A SWOT – TOWS Analysis for Developing the Strategy of Cage-Based Aquaculture Business in Saiburi, Patani Province

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Abstract

Sustainable aquaculture product is a challenge to any community and to the community will need to implement the appropriate strategy. This paper aimed at proposing the strategies of developing cage-based aquaculture business by performing the SWOT analysis and TOWS matrix. Data were collected from in-depth interviews of 30 cage-based aquaculture farmers, 8 fishmongers and 4 fishery officers in Saiburi, Pattani. The SWOT analysis shows that internal factors including labors, quality of fish, fish volumes, knowledge and skills, adequacy of fish breeds and storage management were the significant strengths while less knowledge on the know-how of fish diseases remedy and new technology adoption were the main weaknesses. In the case of external factors, good location, high demand towards aquaculture products and quality of water at the river were the main opportunity whereas COVID 19 pandemic, fish diseases, and irrelevant government policies were the threats and problems. The result of TOWS analysis proposing the strategy development of cage – based aquaculture business was (i) the farmers should put emphasis on creating fresh fish processing, online marketing skills, and establish group networks. (ii) during COVID 19 fishmongers should focus on using online marketing channels to grab more customers. (iii) the government or relevant authorities should conduct holistic knowledge and skills management with regards to the production processes, giving solutions to the fish diseases and performing affective marketing management which are in line with the farmers and fishmonger's needs while continuously doing follow up that allows for further assessment.

Keywords: Strategy development, Cage-based aquaculture business, SWOT analysis, TOWS analysis

Introduction

Coastal aquaculture is now a profession recognized by farmers and is widely engaged throughout the regions of Thailand. In addition, the coastal aquaculture business is another

important economic aquatic production that helps generate income for entrepreneurs as well as the household sectors in Thailand. According to the Fisheries Statistics regarding the survey value of coastal aquaculture in Thailand, it was revealed that the value of coastal aquatic production continued to increase from 21,122 million baht per year in 2007 to 68.5 billion baht per year in 2020 (Division of Fisheries Development Policy and Strategy, 2020). This could be an opportunity for the government or relevant stakeholders to develop the aquaculture industry in Thailand. In addition, Pattani province is one of the areas where coastal aquaculture is produced, especially cage – based aquaculture which is promoted by the Pattani Provincial Fisheries Office for business farming. Mostly aquaculture in Pattani have been registered under the Pattani Provincial Fisheries Office with the total number of 429 farms, 1,676 cages which are produced around 24.41 Rai. The areas of producing the coastal aquaculture in Pattani are mainly from Kapor, Panare, Maiken, Yaring, Saiburi, and Nongcik. However, Saiburi District is the biggest producing aquaculture, especially cage-based aquaculture in Pattani province as compared to other areas within Pattani province. In 2021, there are 303 farms totaling 1,189 cages and 17.4 Rai of aquaculture farms which are mainly for Sea Bass, Tilapia, and Yellow Mystus (Office of Pattani Fisheries, 2021).The number of cage-based farms of each districts in Pattani are shown in Table 1

Table 1 The number of cage-based aquaculture farms, Pattani province in 2021

Districts	Amount of farms	Amount of cage-based	Amount of rai
Kapor	26	115	1.762
Panare	1	3	0.03
Maiken	15	42	0.43
Yaring	80	318	4.66
Saiburi	303	1,189	17.41
Nongchik	4	9	0.12
Total	**429**	**1,676**	**24.41**

Source: Office of Pattani Fishery (2021)

