The role of farmer organizations and networks in the rice supply chain in Thailand

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Abstract

Purpose – The purpose of this paper is to examine the development of rice supply chain in the context of the role of rice farmer organizations and cooperative networks in Thailand.

Design/methodology/approach – Primary data were solicited from the cooperatives and members of cooperatives for this study through questionnaire administration. The questionnaire containing a five-point Likert scale was posed to respondents to ascertain their problems before and after joining the network (for cooperative) and after joining the cooperative (for members). This study employed the independent two-sample student t-test (two-tailed) to test for significant difference in the means of scores regarding the problems of cooperatives before and after the cooperative network, and also to test for significant difference in the means of scores of the problems of members of the cooperatives before and after joining the cooperative.

Findings – The study revealed that key production and marketing problems such as increased transaction costs and market uncertainties confronting the cooperative organizations have been diminished as a result of the networks. Key problems of the members of the cooperatives such as exploitation and opportunistic behavior of traders to whom they sell their products have been reduced as a result of joining the cooperatives.

Research limitations/implications – This paper is not without caveat. The governance structures in relation to leadership, financial arrangements and bargaining power balance have not been analyzed in this study and these are avenues for further research.

Originality/value – To the best of the authors’ knowledge, this study is the first that examined the combined roles of farmer organizations and cooperative networks in developing the rice supply chain in Thailand.

Keywords Marketing, Thailand, Partnerships, Cooperatives, Rice supply chains

1. Introduction

In recent years, food supply chains have become more coordinated and competitive amidst trade liberalization and globalization, and businesses have to face the challenges associated with these developments (Kuwornu, Kuiper and Pennings, 2004; Kuwornu et al., 2005; Kuwornu, Kuiper, and Pennings, 2009; Timsina et al., 2014; Yan et al., 2015).

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Trade liberalization has provided opportunity for the smallholder producer to supply product to international markets. The decreased trade barrier due to liberalization provides the flexibility for the farmer to select buyers of produce and suppliers of inputs. However, smallholder farmers are facing challenges regarding low price of produce and unfair competition from imported substitute products. The high transaction cost, poor access to the information, and other agency problems and coordination costs are also key challenges being faced by the smallholders in the food marketing channels (Kuwornu et al., 2005; Kuwornu, Kuiper and Pennings, 2009; Kuwornu, Opoku, Kwadzo and Mensah-Bonsu, 2009).

In the midst of these challenges, how can farmers participate well in the market so as to enable them benefit from their production activities? The collective marketing through cooperatives seems to be the answer for poor rural producers in this regard. Bienabe and Sautier (2005) reported that farmers’ participation in producer organizations is a way to minimize the market access problem for these farmers. In group marketing through producer organizations, farmers can benefit from transaction costs reduction, increased bargaining power, higher prices, better access to financial resources, capacity building and learning by sharing information (Poole and Donovan, 2014; Promme et al., 2017). Cooperatives are type of producer organizations that are “autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs as well as aspirations through a jointly-owned and democratically-controlled enterprise” (International Cooperative Alliance, 2016). Cooperatives are common in agriculture, finance, health care, marketing, insurance and credit in developed, emerging and developing economies. The estimated number of members in cooperatives worldwide is more than 1bn (Food and Agriculture Organization of the United Nations, 2012).

Cooperatives are one of the key market actors, especially in food supply chains in which they demonstrate good marketing arrangements and skills for improving products and supporting agents in the supply chain. The linkages between cooperative and the private sector operators such as traders, wholesales and middlemen are very important for farmers’ access to the market (Kumar and Kushwaha, 2015). Cooperatives facilitate the production of agricultural commodities through mutual help and interdependences, and are therefore the source of growth for farm operations in both the developed and the developing world (Schöll et al., 2016; Altman, 2015; Barham and Chitemi, 2009; Mazzarol et al., 2013; International Cooperative Alliance, 2016). In developed countries, business linkage among cooperatives is strong and very successful due to a robust coordination and systematic management. However, in developing countries, there exist weak linkages among cooperatives due to a lack of robust management, lack of government support and many uncertain factors. Collective action by members within cooperatives and cooperative network can improve marketing performance and lead to sustainable development (Barham and Chitemi, 2009; Oerlemans and Assouline, 2004).

In Thailand, there are a total of 11,447,405 cooperative members in 8,263 cooperatives comprising 4,480 agricultural cooperatives and 3,783 nonagricultural cooperatives in December 2016 (Cooperative Promotion Department, 2016). The coordination among cooperatives in Thailand relies mostly on financial linkage. The network management among cooperatives varies due to different policies. The business linkages among them are not strong and not continuous (permanent), even policy support from the government tries to strengthen these networks among them. In the past, feedback from downstream cooperatives, which bought products from upstream agricultural cooperatives, was not positive. A lack of management and non-cooperative planning and lack of marketing and distribution are the problems in producer and customer cooperative partnership (Cooperative Promotion Department, 2014). Indeed, many cooperatives are failing in their cooperative business linkages because of high transaction cost, poor management practices
and low margins. Therefore, most cooperatives focus on their main market channels and are not willing to engage in vertical coordination with other cooperatives.

In 2011, the Government of Thailand launched the rice subsidy scheme to guarantee farmers a fixed price, which is higher than the market rate. The cooperatives that did not join the government scheme faced challenges in convincing the farmers to sell through the cooperative as the members of the cooperatives who wanted higher price sold their rice to government-selected rice mills. As a result, these cooperatives were confronted with low levels of stocked rice which affected their rice marketing business and ability to expand. Furthermore, these cooperatives are confronted with agency and network problems relating to transaction costs, moral hazard and adverse selection problems, market uncertainties as well as coordination costs.

The objectives of the study were twofold: first, the study assessed the extent to which problems confronting cooperatives before joining the network have been minimized compared with when they have not joined the network. Second, the study assessed the extent to which problems confronting the individual members within the cooperatives have been reduced compared with when these farmers operated individually. More specifically, this study examined the case for a two-stage cooperative network comprising an upstream cooperative (producer) and a downstream cooperative (buyer), and a three-stage cooperative network comprising an upstream cooperative (producer), an intermediary cooperative (buyer) and a downstream cooperative (buyer)[1].

