

THE SUPPLY CHAIN MANAGEMENT OF OFF-SEASON RICE IN NAKHON CHAI SI DISTRICT, NAKHON PATHOM PROVINCE.

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ABSTRACT

The purpose of this research was (1) to find off-season rice supply chain management model in Nakhon Chai Si District, Nakhon Pathom, (2) to analyze off-season rice supply chain management in Nakhon Chai Si District, Nakhon Pathom and (3) to find solutions to problems of off-season rice farmers. The sample was 334 off-season rice farmers cultivate in Nakhon Chai Si district, Nakhon Pathom. In this study, mixed- method research design was employed. The statistics such as percentage, mean and standard deviation were used.

Results of the analysis of off-season rice supply chain management provide valuable insights into planning, procurement, production and transportation of off-season rice supply chain management. In planning, environmental aspects such as water and climate are considered prior to cultivation as to increase production. In procurement, the cost of ordering and the speed of delivery are considered. Farmers learn about the price of rice variety from the intermediary agents and they compare it to the price of quality rice. The relationship between intermediary agents and farmers is essential. A future sale contract is made which enables the intermediary agents to acquire quality products that have been verified ensuring that product quality meets the standards. In production, farmers have expertise in cultivating and harvesting rice which meet the standards. There is an appropriate harvesting period which enables farmers to obtain high yield with good quality. In transportation, the rice mill provides transportation of paddy by sending trucks to the cultivation areas. When the harvesting season arrives, harvesters and transportation vehicles from the rice mill will be sent to the cultivation areas which allows for fast and convenient transportation of paddy.

Keywords: supply chain management, off-season rice.

INTRODUCTION

Rice is an important grain and food source in the world, especially for the population in Asia, the Middle East and Africa in which rice is a staple. Rice is, therefore, an important economic crop that has a wide impact on the world's population. As the culture and taste of rice consumption in each region of the world is different, attention must be paid to standards and quality of rice so that rice producers in Thailand will be able to compete in the world's rice market. Emphasis must be placed on packaging which is not only intended for storage [1]. Transportation functionality and aesthetics of packaging should also be developed in

order to add value to rice [2]. Hence, rice can be up to the internal export standard in quality and cost competitive globally.

Currently, the government and private sectors are encouraging and supporting farmers to develop more standardized export products. However, farmers are experiencing problems in managing the rice supply chain due to lack of good management which is caused by lack of problem identification and analysis in rice supply chain management such as product movement, information flow, cash flow and risk diversification in product movement, market structure and competition, production process and technology, and product distribution channels [3]. Therefore, rice farmers in Nakhon Chai Si District need to be encouraged to participate in the development of rice varieties with efficient supply chain management. New production methods which help reduce production costs, increase productivity and increase the quality of rice from upstream to downstream need to be developed by rice farmers in order to increase their production potential [4].

Farmers and entrepreneurs should find new production methods that help reduce production costs, increase productivity, improve rice quality from upstream to downstream and develop new rice varieties. This can be done by using technology and new agricultural concepts to create diversity and rotate rice varieties in cultivation. If rice farmers can adapt themselves to new business environment and develop their product potential as mentioned, it will be an advantage for Thailand in which Thailand will be an important rice production and export base and a distribution center for rice export to countries around the world. In commercial production of rice, basic knowledge and know-how need to be learnt. This includes technology, production innovation packaging, transportation and marketing which many farmers and entrepreneurs generally ignore [5]. As a result, it causes problems such as high production costs, loss of produce during transportation and low selling price. The important thing is that involved parties in rice production need to start realizing that Thai rice export will face strong competition; therefore the development of production technology needs to be accelerated in order to increase the quality of rice. Rice export is facing a new challenge and involved parties must adapt themselves to changing business environment in order to keep the existing market and expand to new markets [6].

OBJECTIVE

1. To find the off-season rice supply chain management model in Nakhon Chai Si District, Nakhon Pathom.
2. To analyze the off-season rice supply chain management in Nakhon Chai Si District, Nakhon Pathom.
3. To find solutions to problems of off-season rice farmers.