According to the interview regarding the local geography, the geography of Sai Buri district is suitable for producing the cage-based aquaculture. Saiburi is geographically flat in surface and located nearby to the gulf of Thailand sea on the east coast while the Saiburi river runs into the Gulf of Pattani. The cage-based aquaculture farmers confirmed and agreed that the water of Saiburi river is pure and decent for producing the cage - based aquaculture due to the fact that the areas are not surrounded by factories. Thus, in the early 10 years of involvement in aquaculture farming before, many aquaculture farms were happy and able to produce more aquaculture yields. However, the yield and value of cage-based aquaculture in Pattani province in the past 2 years had decreased due to the impact of the coronavirus 2019 (COVID - 19) pandemic (M. Muhamad, personal communication, 2 April 2021). This situation has led to the

decrease in market demand of aquaculture products as a result of the policy measures enforcement such as entry-exit measures, cross-province or countries travel measures, as well as curfew time, closing malls and restaurants and et cetera. Consequently, these enforcements had also led to the inaccessibility of merchants from Malaysia who could not cross the border and buy the cage - based aquaculture products in this area. All barriers of entry have led the cage - based aquaculture farms to slowly lessen their production. The problems mentioned earlier need to be solved and researched on in order to develop and figure out the solutions in terms of inputs, marketing, as well as the environment both directly or indirectly that are affecting the cage - based aquaculture entrepreneurs.

Previous practices have shown that the SWOT analysis had been widely used in analyzing a situation for strategic propositions (Fajriah, et al., 2021; Poophayang et al., 2021). The Social Enterprise for Economic Development program organized by Prince of Songkla University and ASEAN Learning Network in 2018 had conducted research on an aquaculture project at Danrok and successfully came out with a business plan output by using the SWOT analysis method in Rusamilae Village, Pattani Province. The report revealed that the main problem faced by aquaculture farm was the high production cost especially feeding cost that had led to the high price of aquaculture products. This problem has caused the farmers to stop running aquaculture business (Sainuddin, 2018). Likewise, Poophayang et al. (2021) have pointed out that the main problems of developing the cage-based aquaculture in Chaiyapum province are high cost of feeding and water problems. In addition, Kuldilok et al. (2018) employed the SWOT analysis in studying the aquaculture farmers in Thailand and revealed that the internal factors that drove a successful aquaculture business were leaders and members, production, marketing development and funding. Whereas the external factors were government support, disease risk, and water problems. The study thus proposed the strategy to develop the aquaculture farm were strong collaboration among the members, skills of leaders, convenient offices to serving the members and full supply chain services to the members. However, aquaculture farmers have faced many challenges during COVID-19 pandemic as mentioned by Alam et al. (2022) have pointed out that COVID-19 has led numerous challenges to fish supply chain actors, including a shortage of inputs, a lack of technical assistance, an inability to sell the product, a lack of transportation for the fish supply, export restrictions on fish and fisheries products, and a low fish price. These challenges lead to inadequate production, unanticipated stock retention, and a loss in returns. Likewise, Kiruba-Sankark et al., (2021) revealed that critical issues faced by fresh aquaculture farmers such as fish seed unavailability, limitations in feeding, insufficient logistical support, movement related restrictions, lack of inputs, manpower shortages, etc. as the important constraints during lockdown. Based on the above references, therefore, this study attempts to study strategy for the development of cage-based aquaculture business in Saiburi, Pattani Province. The findings obtained in this research would later be developed into proposing policy suggestions to the policy makers in the future.

Literature review

Strategy's creation in organization

Definition of strategy

Strategy has never had a single definition. The term of strategy has several meanings, different in the scale and complexity. It sometimes refers to tactics, policies, goals, objectives, or program among others (Mintzberg, 1987). In addition, strategy defines 'where do you want to go?' and how do you want to get there?' (Ta- mosiuniene & Jasilioniene (2007); Ben-Yair et al. (2007)).The strategy is measured by internal and external factors which could affect the businesses or organizations. These two factors should be corelated between the values of internal competences to a firm's external environment (Viljoen & Dann 2003). Moreover, the environment can be totally different thus firms should develop their capacities and organizational cultures to confront a new environment (Porter, 1981). In addition, they should be ready for the new environment that the future may bring. This is a challenge for the firms to find the ' fit' by considering what the firms do and what the environment needs. Managers might scan their environment and decide to do some major changes that fits into what is occurring in the business world and adapt into it. They might decide through internal analysis by looking at what are their abilities to develop a new way of doing business that can redefine the nature of their business. If changes are the order of the day, two types of analysis that should be addressed are: internal and external analysis. For changing the strategy in the businesses or works, there should be arrangement between internal capacities and external opportunities. This is defined as 'strategic fit'.

