

# Supply Chain of Organic Rice in Suphan Buri Province

## ห่วงโซ่อุปทานข้าวอินทรีย์ในจังหวัดสุพรรณบุรี

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### Abstract

This study of the supply chain of organic rice in Suphan Buri Province aimed at surveying the stakeholders in the supply chain, which have been linked together from upstream, midstream, and downstream. It also analyzed the supply chain in terms of quantity and income/value received by the farmers. This study was based on a qualitative approach. The 4 groups of research population and the sample were Suphan Buic organic company limited social enterprise. Community enterprise for the promotion of organic farmers. Thung Thong organic community enterprise and export organic rice. The government sector, private sector, financial sector and educational institutes cooperated to find development guidelines for shifting the supply chain to he a value chain. The result indicated that the upstream in 4 groups included the farmers who sold the production factors ; the, government sector, educational institutes, financial institutions and, inspection agencies. The midstream stakeholders included the personal rice mills and community rice mills. The downstream stakeholders included the consumers who were the direct purchasers, retailers, wholesalers, farmers who purchased the rice seed, exporters, and community markets. From an analysis of the supply chain of organic rice in Suphan Buri Province in terms of quantity, income, and value received by farmers, the value of the whole supply chain was THB 6,608,100 with the average

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output per person of 34.2 tons/Rai/year, average production cost of THB 26.94/kilogram, average selling price received by famers of THB 48.75-80/kilo, and average return received by farmers of THB 21.80-53/kilogram. From their results, it was suggested that the circular economy of organic rice in Suphan Buri Province should be studied.

**Keywords:** Supply chain, Organic rice, Stakeholder

## บทคัดย่อ

การวิจัย เรื่อง การศึกษาห่วงโซ่อุปทานข้าวอินทรีย์ในจังหวัดสุพรรณบุรี มีวัตถุประสงค์ เพื่อสำรวจข้อมูลผู้มีส่วนได้ส่วนเสียในห่วงโซ่อุปทานข้าวอินทรีย์ในจังหวัดสุพรรณบุรี ที่มีความเชื่อมโยงกัน ตั้งแต่ต้นน้ำ กลางน้ำ และปลายน้ำ และวิเคราะห์ห่วงโซ่อุปทานด้านปริมาณ รายได้/มูลค่าที่เกษตรกรได้รับในห่วงโซ่อุปทานข้าวอินทรีย์ในจังหวัดสุพรรณบุรี เป็นการวิจัยเชิงคุณภาพ ประชากร คือ บริษัท ออร์แกนิกสุพรรณบุรี (วิสาหกิจเพื่อสังคม) วิสาหกิจชุมชนกลุ่มส่งเสริมเกษตรกรอินทรีย์ วิสาหกิจชุมชน เกษตรอินทรีย์ทุ่งทองยั่งยืน และข้าวส่งออก-บ้านสวนข้าวขวัญนาข้าวอินทรีย์ วิธีการศึกษา คือ การประชุมกลุ่มย่อยแต่ละกลุ่ม และประชุมกลุ่มใหญ่ รวมภาครัฐ ร้านค้าปลีก ภาคเอกชน และสถาบันการศึกษา เพื่อหาแนวทางพัฒนาเพื่อยกระดับเป็นโซ่คุณค่า ผลการศึกษาพบว่า เกษตรกรต้นน้ำทั้ง 4 กลุ่ม ประกอบด้วย เกษตรกร ผู้ขายปัจจัยการผลิต ภาครัฐ สถาบันการศึกษา สถาบันการเงิน หน่วยงานตรวจรับรอง กลางน้ำ ได้แก่ โรงสีข้าวตนเองและโรงสีข้าวชุมชน ปลายน้ำ ได้แก่ ผู้บริโภคที่ซื้อข้าวอินทรีย์จากเกษตรกรโดยตรง ผู้แปรรูป ผู้ค้าปลีก ผู้ค้าส่ง เกษตรกรที่ซื้อพันธุ์ข้าวปลูก ผู้ส่งออก และตลาดชุมชน ผลการวิเคราะห์ห่วงโซ่อุปทานข้าวอินทรีย์ในจังหวัดสุพรรณบุรีด้านปริมาณ รายได้และมูลค่าที่เกษตรกรได้รับมีมูลค่ารวมทั้งห่วงโซ่ 6,608,100 บาท ผลผลิตรวมเฉลี่ยต่อราย 34.2 ตัน/ไร่/ปี ต้นทุนการผลิตเฉลี่ย 26.94 บาท/กิโลกรัม ราคาที่เกษตรกรผู้ปลูกขายได้เฉลี่ย 48.75-80 บาท/กิโลกรัม และผลตอบแทนที่เกษตรกรได้รับเฉลี่ย 21.80-53 บาท/กิโลกรัม ผลการวิจัยมีข้อเสนอแนะให้มีการศึกษาเศรษฐกิจหมุนเวียน (Circular Economy) ข้าวอินทรีย์ในจังหวัดสุพรรณบุรี