METHODOLOGY

Population and sample groups

Mixed-method design was employed for this research. 2 sets of population and sample were used which are the following:

1. Quantitative study: Population of 2,034 people who are off-season rice farmers living in Nakhon Chai Si District Nakhon Pathom was specified. The sample of 334 people

who are off-season rice farmers was determined. Purposive Sampling was used to select the sample and Taro Yamane's formula was used to determine the sample size [7].

2. Qualitative study: Population of off-season rice farmers who live in Nakhon Chai Si District Nakhon Pathom was specified. The sample selected was 10 farmers from Off-Season Farming Collective which is located in Nakhon Chai Si District and registered with the Nakhon Pathom Provincial Agricultural Office. The sample size was determined using the table of Krejcie & Morgan [8].

The research tools

The research tools used were questionnaires and in-depth interview. 4 tools were used in 4 parts: (1) a questionnaire on general information of the respondents (2) a questionnaire on finding suitable models for off-season rice supply chain management (3) a questionnaire on the analysis and development of off-season rice supply chain management system (4) an open-ended questionnaire. Likert (Rating Scale) [9] was used in the questionnaires and each item was divided into 5 levels: highest, high, medium, low and lowest.

RESULTS

The research results provide insights into off-season rice supply chain management model and as follows:

1. The sample was rice farmers. They are mostly male between the ages of 41-50 years and have experience in rice cultivation for 21-30 years. Most of them have an average income of ₱130,001-170,000 per year from rice cultivation.

2. From studying off-season rice supply chain management model in Nakhon Chai Si District, Nakhon Pathom, the following results were found:

2.1 Production - the rice variety that is mainly used in rice cultivation is Pathumthani fragrant rice which accounts for 31.44 %. Rice cultivation method which is mostly used by Nakhon Chai Si farmers in Nakhon Pathom is sowing which accounts for 89.22%. Primary water source for rice cultivation is canal and pond accounting for 88.92%. Chemical fertilizer is mainly used which represents 85.63%. The most common disease in rice is the brown spot disease constituting 26.65%. The main rice pest is thrips accounting for 24.85%. The major method of pest control and eradication is spraying chemicals constituting 100%. Most of the off-season rice farmers employ temporary labor which represents 89.52%;

2.2 Storage - rice that has a growth period of 111-120 days is preferred representing 47.31%. The rice yield (Kwain/cultivation cycle) is 11-20 Kwain (1 Kwain is equivalent to 2000 liters) accounting for 81.14%. In terms of moisture content of rice, rice, regardless of its moisture content, is bought by rice mills or intermediary agents at the standard price which accounts for 53.89%. The chief method of reducing rice moisture is exposing rice to sunlight representing 100%. The rice mill is the major sales channel for rice farmers which accounts for 91.32%. Price is determined by the market which constitutes 59.28%. Paddy is mostly sold by Kwain to the intermediary agents representing 100%. Payment method of the sale of paddy used by the intermediary agents is cash accounting for 61.08%;

2.3 Transportation - The main transportation of rice is provided by the intermediary agents, accounting for 78.74%. The chief mode of transportation is 6-wheel trucks representing 61.68%;

2.4 Production Control - The primary method employed to increase rice production is planting rice in the space between rows which accounts for 51.50%. Production costs are reduced by water control and weed control representing 46.11%.

3. From the analysis of the development of off-season rice supply chain management model in Nakhon Chai Si District, Nakhon Pathom, the following results were found:

3.1 Planning - The overall planning is at a high level with the mean of 3.72. Moreover, environmental consideration in water and climate prior to rice cultivation is the highest with the mean of 4.7;

3.2 Procurement - The overall procurement is at a high level with the mean of 3.33. Moreover, examination of the price of paddy in the market is the highest with the mean of 4.47;

3.3 Production - The overall production is at a high level with the mean of 3.53. Moreover, regular spraying of insecticides and chemicals to prevent rice plant diseases is the highest with the mean of 4.53;

3.4 Transportation. The overall transportation is at a medium level with the mean of 3.04. Moreover, suitable vehicles used for transportation is the highest with the mean of 3.73.