In the long run, our analysis regarding the cage-based aquaculture is attempting to create strategies for developing aquaculture business in Saiburi, Pattani province in order to gain competitive advantages. The SWOT analysis therefore is utilized to figure out internal strengths to grab opportunities and to tackle and stabilize the external environmental threats as well as preventing internal weaknesses. In addition, TOWS matrix is another tool analysis which is a complementary tool of SWOT to designate strategies. These methods are well known in creating strategies and are usually used by many firms. Similarly, SWOT and TOWS matrix are more crucial in combining internal and external data to generate strategies. Therefore, in this study SWOT analysis and TOWS matrix are employed to create and develop the strategies for cage-based aquaculture business in Saiburi, Pattani province. The details of SWOT analysis and TOWS matrix are elaborated below in the following section.

SWOT analysis in organization

To attain a systematic approach and support for decision making, SWOT analysis is a tool for assessing an organization using internal and external environments. If applied correctly, it can gain a good base for successful strategy formulation (Hsu-His & Wen-Chih 2006). SWOT analysis is conducted before making of a mission and goal statement of organization (Hax & Majluf, 1991). It is well known method to identify Strengths and Weakness and inspect the Opportunities and Threats of an organization. In addition, SWOT analysis indicates that firms assess their internal strengths in exploring the environmental

opportunities and stabilizing environmental threats, whereas preventing internal weaknesses, to gain competitive advantages than other organizations (Jay & Hesterly, 2007). Moreover, SWOT analysis is a tremendously useful tool for strategic analysis and understanding the current position of an organization in its business environment. The implementation of SWOT analysis can be beneficial for self-assessment in an organization. The internal assessment is relevant all aspects of the organization, for instance, personnel, facilities, technical knowledge, products and services, and location in order to measure the strengths and the weaknesses of the organization. The external assessment scrutinizes for example political, economic, social, technological anthropological effects, and competitive environments in order to identify the opportunities and threats of the organization. These assessments therefore support the organizational decision as depicted in the Figure 1.

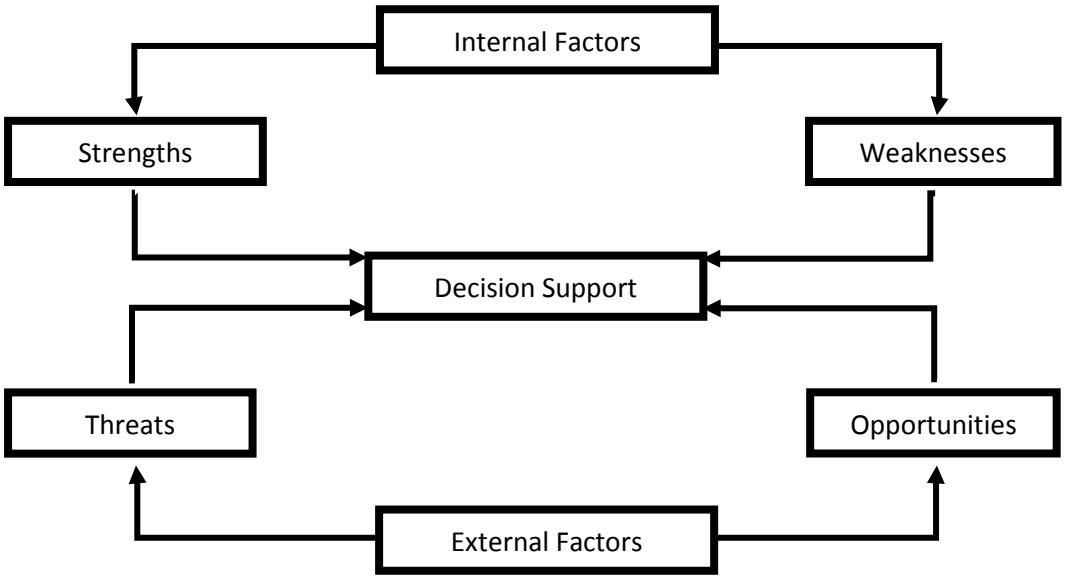

Figure 1 SWOT analysis and decision support
Source: Thomson (2005)

The analysis should be differentiated between where the organization is today, and where is could be in the future. Moreover, the analysis also must distinct internal issues and external issues. Short and simple SWOT analysis will help the organization using the information to analyze another tool such as TOWS matrix in order to create and develop the organizational strategy. The TOWS matrix thus uses in this study in order to develop the strategy of cage-based aquaculture that will be discussed, and the detail of TOWS matrix are described in the following section.

