

Economic and Marketing Capability Improvement for Small Scale Aquaculture Farmers through Community Organizations

Kulapa Kuldilok^{1,*}, Ruangrai Tokrisna¹ and Kulapa Boonchowong²,

ABSTRACT

The majority of aquaculture practices in Thailand are small scale, composed of individual farms and, therefore, the development of aquaculture needs to be managed by community organizations to increase the power of negotiation with middlemen. There are various community organizations: non-juristic organizations, juristic organizations and cooperatives. The purposes of this study include the following: 1) the study of cost-return, and, 2) SWOT analysis to improve community organisation. Data were collected from in-depth interviews of 30 group members, 10 community leaders and local government officers in each organization. The research methods employed were cost-return analysis and SWOT analysis. The net profit of members in community organizations is a factor indicating the capacity of the aquaculture organization. The net profit organisations are from Pan, Pak Phanang, Tatong, Chachoengsao, Tasoong and Chanthaburi while the others (Nakhon Nayok and Samroi-yot-Pranburi) were non-profit organisations. SWOT shows that internal factors including leaders and members, production and marketing development and funding were the most significant in driving the success of the community groups. External factors including government support, disease risk reduction and water problem reduction support the capacity of the community organization. Recommendations for community organization development include: 1) members' collaboration, 2) skills of leaders, 3) convenient offices serving the members, and, 4) Full supply chain services to members.

Keywords: Aquaculture, Thailand, Community organization

INTRODUCTION

The main problems of small scale aquaculture in Thailand are that individuals lack negotiation power in setting prices (Tokrisna *et al.*, 2013). Not only small aquaculturists are inefficient in production, but also they normally do not have marketing skills. The way to improve the situation is to develop their ability to work as a commodity organization since it can enhance their power to negotiate with suppliers to get lower input prices, to learn about efficient aquaculture production, to

collect aqua products in large amounts to transfer them to consumers at higher prices, and to process aqua products to increase value (Tokrisna *et al.*, 2016). Nowadays, there are many types of community organizations, such as network groups that are non-juristic organizations and groups that are registered as juristic organizations and cooperatives. Although many community organizations are successful (Laknapichonchat *et al.*, 2008), it has been found that others still face several obstacles, such as with the relationships between members and leaders and profit-focused principles (Ajjimangkul

¹ Agricultural and Resource Economics, Faculty of Economics, Kasetsart University, 50 Ngamwongwan Rd. Ladyao, Chatuchak, Bangkok 10900, Thailand.

² Department of Fisheries, Kaset klang Chatuchak Bangkok 10900, Thailand

* Corresponding author, e-mail address: kulapa.s.k@gmail.com

Received 11 September 2017 / Accepted 16 January 2018

et al., 2008). This research aims to study the capacity of small scale aquaculturists to identify the factors that lead to success and to determine the ways to manage organizations or groups to enhance aquaculture development in Thailand.

MATERIALS AND METHODS

Data collection

Questionnaire design

The questionnaire lists focus on the costs and returns of aquaculture. Researchers conducted in-depth interviews with members, leaders and other local government staffs in each community organization for SWOT analysis (Porter, 1985 and

Houben *et al.*,1999).

Community organisation selection

Selected community organizations (Figure 1) included the Chachoengsao Province Sea Bass Aquaculture Network Groups as a non-juristic organization, the Tambon Tasoong Aquaculture Group, which is registered as a juristic organization, two tilapia aquaculture cooperatives including Pan Fisheries Cooperative, Ltd., and the Nakhon Nayok Aquaculture and Processors Cooperative, Ltd., and shrimp aquaculture cooperatives in four watersheds: Samroi-yot-Pranburi, Tatong, Pak Phanang, and Chanthaburi.

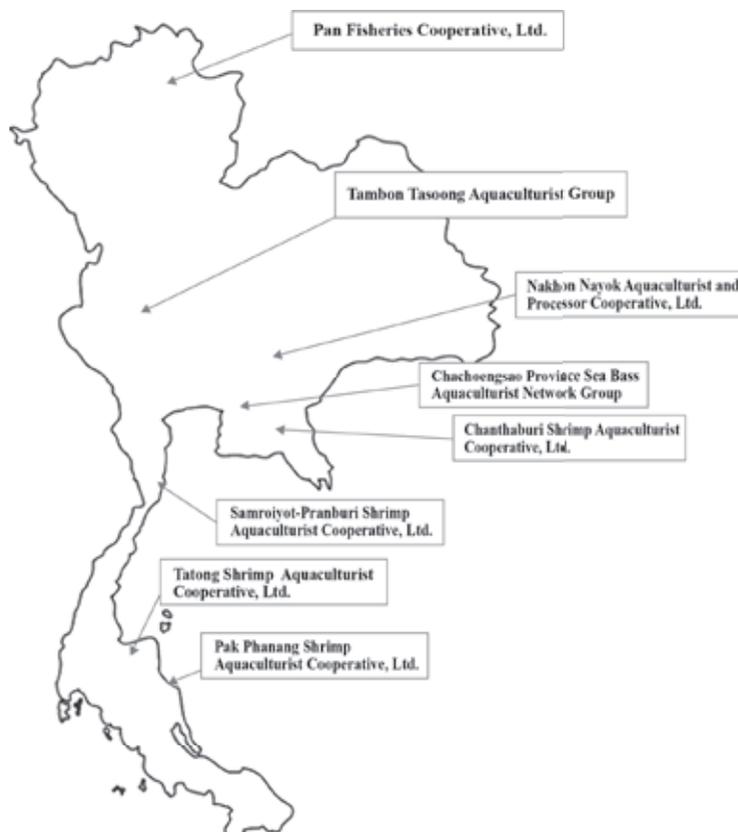


Figure 1. Location of the eight organizations. Source, map outline: World Atlas, 2017