**คำสำคัญ:** ห่วงโซ่อุปทาน, ข้าวอินทรีย์, ผู้มีส่วนได้ส่วนเสีย

## Introduction

Rice farming is one of main careers of Thai farmers. Most of Thai farmers have focused on the production process to obtain the high production volume by relying on chemicals, e.g. chemical fertilizer, growth-control chemicals, and pesticide, which push the production cost higher. The organic rice production does not rely on any chemicals,

but use the natural materials, reduce the pesticide residue in the environment, and reduce the production cost. As a result, the farmers have gained more income because the price of organic rice is higher than the chemical rice. The Suphan Buri development plan, year 2017-2021, states its vision that "Suphan Buri would be a source of agricultural goods production, safe food, constructive

tourism, clean city, abundant nature, educational and sport center, and good quality of life” where rice would be a main economic plant generating income for the province. This study aimed at surveying the stakeholders in the supply chain of organic rice in Suphan Buri Province, which have been linked together from upstream, midstream, and downstream, including Suphan Buri organic company limited (social enterprise), community enterprise for the promotion of organic farmers, Thung Thong organic community enterprise, and exported organic rice-Baan Suan Kao Kwan Na organic rice, and at analyzing the supply chain in terms of quantity and income/value obtained by the farmers in the organic rice supply chain in Suphan Buri Province.

### **Objective of the study**

The objectives of the study include the following.

1. Studying the organic rice supply chain for the whole cycle from upstream, midstream to downstream.
2. Analyzing the supply chain in terms of quantity, income/value received by the farmers.

The research on the organic rice supply chain in Suphan Buri province was the study developed from the research in the first phase, which investigated the study of management accomplishment of the group of organic rice’s community enterprise to decrease the expenses of organic rice

productions in the U-Thong district, Suphan Buri province (Chuea-insoong *et al.*, 2019). In addition, studying the organic rice supply chain for the whole cycle from upstream, midstream to downstream needed the area based collaborative development from three organic rice community enterprises in Suphan Buri Province, which have received the PGS certification and another 1 export group. As Suphan Buri Province is one of provinces in the central region where growing the rice most (GAP: Good Agricultural Practices), this research would present the total value received by the organic rice farmers throughout the supply chain. As a result, all related government authorities, e.g. provincial agricultural office, provincial agricultural and cooperative office, land development station, land reform, irrigation, provincial energy, district agricultural cooperative, bank for agriculture and agricultural cooperatives, Thailand rice science institute, field crops research center, industrial promotion center-region 8, community pest management center, provincial offices for natural resources and environment, provincial public health, food institute, Suphan Buri Industry Council, provincial commerce, provincial industry, provincial community development, provincial chamber of commerce, convenience stores, and community enterprises who have processed the rice will be able to revise their policies, and encourage the rice farmers to do the organic rice farming to be consistent with the global circumstances regarding the

outbreak of COVID-19 and all related parties will be prepared for the organic agriculture.

The results of this study showed that there were 3 groups involving 31 organic rice

farmers in Suphan Buri covering 476 Rai, who were certified for PGS (Participatory Guarantee System), and another group has been certified by the international standard (Table 1).

**Table 1** Rice Organic Community Enterprise in Suphan Buri

No.	District	List of Community Enterprise	Guarantee
1	Muang	Suphan Buri Organic Company Limited (Social Enterprise) (9 persons)	PGS Suphan Buri
2	U Thong	Community Enterprise for the Promotion of Organic Farmers (12 persons)	PGS Kao Kwan
3	U Thong	Thung Thong Organic Community Enterprise (9 persons)	PGS Lemon Farm
4	Muang	Exported Organic Rice-Baan Suan Kao Kwan Na Organic Rice (1 person)	IFOAM, Bio Agricert, NOP, EU

**Source:** Research Team, September 2018

At present, Suphan Buri organic company limited (social enterprise) involves 9 organic rice farmers covering 133 Rai, who have passed the guarantee of PGS Suphan Buri. Each member owns the private market and grows different rice seeds, e.g. Kao GorKor 43, Kao Hom Nil, Kao Hom Kanya, Kao Tap Tim Chumpae, Kao Ton Mueang, Kao Niao Kiao Ngu, Riceberry, Kao Hom Mali, Kao Hom Mali Daeng 105, Kao Hom Suphan, Hom Pathum, Kao Kao Yao Chomnat, Kao Niao Dum, and Kao Niao Daeng. Most farmers sold their rice in pack, and some sold the parboiled rice.