TOWS matrix analysis

TOWS Matrix or SWOT matrix is a theory that has been chosen and developed in this research. Fred R. David (2006) developed this theory by proposing the concept of strategic management as the means for competition approach. In addition, TOWS matrix is a significant measurement to assist the CEOs or managers of the firms in developing the four strategic types; Strength-Opportunity (SO); Weakness-Opportunity (WO); Strength-Threat (ST); and Weakness-Threat (WT). The SO strategy is used for measuring the internal strength of the organization to obtain profit from external opportunities, the WO strategy is to fight against internal weaknesses using the external opportunities. While the ST strategy is used to apply for organizational strengths in minimizing or getting rid of the external threats, the WT strategy is used to minimize the internal weakness in order to get rid of external threats. Table 2 defines and represents the TOWS matrix. TOWS matrix is described by nine cells. This TOWS matrix cell determines nine cells, and one of the nine cells is put in a blank on the left side, as well as measuring four strategic cells shown as SO, WO, ST, and WT which have been developed to complete the four key-cells of S, W, O, and T. The results of these analyzes will create the strategies in order to propose the strategic management to the organizations to get more competitive advantages than other organizations. This study therefore applied TOWS matrix as a tool to analyze the results of S, W, O, T as well as measuring SO, WO, ST and WT for developing strategy of aquaculture business in Saiburi.

Table 2 TOWS matrix analysis

TOWS matrix	**External Opportunities (O)** **1.** **2.** **3.**	**External Threats (T)** **1.** **2.** **3.**
Internal Strengths (S) **1.** **2.** **3.**	SO Strategies that use strengths to maximize opportunities	ST Strategies that use strengths to minimize threats
Internal Weaknesses (W) **1.** **2.** **3.**	WO Strategies that minimize weaknesses by taking advantage of opportunities.	WT Strategies that minimize weaknesses and avoid threats

Many researchers have applied the use of SWOT and TOWS matrix analysis in investigating the development of the strategy of aquaculture. Hence, the researchers proposed that the strategy for the development of aquaculture is for these purposes namely: (i) building the capacity of the community in terms of human resources, quality of local process of the products, healthy and hygienic processed products, developing market (Fajriah et al., 2021), good member's collaboration, skills leaders, and convenient office serving the members

(Kuldilok et al., 2018). (ii) increasing the capacity of the government role in terms of infrastructure support, assistance to maintain the cleanliness of coastal environment (Fajriah et al., 2021), (iii) monitoring the quality control both seed and feed at fair prices to reduce the aquaculture cost and increase aquaculture efficiency (Kuldilok et al., 2018; Uddin et al., 2018). (iv) establish partnerships and networks in developing fishery product processing businesses (Fajriah et al., 2021).

Research methodology

Data collection

Questionnaire design

This research employed qualitative method where a semi-structured questionnaire was designed using an in-depth interview with the local aquaculture farmers, fishmonger's businesses and local fishery officers in Saiburi district, Pattani province. The questionnaire lists focus on the socio-economic profile as well as the current constraints and future possibilities of local aquaculture in Saiburi, Pattani using the SWOT analysis and TOWS matrix analysis (Rattan, 2010).

Community organization selection

This research selected three sectors as listed below:

(i) local cage-based aquaculture farmers in Saburi district, Pattani province. 30 farms were selected out of 303 farms registered under provincial fishery office in Pattani by using the purposive random sampling technique with the proportion 1 out of 10.

(ii) fishmonger's businesses in Saiburi markets. 8 people were chosen randomly using the snowball or chain sampling technique and

(iii) 4 fishery officers in Saiburi fishery office in Pattani.