Surveys

Surveys were conducted three times, which included, 1) a pre-survey to collect background information about location, organization, socio economic information and aquaculture organization forms (October-November 2014) and to interview key informants in local areas such as the officers of sub-district administrative organizations, aquaculture leaders, and local government staffs to analyse opportunities and threats; 2) 30 questionnaires for each organization (December 2014- February 2015) to collect the opinions of members, leaders, and local government staffs in each organization about the participation and expectations of the leaders, the capacity of the organization, the aquaculture methods to analyse strengths, weaknesses, opportunities and threats, and the costs and returns of aquaculture business; and, 3) Interviews at group meetings with the leaders, members, and government officers to analyze strengths and weaknesses (June-July 2015).

Data analysis

All data used descriptive methods for analysis. Data from the first survey were used to study the development of community organizations, socioeconomics, and aquaculture community history (Ostrom, E., 1990). Data from interviews using questionnaires were used to study the costs and returns of the aquaculture activity in each community organization. All data and information from the three surveys were used. SWOT analysis was used in order to explain the current constraints and future possibilities of community organizations. A SWOT analysis used the discussions with key informants to identify the key variables that affect community organizations (Houben *et al.*, 1999).

RESULTS

The development of community organizations

Eight community organizations were studied in regard to the differences in the physical environments, the structure of operations and member information. Firstly, the Chachoengsao

Province Sea Bass Aquaculture Network Group (as a non-juristic organization) located in Bangpakong and Muang District in Chacheongsao province. Sea bass aquaculture is carried out in ponds in three areas: Bang Klueasub, Bang Samak and Hom Sin districts. In these areas, the sea bass aquaculture network group is for upstream to middle stream and includes feed mill suppliers, hatcheries, nurseries, ponds, cement producers and collectors.

The second is the Tambon Tasoong Aquaculture Group, which is registered as a juristic organization. This organization is located in Tasoong sub-district, Muang District, Uthai Thani province. Freshwater cage aquaculture is conducted in Sa Kae Krang River which is a tributary of the Chao Phraya River. The Tambon Tasoong Aquaculture Group also operates in this area. Most members culture fish next to the river and directly sell the products to a local market which is also near the river. The most popular fish species in this area are tilapia, catfish, giant gourami (*Osporonemus goramy*) registered by GI (Geography Indicator) (DIP 2018), and black ear catfish.

The third and fourth organisations are two tilapia aquaculture cooperatives: the Pan Fisheries Cooperative, Ltd. and the Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. The Pan Fisheries Cooperative, Ltd. is organized by tilapia farmers. The primary industries for Pan are paddy fields, fruit farms, vegetables, livestock and freshwater fish aquaculture, particularly tilapia. The members of the cooperative are in three areas: Hua Ngum, Pha Hung and San Khang sub-districts of Pan district, Chiang Rai, Northern Thailand. Most of the tilapia culture systems are in ponds, which have two types, namely, tilapia farm and pig-tilapia farm. This cooperative is efficiently organized. Meanwhile, the Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. is located in Nakhon Nayok province. The study areas are Bang Somboon, Ongkharuk district and Sri Chula and Sri Nava in the Muang district. The primary industries are paddy fields, fruit farms, and fish polyculture. The cooperative has efficient marketing performance because of the leader's experience. He has learnt from the Thai Shrimp Farmers' Cooperative Co., Ltd. to find new markets for tilapia products such

as Tesco Lotus. The cooperative tends to build larger network groups in other areas.

The four shrimp aquaculture cooperatives, namely Samroi-yot-Pranburi Cooperative, Ltd., Tatong Cooperative, Ltd., Pak Phanang, Cooperative, Ltd., and lastly, Chanthaburi Cooperative, Ltd. are members of the Thai Shrimp Farmers' Cooperative Co., Ltd. The cooperatives support small scale shrimp farmers and service product collectors, modern trade market channels, storage company contracts, and ASEAN market development. However, the Thai Shrimp Farmers' Cooperative Co., Ltd. stopped operating due to the problems of the cooperatives. Now the four shrimp aquaculture cooperatives collaborate to share market information.