Community enterprise for the promotion of organic farmers, Tambon Jedi, Amphoe U Thong, Suphan Buri had 12 members who have grown the dry-season rice for 2 periods/

year in the total areas of 131 Rai. The members produced Kao Kao Ta Khleub, Kao Hom Mali 105, Kao Hom Mali Daeng, Kao Hom Nil, Kao Hom Pathum, Kao Kum Ka Dum, Kao Mei Nong, and Gor Kor 43. Most members have grown rice for their household eating while some rice was sold in pack. The remaining rice was processed into the rice flour. This group was guaranteed by GPS Kao Kwan.

Thung Thong organic community enterprise at Amphoe U Thong, Suphan Buri involved 9 members who have grown the wet-season rice in the total of 172 Rai. They were guaranteed by the participatory PGS and Lemon Farm Organic PGS. They have grown Riceberry, Hom Mali Daeng, Gor Kor 43, Hom Nil, Hom Pathum, Pathumthani 1,

and Hom Thammasat, which were sold in wholesale (Bulb) to the major rice processors (Thai Xongdur Organic Food co.,Ltd.), and in retail (kilo/pack) through some retailers (Lemon Farm).

Exported organic rice had only one member who has grown the wet-season rice in the total 40 Rai. This group was guaranteed by the international standard. The rice grown included Gor Kor 43, Tap Tim Chum Pae, Hom Mali Nil, Hom Mali Daeng, Hom Pathum, and Riceberry. Riceberry and Tap Tim Chum Pae have been exported to Hong Kong via on-line traders.

## Literature Review and Research Background

The nature of supply chain is a group of organizations or persons, or a complicated network of organizations or business units connected with each other in respect of physical characteristics, information technology, and cash flow to use the goods and/or service from upstream to downstream (Lambert *et al.*, 1998 ; Felea *et al.*, 2013). These organization networks consist of manufacturers, distributors of raw materials, transportation service providers, wholesalers, retailers, consumers, and other middlemen. The organizations in the supply chain would work together to change raw materials into products to be delivered to the consumers. Supply chain covers many direct and indirect duties to serve the customers' demands, e.g. production, processing, operating, marketing, finance, service provided to consumers, as well as

focal firm and logistics service provider. Supply chain development is a linkage between organizations including raw material supplier, manufacturer, logistic service provider, customer, and warehouse as well as other activities in the supply chain system. These supporting and basic activities take effect to the economic, social and environmental sustainable development (Msimangira *et al.*, 2014). According to Sharma *et al.* (2013) who studied the management of rice supply chain in India with an objective of studying the development guideline of increasing the efficiency of rice supply chain in India. The results showed that: 1) cooperation for information shared between retailers and rice milling companies that led to an efficient response to the customers ; 2) management of inventories compiled by rice milling companies to save the size and quantity of inventories ; 3) supplies because the retailers had to predict the rice demand during the year in order to supply some paddy, control the growing process to obtain the rice quality as required ; and 4) logistic system-rice milling companies had to set up the rice centers to purchase a large amount of rice, and the rice center location also enabled the farmers to sell their paddy through middlemen as little as possible. There was also the goods distribution process to reach the retailers.

According to the study by Yaowasakunmat *et al.* (2019) on the promotion of supply chain management for organic jasmine rice among farmers in the

lower northeastern region in relation to economic and social circumstances, receipt of information, opinions, production condition, quality management, value-added, rice market, problems and obstacle among 250 organic Jasmine rice producers, the result indicates that, at the upstream level, the agricultural extension workers, technical officers, and farmers should be developed consistently so that they would have the information relating to the organic rice production. At the midstream, all related agencies, e.g. rice department, department of agriculture, ministry of commerce, ministry of industry, and local educational institutes should share their technologies or innovations appropriate for product harvest. For the processing to add the product value at the downstream, the agricultural extension workers should coordinate with all related agencies in the province to share their learning, and find out various distribution channels in the country or on abroad.

Meanwhile, Prasertwattanakul *et al.* (2016) conducted an analytical study on supply chain of Thai organic rice: case study of Baan Nong Waen community enterprise, Uthai Thani province with objectives of surveying the supply chain of a community enterprise to create the sustainability of product quality and to increase the output, of analyzing the business operation process, supply chain problems by focusing on the farmers and community enterprises by using Integrated Definition) Methods

(IDEF), and of suggesting the opportunities of improving the efficiency of supply chain for Thai organic rice. The results showed that the persons in such supply chain involved the farmers, community enterprises, community rice mills, community retailers, consumers, and Rice Department. The index comprised the quality of rice seed, growing technique (bioproduct, water management, and humidity measurement), yield record, and activity cost arousing the product increase. The community enterprises had to have teamwork, integrity, and participation, e.g. planning, storing, and transporting. It was suggested from the study that the community enterprises should improve their organic rice supply chain management in order to boost their local competitiveness, and prepare for foreign markets.

