

Antecedent Factors for the Success in Processed Rice Product Development

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ABSTRACT

The Thailand 4.0 Policy focuses on the development of processed food industry by applying advanced technology in rice production and processing. Through this practice, rice can be processed into food or various products, resulting in new innovations from rice products. The objectives of this research were to study: 1) levels of success of processed rice product development; 2) factors influencing the success of processed rice product development; and 3) a model for the success of processed rice product development. This research employed a mixed research methodology combining quantitative and qualitative methods. For the quantitative research part, the research sample consisted of 400 people residing in Bangkok, Nakhon Pathom, Ratchaburi, Chonburi, Chiang Mai, Udon Thani and Phang Nga Provinces. They were selected via multi-stage sampling. The sample size was determined based on the criterion of 20 times the observed variables. Data were collected with the use of a questionnaire and analyzed with a structural equation model. As for the qualitative research component, in-depth interviews were conducted with 30 key informants who were entrepreneurs of rice processing businesses. Data were analyzed with content analysis. The findings showed that: 1) the success of processed rice product development were rated at a high level in overall; 2) knowledge had the greatest direct influence on the success of processed rice product development, followed by government policies and knowledge management whereas related stakeholders had an indirect influence, and the model conformed with the empirical data; and 3) the model for the success of processed rice product development consisted of: (1) the application of innovations, obtaining a certification demonstrating that the products had been certified with specified standards, and having competitive advantage in the global market; (2) the processed products being of high quality as well as being safe and environmentally friendly; and (3) modern technology used in the development of processed rice products perfectly responding to consumers' needs. These research findings are beneficial for the government sector as they can be used as a guideline in determining policies for the promotion of cooperation in the development of rice-related innovations. Moreover, the findings can also serve as a guideline for the private sector in developing food processing procedures and rice production in order to enhance the potential of international trade

Keywords

Rice Processing, Product Development, Processing Innovation

Introduction

According to the information from the Institute of Intellectual Property of Chulalongkorn University, the tendency of the global food industry in 2017 revealed that the consumers would prefer healthy food in more specific forms such as less processed, reducing the meat protein, consuming more plant protein, reducing dietary fat, focusing on the environment more, reducing waste in the food production and leftovers from consumption, and ASEAN food. In addition, consumers of all ages have started to focus on healthy food in order to reduce future health care costs. Modern food must be in beautiful packages, convenient to use and in smaller size suitable for one meal. In terms of distribution channels, consumers pay more attention to online information as well as more interested in online shopping (Kasikorn Research Center, 2018).

Apart from being one of the wonderful plants of the world, "rice" can explain the harmonious relationship between the nature and human in many ways. For example, the use of rice in rituals to express belief, respect and faith is the cultural relationship. The use of rice for consumption and trade is an economic relationship. Using rice as a tool in issuing campaign policies to help farmers is a political relationship, etc. At present, science and technology play a role in the rice process more in terms of production, processing and trade causing the relationship of rice to

various contexts to change (Kasikorn Research Center, 2018).

"Rice" is the main food of Thai people and is also processed into food or products according to folk wisdom that has been accumulated from generation to generation. The science, technology and innovation are brought to develop in the rice production and rice processing. The new forms of rice products are innovated. The market trend of Thai rice processing products (Rice Department, 2018) found that in 2018 it should be able to support itself. The Kasikorn Research Center expected that in 2018, Thailand would have an export value of processed agricultural products at approximately US\$17.2 billion or expanded by 1.7 percent (YoY), driven by demand in the world market that supported good economic conditions and the adaptability of Thai entrepreneurs like canned and processed seafood, wheat products and other processed foods including beverage. Meanwhile, the volume of agricultural products which are the important raw ingredients in the production of processed agricultural products such as seafood, sugar, fruit and rice, has a tendency to expand continuously. The support is also given by the government in the project to develop the competitiveness of the regional agricultural processing industry (OPOAI: One Province One Agro-Industrial Product) and the Thailand Food Valley project.

According to the data from the National Science and Technology Development Agency (NSTDA) together with the Center for Incubation and Innovation for Agricultural SMEs (Small and Medium Enterprise), Bank for Agriculture and Agricultural Cooperatives (BAAC) develops the potential of agricultural entrepreneurs to become the development of prototype products from rice processing 19 original products with science, technology and innovation elevating “rice” to be more than the main component in a dish. This results in various products to creates the added value to “rice” and creates a cost-effective use of resources from rice cultivation such as rice jelly mixed with millet and sesame, germinated brown rice milk jelly with soybean, sesame sticky rice daifuku, cookies, rice stuffed with cream, rice bran, organic rice noodles, beverage, rice mixed with licorice, mixed rice drink, bird’s nest, rice drink powder, organic riceberry, etc. (Kasikorn Research Center, 2018).