Analysis of Costs and Returns

Economic cost and return analyses are divided into two types of aquaculture: fish and shrimp. When comparing the five fish aquaculture organizations, the average cost of pond aquaculture was highest at the Sea Bass Aquaculture Network Group in Chachoengsao Province, at 189,158 baht·rai⁻¹·crop⁻¹ (1 USD = 35 Baht; 1 ha. = 6.25 rai; 1 rai = 0.16 ha.), followed by the tilapia farm cost at the Pan Cooperative (114,699 baht·rai⁻¹·crop⁻¹), and the tilapia-white leg shrimp polyculture at the Nakhon Nayok Cooperative (66,519 baht·rai⁻¹·crop⁻¹). On the other hand, for aquaculture in cages, the red tilapia production cost of the Nakhon Nayok Cooperative was the highest at around 3,810.4 baht·m⁻²·crop⁻¹, followed by the tilapia-giant gourami polyculture of the Tasoong Aquaculture Group (1,906 baht·m⁻²·crop⁻¹).

Total revenue from fish ponds varied from 115,056 to 241,673 baht·rai⁻¹·crop⁻¹. The sea bass network group earned the most revenue at around 241,673 baht·rai⁻¹·crop⁻¹ while the tilapia and pig-tilapia farms at the Pan Cooperative earned 135,711 and 115,056 baht·rai⁻¹·crop⁻¹, respectively. In contrast, black ear catfish-striped catfish-giant gourami polyculture in cages at the Tasoong Aquaculture Group received 5,166 baht·m⁻²·crop⁻¹ and striped catfish in cages grossed 3,992 baht·m⁻²·crop⁻¹.

Net profit from sea bass in ponds for the sea bass network group made the most profit at 61,471 baht·rai⁻¹·crop⁻¹, followed by the pig-tilapia farm and tilapia in ponds, which received net incomes of 59,503 and 21,042 baht·rai⁻¹·crop⁻¹ respectively. For fish in cage systems, striped catfish culture earned 494 baht·m⁻²·crop⁻¹ while black ear catfish-striped catfish-giant gourami polyculture in cages made only 482 baht·m⁻²·crop⁻¹.

Regarding the variations in fish aquaculture, Table 1 shows the costs, revenues, and net profits of only the main fish species produced in ponds (sea bass and tilapia farms). Fixed costs were less than variable costs, particularly for feed cost. The feed cost of sea bass in Chachoengsao had the highest proportion (68.52%). For the Pan Cooperative, feed cost from the tilapia monoculture system (51.60%) was higher than that of tilapia farms with pigpens (44.90%), while the tilapia-shrimp poly-culture system feed cost (43.87%) was higher than tilapia monoculture (30.11%) at the Nakhon Nayok Cooperative. In contrast, the highest profit was from the pig-tilapia farm in Pan (52.43 %) followed by sea bass farm in Chachoengsao (25.42%) whereas the tilapia shrimp poly-culture system (-59.40%) and the tilapia monoculture system (-6.33%) at the Nakhon Nayok Cooperative faced losses.

Table 2 shows that the fixed costs of the four shrimp cooperatives were far less than the variable costs. The shrimp farms of the Tatong Cooperative had the highest cost (106,863 baht·rai⁻¹·crop⁻¹) with the highest net profit (235,038 baht·rai⁻¹·crop⁻¹) while the cost at Pak Phanang shrimp farms was 86,062 baht·rai⁻¹·crop⁻¹ with a net profit 198,320 baht·rai⁻¹·crop⁻¹. The main variable costs in the four shrimp cooperatives were different. The highest proportion of cost for the Chanthaburi Cooperative was labour cost (28.48%). Shrimp culture at the Samroi-yot-Pranburi Cooperative had the highest variable cost for fuel at about 26% while seed cost for shrimp culture at Tatong was the highest (23.14%) followed by the shrimp feed cost at Pak Phanang (22.19%). In contrast, the net profit of shrimp culture at Pak Phanang and Tatong was similar at around 70%, with

Table 1. Comparison of costs, revenues, and net profits in the main fish species cultured by five aquaculture organizations

	Sea bass, Chachoengsao		Tilapia farm, Pan		Pig-Tilapia Farm, Pan		Tilapia farm, Nakhon Nayok		Tilapia-shrimp farm, Nakhon Nayok	
	baht·rai ⁻¹ ·crop ⁻¹	% of total cost	baht·rai ⁻¹ ·crop ⁻¹	% of total cost	baht·rai ⁻¹ ·crop ⁻¹	% of total cost	baht·rai ⁻¹ ·crop ⁻¹	% of total cost	baht·rai ⁻¹ ·crop ⁻¹	% of total cost
Fixed cost	9,348.56	5.19	14,695.00	12.82	9,143.00	16.70	3,340.00	14.00	6,177.00	9.29
Feed cost	123,501.57	68.52	59,169.20	51.60	24,576.91	44.90	7,184.25	30.11	29,181.89	43.87
Other variables	47,391.28	26.29	40,804.80	35.58	21,017.09	38.40	13,335.75	55.89	31,160.11	46.84
Total cost	180,241.41	100.00	114,669.00	100.00	54,737.00	100.00	23,860.00	100.00	66,519.00	100
Revenues	241,673.70	100	135,711.00	100	115,056.00	100	22,440.00	100	41,732.00	100
Total cost	180,241.41	74.58	114,669.00	84.49	54,737.00	47.57	23,860.00	106.33	66,519.00	159.40
Profit/lost	61,432.29	25.42	21,042.00	15.51	60,319.00	52.43	(1,420.00)	-6.33	(24,787.00)	-59.40

Table 2. Comparison of costs, revenues, and net profits in the main shrimp cultures of four cooperatives