## Methodology

This study was the qualitative research conducted to answer each research objective as follows:

1. To answer research objective 1. the data of all persons related to the organic rice supply chain in Suphan Buri Province was surveyed by means of the focus group for those 4 groups of population, including Suphan Buri organic company Limited (Social Enterprise), community enterprise for the promotion of organic farmers, Thung Thong organic community enterprise, and exported organic rice Baan Suan Kao Kwan Na Organic Rice. The subjects of each group were selected by the purposive sampling, which included 9 members from Suphan Buri

organic company limited (social enterprise), 12 members from community enterprise for the promotion of organic farmers, 9 members from Thung Thong organic community Enterprise, and 1 member from Exported organic Rice-Baan Suan Kao Kwan Na Organic Rice (Table 1) in order to survey all stakeholders connected together from upstream, midstream and downstream.

2. To answer research objective 2 in order to analyze the quantitative data regarding revenues/value received by farmers by arranging the academic seminar. The subjects included the head and a member of Suphan Buri organic company limited (social enterprise) who have grown the organic rice, the head and a member of community enterprise for the promotion of organic farmers, the head and a member of Thung Thong organic community enterprise, and 1 member from exported organic Rice-Baan Suan Kao Kwan Na organic rice in the total of 7 persons. The second group of subjects involved the personnel in government agencies, private sector, financial institutions, educational institutes and other private agencies related to the organic rice supply chain, e.g. officers of Kao Kwan Foundation, Suphan Buri Provincial Agricultural Office, officials of the National Rice Science Institute, processing personnel of Suan Dusit University, provincial land development station, executives of lemon farm, officers of Sri Prachan Hospital, nutritionists of Chao Phraya Yommaraj

Hospital, executives of U-Thong Piyarat Hospital, Lan Pan Sook operator, executives of Xongdur Thai organic food Co., Ltd., members of Suphan Buri chamber of Commerce, sellers of Na Hia Chai Seeds, and Bank for Agriculture and Agricultural cooperatives in the total of 21 persons.

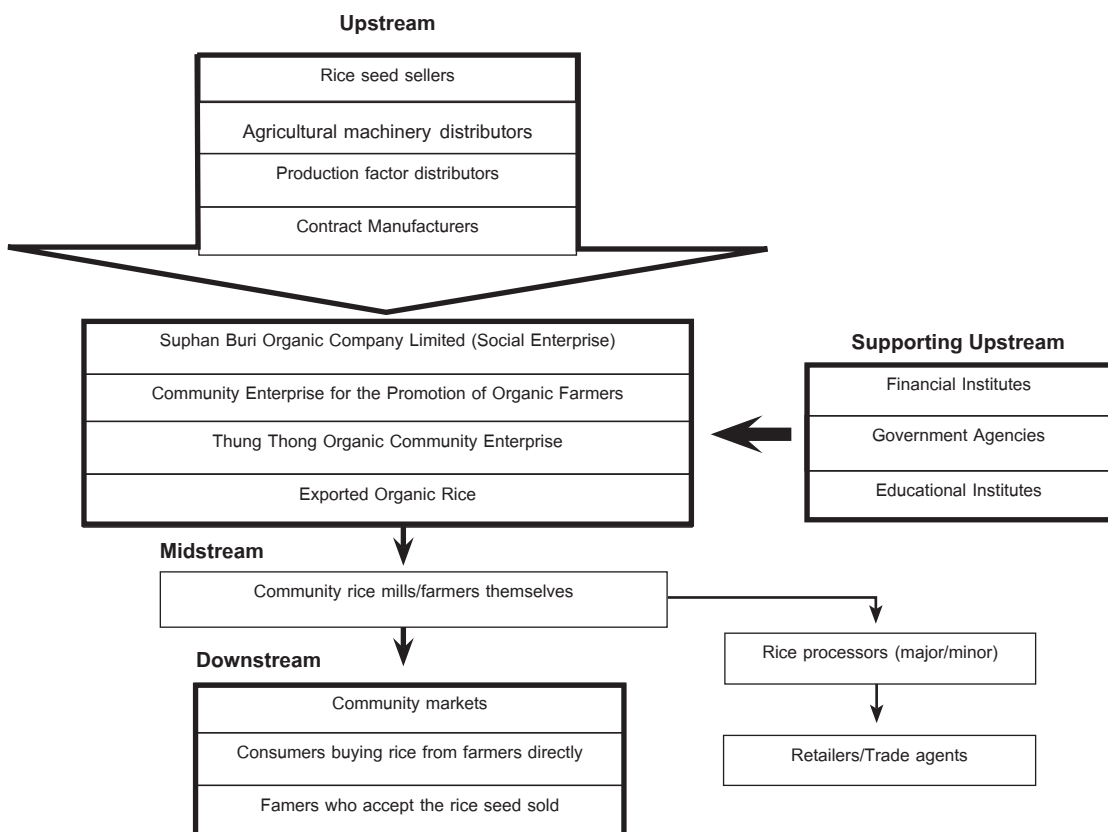
The mixed method was used in this research by compiling the information from interviewing 31 leaders and farmers in 4 agricultural groups. The data was collected from the private sector by interviewing the related government agencies, by the participatory observation, and academic seminar before analyzing the data with those technical officials, officials from both government and private sector in order to summarize the opinions and suggestions, and factors related to the organic rice supply chain in Suphan Buri Province.