2. Theoretical framework
Vertical coordination in food supply chains is critical to the success, proper functioning and sustainability of these supply chains (e.g. Boehlje et al., 1999; Wolf et al., 2001; Kuiper et al., 2003; Kuiper and Meulenberg, 2004). The actors in a vertically coordinated supply chains have roles to play to ensure the realizations of the benefits of such networks and/or partnerships. Although this study is based on the organizational framework of cooperatives, it is in general partially rooted in the agency theory and transaction cost frameworks (Cook and Barry, 2004; Williamson, 1975, 1985, 2004). The key tenet of the agency theory is that principal–agent relationships should reflect efficient information and risk sharing, incentive alignment and the contract as the unit of analysis (Cook and Barry, 2004; Kuwornu, 2006)[2]. Most often, the partnerships exist but do not function properly for the realization of the objectives of the networks due to agency problems such as moral hazard, adverse selection and risks resulting from information asymmetry among the members of the partnership. These problems lead to high transaction costs, high coordination and information search costs and marketing costs and uncertainties. For this reasons, this study is also partially rooted in the transaction cost theory in the sense that some dimensions of transaction costs (i.e. uncertainty of transaction and opportunistic behavior of actors) are evident in the relationship among farmers and cooperatives, and among cooperatives in the network[3]. The uncertainty of transaction and opportunistic behavior of actors are worsened when farmers operate (i.e. produce, process and sell) as individuals, since these farmers possess low or no bargaining power and lack the necessary information regarding developments in the market, especially in emerging economies. In this respect, farmers are exploited by marketing firms such by middlemen, wholesalers, processors, exporters and retailers (Kuwornu, Kuiper and Pennings, 2004; Kuwornu, Kuiper, Pennings and Meulenberg, 2004). Numerous studies have revealed that cooperative organization and networks yield enormous benefits to farmers and cooperatives (e.g. Vasa et al., 2014; Sahawatcharin et al., 2013; Altman, 2015; Mazzarol et al., 2013; Hannan, 2015; Schöll et al., 2016). In this regard, this study assessed the role of cooperatives and networks for the reduction of challenges regarding the rice production, input procurement, logistics, information sharing and marketing in Thailand.
3. Methodology
3.1 Study area
In this study, the criterion for the selection of the study area was based on the type of network. There are two types of the partnerships. The first is a two-stage network which is a food supply chain between an agriculture cooperative, a rice producer (upstream), and another agriculture cooperative, a rice buyer (downstream). The downstream cooperative sells rice to its members. The second partnership is a three-stage network which is a linkage among rice producer cooperative (upstream), intermediary cooperative (buyer) and downstream cooperative (buyer). The partnerships among these cooperatives were active and existed for more than three years at the time of data collection in 2014 (Figure 1).

Two-stage cooperative network. The two-stage cooperative network comprises an upstream cooperative and a downstream cooperative.

The upstream cooperative, Kasetwisai Agricultural Cooperative (KAC), is located in Roiet Province in the northeast of Thailand, and the most famous rice production area is known as “Thungkula.” Thungkula is the special area consisting of five provinces. The variety of rice (jasmine rice), which is produced in this area, has its own identity, special aroma and very soft in texture. KAC is selected to be the head of rice cluster network in a government project, which is a combination of five main rice producer cooperatives to produce one brand of rice “Thungkula farm.” KAC is a large cooperative, which has long business experience and many marketing channels including supermarket and consumer cooperative shops and often sells its products at specially organized market events. The activities performed by this cooperative include input procurement, product collection, processing, seed production, rice marketing, credit business and gas sales. In 2011, this cooperative had 8,183 members and the value of sales by the cooperative was $4,094,804.37 (Kasetwisai Agricultural Cooperative, 2011).

The downstream cooperative, Meuang Suratthani Agricultural Cooperative (MAC), is located in Suratthani Province in the southern region of Thailand, and is a buyer of the rice from KAC for the past 15 years. It had a membership of 1,143 as of 2013. The activities of this cooperative include input procurement, buying and selling of rice, and credit business. In 2013, the value of rice sales by the cooperative was $569,528.17 (Meuang Suratthani Agricultural Cooperative, 2013). MAC sells the rice to its members and individual consumers.

The network between KAC and MAC was formed in 2001 when KAC encountered the problem of oversupply of rice. KAC’s manager had a long-standing personal relationship with the manager of MAC at the time and this facilitated the establishment of this network.

Figure 2 shows the product flow from KAC (upstream cooperative) to MAC (downstream cooperative). After buying the rice from members, KAC processes some of the rice and packs in its brand bags for sale to traders and supermarkets. In addition, KAC sells some of the rice packaged in MAC’s brand bags to MAC. It is interesting to note that the MAC brand bags are produced by MAC. The rice is distributed to the southern region of Thailand by Agricultural Cooperative’s truck, which has its own gas station. When the truck arrives at Suratthani Province, all rice bags are kept at the storage in MAC’s warehouse. MAC sells the product to individual customer and cooperative members at cooperative shop and also distributes to its members at their locations (members’ group offices). The rice is sold to members in the brand name of the cooperative to promote members’ loyalty to the cooperative. Furthermore, the management team of MAC plans visits to member groups and sells the rice at the group meetings. The rice is sold on credit to members and they have to make payment in the next group meeting.

Moreover, MAC tries to educate its members to know where the rice is produced and the advantages of buying the rice from cooperative. In 2012, KAC and MAC were selected to be cooperative distribution channels as part of the government project on “cooperative
distribution center,” for which these cooperatives distribute not only rice but also oil, sugar and fruits (Cooperative Promotion Department, 2012).

Three-stage cooperative network. The three-stage cooperative network comprises an upstream cooperative, an intermediary cooperative and a downstream cooperative.

The upstream cooperative, Nonsung Agricultural Cooperative (NAO), is located in Nakhonratchasima Province in the northeastern region of Thailand. The government agencies try to promote jasmine rice production in Thungsomrit within the Nakhonratchasima Province and Buriram Province. The activities performed by the cooperative include input procurement, credit business, rice collecting, processing, rice marketing and gas sales.
The cooperative had a membership of 5,622 and the value of sales was $1,014,865.24 in 2014 (Nonsung Agricultural Cooperative, 2014). NAC is a medium-sized cooperative. Before the cooperative network, it has limited market channel and used to sell its product only in Nakhonratchasima and nearby provinces.

The intermediary, Nayong Agricultural Cooperative (NYAC), is located in Trang Province in the southern region of Thailand. This cooperative buys rice from NAC and sells to its members and the downstream cooperative, Yantakhaoo Agricultural Cooperative (YAC), which is located in the same province. The activities of NYAC include input procurement, credit business, rice marketing and gas sales. In 2014, the cooperative had a membership of 2,675 and the rice sales value amounted to $241,995.82 (Nayong Agricultural Cooperative, 2014).