	Samroiyot-Pranburi Cooperative		Pak Phanang Cooperative		Tatong Cooperative		Chanthaburi Cooperative	
	baht·rai ⁻¹ ·crop ⁻¹	% of total cost						
Fixed cost	5,899.00	15.00	11,699.00	13.59	15,720.00	14.71	8,444.00	15.30
Major cost	10,226.06	26.00	19,097.16	22.19	24,728.10	23.14	15,716.40	28.48
Other variable cost	23,205.94	59.00	55,265.84	64.22	66,414.90	62.15	31,023.60	56.22
Total cost	39,331.00	100	86,062.00	100	106,863.00	100.00	55,184.00	100.00
		% of revenues		% of revenues		% of revenues		% of revenues
Revenues	37,940.00	100	284,382.00	100	341,901.00	100	77,760.00	100
Total cost	39,331.00	104	86,062.00	30	106,863.00	31	55,184.00	71
Net Profit	(1,391.00)	-4	198,320.00	70	235,038.00	69	22,576.00	29

Chanthaburi at 41% whereas Samroi-yot-Pranburi faced losses. All four cooperatives faced early mortality syndrome (EMS) resulting in culture breakdown. Net profit can be a factor demonstrating the capacity of group management. However, good organizational management requires other factors which are both internal and external factors (SWOT analysis) to set the strategies (TOWS) and to develop the organizations.

SWOT Analysis

SWOT analysis was divided into two parts: fish community organizations and shrimp community organizations and these can identify how the community organization will improve the organization as follows.

SWOT Analysis of Fish Community Organizations

Strengths

Firstly, the leader of the fish community organization is the most significant strength that has knowledge, capability and expertise to advice all members in regard to seed selection, feed usage, production, and marketing. However, the strength in the Pan Fisheries Cooperative is the knowledge of members who have high education and more experience to collaborate with the cooperative.

The second strength is the type of community organization: non-juristic organizations, juristic organizations and cooperatives. Both juristic organizations and cooperative have advantages of funding from external sources such as government and commercial loans. Non-juristic organizations, however, rarely receive loans from external sources. The Tambon Tasoong Aquaculture Group is a juristic organization that has good management that exchanges knowledge about input procurement, financing sources, production and marketing. The Pan Fisheries Cooperative, Ltd. has strengths on seed planning that matches production and demand in the market and good connections with other related network groups including domestic and international associations, while the Nakhon Nayok

Aquaculture and Processors Cooperative, Ltd. has strengths in terms of good experience in contacting other business customers such as modern trade firms (Tesco) to extend their market and in providing many careers related both to aquaculture products and non-aquaculture products.

On the other hand, the Sea Bass Aquaculture Network Group, a non-juristic organization, had for its main strength the culture knowledge from leaders to members and the other strengths are certain markets, input credit from suppliers who are leaders, and regular informal meetings (Table 3).

Weaknesses

The weaknesses of the four fish community organizations are different. Table 4 shows the weaknesses of the four fish community organizations. Members in the Sea Bass Aquaculture Network Group still faced problems with member collaboration, a lack of loan facilities from external sources, no regulations and no production planning in the group. The Tambon Tasoong Aquaculture Group's weaknesses were insufficient feed produced by the group, less negotiation power for output prices, and insufficient household labor. The Pan Fisheries Cooperative, Ltd. faced a lack of collaboration and communication between members when making decisions together. Moreover, there were some members who were not experienced in tilapia culture. The weakness of Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. was insufficient working capital so the organization sometimes had problems buying tilapia from members selling to the modern trade (Table 4).

Opportunities

The opportunities for fish culture organizations were not considerably different. A location with good transportation, seed sources and infrastructure were opportunities for the Chachoengsao Province Sea Bass Aquaculture Network Group and the Tambon Tasoong Aquaculture Group followed by many market channels. However, the Tambon Tasoong Aquaculture Group and two

Table 3. Strengths of Fish Community Organisations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
S1 Three leaders are experts for seeding selection and advise the members.	S1 Leader determined to improve marketing skills.	S1 Members have high education and experience. Also, members have their own land for culture.	S1 Leader has knowledge, gives advice, and keeps trying to run the cooperative.
S2 Three leaders are efficient sea bass culture farmers so the members will accept them when they give any advice.	S2 Group members have good relations to exchange information and knowledge of production and marketing.	S2 Members frequently participate in cooperative activities.	S2 Regular meetings
S3 Three leaders are main feed suppliers and know sources of seed.	S3 Giant Gourami registered with GI.	S3 Well prepared for production planning such as appropriate seeding time for growing tilapia.	S3 Good cooperation with other networks such as other fish culture cooperatives and modern trade companies.
S4 Three leaders are reliable and adaptable.	S4 Value added process product development.		S4 Members have many careers.
S5 Members have sea bass and fish culture experiences in many years.	S5 Lower feed price with negotiation.		
S6 Three leaders can work together to support the operation from managing inputs, operation, collecting, selling to wholesalers, processors and retailers.	S6 Can reduce feed cost (60%) by producing own feed.		
S7 Network group has regular informal meetings.	S7 Low credit loan for members		
	S8 Receive Outsource Funding		
	S9 Good communication and making decisions together		
	S10 Members are good followers and are trusted.		
	S11 Members have much experience to culture many types of fish.		