## Analysis and Results

From the data survey on stakeholders in the organic rice supply chain in Suphan Buri Province, which involved Suphan Buri organic company limited (social enterprise), the promotion of organic farmers, Thung Thong organic community enterprise, and exported organic rice-Baan Suan Kao Kwan Na organic rice, which have been linked from upstream, midstream and downstream, it was found that the rice output was subject to the season. In general, the farmers who were the subjects in the supply chain were similar (separate growing, but joint selling), that is, they kept some rice for consumption while

some farmers sold their paddy (paddy seeds) to other farmers who were their customers inside and outside Suphan Buri psrovince. The stakeholders in the supply chain of organic rice in Suphan Buri province included Suphan Buri organic company limited (social enterprise), community enterprise for the promotion of organic farmers, Thung Thong organic community enterprise, and exported organic

rice, which have been linked together from upstream, midstream, and downstream. This supply chain was not complicated because there were not so many middlemen between producers and consumers. Mostly, rice was produced by the farmers, moved and milled to transform the rice. Next, rice (rice seed) might be sold to other farmers and regular customers.



**Figure 1** Overall supply chain of organic rice in Suphan Buri

## Upstream

The supply chain of all groups (Figure 1) involved: upstream included the rice seed

sellers (rice seed distributors), agricultural machinery distributors (distributors of pushcart, rice combine harvester, rice transplanter,



backhoe, and spare parts), distributors of production factors (entrepreneurs selling the organic fertilizer), contract manufacturers. The farmers who had no machinery usually hired some entrepreneurs to plough up and over, plough roughly, plough in regular furrows, and puddling that had some expenses/Rai, and financial institutions, e.g. Bank for Agriculture and Agricultural Cooperatives (BAAC) together with the village fund, and agricultural cooperative. The supporting agencies was the government sector comprising provincial agriculture, provincial agriculture and cooperatives, provincial land development station, provincial irrigation, provincial thailand rice science institute, provincial industry, provincial commerce, provincial community development, local educational institutes, provincial chamber of commerce, F.T.I. Provincial Chapter and financial institutions with duties of supporting, promoting, training, educating, giving budget, and financing.

### Midstream

Private/community rice mills-As the organic rice would not be milled together with GAP (Good Agricultural Practices), so the farmers used their private mills, and some farmers used the community rice mills nearby

to reduce the transportation cost. The minor rice processors were the small entrepreneurs who transformed some rice flour into Thai dessert and bakery. The major rice processors were the merchants who purchased a large amount of rice (bulb) for processing.

### Downstream

Traders, entrepreneurs registered as rice exporters to buyers on abroad in type of business-to-business, community markets, hospital green market, and other community markets, consumers who bought some rice from the farmers directly, e.g. elderly, health-focused consumers, families of patients, purchasers of rice seed, other farmers that wanted to grow some rice seed as the organic rice and to be guaranteed by the department of agriculture, who were the customers living and not living in Suphan Buri.

2. From an analysis of supply chain in respect with the quantity, income/value obtained by the farmers in the supply chain of organic rice in Suphan Buri (Table 2), the quantity of organic rice for rice strains of GorKor43, Riceberry and jasmine rice produced and launched to the market by these 4 groups were illustrated in Table 3

**Table 2** Quantity of organic rice in each strain launched to the market (ton)

Strain	Suphan Buri Organic Company Limited (Social Enterprise) (ton)	Community Enterprise for the Promotion of Organic Farmers (ton)	Thung Thong Organic Community Enterprise (ton)	Exported Organic Rice (kilogram)	Total (ton)
1. Rice berry	11.5	-	20.2	600	32.3
2. GorKor43	15.5	7	12.1	-	34.6
3. Jasmine rice	5.8	11	19	-	35.8

Supply chain of organic rice in Suphan Buri was linked in 3 parts: upstream, midstream, and downstream with the total value of supply chain of Baht 6,608,100. The output included 3 rice strains: Rice berry, GorKor43, and Jasmine rice (see Table 3).

