation from the Chachoengsao Rice Research Center (CRRC), a government institution. In return, members have to give back the same rice seed variety after cropping with a 10% increase from its original weight received. Aside from the provision of seeds, CRRC also provides technical skills on rice seed production and cost and return calculation to the enterprise members.

The enterprise has its rice milling machine, which has a maximum milling capacity of 2,400 kg paddy rice per day. However, the enterprise currently processes an average of 500 kg per day from available paddy rice from its members. The rice mill operates four days a week, eight hours per day with one operator. The enterprise allows its members to use the rice mill without monetary charge but collects members' by-products from milling. The income obtained from selling by-products is used for the payment of maintenance and utility expenses. In addition, the enterprise has its farmers' market showcasing its own rice products. On top of these, the enterprise also caters to other consumers in various distribution outlets.

**Supply chain structure**

The supply chain structure of Baan Nong Saeng community enterprise is shown in Figure 2. The enterprise’s supply chain comprises three main parts – upstream, midstream, and downstream. The following description is presented according to the three main flows of a supply chain – product, information, and financial flow.



**Figure 2.** Simplified supply chain structure of Baan Nong Saeng community enterprise, Sanam Chai Khet district, Chachoengsao province, Thailand

**Product flow:** The input suppliers and the farmers comprise the upstream part of the community enterprise’s supply chain. The enterprise has its fertilizer and seed bank facilities available for use by its members. As for membership, the enterprise has a total of 44 farmers: 23 of which are GAP certified rice producers, 15 of which are under Organic Thailand certification, and eight of which are producing organic rice under the traditional system (uncertified). The farmers’ primary role is to produce rice according to standards. Jasmine rice and riceberry are the two main rice varieties. The paddy rice produced by farmers goes to the collector. The collector then forwards the aggregated paddy rice to the two processors – the primary and final processors. The primary processor mills the collected rice using the enterprise’s rice mill. The primary processor has to ensure that the paddy rice is processed according to the enterprises’ quality standards. The processing output in this stage is polished rice.

Primary processed or polished rice goes to the final processor. The final processor is responsible for adding value to the polished rice through vacuum-packing and branded packaging. The final processor has to ensure that the packaging facilitates transportation and handling of rice to the distributors and dealers. There are four types of value added rice products by the community enterprise under the brand Pin Phet Farm. These are the polished Jasmine rice for scoop, vacuum-packed Jasmine rice, vacuum-packed riceberry rice, and polished Jasmine brown rice for scoop. Moving forward the supply chain are the retailers and dealers. Retailers sell both vacuum-packed and scooped rice to consumers within and outside the community enterprise. On the other hand, the dealers sell rice in large volumes at different shops. In the interviews, it was revealed that the enterprise distributes rice to different markets situated in PTT Phanom Sarakham, Sanam Chai Khet Hospital, Wat Phra That Wayo and the community enterprise's farmers' market. Final consumers buy community enterprise's rice products from these markets. These distribution outlets reduce the burden of farmers in finding markets for their rice products. In addition, they help in marketing communication and encourages more consumers to purchase community enterprise's rice products. Figure 3 shows the vacuum-packed rice products of Baan Nong Saeng community enterprises.



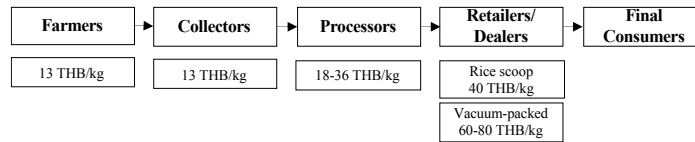
**Figure 3.** Vacuum-packed rice products of Baan Nong Saeng community enterprise

Like most business' supply chain, external players also play important roles. This study has found four key players outside of the community enterprise supply chain. First, the Sanam Chai Khet District agriculture office

supports the community enterprise farmers through sharing technical knowledge on rice production and organizing exhibits to support the marketing of enterprise's products. This enables the enterprise to sell their rice products to other consumers such as visitors and tourists aside from the local consumers within their immediate market reach. Second, the Chachoengsao Rice Research Center provides the enterprise with open-pollinated varieties (OPV) of quality rice seeds that are used by farmers, which can also be used in the next growing season. Third, the Ministry of Agriculture and Cooperatives (MOAC) also supports the enterprise in terms of farm record keeping and capacity development. These programs by the ministry are part of their mission in transforming traditional farming into smart farming system. Finally, the Ministry of Commerce (MOC) provides access to convenient product distribution through opening various channels which allows farmers to have more outlets for their products. The ministry also supports in the development of community enterprise's products.