Table 4. Weaknesses of Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
W1 Members still lack cooperation in the group and do individual farming.	W1 Capacity of feed production by own group is limited so some members have to buy from commercial firms	W1 Lack of decision making among members to operate Cooperative	W1 Lack of funds to buy output from members during credit time of wholesalers (Tesco)
W2 Members just follow leaders but not develop the network group.	W2 Funding is still in adequate to expand	W2 Increasing feed costs caused delayed harvesting	W2 Can't meet the contract order (quantity of fish can't reach customer's order)
W3 Lack of internal and external sources of funds because of informal network group.	W3 Household labor in aquaculture is still insufficient	W3 Aquaculture areas of members are scattered so it is hard to manage	W3 low power of price negotiation with buyer
W4 Lack of consistent second careers		W4 Less activities to join and share information	W4 Accounting system is delayed
W5 Lack of regulations		W5 Lack of skilled members for quality of seeds	
W6 Lack of seeding plan with other hatchery and nursery firms			
W7 Members individually buy inputs so never get lower prices.			
W8 Less contact with cold storage companies			
W9 Less value-added process product development			

cooperatives received more support from the local government through the cooperative officers and DOF officers, because of their juristic status. Moreover, the Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. has a good contract with a retail company that buys its fish (Tesco Lotus) (Table 5).

Threats

The significant problems and threats in fish community organizations were fish disease and water pollution which lowered production in the organizations. Moreover, they still faced uncertain fish prices (Table 6). After using SWOT

Table 5. Opportunities for Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
O1 Network group is near hatchery and nursery areas which have the highest number of seabass hatcheries and nursery firms in Thailand.	O1 Group is near the market and tourism area. Easy to transport both road and river ways.	O1 Government supports the cooperative.	O1 Contract demand from Tesco Lotus
O2 There are many collectors, wholesalers and retailers.	O2 Seeds can be found in the river	O2 Good infrastructure can support communication and transportation (such as exporting to Myanmar)	O2 Good infrastructure
O3 Good infrastructure can support communication and transportation.	O3 Government and private organization support the group.		O3 Group is near the central market
O4 Network group is near Bangkok where fish can be transferred to the main customers.	O4 Quality of water in the river has been frequently monitored which benefits the culture of the group		O4 The Chaipattana foundation is the brand of tilapia in the cooperative
O5 Good registration system for processed product			
O6 Cooperative center support farmer group to be a cooperative			

Table 6. Threats to Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
T1 Fish disease still is the significant problem	T1 Water pollution problem in some areas	T1 Fish disease	T1 Fish disease
T2 Hatchery and Nursery lack seed quality control	T2 Fish disease	T2 Selling price is uncertain	T2 High feed cost
T3 Lack of water from drought	T3 Flood problem	T3 Obstacles from selling feed because of many feed firms in the area	T3 Water pollution problem from agriculture
T4 Changing community from rural to urban affects the water for aquaculture.	T4 Summer season affects fish in the cage	T4 Lack of water from drought	T4 Flood problem
T5 Less support from local government organization	T5 Less quality seed		T5 Selling price is unfair from wholesalers
T6 Lack of water quality monitor in the area	T6 Lack of hatchery and nursery		T6 Lack of communication with government cooperative center
T7 Climate change affects aquaculture	T7 Less low interest rate from loan		
T8 Department of Fisheries support sometimes does not completely reach the group and is not related to what the group wants			
T9 Selling price is uncertain			

analysis for audit and analysis at the beginning of planning process, TOWS bring all SWOT to set strategies for the organizations. There are four strategies as follows:

SO strategy

Strengths are used to exploit opportunities for the fish communities (Table 7). All fish community organization types have leaders with high level of capability. Chachoengsao Province Sea Bass Aquaculture Network Group has good locations for various seed suppliers and easy market access as opportunities. Therefore, leaders could negotiate about the quality of seed and they could collect all fish products from members and charge

higher prices in several markets. For the registered organizations such as Tambon Tasoong Aquaculture Group, the Pan Fisheries Cooperative, Ltd., and the Nakhon Nayok Aquaculture and Processors Cooperative, Ltd., they receive support from the local government agencies and private companies and have good infrastructure. Hence, making products available in more locations and sustainable development for the groups are their SO strategies.

ST strategy

ST strategy will use strengths to reduce the external threats. Fish community organizations have strong leaders but face threats from the external environment such as water pollution, fish disease,

Table 7. SO Strategy of Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
1. Network group should increase negotiation power to buy seeds at lower price	1. Increase market channels such as setting up floating markets and collaborating with conservation tourism groups to sell products.	1. Increase market channels such as exporting tilapia to border markets	1. More sharing of information and increasing communication using social media
2. Network group should sell fish in high volumes to reduce transportation cost.	2. Prepare giant gourami fish for fish farmers with large land plots	2. More collaboration with department of fisheries, government cooperative center, local government organization to develop tilapia production and marketing	2. Increase market channels
		3. More sharing of information and increasing communication using social media	3. Increase value added fish products

seed quality and marketing. To solve the problems, the organizations need to build a network of seed suppliers, collectors and retailers. The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. needs to work and discuss issues with government staffs to better understand the work processes of the cooperative, which focus on marketing more than production. Moreover, the Pan Fisheries Cooperative, Ltd. and the Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. have good strengths in terms of management and funding; therefore they can develop the selling of products to final customers and the feed business to increase income (Table 8).