However, as consumer behavior has changed, this is an important opportunity to support rice processing products to meet the needs of various consumer consumption patterns and is more specific to the group regardless of the degree of success of rice-processing product development depends on knowledge management factors, government policy factors, innovation factors, network and participation factors. Therefore, the researchers are interested in studying, exploring, and researching the factors that influence the success of the development of rice processing products as a guideline for development to bring the research results to expand the products of entrepreneurs and access to quality products (rice processing) for consumers in a sustainable way as well as being able to increase productivity and compete in the world market.

LITERATURE REVIEW

Concepts and theories about innovation

Innovation is the use of thought processes, skills, knowledge, experiences, creativity, and available resources to improve and develop and/or create new products, tools, or services for economic and social benefits. According to Hughes (2003), the definition of innovation is the implementation of new methods after undergoing experimentation or being developed in steps including 1) Invention, 2) Development or Pilot Project, and 3) Implementation which come from jointly searching for new methods, finding future needs, and developing altogether to exchange knowledge. The gathering of people creates important discoveries or the process of offering something truly new which looks completely different from the original process and concept or is the nature of a completely new change resulting in the New Dominant Design.

Concepts and theories of participation

Regarding the concept of participatory process that scholars have pointed out in the aforementioned above, there is enough variety in the subject matter. However, if compiled into a systematic manner according to the concepts of Cohen, J.M., & Uphoff, N.T. (1980), it can be seen that there is a systematic approach to key issues taking the participatory process from many academics and compiled into the main concept and classified the participative process model; Step 1: Decision Making; Step

2: Implementation, Step 3 Participation in receiving benefits, Step 4: Evaluation. In summary, the participation process focuses on the process of participation in the issues, participation in the search for the cause and needs, participation in planning and execution, participation in decision making, participation in the operation, participation in the evaluation, and participation in public relations.

Government policy on food security

Food security is developed into a more complex dimension based on the dynamics of people’s understanding of the role of food or even differences in each country and region. The Food and Agriculture Organization of the United Nations (FAO) defines the term “Food security” as the state that people have an adequate “quantity” of food for consumption. There is a “variety” of the types of food they receive, and that food is “quality” meaning it is nutritious and clean. People can also “access” food resulting from the distribution system. The details are; 1) sufficiency which is the sufficiency of quantity of food with appropriate quality; 2) accessibility referring to the ability of a person to regulate a group of goods under the legal, political, economic and social context of a community where a person lives. This includes traditional rights such as access to community common resources (FAO. 2006. “Food Security”. Policy Brief. June. Issue 2). 3) Food use through adequate food, clean water, health care, and sanitation in order to access nutritional well-being, 4) People’s stability: households and individuals must have access to food sufficiently all the time. It covers both the sufficiency and food access dimensions.

Research conceptual framework

From the review of various concepts and theories as well as related research as mentioned above, it shows that the factors influencing the success of rice processing product development are 1) government policy factor (GM), 2) innovation factor (IN), 3) knowledge management factor (MK), 4) participation factor (BH), and 5) success in the development of processed rice products (SSR).

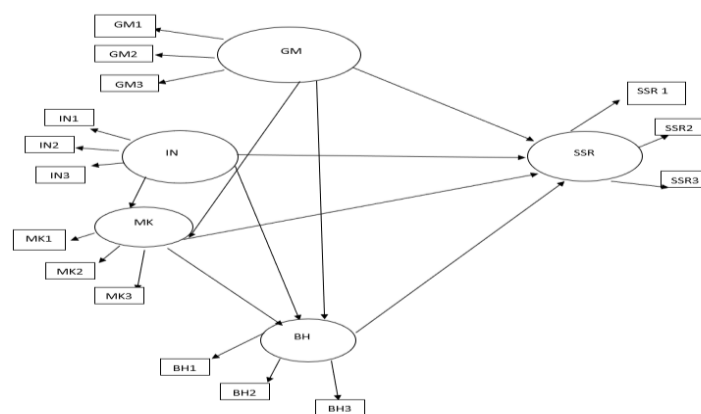


Figure 1 Research conceptual framework

RESEARCH METHODOLOGY

This research uses a combination of quantitative and qualitative research. The data were collected with questionnaires and interview forms from the sample group and the data were analyzed with descriptive statistics and

structural equation modeling methods. The researchers used the mixed method research, both quantitative and qualitative.