The downstream, YAC, is a large cooperative with a variety of businesses including sales of different brands of rice, owned convenient store and gas sales. In 2014, the number of members was 4,766 (Yantakhaoo Agricultural Cooperative, 2014).

Figure 3 shows that before the network, NAC (upstream cooperative) buys the rice from its members and individual producers in the northeast region and processes the rice and then sells to local traders. Thus, before the network, NAC had limited market channel because it was a small cooperative and not well known as much as other cooperatives in Nakhonratchasima Province. After the partnership among cooperatives was created, NYAC (intermediary cooperative) had relatively larger volume orders from other cooperatives in the southern region. NYAC sells the rice to its members, individual customers as well as to other cooperatives. It is important to note that some members of NYAC have their own shop through which they sell the rice to individual consumers in the village. In addition, YAC

**Figure 2.** Two-stage cooperative network and product flow

**Figure 3.** Three-stage cooperative network and product flow
(downstream cooperative) sells many rice brands to its members and individual customers. Similarly, some members of YAC established their own shop through which they sell the rice to individual consumers in the village.

### 3.2 Sampling and data collection

Primary data were solicited from the cooperatives and members of cooperatives for this study. The data were obtained through questionnaire administration. The questionnaire that contained a five-point Likert scale was posed to respondents to ascertain their problems before and after joining the network (for cooperative) and after joining the cooperative (for members). Two types of questionnaires were used to collect the data for the study.

The first questionnaire was used to interview key persons who were in charge of marketing business for each cooperative such as cooperative managers, cooperative committees and marketing staffs. A total of 25 key persons were interviewed at the cooperative level. Ten key persons in the upstream and downstream cooperatives were interviewed for the two-stage network, whereas 15 key persons from the upstream, intermediary and downstream cooperatives were interviewed for the three-stage network. The cooperatives personnel were interviewed on the linkages among the cooperatives and the challenges they faced before and after joining the network.

The second questionnaire was used to interview the members of the cooperatives. The members who sell rice to the upstream cooperative were interviewed as the upstream cooperative members and the members who buy rice from the downstream and intermediary cooperatives were interviewed as the downstream and intermediary cooperative members. A total of 293 cooperative members were interviewed: 121 for the two-stage network and 172 for the three-stage cooperative network. These members were interviewed on their opinion about cooperative business, cooperative linkage and the benefit they gain from the cooperative.

### 3.3 Data analysis

The student t-test is one of the statistical methods for testing the difference in the means of two samples. The student t-test is suitable for larger samples ($N \geq 30$), where equal variance (homogenous population) and normal $t$ distribution are assured (Sokal and Rohlf, 1987). However, there are no objections to using the $t$-test for a small size as small as two (De Winter, 2013). Therefore, the $t$-test is appropriate for our analysis at the cooperative level (with relatively smaller sample sizes) and at the member level (with relatively larger sample sizes).

In this regard, this study employed the independent two-sample student $t$-test (two-tailed) to test for significant difference in the means of scores regarding the problems of cooperatives before and after the cooperative network, and also to test for significant difference in the means of scores of the problems of the members of the cooperatives before and after joining the cooperative.

Cooperative organizations and networks yield enormous benefits to both farmers and cooperatives (e.g. Vasa et al., 2014; Altman, 2015; Hannan, 2015; Schöll et al., 2016). Based on this premise, we postulate the following hypotheses.

The hypotheses for the cooperative level and the member level are specified as:

- $H1$. The problems confronting cooperatives have been minimized compared with when they have not joined the network.
- $H1_o$. The problems of the cooperative remain the same after they have joined the network.
- $H1_a$. The problems of the cooperative are minimized after they have joined the network.

- $H2$. The problems confronting the individual members within the cooperatives have been minimized compared with when these individual farmers operated on their own.
H2a. The problems of the cooperative member remain the same after they have joined the cooperative.

H2a. The problems of the cooperative member are minimized after they have joined the cooperative.

4. Results

4.1 Cooperative level results: two-stage network

Trading problems of middlemen reduced. The marketing business problems of the upstream and downstream cooperatives were reduced as a result of the cooperative network. The upstream cooperative’s problems including delayed payment ($p < 0.1$), lack of bargaining power ($p < 0.1$), risk from market uncertainty ($p < 0.05$) and the problem of low product selling price ($p < 0.1$) were reduced significantly due to the network (Table I). Before the network, there was high competition in the rice market as the rice product of the upstream cooperative has to compete with other private brands. However, after the network, the competition for rice marketing diminished ($p < 0.1$). The downstream cooperative’s problems including lack of bargaining power ($p < 0.01$), risk from market uncertainty ($p < 0.05$), obscure trading conditions ($p < 0.05$), insincerity ($p < 0.01$), dependence on trader ($p < 0.01$), untimely delivery ($p < 0.01$), unstable product quality ($p < 0.01$) and cheating from middlemen ($p < 0.05$) were reduced significantly due to the network. The previous middlemen that the cooperatives were trading with exhibited opportunistic behavior in their relationships. This means that due to the cooperative network both cooperatives were more satisfied in their business relationship than without the network (Table I).

<table>
<thead>
<tr>
<th>Cooperative problems</th>
<th>Upstream cooperative</th>
<th>Downstream cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t$-statistic</td>
<td>SE</td>
</tr>
<tr>
<td>Delayed payment from previous buyers</td>
<td>2.138</td>
<td>0.374</td>
</tr>
<tr>
<td>Lack of market information</td>
<td>2.138</td>
<td>0.374</td>
</tr>
<tr>
<td>Lack of bargaining power</td>
<td>2.449</td>
<td>0.245</td>
</tr>
<tr>
<td>High sale competition</td>
<td>2.449</td>
<td>0.245</td>
</tr>
<tr>
<td>High market uncertainty risk</td>
<td>4.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Uncertainty to buy large amounts of products from members</td>
<td>2.449</td>
<td>0.245</td>
</tr>
<tr>
<td>Cost of market information</td>
<td>2.449</td>
<td>0.245</td>
</tr>
<tr>
<td>Low price</td>
<td>-2.138</td>
<td>0.374</td>
</tr>
<tr>
<td>Products do not meet members’ demand</td>
<td>9.000</td>
<td>0.200</td>
</tr>
<tr>
<td>No product differentiation from those of other stores</td>
<td>6.532</td>
<td>0.245</td>
</tr>
<tr>
<td>No product variety</td>
<td>6.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Product waste/loss</td>
<td>3.162</td>
<td>0.316</td>
</tr>
<tr>
<td>Communication cost</td>
<td>6.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Low quality/quality not stable</td>
<td>9.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Obscure trading condition</td>
<td>3.500</td>
<td>0.400</td>
</tr>
<tr>
<td>Insincerity</td>
<td>6.532</td>
<td>0.245</td>
</tr>
<tr>
<td>Dependence on trader</td>
<td>6.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Untimely delivery of product</td>
<td>6.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Cheating from middlemen</td>
<td>4.000</td>
<td>0.200</td>
</tr>
<tr>
<td>Member’s products feature does not comply with cooperative’s demand</td>
<td>2.236</td>
<td>0.447</td>
</tr>
<tr>
<td>Faithfulness of cooperative members</td>
<td>6.532</td>
<td>0.245</td>
</tr>
<tr>
<td>Members do not buy product at cooperative shop</td>
<td>6.532</td>
<td>0.245</td>
</tr>
<tr>
<td>Members do not repay their loans</td>
<td>6.532</td>
<td>0.245</td>
</tr>
</tbody>
</table>