WO Strategy

Chachoengsao Province Sea Bass Aquaculture Network Group and seed suppliers should have plans to produce seed to control the supply in the market to sustain the fish price.

Moreover, the Sea bass group should directly collect all fish from members selling in collectors or retail markets to receive a higher price. Lastly, they need to create value-added products to increase income. Tambon Tasoong Aquaculture Group should increase its capability to produce feed and processed products. The Pan Fisheries Cooperative, Ltd. focuses on sharing information between members. The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. obtained external sources of funding to improve its management and to increase production and marketing (Table 9).

WT Strategy

Chachoengsao Province Sea Bass Aquaculture Network Group should build the network of hatcheries, nurseries, production, cold storage and processing to increase the group's capability to reduce uncertain income. The Tambon Tasoong Aquaculture Group should increase funds

Table 8. ST Strategy of Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
1. Leaders and DOF collaborate to set hatchery and nursery farm plans to control the quality and quantity of seeds.	1. Set up other network groups to produce seeds for the group	1. Encourage members to make decisions together	1. To coordinate with the government to improve cooperative management
2. Leaders and local community development staff to create value added processed fish products	2. Leaders and DOF collaborate to set hatchery and nursery farm plans	2. Improve production plan meeting market demand	
3. Negotiate with government to apply funding, inputs, and training courses. Increase negotiation with cold storage entrepreneurs to export more products	3. Set the production plan for market demand and the standard of fish		
	4. Increase multi culture to improve the quality of water in the river		

Table 9. WO Strategy of Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
1. Improve fingerling and sea bass production planning to yield a good price in the market	1. Improve the efficiency of feed production	1. Increase communication skill using social media to share information in the cooperative	1. Request government funding to improve cooperative management
2. Collect all products of members to increase the price	2. Develop variety of processed products		2. Expand production
3. Create processed products to decrease the price risk	3. Encourage members to culture giant gurami		3. Develop marketing skills

from external sources to improve the group's capability such as feed production quality, processed products, and organizational development. The Pan Fisheries Cooperative, Ltd. should develop teamwork amongst members to solve problems such as fishdisease, and to develop their competitive power and input businesses. The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd. should coordinate with local government to support the supply chain of the cooperative (Table 10).

SWOT of Shrimp Community Organizations

Strengths

For Pak Phanang Shrimp Cooperative, Ltd. and Tatong Shrimp Cooperative, Ltd., firstly members have advantages in education, shrimp culture experience, and cooperation. They also have experienced leaders. The cooperative could be organized by committee. Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd. shows that the leader is proficient in managing the organization. Strong members who come from each area are representatives on committees and they have various input businesses to support the members. Chanthaburi Shrimp Cooperative, Ltd. has good cooperation with other aquaculture cooperatives,

and the leader is committed to improving the sustainably of the cooperative (Table 11).

Weaknesses

The main weaknesses of all shrimp community organizations were the lack of collaboration among members, members with lack of funds, and losses (Table 12).

Opportunities

Two main opportunities show that a good location for culturing shrimps is the most significant factor in shrimp cooperatives. Furthermore, the infrastructure of cooperatives is convenient for transportation and extending into new markets (Table 13).

Threats

Four shrimp cooperatives experienced losses due to Early Mortality Syndrome (EMS) outbreak. Uncertain shrimp price was the second threat. Other threats were about the effects of climate change such as temperature and wind patterns, insufficient funds to run the business, and high competition in the local area (Table 14).

Table 10. WT Strategy of Fish Community Organizations

Chachoengsao Province Sea Bass Aquaculture Network Group	Tambon Tasoong Aquaculture Group	The Pan Fisheries Cooperative, Ltd.	The Nakhon Nayok Aquaculture and Processors Cooperative, Ltd.
1. Build networks of hatcheries, nurseries, production, and cold storage and processing companies to plan sea bass production and marketing	1. Government support loan with low interest rate 2. Sitting training courses when culture is in warm temperature and flooding	1. Building network group to solve input price and disease problems and to have more competitive advantages	1. Coordinate with the government to support the input and retail group/cooperative projects (Supply chain) 2. Coordinate with the government to improve production plan and collection system to sell

Table 11. Strengths of Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
S1 Leader is industrious, reliable and willing to give advice	S1 Good cooperation with other networks	S1 Members have high education and experience. Also, members have their own land for culture.	S1 Members have high education and experience. Also, members have their own land for culture.
S2 Cooperative has regular meetings and has members from many local areas	S2 Leader makes more effort to sustain the cooperative	S2 Members frequently participate in cooperative activities	S2 Members frequently participate in cooperative activities
S3 Cooperative has certain input sources and market channels for output		S3 Leader has a lot of experience in shrimp culture and committee members sacrifice working with the cooperative	S3 Leader has a lot of experience in shrimp culture and committee members sacrifice working with the cooperative
S4 Members have good cooperation		S4 Cooperative provides fund for shrimp culture S5 Culture areas are in the Royal project for fresh and marine water therefore there is no conflict when using resources	

