SOCIO-ECONOMIC STATUS OF THE POST-TSUNAMI CAGE AQUACULTURE FARMERS ALONG ANDAMAN SEA COAST, THAILAND

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ABSTRACT

This study focused on analysis of the influences of the Post-Tsunami Rehabilitation Programs on the socio-economic status of cage aquaculture farmers along Andaman sea coast, Thailand. The study also emphasized on the enhancement of the livelihood of the farmers. Data was collected by interviewing 164 farmers, who reside in the affected-tsunami areas. The study showed that a large number of farmers were engaged in fish cage culture and small-scale fisheries as main occupations. However, the income from these economic activities could not provide enough for their basic expense, this caused by the effects of tsunami on cage culture. Therefore many farmers have to work as labors. A Post-Tsunami Rehabilitation Program since year 2005 has been trying to help and support farmers a fund to improve the materials of aquacultural cages and fishing gears. The analyses showed that the quality and quantity of equipment, seeds and feeds invested in aquaculture farms were increased (P<0.01) comparison to pre-recovery period. Importantly, the farm area, growth rate, amount of product and revenue were improved (P<0.05) during the post-tsunami rehabilitation period. Additionally, the area and quality of house, household consumption, household infrastructures, health care and education were also improved (P<0.01). The satisfaction of farmers regard to the recovery programs was quite high (WAI=3.88). However, their expectation was to have more support of fund and knowledge/technology transfer. In this study, we also found that the knowledge on fish marketing and culture techniques were poor. Lack of alternative income generation would threat on cage culture and small-scale fisheries. Henceforth, the rehabilitation program should be more paid attention on these findings. Capacity building for community strengthening was also important for sustainable post-tsunami aquaculture and small-scale fisheries in this area.

Keywords: socio-economic, post-tsunami rehabilitation, cage culture, Andaman sea coast, Thailand.

INTRODUCTION

The large number of cage aquaculture farm along Andaman sea coast of Thailand damaged by tsunami, this indicates serious impacts to livelihood of cage aquaculture farmers. Adhinand (2005) reported that the damages on both fisheries and aquaculture sector value at 440 million US$. This determines loss of massive economic conditions of many affected farmers. Therefore, Department of Fisheries (DOF) which is main government organization assisted the farmers to re-establish sustainable fisheries activities and restore fisheries-based livelihoods. Specially, affected farmers in the most affected provinces were assisted to resume fish harvesting for improved their income (FAO, 2007). The tsunami recovery efforts were allocated in 3 periods; immediate rehabilitation action at first year (Dec 26, 2004-June, 2005), mid-term rehabilitation action at second year (July, 2005-June, 2006), long-term rehabilitation action at third year onward. Under study period, the assistant programs operating in the long-term period. At least, the distribution of livelihood restoration programs such as financial support, education grants for children, boat repairing program for local people, material support for cage reconstruction, alternative occupation

introduction, and credit programs are distributed in the affected areas. Importantly, the social and economic conditions of the affected farmers should be also improved by all rehabilitation action mentioned above. The assessment of social and economic status of post-tsunami cage aquaculture farmers aims to better understand the efficiency of the post-tsunami aquaculture motivation on livelihood of affected aquacultural farmers. Additionally, socio-economic assessment would be valuable to support any rehabilitation and management programs in these targeted areas. Bunce et al (2000) mentioned that socio-economic assessment is valuable for presenting a picture of socio-economic conditions in the coastal community and how they have change overtime. Finally, the assessment can identify the key issues of the post-tsunami aquacultural farmers and propose the proper management programs for future distribution.