For the population and sample, the quantitative sample group consisted of 300 people in Bangkok, Nakhon Pathom, Ratchaburi, Chonburi, Chiang Mai, Udon Thani and Phangnga areas being selected using a multistage sampling method. The data were collected using questionnaires and the data were analyzed with descriptive statistics and structural equation modeling. For the qualitative sample group, the data were collected by in-depth interviews on 30 rice processing operators.

The research tools were questionnaires used for collecting the data. The quality was checked by using Cronbach's alpha coefficient. The reliability coefficient was between 0.921 and 0.984 by questionnaire conformance index. The IOC value was between 0.60-1.00. The tools used for the data collection had the conformance index value meeting the defined criteria (IOC criteria ≥ 0.60).

For the data analysis, the descriptive statistics were used to describe the general condition of all variables including the percentage, mean, standard deviation and were analyzed with the structural equation model.

RESEARCH RESULTS

1. According to the research results on the level of success of rice processed product development in 5 aspects; 1) government policy factors, 2) innovation factors, 3) knowledge management factors, 4) participation factors, and 5) success in developing processed rice products, it was found that the overall picture was at a high level. The results of the study were summarized as follows.

1) Government policy (GM) overall was at a high level ($\bar{X} = 3.622$), with the support of knowledge from government policies at a high level ($\bar{X} = 3.650$), followed by funding source support ($\bar{X} = 3.638$), and budget support ($\bar{X} = 3.579$), respectively.

2) In terms of innovation (IN), the overall picture was at a high level ($\bar{X} = 3.673$), the incentives for innovation development were at a high level ($\bar{X} = 3.710$). The support of various organizations in the field of innovation in the development of processed rice products was at a high level. ($\bar{X} = 3.659$) and the support for innovation processes was at a high level ($\bar{X} = 3.650$), respectively.

3) In terms of knowledge management (MK), the overall picture was at a high level ($\bar{X} = 3.625$) Knowledge in applying modern technology to develop rice processing products. At a high level ($\bar{X} = 3.659$), knowledge of rice product development planning is at a high level ($\bar{X} = 3.638$) and knowledge in creating a rice product development plan. at a high level ($\bar{X} = 3.579$), respectively.

4) The Participation (BH) was entirely at a high level. ($\bar{X} = 3.666$) The assistance from the network to develop rice processing products was at a high level ($\bar{X} = 3.710$). The opportunity for the community from all sectors to cooperate and participate was at a high level ($\bar{X} = 3.650$) and the development of creativity in developing rice processing products was at a high level ($\bar{X} = 3.638$), respectively.

5) The overall success in the development of processed rice products (SSR) was at a high level ($\bar{X} = 3.623$). The access to global markets was at a high level ($\bar{X} = 3.718$). The addition of value from using technology and innovation to develop products was at a high level ($\bar{X} = 3.670$). The product design which was in line with consumer behavior was at a moderate level ($\bar{X} = 3.481$).

Table. 1 Level of variables used in research

Variables	Average \bar{X}	Results
(GM) Knowledge management factors		
1. (GM1) Knowledge of rice processing product development planning	3.650	High
2. (GM2) planning	3.638	High
3. (GM3) Budget support	3.579	High
Total	3.622	High
(IN) Innovation factors		
1. (IN1) Support from various organizations in the field of innovation in the development of rice processing products	3.659	High
2. (IN2) Incentives for developing innovative rice processing products	3.710	High
3. (IN3) Support in the innovation processes	3.650	High
Total	3.673	High
(MK) Knowledge management factors		
1. (MK1) Knowledge of rice processing product development planning	3.638	High
2. (MK2) Knowledge of creative development of processed rice products	3.579	High
3. (MK3) Knowledge in applying modern technology to develop rice processing products	3.659	High
Total	3.625	High
(BH) Participation factors		
1. (BH1) Assistance from the network for the development of rice processing products	3.710	High
2. (BH2) Opportunity granted for communities from all sectors to participate	3.650	High
3. (BH3) Creativity development in	3.638	High

rice processing product development		
Total	3.666	High
(SSR) Success in the development of processed rice products		
1. (SSR1) Product design in line with consumer behaviors	3.481	Moderate
2. (SSR) Access to global markets	3.718	High
3. (SSR3) Addition of value from using technology and innovation to develop products	3.670	High
Total	3.623	High