Table 12. Weaknesses of Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
W1 The majority of members are small scale and lack budget	W1 Cooperative faced losses	W1 Members don't join decision making because of living in different areas.	W1 Members don't join decision making because of living in different areas.
W2 Fish price is set by collectors without negotiation	W2 Members don't believe in the cooperative procedure and don't join the meetings	W2 Young members lack understanding about cooperative	W2 Committees have limits of time to manage cooperative
W3 Members can't pay loans back on time when they have operating losses	W3 Less savings from membership	W3 Fish price is set by collectors without negotiation	
W4 Less savings from membership		W4 few members buy cooperative's input	
W5 Members lack income and expenditure records			
W6 Members have less shrimp culture experience			

Table 13. Opportunities of Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
O1 Most members are land owners	O1 Good location for shrimp culture	O1 Good location for shrimp culture	O1 Good location for shrimp culture
O2 Good infrastructure and utilities	O2 Good infrastructure and utilities	O2 Many local government agencies in the area support shrimp aquaculture	O2 Many local government agencies in the area
O3 Tourism development in the area	O3 Tourism development in the area	O3 Good infrastructure and utilities	O3 Good infrastructure and utilities
O4 Near a large wholesale seafood market	O4 Department of fishery provides solutions disease problems	O4 Many market channels to sell products O5 Good relationship with many fishermen groups such as local fisher associations and local small-scale fisher network associations	O4 Many market channels to sell products

Table 14. Threats to Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
T1 Facing EMS and disease problems	T1 Facing EMS and Disease problems	T1 Facing EMS and Disease problems	T1 Facing EMS and Disease problems
T2 Climate change affects shrimp culture	T2 High salinity water affects shrimp culture	T2 High completion of shrimp cultures	T2 High completion of shrimp cultures
T3 Flooding in some areas	T3 Shrimp price is uncertain	T3 Shrimp price is uncertain	T3 Shrimp price is uncertain
T4 Some culture areas in National Park	T4 Lack of funds	T4 High competition of input firms in area	T4 High competition of input firms in area
T5 Shrimp price is uncertain		T5 Lack of shrimp industry development planning in area	
		T6 Lack of funds	

SO Strategy

Four shrimp groups had similar strengths and opportunities. Leaders and members are the main factors to drive the organization because of the leaders' capability and members' knowledge. They have good culture areas and infrastructure to develop sustainable shrimp cultures and new markets (Table 15).

ST Strategy

Samroiyyot-Pranburi Shrimp Aquaculture Cooperative, Ltd. and Chanthaburi Shrimp Cooperative, Ltd. should build relationships with other network groups such as input suppliers, cold storage companies, processors, government agencies and retailers to increase production and marketing capacity. High education, knowledge and shrimp culture experience for the leader and members from Pak Phanang Shrimp Cooperative, Ltd. and Tatong Shrimp Cooperative, Ltd. can be used to increase member cooperation in managing the

cooperative in terms of reducing shrimp diseases and input price and increasing income (Table 16).

WO Strategy

The WO strategy of shrimp cooperatives will reduce the weaknesses. Samroiyyot-Pranburi Shrimp Aquaculture Cooperative, Ltd. should focus on collecting all shrimp products from members to increase negotiating power and to create value added shrimp products sold in the local area. Chanthaburi Shrimp Cooperative, Ltd. should also reduce the losses of the cooperative by increasing income by selling other fish products. Lastly, the lack of cooperation from committees and members of Pak Phanang Shrimp Cooperative, Ltd. and Tatong Shrimp Cooperative, Ltd. can be reduced by increasing the roles and functions to collaborate in regard to production and marketing activities of the cooperatives and to share information to enhance communication. These activities can promote the cooperatives and enhance the decision making of committees and members (Table 17).

Table 15. SO Strategy of Shrimp Community Organizations

Samroiyyot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
1. Encourage members to use social media to exchange knowledge about sustainable shrimp culture and cooperative management	1. Encourage members to use social media to exchange knowledge about sustainable shrimp culture and cooperative management	1. Collaborate and work together with related parties	1. Collaborate and work together with related parties
2. Expand marketing channels and building value added processed products	2. Find new markets and collaborate in nearby area with local collectors	2. Encourage members to work together	2. Encourage members to work together
		3. Expand the business to increase income	3. Expand the business to increase income

Table 16. ST Strategy of Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
1. Build the network of related parties to solve problems such as uncertainty of price and market channel expansion	1. Build the network of related parties to solve problems such as uncertainty of price and market channel expansion	1. Support working together among members to help each other to solve problems, develop the cooperative and have stable input prices 2. Cooperate with the government to support stable shrimp prices	1. Support working together among members to help each other to solve problems, develop the cooperative and have stable input prices 2. Cooperate with the government to support stable shrimp prices

Table 17. WO Strategy of Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
1. Develop processed products to increase income in the local area 2. Collect shrimp products from all members and distribute to central market at higher price	1. Find other seafood products to increase cooperative's income	1. Increase sharing of information by social media 2. Design marketing promotion to expand sales 3. Increase negotiation power	1. Increase sharing information by social media 2. Design marketing promotion to expand sales

WT Strategy

To be aware of the weaknesses and threats of shrimp cooperatives, they need to reduce many risks from external threats. To decrease shrimp disease risks, Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd. should inform members about culturing more varieties of fish species. Chanthaburi Shrimp Cooperative, Ltd. faced losses in the

cooperatives because of EMS outbreak among their shrimp, therefore it needs to promote other businesses to reduce risk such as other fish cultures or other agricultural products. Pak Phanang Shrimp Cooperative, Ltd. and Tatong Shrimp Cooperative, Ltd. should encourage members to collaborate in cooperative activities to solve EMS outbreaks, to compete with other shrimp farmers and to extend input businesses (Table 18).