Survey

Surveys were conducted three times, which are included in these sequences:

(i) 30 questionnaires for each cage-based aquaculture farmer in Saiburi (April-July 2021) were distributed to collect background information regarding the location, organization, socio-economic information, production and marketing management, satisfaction opinions regarding the internal and external environment related to production methods and marketing of cage-based aquaculture in Saiburi, Pattani.

(ii) 8 questionnaires for fishmonger's business were surveyed to collect information on the production methods, aquaculture purchase price, aquaculture yields and marketing management of fishmongers.

(iii) 4 questionnaires for local fishery officers in Saiburi, Pattani were distributed to collect data on the possibility and expectation of developing the cage-based aquaculture in Saiburi, Pattani. The suggestions and comments regarding the production and marketing management of cage-based aquaculture in Saiburi, Pattani were also illicited.

Data analysis

All data were used for analysis by using the descriptive methods. The three-survey data from cage-based aquaculture farmers, fishmongers, and local fishery officers were used to analyze the strengths, weaknesses, opportunities and threats of coastal aquaculture in Saiburi using SWOT analysis in explaining the current constraints and future possibilities of Saiburi cage-based aquaculture. As an addition to the SWOT analysis, TOWS matrix was analyzed to propose the strategy in developing the cage-based aquaculture in these findings.

Findings and discussion

Socio-economic of the cage-based aquaculture in Saiburi, Pattani Province

The dominant gender of cage-based aquaculture respondents in this study are mostly male (96.7%) rather than female (3.3%). The average age of the respondents involved in this business are 48 years' old which are mostly in the age range of between 46-52 years old. Majority are married (90%) and Islam is their main religion (93.3%) while only a few of them are Buddhist (6.7%). Almost half of the cage-based aquaculture farmers in Saiburi have low level education. Basically, most of them only finished primary school level (43.3%) while a few are graduated with a bachelor's degree (6.7%). The income level of the respondents is mostly low which is in the range of 5,000-10,000 bath per month whereby only 6.6% received their income more than 15,000 bath and above. The details of socio-economic profile of cage-based aquaculture in Saiburi is depicted in Table 3.

Table 3 Socio-economic of the cage-based aquaculture in Saiburi, Pattani

Profile	Description	Frequency (n = 30)	Percentage (%)
Gender	Male	29	96.7
	Female	1	3.3
Age (Year)	25 – 31	4	13.3
	32 – 38	2	6.7
	39 – 45	5	16.7
	46 – 52	9	30.0
	53 - 59	6	20.0
	>59	4	13.3
	Average (Year)	48.0	
Status	Single	3	10.0
	Married	27	90.0
Religion	Islam	28	93.3
	Buddha	2	6.7
Education	Unlettered	1	3.3
	Primary School	13	43.3
	Secondary School	6	20.0
	Diploma	8	26.7

Profile	Description	Frequency (n = 30)	Percentage (%)
	Degree	2	6.7
Income (baht/month)	< 5,000	10	33.3
	5,000 – 10,000	16	53.3
	10,001 – 15,000	2	6.7
	15,001 – 20,000	1	3.3
	20,001 – 25,000	1	3.3

SWOT analysis of coastal aquaculture

Strengths

The major strength for cage- based aquaculture farmers in Saiburi, Pattani has an adequate supply of household labor where most of them mainly hired to work at the farm. Furthermore, the aquaculture farmers have vast experiences in running the aquaculture business for many years and these experiences are passed on from one generation to the other generation. Thus, they are well equipped with the traditional knowledge and skills in running the cage- based aquaculture business. Another strength is adequacy of fish breed. The fish breed is sold everywhere through online markets as well as direct buying from the fish breed markets which are located nearby the farm for instance local fishery office in Pattani, and fish breed company in Songkla. Besides, the local fishery office in Saiburi has a good track record of research in developing the fish breeds which are appropriate with the local areas in Saiburi. By this way, the farmers have accessed to those high quality aquaculture product in Saiburi. As a consequence to the strengths as mentioned earlier, the cage-based aquaculture farmers can continue to produce aquaculture products throughout the year which will in turn enable them to serve the customers in the markets.