4. Guidelines for solving problems of off-season rice farmers in production process and reducing cultivation costs are as follows:

4.1 Reducing chemical fertilizer costs, use of pesticides and weedicides and organic chemicals for rice plant disease control or using natural methods to eradicate pests and weeds;

4.2 Reducing costs by creating a community store of rice seeds and selecting suitable rice varieties for local cultivation.

4.3 Increasing productivity per rai (1 rai is equivalent to 0.16 hectare) or per cultivation area which can be done as follows:

4.3.1 Using high-yielding rice seeds which will result in produce being used as seeds for future cultivation;

4.3.2 Using correct cultivation techniques and methods which have been proven by research or from conventional wisdom such as soil preparation, water use, sowing, transplanting, using fertilizer, and harvesting. If proper cultivation techniques are employed, it can raise productivity;

4.3.3 Optimizing small-scale farms which can reduce losses, increase productivity and save costs for farmers who have 2-3 rai of land. Use of seasonal labor should be kept to the minimum. Farmers need to work no less than 4-5 hours per day in the rice fields throughout the season;

4.4 The quality of rice is measured by the percentage of full rice grains, weight, taste, smell, color and nutrients that are desired by various groups of consumers. Increasing the quality can be done as follows:

4.4.1 Producing organic rice as it is nowadays accepted that organic crops are high in quality;

4.4.2 Adding flavor, smell, color, vitamins and nutrients can increase the value of rice by turning it into healthy and healing food. As a result, rice can be sold to niche market at a higher price;

4.4.3 Maintaining the quality of rice and selling it 2-3 months after harvest will help farmers get a better price. Therefore, if farmers do not have their own barn, a community barn and drying area should be built. Thus, rice can be properly stored, resulting in higher quality of rice and good selling price;

4.5 Having sufficient production factors which are land, water, capital, knowledge and technology can help solve production issues. Most farmers lack water for production, especially in-season farmers. They rely on seasonal rainwater which allows them to cultivate rice once a year. Moreover, most farmers lack knowledge and technology, especially the knowledge which will help them to keep up with the changing market;

4.6 Being aware of the market and being able to adapt to changes can help reduce costs and increase production in dynamic market;

4.7 Farmers who mainly produce rice for sale and rely on sustainable income from rice production must focus on reducing costs, increasing productivity and quality. They should not rely on rice subsidy and rice pledging by the government as they are not continual because of budget problems and higher cost of rice compared to rice from other countries, causing Thailand to be less competitive in the world's rice market.

DISCUSSION

From the analysis of the results, the following findings will be discussed:

1. The results of the research of off-season rice supply chain management model of Nakhon Chai Si District, Nakhon Pathom revealed that in production process, the main rice variety that rice farmers use in cultivation is Pathumthani fragrant rice which is suitable for cultivation in the climate and can be grown 2-3 times per year in the cultivation area of 11-20 rai. In preparation of cultivation area, most farmers utilize technology to enhance cultivation. Machinery is employed to level rice fields prior to cultivation. In preparation of rice varieties for cultivation, most farmers mainly consider the rice varieties that have a high selling price of the harvest. High-yielding, good weight and full-grain are also characteristics of rice that farmers prefer. In fertilizer application methods, fertilizer must be applied correctly, properly and timely. 2 types of fertilizers are used which are organic and chemical fertilizer. Organic fertilizer is derived from overturning the soil with weeds. Weeds in the soil are overturned and left to decompose. In water source, cultivation of quality rice requires sufficient water. The main water source for rice cultivation is canals and ponds in which water is available throughout the season. Controlling water level is important in attaining high yield of rice. In harvesting, 20 days after flowering takes place, farmers will drain their rice fields in order to speed up the ripening process and ensure that the rice grains will have the right moisture content. Harvesting can be done in about 10 days after water is drained, which is the suitable time for harvesting. There are 2 methods of harvesting: 1) Technology is used to help reduce the harvesting time. 2) Harvesting is done by labor. Laborers will line up in a row and face the rice plants. Rice plants are bent in the same direction for easy harvest. The average harvesting time is 3-5 days, which is consistent with the research of Phimonratanakarn [10] on the supply chain management of orchid agriculture in Phutthamonthon District. The result of the research shows that the promotion of the model of supply chain management of orchids through community engagement will lead to innovative ideas, problem solving and resource gathering. This is a positive way for businesses in the Phutthamonthon community to be successful, sustainable and self-reliant. It is also the way for farmers to develop their businesses according to the external environment and business competition. The model of the supply chain management of orchids using information technology in the process has resulted in amelioration of the model of supply chain management for orchids.