Upstream stage-the goods value that were the upstream rice strains (rice) totaled Baht 66,500, comprising GorKor43 for 2 tons amounting to Baht 48,500, and Rice berry for 600 kilograms amounting to baht 18,000.

Midstream stage-The value of midstream goods that were the herbal parboiled rice and rice flour totaled Baht 958,000. If comparing the production cost from upstream to midstream, the production cost at midstream was higher than the upstream cost from only baht 66,500 to baht 958,000 or the

cost increased for Baht 891,500.

Downstream stage-The value of products processed from rice, which was the downstream goods, totaled baht 5,266,000. If comparing the rice processing cost from midstream to downstream, the production cost at downstream was much higher than the midstream cost from only baht 958,000 to baht 5,266,000 or the cost increased for baht 4,308,000.

After undertaking from upstream to downstream, the upstream value of rice products totaled baht 66,500, the midstream value was baht 958,000, and the downstream value was baht 5,266,000. The total value for the entire supply chain of organic rice was approximately baht 6,608,100.

**Table 3** Income/value obtained between the organic rice and GAP rice (September 2009)

	Suphan Buri Organic Company Limited (Social Enterprise)(baht)	Community Enterprise for the Promotion of Organic Farmers (baht)	Thung Thong Organic Community Enterprise (baht)	Exported Organic Rice (baht)	GAP Rice (baht)
1. Production cost/Rai	5,431*	4,712*	6,759*	11,940*	4,177**
2. Average cost (rice)/ 1 kilo	7.05	6.11	8.77	29.85	Paddy/1 Kilogram 7.90
3. Total cost of vacuum plastic bag,	14	14	14	14	-
4. Total cost (2) + (3)	21.05	20.11	22.77	43.85	-
5. Selling by famers/sell- ing price for retail stores	30/95	50/90	45/55	70/80	-
6. Returns obtained by the farmers from their private selling/retail stores (5)-(4)	8.95/73.95	29.89/69.89	22.23/32.23	26.15/36.15	-
7. Profit/Rai	6,265	20,932	15,561	10,461	2,933

\* output (rice) at 500-700 kilograms/Rai on average

\*\* Output (paddy) at 900 kilograms/Rai on average

\*\* excluding the cost of animal feed and energy

Table 3 from an analysis of profit/Rai, it was found that Suphan Buri organic company limited (social enterprise) was at baht 6,265, Thung Thong organic community enterprise was at baht 15,561, community enterprise for the promotion of organic farmers was at baht 20,932, exported rice was at baht 10,460, and GAP rice was at bhat 2,933. When comparing

the income and value obtained between the organic rice and GAP rice, it was found that the production cost/Rai of GAP rice was close to that of the community enterprise for the promotion of organic farmers. When the rice is packed, its price was higher than the GAP rice sold in the form of paddy to the rice mill (see Table 4).

**Table 4** Comparison of the production cost/Rai of the exported rice with GAP (unit: baht)

List of Cost	Expenses (baht/Rai) Exported Rice	Expenses (baht/Rai) GAP
1. Soil preparation (plough roughly, plough in regular furrows for the second time, furrowing)	600	450
2. Seed	350	450
3. Wage of sowing, transplanting	1,100	60
4. Wage of sowing the fertilizer	240	402
5. Fertilizer	-	515
6. Pesticide	200	180
7. Wage of grass cutting/collecting	1,500	120
8. Fuel	400	400
9. Rice harvesting-moving some rice to the rice storage/ rice mill	550	100
10. Administration cost after harvesting/storing in the warehouse (no barn)	-	500
11. Milling cost (community mill/private/cooperative)	800	-
12. Cost of drying	700	-
13. Tool repairs	375	-
14. Land rental	1,250	1,000
15. Rice farm tax per year (local maintenance tax)	500	-
16. Other expenses	3,375	-
<b>Total</b>	<b>11,940</b>	<b>4,177</b>

\*Average GAP output was 900 kilograms/Rai, and selling price was 7.9 Baht/kilogram

Source: Suphan Buri Farmers Council

Table 4 showed that the production cost/Rai of the exported rice was at baht 11,940, which was higher than Suphan Buri organic company limited (social enterprise, Thung Thong organic community enterprise, and community enterprise for the promotion of organic farmers caused by some expenses from the inspection, EU certification for organic agricultural standard, and standard of the

National Organic Program (NOP) from Organic Agriculture Certification Thailand (ACT) who will certify and issue the notifications in accordance with the International Federation of Organic Agriculture Movements (IFOAM), which could drive the product price higher because the export needs the international certification standard rather than PGS (see Table 1).