All cage- based aquaculture businesses in Saiburi have been registered under fishery office which can provide easy access to the internal and external funding from public financial institutions and other private monetary institutions. This access towards funding has led the cage- based aquaculture businesses to have enough capital to run the aquaculture business. Moreover, the logistics transport for selling the fish products to customers is another strength for Saiburi cage- based aquaculture business. They are able to transport the products to the customers safely while keeping the freshness of the fish products intact. This is made possible due to the availability of frozen storage machine in order to keep the fish products fresh when delivering to the customers (The details of strengths analysis is shown in Table 4).

Weaknesses

The weakness of cage-based aquaculture is depicted in Table 4. Even though the cage-based aquaculture farmers have their own traditional ways in running the cage- based aquaculture business, however they are still faced with many problems. The weakness that the cage-based aquaculture owner faced most in Saiburi is less skillful in using new technology in running the cage-based aquaculture business. Another weakness is lack of knowledge and skills in preventing diseases for their aquaculture fish. The farmers usually treated the fish's diseases

based on their own personal knowledge and ways which was not appropriate, and sometimes chemical based drugs were used which consequently brings hazard to the consumers. In addition. They also faced less unit of harvest hence causing high production cost which will lead to high price of their products.

Table 4 SWOT analysis of Saiburi coastal aquaculture in Pattani

Strengths (S)	Weaknesses (W)	Opportunities (O)	Threats (T)
S1. Adequacy of the number of manufacturing and household labors	W1. Lack of knowledge and skills in treating diseases for aquaculture products	O1. Good location and infrastructure that allow easy access to transport their products, both by road and river ways	T1. Lack of communication with the fishery officers in terms of training, and other government programs
S2. Aquaculture farmers have knowledge and skills in running aquaculture business	W2. Less skillful in using new technology in running aquaculture business	O2. The water in the river is adequate to produce aquaculture products throughout the year	T2. The current situation of Covid-19 pandemic have caused difficulties among the collectors, wholesalers and retailers are difficult to procure the aquaculture products.
S3. Adequacy of fish breeds	W3. Less availability of the breeds which led to the farmers facing high production cost	O3. Quality of the river is clean and hygienic due to the effort of local governor that consistently monitors the river water that finally give benefit to the farmers	T3. The government policies are still irrelevant to the needs of the aquaculture farmers
S4. Continuation/ Sustainability? of producing aquaculture		O4. Many buyers?/collectors, wholesalers and retailers	T4. Less support from the local government in promoting the aquaculture market

Strengths (S)	Weaknesses (W)	Opportunities (O)	Threats (T)
production throughout the year			
S5. The aquaculture product is of good quality		O5. Aquaculture market is close to the farm and it is the main aquaculture market center in these three provinces of Southern border	
S6. Aquaculture farmers have the ability to find the internal and external funding in running the business			
S7. Aquaculture farmers are able to transport the product to the customers			
S8. Aquaculture farmers have the ability to store the products and ensure the freshness.			

Opportunities

The main opportunity of Saiburi cage-based aquaculture is its strategic location with good infrastructure. This strategic location has allowed easy access for transportation, both road and river ways. Many buyers?/ collectors, wholesalers and retailers are comfortable with the direct deal with the cage-based aquaculture farmers at the farm. Moreover, there are many suppliers of aquaculture products in Saiburi where the big central aquaculture market is located since this place is regarded as the main and the biggest aquaculture market chain that supply aquaculture products to other three provinces in southern border of Thailand. Interestingly, based on the interview with the local cage-based aquaculture farmers, the river flowing through Saiburi is still clean. This is due to the fact that there are still not many factories in the area. In addition, the local government is consistently and seriously monitoring those industries which drained polluted water to the river. Therefore, the river in Saiburi is clean and enough to produce the aquaculture products throughout the year (Table 4).