Table 18. WT Strategy of Shrimp Community Organizations

Samroi-yot-Pranburi Shrimp Aquaculture Cooperative, Ltd.	Chanthaburi Shrimp Cooperative, Ltd.	Pak Phanang Shrimp Cooperative, Ltd.	Tatong Shrimp Cooperative, Ltd.
1. Culture other fish to reduce risk	1. Culture other fish to reduce risk	1. Encourage members to have loyalty towards the cooperative	1. Collaborate with members and government organization to solve EMS problem and set a plan to compete with other shrimp farmers in local area
2. Collect shrimp products from all members and distribute to central market at higher prices	2. Coordinate with other related product groups to increase cooperative's income	2. Set a plan to compete with other shrimp farmers in the local area	2. Expand input support to members at low cost
3. Change regulations of the cooperative that are not suitable for management		3. Use social media for exchanging information.	
		4. Expand input support to members at low cost	

CONCLUSION AND DISCUSSION

The net profit of members in community organizations is a factor indicating the capacity of the aquaculture organization. Net profits were obtained by groups from Pan, Pak Phanang, Tatong, Chachoengsao, Tasoong and Chanthaburi, while the others (Nakhon Nayok and Samroi-yot-Pranburi) did not make profits. However, non-registered groups and registered groups (fish farmer groups and cooperatives) were not an indicator that the members would have profits.

Apart from the net profit, SWOT shows that cooperatives seem to be the most efficient organization to promote. However, it depends on the factors that support the organization. If the eight pilot organizations are representatives of other aquaculture groups in Thailand, organizations could improve other factors, particularly for leaders

and input procurement, production and marketing in operations. Moreover, not only internal factors, but also external factors such as government support, disease risk management, uncertain fish and shrimp prices are significant to bring about organizational success.

Recommendations for community organization development include: 1) Member development to realize that collaboration strengthens their capacity; 2) The leaders must be people who are improving, curious, fair and available for the organization's work, as well as acceptable to the members; 3) There should be an office to serve the members conveniently, as well as sufficient funding; 4) The organization should offer full services to members including production promotion, provision of input supplies, information provision, and collaboration with relevant agencies.

ACKNOWLEDGEMENTS

The authors wish to thank all informants and aquaculturists from all organizations that participated in this research. This research was supported by The Thai Research Fund.

LITERATURE CITED

- Ajjimangkul S., C. Limsuwan, N. Chuchird and W. Pattama. 2008. **Network for Extension and knowledge Development for Tacheen Plain Shrimp Farmer Cooperative (2nd year)** National Research Council of Thailand. 137 p.
- DIP. 2018. **GI (Geography Indicator) registration (Online)**. http://www.ipthailand.go.th/images/781/s_56100061_1.pdf
- Houben, G.K., K. Lenie and K. Vanhoof. 1999. A knowledge-based SWOT-analysis system as an instrument for strategic planning in small and medium sized enterprises. *Decision. Support Syst.* 26, 2 (August 1999), 125-135.
- Kuldilok, K. 2016. Strengthening Sea Bass Aquaculturist Capacity via Sea Bass Aquaculturist Group Network in Chachoengsao Province. **National Conference of Sukhothai Thammathirat Open University 2016**. P.45-61 (Thai Proceedings)
- Laknapichonchat, T, Soomboon S, Sirichodok P. 2008. **Empowering the Shrimp Farming Cooperatives Networks for Contract Farming in Thailand and Abroad market**. Report. The Thailand Research Fund (Thai). 320 p.
- Ostrom, E. 1990. **Governing the Commons: The Evolution of Institutions for Collective Action**. Cambridge University Press. 271 p.
- Porter, M.E. 1985. **The Competitive Advantage: Creating and Sustaining Superior Performance**. NY: Free Press. 580 p.
- Tokisna, R., K. Kuldilok and K. Boonchuwong. 2016. **Strengthening Aquaculturist Capacity via Community Organization**. Report. The Thailand Research Fund. (Thai). 237 p
- Tokisna, R., K. Kuldilok and K. Boonchuwong. 2013. **Capacity Building for Thai Fish Farmers towards ASEAN Economic Community: Status and Outlook**. Report. The Thailand Research Fund. (Thai). 702 p.
- World Atlas. 2017. Thailand – **Outline Map (Online)**. <https://www.worldatlas.com/webimage/countrys/printpage/printpage.php?1=/webimage/countrys/asia/outline/thout.gif>. Cited 15 October 2017.