Notes: *, **, *** Significant at the 1, 5 and 10 percent, respectively
Table II shows the comparative costs and benefits of the upstream cooperative’s sale of rice to traders and the downstream cooperative. The upstream cooperative sells the rice at relatively cheaper price to the downstream cooperative (29 THB/kg) than to the trader (30 THB/kg) price. Interestingly, the downstream cooperative pays labor costs of 0.07 THB/kg for delivery (i.e. off-loading costs from the truck at the destination of the product). The upstream cooperative does not have to pay for this cost. Indeed, there is cost sharing in the supply chain of rice among the cooperatives. Thus, while transportation costs of the rice from the upstream cooperative to the downstream cooperative (1.20 THB/kg) are borne by the upstream cooperative, the downstream cooperative bears the costs of off-loading from the truck. This is to facilitate the development of the downstream cooperative and the entire supply chain. On average, the transportation cost for delivering rice to the downstream cooperative (1.20 THB/kg) is higher than to the traders (0.50–1.50 THB/kg) due to the relatively longer distance from the upstream cooperative to the downstream cooperative. Usually, the traders who buy the rice from the upstream cooperative which is located in the northeastern region of Thailand operate their businesses in the same region, whereas the downstream cooperative is located in the southern region of Thailand. Also, the number of days of delayed payment to the upstream cooperative by the traders is longer (i.e. 45–60 days) than by the downstream cooperatives (i.e. 30 days). Furthermore, the traders sometimes fail to make payments to the upstream cooperative.

Table III shows the comparative costs and benefits of downstream cooperative’s purchases of rice from traders and the upstream cooperative. The costs of the downstream cooperative’s purchases of rice from traders entail market information search cost (2 THB/kg), and the transportation costs from business location of the trader to the location of the downstream cooperative (0.5 THB/kg). Thus, while the upstream cooperative bears the costs of delivery to the downstream cooperative, the traders from whom the downstream cooperative buys the rice do not bear the cost of delivery. Moreover, the upstream cooperative gives 30 days credit to the downstream cooperative whereas the traders do not.

Market access and marketing business improved. As a result of the network, market access and general marketing business improved significantly between the upstream and downstream cooperatives.

| Table II. Costs and benefits of upstream cooperative’s sale of rice to traders and the downstream cooperative |
| Selling rice to traders | Milled rice price: 30 THB/kg |
| Logistic/Transportation cost: 0.50–1.50 THB/kg |
| Packaging cost: 7.50 THB/5 kg bag |
| Labor cost: 0.07 THB/kg |
| Benefits |
| Selling rice to traders |
| Number of days of delayed payment: 45–60 days |

| Table III. Costs and benefits of downstream cooperative’s purchases of rice from traders and the upstream cooperative |
| Buying rice from traders | Market information searching: 2 THB/kg |
| Logistic/Transportation cost: 0.5 THB/kg |
| Labor cost: 0.07 THB/kg |
| Benefits |
| Buying rice from traders |
| Pay cash (no credit) |

| Selling rice to the downstream cooperative |
| Milled rice price: 29 THB/kg |
| Logistic/Transportation cost: 1.20 THB/kg |
| Packaging cost: 7.50 THB/5 kg bag |
| Downstream cooperative pay |
| Benefits |
| Selling rice to the downstream cooperative |
| Number of days of delayed payment: 30 days |

| Buying rice from the upstream cooperative |
| No cost |
| No cost (upstream cooperative responsible) |
| Labor cost: 0.07 THB/kg |
| Benefits |
| Buying rice from the upstream cooperative |
| Credit 30 days |
downstream cooperatives. The cooperatives were able to share market information \((p < 0.1\) and \(p < 0.01\) for the upstream and downstream cooperatives, respectively), and this decreased cost of market information search in the upstream cooperative was significant \((p < 0.1)\). Information regarding the type of the product and quality of products was easily accessible between the cooperatives due to the network \((p < 0.1)\). Furthermore, upstream cooperative’s uncertainty to purchase large amounts of produce from members was minimized significantly \((p < 0.01)\) as there was ready market for the produce, i.e., downstream cooperative (Table I).

Figure 4 shows the sales volume of milled rice (in tons) of the upstream cooperative before the network (i.e. 2007–2010) and after the network (i.e. 2011–2016). In general, the sales volume increased after the institution of the network. Furthermore, Figure 5 shows that the marketing channels of the upstream cooperative increased after the network (i.e. department stores, exporters, domestic traders, downstream cooperative and other cooperatives) than before the network (i.e. domestic traders). As a consequence, the upstream cooperative was able to purchase large volumes of produce from members for sale to the various channels after the institute of the network.

![Figure 4](image1.png)

**Figure 4.** The sales volume of milled rice (in tons) of the upstream cooperative in the two-stage network, before the network (2007–2010) and after the network (2011–2016)

![Figure 5](image2.png)

**Figure 5.** The sales volume of milled rice of the upstream cooperative in the two-stage network across the various marketing channels, before the network (2007–2010) and after the network (2011–2016)
inclusion of the network (Figure 6). Also, the number of member farmers who sold rice to the upstream cooperative increased after the network (Figure 7).