Threats

The significant problems and threats in cage-based aquaculture in Saiburi are lack of communication with the fishery officers in terms of training and other related programs from local government. Moreover, the government policies that promotes the cage-based aquaculture are still irrelevant to the farmer's needs. The projects delivered by the government therefore were not beneficial for the cage-based aquaculture farmers. The situation worsen when the farmers were faced with COVID 19 pandemic and as an result of that pandemic, the buyers/ collectors, wholesalers and retailers both locally and internationally were unable to cross the border and buy directly from the farm. This is due to the restrictions enforced by the government policies during the COVID 19 pandemic. This has caused the inability of selling those aquaculture products, thus, making the price of aquaculture to drop (Table 4). After using SWOT analysis, TOWS matrix will bring all SWOT to set the strategies for cage-based aquaculture in Saiburi. There are four strategies as follow:

SO strategy

Strengths are used to exploit opportunities for the cage-based aquaculture in Saiburi (Table 5). The aquaculture products are of good quality, adequacy of fish breeds and sustainable production of the aquaculture products throughout the year coupled with strategic location, clean river and abundance of customer's needs in aquaculture are regarded as opportunities. To set the SO strategies for cage-based aquaculture farmers and fishmongers therefore the farmers could use the strategy of aggressive promotion in order to increase the demand for the products, hence increasing the volume of sales. In addition, they could produce many types of fishes to serve the customer's need as well as establish the community network groups by setting the breed nursery to produce high quality breeds. Besides, online marketing could be employed and promoted both among the farmers and fishmongers in order to sell the fish products via online during the COVID 19 Pandemic. Further creative solution such as processing the aquaculture products into other fish products in order to increased value added for aquaculture products. Hence increasing their income in the future.

WO strategies

For WO strategies, Cage-based aquaculture famers in Saiburi usually were lack of knowledge and skills in solving fish related disease problems which are caused by several factors, such as the infection from internal and external helminth, bacterial infections, fungal infections, and polluted water and etc. Moreover, they were also lagged behind in adopting new technology in running the cage-based aquaculture business. However, there are many opportunities of cage-based aquaculture in Saiburi such as good location, good quality of river water and high aquaculture demands in the markets that can still maintain the opportunities and get rid of the weaknesses. Therefore, the farmers should look for the solutions by inventing a remedy/treatment of fish diseases to suit with the opportunities. This could be done by consulting those related agencies that can provide treatments and work collectively with the villagers or related agencies that can educate regarding the correct and safe treatment of fish diseases in order to supply secured and guaranteed safe concern food to the customers.

Furthermore, the farmers could adopt new technology in the production process to increase their quantity of production and reduce labors or workforce which could further reduce production costs and directly increase income in the future (Table 5).

ST strategies

ST strategy uses strengths to reduce the external threats. Cage- based aquaculture farmers that produced fish products throughout the year and with good quality still faced threats from external environment such as COVID 19 pandemic, irrelevant government policies to farmer's needs, and lack of information regarding training programs from the government. Therefore, the government should provide the training programs related to aquaculture production processes and effective marketing management. On the other hands, the government should promote market channels such as setting up floating markets and collaborating with tourism groups to promote and sell the aquaculture products in this area. The government should play an important role in this regard especially the local fishery officers. When they set policies, they should set those policies which are relevant to the farmers and fishmonger's needs and the policies must be feasible and suitable to the farmers. However, all projects must be continuously followed up. It is clearly elicited below in table 5.

Table 5 TOWS matrix analysis of Saiburi coastal aquaculture in Pattani

SO – Strategy	WO – Strategy	ST – Strategy	WT – Strategy
SO1. Aggressive promotion of the cage-based aquaculture in order to increase the sales volume of aquaculture	WO1. Invent remedies or treatments for the disease to suit with the conditions of the area	ST1. Provide trainings to the farmers which are related to the effectiveness of aquaculture production process and good marketing management practices	WT1. The fishery officers should give knowledge to the farmers regarding methods of treatments/remedies to prevent fish diseases
SO2. Establish the network group in the community to promote breed nursery in order to produce high quality breed	WO2. Promote the adoption of using new technology in aquaculture process	ST2. Increase market channels for instance setting up floating markets and collaborating with tourism group to sell the products	WT2. Encourage the farmers to do extra or secondary jobs in order to increase their income
SO3. Increase value added fish products		ST3. The government especially fishery	WT3. The government should encourage the