In storage, fragrant rice is popular rice cultivated by farmers in Nakhon Chai Si district, Nakhon Pathom. The duration of rice cultivation is 111-120 days. In moisture content, most farmers in Nakhon Chai Si District fragrant cultivate fragrant rice as rice mills or intermediary agents will purchase the rice at the standard price regardless of the moisture content of the rice. In moisture reduction, most farmers in Nakhon Chai Si District use the method of exposing rice to sunlight. In price setting, the price of paddy will be determined based on the market price. This depends on various important factors, including weather and seasons, number of cultivated land, demand of rice and income. All of which affect the price

of paddy in the market, along with the evaluation of rice quality. The sales channels of rice for farmers are rice mills, government rice-purchasing agents and private rice-purchasing agents. In general, farmers will sell the paddy that is harvested to the rice mills which offer a higher price than the government. The payment method for rice is cash or both cash and credit. If credit is given, the payment will be received within 7 days of the sale contract.

In transportation, there are 2 ways to distribute paddy. 1) The rice mills which buy the paddy have their own transport vehicles which are used for transporting paddy directly from cultivation areas. 2) The farmers will use their own vehicles to transport the paddy. If they do not have their own 4-wheel or 6-wheels trucks, they will have to hire them from the mill.

In production control, farmers increase production by planting rice in the space between rows. Quality inspection of rice is performed. Water control and weed control are carried out. Manual work is done by the farmers themselves without hiring laborers. Organic fertilizer is used instead of chemical fertilizer to reduce costs.

2. Having a good supply chain management of off-season rice can help the rice export business of Thailand to become the second largest in the world. Comparing with rice exports of the 5 major exporting countries, it can be seen that in the period from January to September 2018, Thailand was second in rice export with 8.12% market share which was second only to India that had a 9.21%. Thai rice is recognized worldwide because of Thailand's rice production experience.

From the analysis of supply chain management of rice, it was found that rice is an important grain due to its nutrition value. It is also an agricultural product that does not rot or become perishable easily. Moreover, it is the main agricultural product which requires quality production process. Rice is the number 1 food in the world as half of the world's population consumes rice as a staple. Farmers or exporters should use the supply chain management tools to increase efficiency and quality in planning and production. This will lead to production cost reduction and increase in productivity resulting in higher yield.

In procurement, ordering cost and speed of delivery are important. It was found that farmers learn about the rice variety price from intermediary agents and they compare it to the price of quality rice. The relationship between intermediary agents and farmers is essential. A future sale contract is made which enables the intermediary agents to acquire quality products that have been verified ensuring that product quality meets the standards. In addition, the price of paddy is examined in the market before the paddy is sold.

In production, it was found that in evaluating the efficiency and operational effectiveness of the farmers, the farmers have expertise in cultivating and harvesting rice which meet the standards. There is an appropriate harvesting period which enables farmers to obtain high yield with good quality. Control of water level in rice fields, regular use of fertilizer and harvesting technology help reduce labor costs and time for harvesting.

In transportation, the rice mills provide transportation of paddy by sending trucks to the cultivation areas. When the harvesting season arrives, harvesters and transportation vehicles from the rice mills will be sent to the cultivation areas. This provides convenient and fast transportation service to farmers. Moreover, the vehicles used for transportation are suitable and the transportation costs are reasonable, while the quality of the rice remains the same without damage.

CONCLUSION AND FUTURE WORK

1. Quality seeds need to be used. The unit cost will be high, but productivity will be increased resulting in quality products that have good weight.
2. Water is an important factor in the agricultural sector. The government agencies should place importance in solving water problems so that farmers have sufficient water for cultivation.
3. Comparative study of cost management between rice cultivation using sowing and transplanting technique can help farmers to make better decisions on which technique has higher costs and which technique is suitable.
4. Use of technology to help manage off-season rice supply chain should be implemented. Transplanting tools can be used to help reduce labor costs and save time.

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