2. For the results of model analysis of factors affecting the success of the development of processed rice products, the Structural Equation Modeling (SEM) was used to examine the harmony of the causal relationship model established with the empirical data. The structural equation model (SEM) consisted of the following models:

According to the Causal Model Consistency Test of Factors Affecting Causal Influences Based on the assumptions and empirical data, it was found that the model was consistent with the empirical data. This was considered from the statistics used to check the coherence between the model and the empirical data, i.e. the probability p (p-value) was 0.18, the relative chi-squared (χ^2/df) was 1.13, and the GFI was 0.96. The CFI was 0.998, the NNFI was 0.998, the RMSEA was 0.02, and the SRMR was 0.03 for all criteria.

Table 2. Composition of variables

Factor Variables	(Factor loading)	(Standard Error)	(T-test)
Knowledge management factors (GM)			
Knowledge of rice processing product development planning (GM1)	1.220	0.122	9.986
planning (GM2)	1.555	0.160	9.740
Budget support (GM3)	2.044	0.193	10.618
Innovation factors (IN)			
Support from various organizations in the field of innovation in the development of rice processing products (IN1)	1.753	0.158	11.129
Incentives for developing innovative rice processing products (IN2)	1.648	0.129	12.798
Support in the innovation processes (IN3)	0.977	0.0871	11.226
Knowledge management factors (MK)			
Knowledge of rice processing product development	1.991	0.193	10.304

planning (MK1)			
Knowledge of creative development of processed rice products (MK2)	1.012	-	-
Knowledge in applying modern technology to develop rice processing products (MK3)	0.566	0.0553	10.245
Participation factors (BH)			
Assistance from the network for the development of rice processing products (BH1)	1.728	0.187	9.224
Opportunity granted for communities from all sectors to participate (BH2)	4.747	-	-
Creativity development in rice processing product development (BH3)	3.059	0.296	10.349
Success in the development of processed rice products (SSR)			
Product design in line with consumer behaviors (SSR1)	1.413	0.215	6.558
Access to global markets (SSR2)	6.004	-	-
Addition of value from using technology and innovation to develop products (SSR3)	0.575	0.0800	7.191

From Table 2, the composition of the variables, when considering the composition weight values of the gluten, the variables were noted. For the most valuable of each latent variable by identifying the observable variable with the highest value in each latent variable, the t-test statistic (T-test) and the standard error must be considered.

For the government policy factor (GM) component, the most heavily weighted variable, was the budget support (GM3).

For the innovation factor component (IN), the variable with the greatest weight was the motivation for developing innovative rice-processed products (IN2).

For the Factors Component of Knowledge Management (MK), the variable with the greatest weight was knowledge in rice processing product development planning (MK1).

In terms of the factor component of participation (BH), the most weighted variable was creative development in rice-processed product development (BH3).

According to the success factor in rice-processed product development (SSR), the most weighty variable was the value-added from technology and innovation development (SSR3). Success in the development of processed rice products depends on knowledge management factors, the government policy factors, innovation factor and statistically significant participatory factor, i.e. the successful development of processed rice products. There will be factors in knowledge management, government policy factors, innovation factor and the factors related to the participation of the parties which are in accordance with the established guidelines.

1. Knowledge management: 1) knowledge in planning and developing rice-processed products, considering the knowledge of various types of rice; planning to develop rice processing products communication through various media, the ability to apply existing knowledge in the development and processing of rice into various types of food. 2) Knowledge in creating the development of processed rice products is considered from the knowledge of production and product development, positive attitude in product development, technology leadership, and creation of innovative new products, learning new things and always seeing different business opportunities and sharing knowledge with other entrepreneurs. 3) Knowledge in applying modern technology to develop rice processing products is considered from a collaborative plan to avoid duplication of work. The work process is clearly defined to ensure product quality applying modern technology knowledge in production process methods for checking quality standards of processed rice products.

2. Government policies are as follows: 1) Knowledge support considers the promotion from the government to access learning resources. Public relations and continuous information to Thai rice processing situation Continuous development of technology knowledge to increase entrepreneurial potential Competitiveness enhancement promotion and development of knowledge for entrepreneurs or farmers in Thai rice processing; 2) support for funding sources, considering investment planning; sufficient working capital support. There are sources of loans from financial institutions, financial planning control and rigorous audit of income and expenditures and continuous monitoring of the financial system. 3) Budget support: Considering financial management planning to prepare for future income and expenses, sufficient government budget support, cost support for business growth setting guidelines for allocation operating budget and the actual performance is compared with the budget set.