**Better service to member.** Before the network, MAC (downstream cooperative) could not sell rice to the members as much as it wanted because the rice it bought from trader was not of good quality. In fact, quality was not stable and sometimes the jasmine rice was mixed with other varieties of rice, making customers to have negative perception on the product. Therefore, it was difficult to persuade members to buy the product from the cooperative store. However, after partnership with Kasetwisai Agriculture Cooperative (upstream cooperative), the product quality improved ($p < 0.01$). Thus, good-quality rice is now being delivered by the upstream cooperative to the downstream cooperative. The product is now 100 percent jasmine rice. Indeed, the downstream cooperative revealed that rice from the upstream cooperative is easy to sell to members because it is of good quality. The results also revealed that communication cost ($p < 0.01$) and product wastes ($p < 0.05$) of the downstream cooperative reduced significantly. The rice from the upstream cooperative has now been differentiated from other rice brands ($p < 0.01$) and has more varieties ($p < 0.01$) which create consumer choice thereby leading to higher levels of sales (Table I).

**Figure 6.**
The volume of purchases of paddy rice (in tons) from farmers by the upstream cooperative in the two-stage network, before the network (2007–2010) and after the network (2011–2016).

**Figure 7.**
The number of member farmers who sold rice to the upstream cooperative in the two-stage network, before the network (2007–2010) and after the network (2011–2016).
Figure 8 shows that the sales value (in THB) of milled rice of the downstream cooperative increased after network (2011–2016) than before the network (2007–2010). The sales value increased because the downstream cooperative bought relatively better quality and large volumes of rice from the upstream cooperative (after the network) than before the network[5]. The customers who bought rice from the downstream cooperative were the cooperative members, and these members increased after the cooperative network (Figure 9). Figure 10 shows that the average market price of the milled rice was unstable and mostly lower than downstream cooperative’s price. Nevertheless, the customers prefer to buy the rice from the downstream cooperative due to its perceived relatively higher quality compared to the rice sold by the traders.

*Improve collective action among members and cooperative.* The results in Table I also revealed that the network significantly improved members’ participation ($p < 0.01$) and faithfulness in the downstream cooperative ($p < 0.01$). Furthermore, the delayed payment by members for rice purchased from the cooperative was reduced after the network ($p < 0.01$) and loan repayment by members to the cooperative was minimized in which the loan repayment was facilitated by the network ($p < 0.01$). In addition, the downstream cooperative’s problem of low price of the rice diminished by offering better quality rice to members ($p < 0.05$)[6]. As a result of the network, the downstream cooperative members were more willing to support the cooperative activities because the cooperative sells...
products purchased from another cooperative. Moreover, the downstream cooperative delivers rice to their members in village during group meetings, thereby reducing members’ transportation costs and increasing sales by the cooperative. This direct marketing also pertains in other countries such as Japan. The “Sanchoku and Teikei system” in Japan is an alternative marketing system, which was developed parallel to the main market. In this system, Japan Agricultural Cooperatives are linked with customer cooperatives to link farmers to customers in the communities. This partnership among customers and producers led to the sustainable development and promotion of local food in Japan (JCCU, 2012; Prayukvong, 2005).

4.2 Cooperative level results: three-stage network
Marketing problems. The problem of high market uncertainty was prevalent among all the cooperatives in the three-stage network before the partnership. However, after the partnership, the high market uncertainty was significantly reduced ($p < 0.01$, $p < 0.01$ and $p < 0.05$ for the upstream, intermediary and downstream cooperatives, respectively). When three cooperatives started operating as a network, the upstream cooperative had more channels to sell its products, while buyer cooperatives reduced uncertainty of product quality and supply by traders (Table IV).

The problem regarding limited market access diminished mostly with regard to the upstream cooperative ($p < 0.01$). Consequently, the upstream cooperative’s dependence on traders was also significantly decreased ($p < 0.05$). Furthermore, problems relating to the upstream cooperative’s low bargaining power ($p < 0.1$), delayed payment by trader to upstream cooperative ($p < 0.01$), cheating from traders ($p < 0.05$) and upstream cooperative’s high market access cost ($p < 0.05$) were significantly lessened. Consequently, the upstream cooperative’s ability to buy large amounts of rice for sale to the intermediary cooperative and local traders improved significantly ($p < 0.05$). Moreover, the lack of bargaining power on the part of the intermediary cooperative reduced significantly due to the network ($p < 0.01$). Hence, intermediary cooperative’s procurement and high dependence on traders were significantly reduced ($p < 0.01$). Furthermore, the intermediary’s problems including insincerity on the part of traders ($p < 0.01$), obscure trading conditions ($p < 0.01$), unstable product quality ($p < 0.05$), untimely delivery of rice from traders ($p < 0.01$) and high packaging cost ($p < 0.1$) were significantly reduced (Table IV).

In general, the value of rice sales (in THB) by the upstream cooperative shows a positive linear trend after the network as compared to the sales before the network (Figure 11).

![Figure 10. Average milled rice market price and downstream cooperative price in the two-stage network, before the network (2007–2010) and after the network (2011–2016)](image)
The sudden surge in sales value in 2009 is attributed to increased demand for paddy rice by the traders. Thus, in 2009 (i.e. before the network), the upstream cooperative sold only paddy rice in large volumes to traders yielding high sales value.

Similarly, the sales value of rice (in THB) by the intermediate cooperative shows a positive linear trend after the network as compared to the sales value before the network (Figure 12). The number of members who bought rice from the intermediate cooperative was higher after the network than before the network (Figure 13). Similarly, the number of members who bought rice from the downstream cooperative shows a positive linear trend after the network (Figure 14)[7].
Market information problems. The results showed that the lack of market information from the perception of the intermediary cooperative diminished after joining the network ($p < 0.01$). Consequently, the cost of market information search was significantly decreased ($p < 0.05$). Thus, before the network, the intermediary cooperative had to search for information on products that could be sold. After the network, this information became readily available through the upstream and downstream cooperatives. The information sharing and feedback from the intermediary cooperative helped the upstream cooperative to improve its product quality to meet the market demand ($p < 0.01$). This information sharing also helped the upstream cooperative to provide better service to its members that improved their production techniques, leading to better quality product than before the network ($p < 0.05$) (Table IV).

Better cooperative management in product processing, transportation cost and stock management. The sharing of information among the producer (upstream cooperative) and

---

**Figure 11.** The sales value of paddy and milled rice (in THB) of the upstream cooperative in the three-stage network, before the network (2008–2010) and after the network (2012–2016)

**Figure 12.** The sales value of milled rice (in THB) of the intermediate cooperative in the three-stage network, before the network (2007–2010) and after the network (2012–2016)
buyer (intermediary and downstream cooperative) enabled all partners to better manage their stocks and this minimized their expenditures for product storage ($p < 0.05$ and $p < 0.05$ for the upstream and downstream cooperatives, respectively). The upstream cooperative could better manage rice procurement from members and rice processing following specified order based on available information and continue to share information with intermediary and downstream cooperatives. The coordination among the cooperatives helped intermediary and downstream cooperatives share cost of ordering the product and the transportation cost. This system reduced the transportation cost of the intermediary ($p < 0.05$) and product waste ($p < 0.1$) (Table VIII).