**Information flow.** As for the supply chain's information flow, farmers major source of all information (technical, input price, selling price) were their co-farmers. Other farmers also reported to have obtained information from the community enterprise group itself. Social media and television are least considered by farmers as sources of information. Meanwhile, farmers also get other information from players outside of the community enterprise, namely from the district's agriculture office for input and production-related information, and the MOAC and MOC for marketing-related information. Moreover, to the consumers, Baan Nong Saeng community enterprise provides information about their different rice products such as variety-specific information, cooking instructions (i.e., rice to water ratio), among others. The community enterprise also receives feedback from its consumers and considers this feedback for future product and service development.

**Financial flow:** Payment flow of the enterprise's rice (i.e., paddy and milled) was also investigated (Figure 4). It was found that paddy rice products are sold by farmers at an average of 13 THB/kg to collectors. These collectors hand over aggregated rice to processors at the same price. At this stage, the price range of both milled and vacuum-packed rice ranges from 18-36 THB/kg, sold by processors to retailers and dealers. Ultimately, consumers purchase the community enterprise's rice products from various distribution outlets. Rice sold per scoop are priced at 40 THB/kg while vacuum-packed rice products ranged from 60-80 THB/kg.



**Figure 4.** Selling price of rice as it passes through the supply chain  
(Note: 10 THB = 0.30 USD)

#### *Constraints of the community enterprise*

As small farmer organizations, community enterprises are not exempt to various constraints in their operation. This study has found the following key constraints encountered in the production, processing, and marketing aspects. First, in the production aspect, farmers report the high costs incurred in rice farming. Additionally, most of the farmers have no access to irrigation system during dry season and lack proper postharvest management skills owing to farmers' ageing population. Second, in the processing aspect, the enterprise is constrained by the low-capacity utilization of their rice mill. It was revealed in the interviews that actual volume processed was less than the rice mill's processing capacity. It was also found that the rice mill lacks certification, and reportedly, milled rice is of low quality. Finally, in the marketing aspect, the enterprise is constrained by inadequate skills in product development to enhance their current product's design (see Figure 3 above). Also, the enterprise still follows the traditional marketing system, which does not target specific market segments. Product traceability intergration and online marketing channels are one of the emerging trends nowadays in product marketing. Inasmuch as the enterprise would like to be aligned with this trend, the enterprise lacks the skill to operate in this type of strategy and the frequent changes in the rice marketing environment made them unable to adopt to these latest developments.

#### **Discussion**

The conventional Thai rice supply chain is comprised of many members engaged in different activities (Sahavacharin and Srinon, 2016). Typically, rice is produced by small farmers who are the main chain producer and sells paddy rice to various distributors (e.g., merchants, agricultural cooperatives). RPCEs play a crucial role in sustaining rice production in Thailand. These small farmer

organizations get various government supports which contributed to the improvement of the rice supply chain in the past years (Cavite, *et al.*, 2021a, Sathapatyanon *et al.*, 2018). Despite this evidence, the current supply chain structure of RPCEs has not been updated to keep up with the emerging constraints in production and marketing. Thus, this paper examined these gaps and present a more focused discussion of this important form of organization.

### **Key findings**

The current study has revealed three main key findings. First, the enterprise's supply chain has its unique and distinctive features compared to reported chain structures in prior studies (Phuknoi *et al.*, 2018, Prasertwattanakul and Ongkunaruk, 2015). This can be seen by the presence of two types of processors, and two downstream players that deliver rice to final consumers. In addition, vertical coordination and information sharing is present in the current supply chain. This gave opportunity for the community enterprise to sell their rice products extensively (i.e., local and outside markets). This is a common characteristic of most community-based organizations (Kramol *et al.*, 2020, Prasertwattanakul and Ongkunaruk, 2018). Vertical coordination in the agri-food supply chain is essential for organizational success as it allows chain players to capture all value additions and improve their financial position (Mataia *et al.*, 2020, Sathapatyanon, *et al.*, 2018). Moreover, the presence of external players also enables actors to access production, processing and marketing supports. This network played significant roles in facilitating the small farmers in the past years.