3. Factors related to participation are as follows: 1) network assistance in developing rice processing products, considering the assistance from the community in providing

knowledge on rice; Community assistance in processing rice community assistance in processing rice, assistance from the community to bring local wisdom to develop products and the community has brought knowledge and expertise to be used in the development of rice-processed products; 2) the opportunity for communities from all sectors to cooperate and take part, considering their participation in the process of developing rice-processed products; listening to opinions, providing facts and opinions for decision making in various ways. The community plays a role in decision-making in the development of processed rice products supporting scarce and scarce quality raw materials and giving opportunities for all sectors to use local wisdom to develop products; 3) develop creativity in developing rice-processed products, considering the participation in the development creativity, further thinking, production process and generating income, building a long-term career from the development of rice processing products.

4. Innovation: 1) Support of various organizations in innovation in rice-processing product development, considering the use of technology to help develop rice-processed products, product publicity or services through various social networks supporting modern technology and tools used to facilitate work, transfer of innovations to be used in the development of processed rice products and bring new knowledge emphasis on the creation, research and development of processed rice products 2) Motivation for the development of innovative rice processing products considering the initiatives to create new approaches for development, creating outstanding new work by using resources cost-effectively, thinking outside the box, considering the work from a different perspective. Recognition and rewards for innovative use of rice processing Use innovation in production until it is well known and accepted by consumers. 3) Supporting the innovation process, considering the creation of innovations to be used in product processing. Interest in developing innovations for the development of processed rice products processes and tools to create opportunities for learning skills such as knowledge base communication techniques practical techniques, etc., digital development (digitalization) that makes communication possible, efficient, fast, and low cost e-commerce support and system development distribution of processed rice products

3. From the results of the study on the success patterns in the development of processed rice products, the direct influence, indirect influence and the combined influence of factors affecting success in the development of processed rice products were defined as a model for developing successful processed rice products. Success in the development of processed rice products depends on government policy factors, factors related to participation, innovation factors, and knowledge management factors.

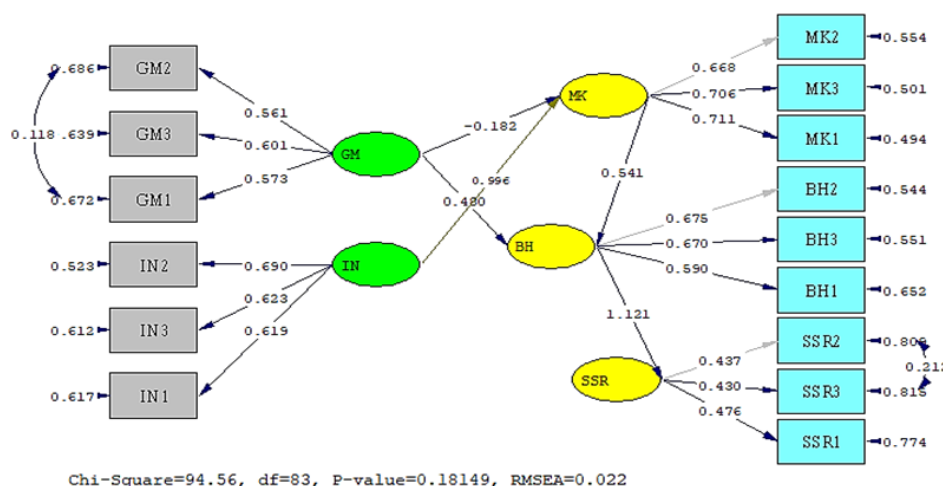


Figure 2

Success patterns in the development of processed rice products

DISCUSSIONS OF RESULTS

- 1) The knowledge management was the most statistically significant factor influencing the success of rice-processed product development which corresponds to Theera Wongsamut (2011).
- 2) The participate factor was the factor having the greatest influence on the success of rice-processed product development with statistically significant significance, such as the assistance from the network in the development of rice-processed products, opportunity for communities from all sectors to cooperate and participate and develop creativity in developing rice-processed products which corresponds to Alissa Mahasawat (2011).
- 3) Government policy was the factor that influenced the success of rice processing product development the most with statistically significant significance. The entrepreneurs received the most funding sources followed by knowledge support and received knowledge support which corresponds to Kittipong Trakulchokamnuay (2014).
- 4) Innovation was the factor that influenced the success of rice processing product development with statistically significant significance. which corresponds to Kittipong Chok Amnuay family (2014)

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