For brevity, the benefits and costs illustrations presented under the two-stage cooperative network are also evident under the three-stage cooperative network.

**Members’ demand.** The results revealed that from the perceptive of the intermediary cooperative, the upstream cooperative offered better quality and differentiated rice product than other brands in the market, and offered more varieties of rice for sale that were consistent with consumers’ demands after the network ($p < 0.01$ and $p < 0.05$, respectively).

---

**Figure 13.**
The number of the cooperative members who bought rice from the intermediate cooperative in the three-stage network, before the network (2007–2010) and after the network (2011–2016)

**Figure 14.**
The number of the cooperative members who bought rice from the downstream cooperative in the three-stage network, after the network (2011–2016)

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Role of farmer organizations and networks
4.3 Member level results: two-stage network

Socio-economic characteristics of the members of the cooperatives in the two-stage network. A total of 121 cooperative members were interviewed in the two-stage network: 61 members in the upstream cooperative and 60 members in the downstream cooperative. About 34 percent of the respondents from the upstream cooperative were in age range of 56–65 years followed by 46–55 years (29.5 percent), and 21.3, 13.1 and 1.6 percent were in the range of 36–45, 66–75 and more than 75 years, respectively. There was no respondent in age range of 25–35 years. For the respondents from the downstream cooperative, 41.7 percent of the members were in age range of 46–55 years, and 20.0, 16.7, 13.3, 5.0 and 3.3 percent were in the range of 56–65, 36–45, 66–75, 25–35 and more than 75 years, respectively.

The majority of the members of the upstream cooperative (62.3 percent) had primary school education followed by secondary school education (34.4 percent), and bachelor degree (3.3 percent). Similarly, for the downstream cooperative, 51.7 percent had primary school education followed by secondary school education (25.0 percent), and bachelor degree (23.3 percent).

Problems of members. The members in the upstream cooperative were rice producers, whereas members in the downstream cooperative were mainly general traders and also had rubber, palm oil and coconut plantations.

Improved production, better market information access and marketing. Before being cooperative members, the farmers had no information about the type and quality of product demands of the market. In general, the traders exhibited opportunistic behavior in their trade relationships with the farmers in terms of grading, weighting and quality checking processes. Although there was a rice subsidy scheme being implemented by the government to guarantee the price, the traders claimed that farmers’ rice did not meet the standard requirements. Therefore, the farmers were facing a considerable level of uncertainty in the market.

After becoming cooperative members, the downstream cooperative members had better access to market information regarding the type ($p < 0.01$) and quality of product ($p < 0.01$). Furthermore, the members in the upstream cooperative had greater understanding of the quality of the rice demanded by the market ($p < 0.05$). Moreover, the members of both the upstream and downstream networks had access to better quality inputs from cooperative shops ($p < 0.01$). The cooperatives organized platforms to gather members’ need and prepared necessary production inputs based on members’ demand such as fertilizer, pesticide and packaging ($p < 0.05$ and $p < 0.01$ for the upstream and downstream cooperatives, respectively) (Table V).

Both the upstream and downstream cooperatives provided extension services to its members. This practice helped members to improve their production and postharvest processes to lower labor cost ($p < 0.05$ and $p < 0.01$ for the upstream and downstream cooperatives, respectively), production and management cost, improve product quality ($p < 0.01$ and $p < 0.05$ for the upstream and downstream cooperatives, respectively) and better quality control ($p < 0.05$ and $p < 0.01$ for the upstream and downstream cooperatives, respectively). Moreover, the members’ problem of calculating the production cost reduced significantly ($p < 0.01$ and $p < 0.01$ for the upstream and downstream cooperative, respectively) (Table V). The upstream cooperative members’ problem of low price ($p < 0.05$), cheating from middlemen ($p < 0.01$) and very high grading standard ($p < 0.01$) decreased after they joined cooperative. Members in the downstream cooperative had better access to the rice product
and decreased logistic cost ($p < 0.05$), and avoided cheating from middlemen ($p < 0.01$). Furthermore, the member farmers produced high-quality standard rice due to production and postharvest extension services provided by cooperatives ($p < 0.01$ and $p < 0.01$ for the upstream and downstream cooperative, respectively) (Table V).

Before joining cooperatives, these individual farmers were facing various problems in their production, marketing and financing. They were cheated by the local traders in terms of price, grading and high uncertainty in purchasing the product, thereby limiting the capacity of the farmers to expand production. Indeed, the farmers' marketing problems were decreased when they became cooperative members. This result is somewhat consistent with Chipeta (2006), who also mentioned that cooperatives can act as intermediaries in marketing channels and provide agricultural advisory services to farmers to increase their incomes through better prices for their products. In addition, the member farmers can increase their bargaining power in the market (Bienabe and Sautier, 2005; Rondot and Collion, 2001; Tita et al., 2011).

**Decreased financial cost.** Before being cooperative members, the farmers had to borrow money from traders to purchase production input. After the harvesting period, the members had to sell their products to these traders who lend them the money. In the process, the farmers had to reimburse the trader and the remaining amount paid to them. This limits the farmers' choice of market for their products. After joining the cooperative, the members of the upstream cooperative had the ability to borrow money for their production at relatively lower interest rate from the cooperative ($p < 0.05$). These member farmers received the full revenue from sales of the rice and later paid back any credit owed to the cooperative (Table V).

The actual market data revealed that the upstream cooperative members benefit from annual patronage dividends of 7.34 percent of the sales volume, and stock dividend of 5–6 percent (depending on the cooperative profit) when they sell to the upstream cooperative. These benefits are lost when members sell to traders (Table VI). Similarly, the downstream cooperative members benefit from annual patronage dividends of 1 percent of the purchase volume, and stock dividend of 5–6 percent (depending on the cooperative profit) when they buy from the downstream cooperative. These benefits are lost when members buy from traders. Furthermore, the members of the downstream cooperative have a credit period of 30 days when they buy from the downstream cooperative (Table VII).