## Results

The organic rice supply chain in Suphan Buri Province was not complicated as there were no so many middlemen between producers and consumers. In general, the farmers produced the rice, and moved it for milling only. Apart from selling, the rice was sold by these farmers to other farmers and permanent customers. This result was consistent with the concept of Lambert *et al.* (1998) and Felea *et al.* (2013) that, for organizations making production by themselves, the supply chain would be short. The downstream stakeholders involved the consumers who bought the product from the farmers directly, retailers, wholesalers, famers who bought the paddy seeds for growing, exporters, and community markets. The midstream stakeholders involved the rice processors, farmers' rice mills, and community rice mills. The upstream stakeholders involved the farmers, sellers of production factors, government sector, educational institutes, financial institutions, and certification agencies. This result was consistent with the research conducted by Msimangira *et al.* (2014) and Yaowasakunmat *et al.* (2019) that the supply chain links the stakeholders from upstream, midstream, and downstream, and between organizations. It was the sustainable economic, social and environmental development by growing some rice for household consumption, and selling some paddy seeds to other customers inside and outside Suphan Buri Province. The first group of farmers

upgraded their supply chain by streaming their rice with some herbs or the second group of farmers processed some rice to be the organic rice powder and sold it through the middle businessmen. This result was consistent with the research conducted by Prasertwattanakul *et al.* (2016) that the supply chain of community enterprises could build the sustainability in respect with product quality and output increase.

## Conclusion and Recommendation

From the academic seminar forum where the participants shared their opinions, there were the problems and hindrance that although the GAP rice farmers have received the high returns, the GAP farmers had no motivation to change their growing method because the production process was quite complicated and they had to manage their cost to fit their existing financial condition (debt). The changing process to obtain the standard certificate might last 12 months, so the farmers obtained little output and income while they had to use certain organic production factors such as fertilizer, pesticide, soil nutrients. Meanwhile, the chemical farmers were unable to access to the correct information about organic agriculture. When they faced any problems and were unable to solve them ; they felt tired and returned to use the chemicals again as they felt that the chemical farming was convenient and saved time. These are the details that the government sector should conduct the psychological study. Table 3 illustrates that the organic farmers

received the slight sharing from returns, and they were disadvantaged by the midstream and downstream entrepreneurs. Although the formation as the community enterprise would make the farmers have more roles, negotiation power, and profit sharing while the exporters/retailers had the fair trade by allowing the farmers to fix the rice price, the farmers had to be responsible for the packaging process and transport cost. Although the farmers set the rice price quite high, they still earned the little income. Thus, some farmer groups decided to find out the markets by themselves so that they would not be under certain business conditions and limitations. In addition, the farmers continued bearing the highest risk, that is, when their product cost was high, they did not want to have any loss (debt) frequently. The farmers also had other risks of production from the global warming condition, water and air condition, natural disaster that had to be supported by technologies. These farmers had no power in price negotiations while the output might be excessive or oversupply or the consumers' demand was limited because the high selling price could not persuade the consumers who cared for health and environment to consume this organic rice at all time.

Problem-solving guideline and strategy. As the organic rice supply chain in Suphan Buri Province dealt with many stakeholders from upstream, midstream, and downstream ; therefore, only relying on the retail and wholesale entrepreneurs cannot help

the farmers survive. To distribute the interest from producers to consumers, the farmers must add more value to their organic rice by applying the innovation rather than distributing the product in forms of paddy or rice. When there are a lot of producers, the buyers will have more negotiation power. Therefore, the farmers must transform their product to have more value and such transformation can be done by the community enterprise (Figure 2). The government sector must support the farmers by creating a business model to strengthen the old-generation farmers via young smart farmer or start up program. The social enterprise may be formed, that is, the provincial agriculture office must build the new-generation leaders of agriculture communities who have abilities to think like the entrepreneurs, to carry out the marketing activities, cost accounting, and risk management holistically, not only growing the rice. These leaders must communicate with the consumers directly. Meanwhile, the government authorities, private sector, educational institutes, etc. should jointly arouse public awareness so that the general people realize the importance of consuming the certified organic rice in order to change the public behavior. The financial institutions should offer loans with low interest rates about 4-7% per year for PGS farmers.

From Figure 2 regarding upgrading the supply chain of organic rice in Suphan Buri, the farmers will be able to notice their opportunities, and choose to undertake

based on their community potential for their best interest. From the harvest process, some rice straw may be made to be the fertilizer or briquette fuel. After milling some paddy to be the brown rice, it may be made to be the pre-cooked rice porridge for patients, elderly, children, and healthcare people, or organic rice porridge for patients in state-owned hospitals and private hospitals while the community rice mills will be the distribution center. Some husk and rice bran after milling may be used as the biomass fuel and to pave the farm ground, to be the fertilizer and ingredients of animal feed, which may be kept for consumption in household or they may be made to be the wine vinegar. For the head rice, broken rice, grist, and rice germ, they may be made to be some snack, rice pellet, extracts for drug, and supplements. The farmers may form a group to carry out the eco-tourism linking upstream, midstream, and downstream together, which will be delivered to the consumers through the story creation, from farm to table activities, production of food containers from rice straw. These stories may be communicated to the consumers via applications

linked to the mobile and website.