SO – Strategy	WO – Strategy	ST – Strategy	WT – Strategy
		office should set policies in line with the farmer's needs and feasible to the farmers. Follow up programs and continuous assess of the project is advisable.	farmers to produce their own feeds from the available natural resources
SO4. Promote online marketing to the cage-based aquaculture farmers and fishmongers to sell their products via online			
SO5. Encourage the cage-based aquaculture farmers to produce many types of fish to serve the customer's need			

WT strategies

According to WT strategy, the fishery officers should give the knowledge to the farmers pertaining to the methods of treatment or remedy in preventing fish diseases. Moreover, the government should encourage the farmers to do extra or secondary jobs such as planting organic vegetables nearby the aquaculture farm in order to increase income. The farmers could produce their own feeds from the surrounding natural resources to create a unique value for aquaculture products by using the campaign of Saiburi organic aquaculture products (Table 5).

Conclusion

According to the result of SWOT analysis and TOWS matrix, this study proposed the strategies and guidelines for cage-based aquaculture business in Saiburi, Pattani, which can be summarized as follow (i) SO strategies-using business strengths by exploiting the environment through increasing the volumes of aquaculture products to serve the customer's needs, creating innovative strategies by producing several types of fish breeds as well as promoting online marketing to both the farmers and fishmongers in order to cope with COVID19 pandemic as well as applying aquaculture processes to create more fish products and increase value added aquaculture products. (ii) WO strategies - adjusting the weaknesses and grabbing the

opportunities by inventing the safe treatment to cure the fish diseases and adopting new technology in running cage-based aquaculture business. (iii) ST strategies-using the strengths to avoid the obstacles by providing training programs to promote the acquisition of significant knowledge, skills and marketing management in order to tackle COVID 19 pandemic and promote the establishment of agricultural markets, as well as establishing policies that are in line with the needs of the farmers that can be implemented and monitored continuously. Lastly (iv) ST strategies-reducing the weaknesses and avoiding the external obstacles by educating the farmers in the area of treatment and prevention of fish diseases to reduce the fish mortality rate. The farmers are also encouraged to do other auxiliary jobs while promoting them to produce fish breeds using natural resources so as to reduce the cost of fish breeds.

Below are some recommendations for cage-based aquaculture business development which are beneficial to the farmers, fishmongers and fishery office as listed below.:

Cage-based aquaculture farmers

1) Cage-based aquaculture farmers produced only fresh fish sales, the farmers therefore could find other up-stream activities such as processing those fresh fish into other products such as pickled fish, dried fish, smoked fish and crispy fish cracker in order to increase value added and income of the farmers.

2) Due to COVID 19 pandemic, the farmers should learn and apply online marketing in promoting their aquaculture products both fresh and processed fish products to online channel platforms. This will in turn grab more customers and increase their income.

3) The farmers should establish group network and collaboration with relevant agencies so to increase the power of negotiation in fish breed's price.

Fishmonger's business

1) Due to current COVID 19 pandemics, exporting aquaculture products to other countries especially Malaysia seemed bleak and difficult. Fishmongers therefore should focus on promoting their aquaculture products using online marketing in order to promote the products both locally and internationally.

Fishery offices

1) Local fishery officers should conduct the holistic knowledge and skills management in producing of aquaculture business to the cage-based aquaculture farmers such as production and technology management, promotion management of fish seeds and fish breeds and marketing management of the business in general. Fish diseases management and storage management should also be given priority by those fishery offices in ensuring a more effective and sustainable aquaculture business.

2) The fishery officers should adopt policies which are relevant and aligned with the cage-based aquaculture farmers' s needs and practically implementable. Therefore, the government or relevant authorities should conduct a real survey from the cage-based aquaculture farmers and the fishmongers in order to get a realistic data in assisting and giving

the best solutions to develop and promote the cultivation of the cage-based aquaculture business.

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