<table>
<thead>
<tr>
<th>Member problems</th>
<th>Upstream cooperative</th>
<th>Downstream cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t$-statistic</td>
<td>SE</td>
</tr>
<tr>
<td>Loan interest rate from trader</td>
<td>$-2.099$</td>
<td>0.187</td>
</tr>
<tr>
<td>Low quality of products</td>
<td>$-9.673$</td>
<td>0.232</td>
</tr>
<tr>
<td>Crop production cost</td>
<td>$-4.839$</td>
<td>0.159</td>
</tr>
<tr>
<td>Production cost calculation</td>
<td>$-7.577$</td>
<td>0.212</td>
</tr>
<tr>
<td>Unawareness of product quality demand by the market</td>
<td>$-2.094$</td>
<td>0.141</td>
</tr>
<tr>
<td>Unawareness of product type demand by the market</td>
<td>$-5.080$</td>
<td>0.154</td>
</tr>
<tr>
<td>Low-quality production inputs in market</td>
<td>$-4.684$</td>
<td>0.171</td>
</tr>
<tr>
<td>Labor cost in production and postharvest cost</td>
<td>$-0.077$</td>
<td>0.150</td>
</tr>
<tr>
<td>Packaging cost</td>
<td>$-0.023$</td>
<td>0.087</td>
</tr>
<tr>
<td>Quality control/management cost</td>
<td>$-0.023$</td>
<td>0.087</td>
</tr>
<tr>
<td>Market access cost</td>
<td>$-3.212$</td>
<td>0.189</td>
</tr>
<tr>
<td>Logistic cost</td>
<td>$-2.534$</td>
<td>0.220</td>
</tr>
<tr>
<td>Cheating from middlemen</td>
<td>$-6.155$</td>
<td>0.234</td>
</tr>
</tbody>
</table>

**Notes:** $^{*, **, ***}$Significant at the 1, 5 and 10 percent, respectively

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Table V. Results of the member problems of the two-stage network involving one upstream and one downstream cooperative.
4.4 Member level results: three-stage network

Socio-economic characteristics of the members of the cooperatives in the three-stage network. A total of 172 cooperative members were interviewed in the three-stage network: 55 members in the upstream cooperative, 62 members in the intermediary cooperative and 55 members in the downstream cooperative. About 44 percent of the respondents from the upstream cooperative members were in age range of 46–55 years, and 29.1, 14.5, 10.9 and 1.8 percent were in the range of 56–65, 36–45, 66–75 and 25–35 years, respectively. For the respondents from the intermediary cooperative, 37.1 percent of the members were in age range of 46–55 years, and 25.8, 24.2, 11.3 and 1.6 percent were in the range of 36–45, 56–65, 25–35 and 66–75 years, respectively. In the downstream cooperative, 36.4 percent of the members were in age range of 36–45 years, and 23.6, 20.0, 12.7 and 7.3 percent were in the range of 56–65, 46–55, 25–35 and 66–75 years, respectively.

The majority of the members of the upstream cooperative (83.6 percent) had primary school education followed by secondary school education (12.7 percent), whereas 3.6 percent had no education. For the intermediate cooperative, 54.8 percent of the members had primary school education followed by secondary school education (25.8 percent), bachelor degree (14.5 percent) and no education (4.8 percent). For the downstream cooperative, 47.3 percent of the members had primary school education followed by bachelor degree (36.4 percent) and secondary school education (16.4 percent).

Problems of members. The members’ problems decreased in the three-stage network are presented in Table VIII.

In the three-stage network, members’ problems in the upstream, intermediary and downstream cooperatives mostly were minimized: market information cost (\( p < 0.05, p < 0.01 \) and \( p < 0.05 \) for the upstream, intermediary and downstream cooperatives, respectively), the members’ problem of calculating production cost (\( p < 0.05, p < 0.01 \) and \( p < 0.05 \) for the upstream, intermediary and downstream cooperatives, respectively), the awareness of the market demand regarding product type (\( p < 0.01, p < 0.01 \) and \( p < 0.1 \) for the upstream, intermediary and downstream cooperatives, respectively), and product quality (\( p < 0.01, p < 0.01 \) and \( p < 0.05 \) for the upstream, intermediary and downstream cooperatives, respectively).

The cooperatives’ extension services and quality input service helped its members improve their products quality (\( p < 0.01, p < 0.01 \) and \( p < 0.05 \) for the upstream, intermediary and downstream cooperatives, respectively) and reduced the overall crop production cost.

Table VI.
Comparative benefits gained by the upstream cooperative members for selling rice to traders and the upstream cooperative

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Selling rice to traders</th>
<th>Selling rice to the upstream cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>Patronage dividends (7.34% of volume sold)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stock dividend (5–6%, depending on cooperative profit)</td>
</tr>
</tbody>
</table>

Table VII.
Comparative benefits gained by the downstream cooperative members for purchasing rice from traders and the downstream cooperative

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Buying rice from traders</th>
<th>Buying rice from the downstream cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>Patronage dividends (1% of volume purchased)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stock dividend (5–6%, depending on cooperative profit)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit payment (30 days)</td>
</tr>
</tbody>
</table>
($p < 0.05, p < 0.01$ and $p < 0.1$ for the upstream, intermediary and downstream cooperatives, respectively), and access better inputs ($p < 0.01$, $p < 0.01$ and $p < 0.05$ for the upstream, intermediary and downstream cooperatives, respectively). The quality control problems in the downstream cooperative decreased after the network ($p < 0.05$).

The three cooperatives also provided loans at relatively low interest rates to their respective members ($p < 0.01$, $p < 0.01$ and $p < 0.1$ for the upstream, intermediary and downstream cooperatives, respectively). The labor costs of the members of the intermediary cooperative were significantly decreased ($p < 0.1$).

In terms of marketing, market access costs of the members of the three cooperatives were minimized ($p < 0.01$, $p < 0.01$ and $p < 0.1$ for the upstream, intermediary and downstream cooperatives, respectively)[8]. For the upstream cooperative, the problems regarding high grade demand of the product ($p < 0.01$) and high-quality requirements from traders were minimized after the network ($p < 0.01$). Moreover, after the network, the problems of members in the intermediary and downstream cooperatives regarding cheating from traders, market uncertainty and high logistic/transportation costs were significantly minimized ($p < 0.05$, $p < 0.05$ and $p < 0.01$ for the intermediary cooperative, and $p < 0.01$, $p < 0.05$ and $p < 0.05$ for the downstream cooperative, respectively).