Second, although the current supply chain shows some resemblance of the common enterprise chain structure, there are some notable features that needs to be highlighted. This includes the presence of own fertilizer and seed banks, evident support from various ministries and offices, and organized flow of paddy and milled rice from farm to consumers. Such observations are indicative of the enterprise's effective efforts in utilizing its external opportunities and internal strengths. These are important strategic moves in any business organization. Collaboration with external players allows the enterprise to utilize other institutions' expertise and gain access to resources not within their current structure (Thitinunsomboon *et al.*, 2008). This strategic option has been recommended in a previous study by the same authors (Cavite, *et al.*, 2021a).

Third, in the modern supply chain structure, key constraints across production, processing, and marketing are still evident. Most common of these problems concern the enterprise's product and marketing. Similar problems

were also noted in the studies of Changwatchai and Santipolavut (2015), Sutthisakorn (2013) and Santipolavut and Sripruetkiat (2012). This can be explained by the fact that small farmers are usually constrained of technical knowledge related to product development (Suwanmaneepong, *et al.*, 2019). This also expounds why the enterprise get stuck in the traditional system of rice marketing. Previous studies have reported similar problems (Naipinit, *et al.*, 2016, Rerkasem, 2017, Somswasdi, *et al.*, 2015). Latest developments nowadays involved the use of technological advancements over the internet, which the enterprise lacked the skill to operate. Other problems by the enterprise relate to the production aspect as most of farmers lack proper postharvest management skills. This problem is common among rice farmers in the developing countries and can be explained by farmers' perceived risks and uncertainties when presented with new farming practices or technologies (Kasem and Thapa, 2011).

### ***Implications***

As for this study's implication, the authors have found two important points, which both tackle theoretical and practical aspects. First, this study is one of the latest attempts to investigate the current supply chain structure of RPCEs in Thailand. RPCEs dominate the rice production sector in the rural areas, assisting farmers in their livelihood and income. Understanding the modern supply chain would assist leaders and farmer-members to look for competitive advantages (Stadtler, *et al.*, 2014). Moreover, this study does not only present the modern supply chain structure of RPCEs, but also identify major constraints that give insights of the areas needing improvement. This study extends previous findings of the rice supply chain structure in Thailand particularly in the context of community enterprises. This is a new contribution to the literature.

Second, in a practical sense, this study provides new insights to policymakers assisting them in formulating specific program interventions based on the identified constraints and supply chain overview. Such a contribution would help enhance the competitiveness of RPCEs as important players of the rice production sector in the rural areas of Thailand. The current findings implied that rice community enterprises need to upgrade their operations along with the emerging concerns (e.g., product design, marketing). Utilizing latest technologies in online marketing and product development (Cavite *et al.*, 2021b), through collaboration with more capable insitutions would help achieve this goal and consequently reach more consumers for their rice products (Cavite, *et al.*, 2021a). The enterprise's problems from production

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to marketing provide insights to supply chain stakeholders, especially policymakers to focus on giving stronger policy support to small farmers on these aspects; thereby helping them adjust and cope up with the changing landscape of rice production and marketing in Thailand.

### **Conclusion**

This study investigated the supply chain structure and constraints of Baan Nong Saeng community enterprise. Results revealed that the supply chain structure of the community enterprise involves the following major players: farmers, collectors, processors (rice millers), and distributors. Vertical coordination and information sharing is present in the current supply chain which gave opportunity for the community enterprise to sell their rice products extensively in both local and outside markets. However, key constraints across production, processing, and marketing are still evident. Most common of these problems concern the enterprise's product and marketing, and farmers' inadequate skills for new technology. Practical implications on these aspects are addressed to policymakers. Moreover, this study may have a few limitations. First, this study was conducted in a small group of community enterprise in Chachoengsao province, Thailand which makes the result not generalisable to other large enterprise groups. Second, this study only focuses on the identification of constraints. Future research may add on formulating strategic options and guidelines for community enterprise development based on the current supply chain structure and identified constraints.

### **Acknowledgement**

This work forms part of the first author's PhD dissertation, supported by King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand Doctoral Scholarship Grant KDS2019/026. The authors would like to thank the leader, committee members and farmer-members of the Baan Nong Saeng community enterprise for their time in participating the interviews and discussions. Data gathering assistance from Athiwat Joedsak, Nuttanan Direksri, and Chanhathai Kerdsriserm are likewise fully acknowledged.

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