Therefore, the processing of organic rice is an innovation possibly made by local communities to generate more income and to shift their quality of life, and this will be a sustainable development. Meanwhile, the operations among the government and private sectors should be integrated. Certain main agencies, including provincial community development and Pracharat Rak Samakkee (social enterprise) Co., Ltd. to set up the food safety project by the civil state mechanism so that the output will be linked to 5 Ror., that is, delivery the vegetables and organic rice to community hospitals in 2 districts, lunch for community schools in 1 district, but the hotels, restaurants and factories are on the process of coordination.

It is suggested for further study that: 1) a study on the cost reduction for circulation economy of organic rice in Suphan Buri should be conducted ; 2) a study on indicators should be conducted in order to analyze both financial and non-financial performance of supply chain to obtain various and balanced viewpoints ; and 3) a study on the organic rice supply chain in other areas should be conducted and compared.

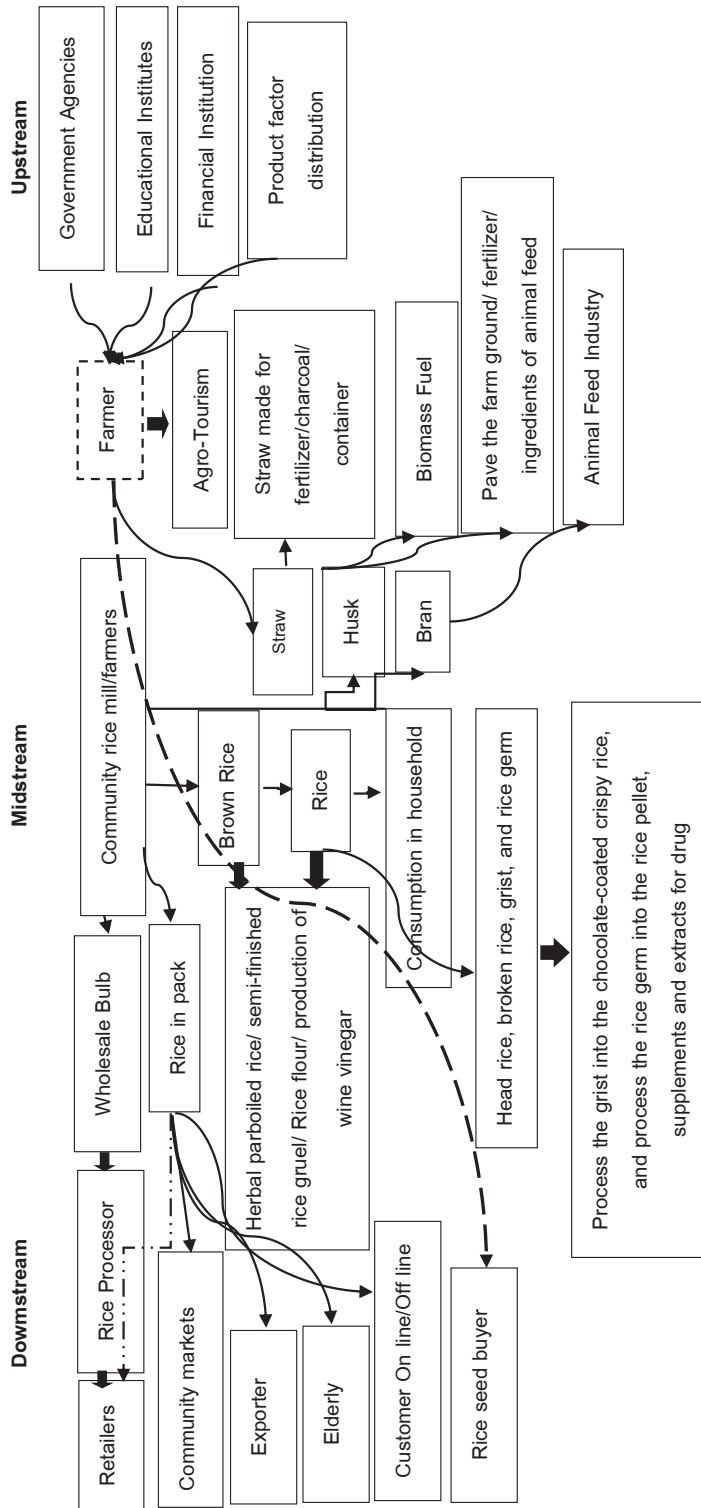


Figure 2 Creation of added value for organic rice in Suphan Buri



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