For brevity, but without the loss of generalizations for the conclusions, as in the two-stage cooperative network, the members of the cooperatives in the three-stage cooperative network also receive annual patronage dividends and stock dividends as well as credit payment facilities, even though the percentages of these dividends are slightly different.
5. Discussion and conclusions

The problem minimizing the ability of the two- and three-stage networks at both the cooperative level and the member level was compared. At the cooperative level, both the two- and three-stage networks performed creditably well in reducing problems that existed before the network, although the types and number of problems minimized were different depending on the role and behavior of actors in the network. At the member level, the results revealed that more marketing problems of the members in the two-stage network were reduced than in the three-stage network. In the three-stage network, the problems regarding opportunistic behavior on the part of the middlemen, market uncertainty and logistic cost, high labor cost, production and postharvest, quality control and management costs were not reduced for the upstream cooperative. For the intermediary cooperative, only quality control and management cost of members were minimized after joining the cooperative, whereas for the downstream cooperative, members were still facing high labor costs of production and postharvest management.

The problems of the upstream cooperatives in trading with the traders still persist because the purchasing volumes from the downstream cooperative are less compared to the total rice volume produced in the upstream cooperative. The main marketing channel of rice for the upstream cooperatives is private traders and this is still a major challenge.

The partnerships among cooperatives in the rice supply chains in the two-stage and three-stage networks reduced production and marketing problems at the cooperative level and at the member level. The results of the study revealed that all actors in the two-stage and three-stage networks can decrease the market uncertainty of their products. This result is consistent with previous studies that the cooperative network enables information sharing regarding the demands of the market, internal collective action by the members of the cooperative, and ensuring trust and transparency, thereby reducing market uncertainties for actors in food supply chains (Lee, 2002; ICA, 2016; Stringfellow et al., 1997; Vasa et al., 2014). This is also consistent with previous research that revealed that the motivations for farmers to join cooperative in Thailand are derived from financial (e.g. dividends and increased incomes) and non-financial benefits including trainings and meeting platforms (Sahawatcharin et al., 2013). Cooperatives should use the core competencies which form cooperative principles and cooperative ideology to create the core value of cooperatives network and use robust strategy to ensure economic sustainability of the cooperatives (Altman, 2015; Mazzarol et al., 2013). The mutual help among cooperatives, participation of members and the high trust of members to the cooperative are the core value of cooperative network (Hannan, 2015). This is revealed by the results of the present study in which the faithfulness of the members of the cooperatives, information sharing among cooperatives and members and active participation by members resulted in the minimization of some key problems of the cooperatives and members in the rice supply chain. The results in this study also corroborate previous studies that participation of all stakeholders' in a supply chain and group marketing can increase members income and create more shared understanding, shared objective and trust among the stakeholders, leading to fair-trade partnership (Tallontire, 2000; Schöll et al., 2016).

Vertical coordination and information sharing in the cooperative network creates the opportunities for the small-scale producer cooperative to sell their products extensively, while the small buyer cooperative can decrease their transportation and inventory costs. The information sharing in the supply chain partnership creates more value to enable the actors to respond to customers' needs (Handayati et al., 2015). However, we are careful to generalize these results to other markets because of certain distinct characteristics of those markets. Food markets may share some similar characteristics but not all markets are totally the same because of the differences in the bargaining power of actors, market risk, coordination costs, competition and characteristics of the products in these markets (Kuwornu, Kuiper and
Pennings, 2004; Kuwornu et al., 2005; Kuwornu, 2006; Kuwornu and Saqib, 2017). Therefore, we may be overgeneralizing if we extend the results to other markets around the world.

To strengthen the cooperative network, all cooperatives actors (i.e. cooperative organization and members) in the network should be more engaged in the information sharing to increase sales and profitability for all actors. The limitations of each cooperative should be properly analyzed to design mutual strategy for the growth of the businesses. The public awareness creation by educating members and communities to clearly understand cooperative principle and cooperative network activities will be a step in the right direction to minimize the likelihood of cooperative network discontinuation. The government agencies and other service providers should provide policy advocacy support and organize the platforms for cooperatives to create more cooperative network and also establish stronger alliance between cooperative network and other market actors to facilitate the development of businesses in the rice supply chain for the sustained growth of the economy.

This paper makes some theoretical contributions to the existing literature on industrial organizations. The operation of the cooperatives and the networks (agency relationships) among the cooperatives played significant roles in facilitating information sharing among the rice producers and the cooperatives, as well as among the cooperatives. This reduced a number of challenges in the rice supply chain including market uncertainties regarding the price of the product and the type of rice preferred by the market, logistic costs, transaction costs and overall marketing costs for both farmers and the cooperatives. Furthermore, the cooperatives and the partnerships among the cooperatives resulted in improved and differentiated rice products for the market, thereby increasing the values and enhancing the overall performance of the supply chain.

The key challenge of the system is that the cooperatives appear to benefit more than the member farmers in the sense that not all benefits accruing from the activities of the network are given to these farmers.

This paper is not without caveat. The governance structures in relation to leadership, financial arrangements and bargaining power balance have not been analyzed in this study and these are avenues for further research. Also, in as much as the results provide some information on the perceived and actual costs and benefits of the networks and farmer organizations, detailed benefit – cost analysis is beyond the scope of this paper. This is another great opportunity for future research.

Notes

1. The two-stage cooperative and three-stage cooperative networks analyzed in this study are specific organizational designs in the rice sector in Thailand.

2. In this study, there are agency relationships (i.e. in the form of relationships among farmers and their respective cooperatives, and relationships among cooperatives in the networks) but without contractual agreements. Thus, the key ideas of agency relationships regarding efficient information and risk sharing as well as incentive alignment are the characteristics of cooperatives and cooperative networks.

3. The asset specificity and frequency of transaction dimensions of the transaction cost theory are beyond the scope of this study.

4. The only exceptions were the volume of rice purchases from the members for the years 2012–2014 due to the Thailand’s rice subsidy scheme in 2011–2014 which offered higher prices to producers than the market price. Therefore, the producers preferred to sell their products to the rice millers under the government subsidy scheme. Nevertheless, there were increases in the volume of rice purchases by the upstream cooperatives in 2015 and 2016 when the government’s subsidy program ended.

5. Before the network, the downstream cooperative bought relatively lower quality rice from the downstream cooperative for sale.
6. The study examined several other variables in the cooperative network, but for brevity and without loss of generality for the conclusions, the results of only the significant variables are presented in Table I. The same applies to the presentation of the results at the cooperative member level. The complete set of results is available from the authors upon request.

7. The downstream cooperative could not provide the data for the number of its members who bought rice from the cooperative before the network.

8. Previously when these farmers operated individually, traders demand money from the farmers as a condition for selling their products to them (i.e. the traders).

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