Objectives

- Studying the socio-economic conditions of affected cage aquaculture farmers by the post-tsunami rehabilitation programs in Andaman sea coast.
- Evaluating the efficiency of post-tsunami rehabilitation program on livelihood and aquaculture activities of the farmers at the Andaman tsunami areas

Methodology

The data were collected by interviewing the affected cage aquaculture farmers in five affected tsunami coastal provinces along Andaman sea coast of Thailand (Satun, Trang, Krabi, Ranong, and Phang-gna). A highly structured questionnaire was designed by using both close and open ended questions, which can get the specific and proper quantitative data/information statistically. On another hand, the qualitative data/information was collected through field observation. The descriptive statistic methods were used to explore the features of the sampling and measured data. The results of statistic analyses include percentage, means, and standard deviations, which were summarized in the tabulations and graphics. Weigh Average Index (WAI) was applied to evaluate the farmers' satisfaction from the activities of the post-tsunami rehabilitation programs and also applied to evaluate the mean quality of parameters related to the livelihood and farm of the farmers. Additionally, t-test statistical analysis was used to explore the difference of mean quality of those parameters between two periods (pre and post-rehabilitation). The means of WAI were scaled from 1 to 5 and narrated from low to high as shown below.

$$1.00\text{-}2.33 = \text{low}$$
$$2.34\text{-}3.66 = \text{medium}$$
$$3.67\text{-}5.00 = \text{high}$$

The index was calculated by the following equation:

$$I = \Sigma s_i f_i / N$$

Where,

I = priority index
s_i = scale value at i^{th} priority
f_i = frequency of ith priority
N = total number of observations

RESULT

There were 7 aquatic species cultured in the study area. The percentage of number of cage aquaculture of each species, and the distribution of cultured species in each affected province are presented in Table I.

Table I: Cage aquaculture operations in the five affected provinces

Cultured species	Percentage	Province and Distribution				
		Satun	Trang	Krabi	Ranong	Phang-gna
Grouper	37.7	x	x	x	x	x
Sea Bass	35.0	x	x	x	x	x
Red Snapper	11.8	x	x	x	x	x
Cobia	10.1			x		x
Green mussel	4.4		x		x	x
Oysters	0.7			x		
Lobster	0.3	x				
Total	100.0					

Household demographics

The important indicators of household demographics such as gender, age, education, religion, household size, employment, occupation and household income, ownership of immovable property, and household monetary situation are summarized as follows.

Gender is measured by the percentages of the male and female population. The results of gender analysis showed 51 percent were male and 49 percent were female. Figure 1 shows the classification of age of the farmers and their household members, 43 percent were less than 20 years old (young), 26 percent were between 20 to 35 years old (young adults), 22 percent were between 36 to 50 years old (middle adults) and 9 percent were older than 50 years old (maturity adults). The high percentage of young population indicates the high pressure on the resource uses in the coming years.
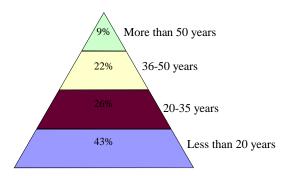

Figure 1. Age structure

Figure 2 shows the education level of the farmers and their household members, this analysis was not applied for group having below school age. A large number of population (64%) finished primary school, the next was secondary school education, and the follows were high, diploma, and bachelor's degree or higher levels. However, five percentage of population had participated in informal education programs. These indicate the low education level among farmers and consequently resulting in disadvantage job opportunity.
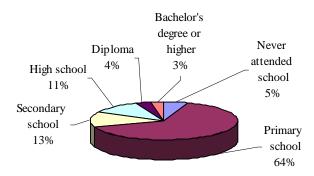
Figure 2. Education level

Regarding household size, the average number of household member is 5 people with a standard deviation of 1.9. The biggest household size is 12 members. In addition, the average number of employed and unemployed members are 2 and 3 members per household, respectively (see Table II).

Table II: Household size and employment

Topics	Minimum	Maximum	Mean ± Standard deviation
Number of household member	1	12	5.0±1.9
- number of male	-	8	2.5±1.4
- number of female	-	9	2.5±1.4
Number of employed member	-	8	2.0±1.1
Number of unemployed member	-	8	3.0±1.6

Table III shows the main occupations, economic activities, and income of the farmers in the study area. The two main occupations are small-scale fisheries (56.7 percent), and cage aquaculture (20.7 percent), with the average income per month generated by each occupation is 6,733.3 and 4,020.3 baht, respectively. The diversity economic activities at each household indicate the stability of household income in this area. Additionally, the results also showed that majority of the farmers depend on the coastal resources, which are unstable resources because the coastal resources can change overtimes.

Table III: Main occupations and average income per month

Occupations	Percentage	Average income (baht/month) ± Standard deviation
Small-scale fisheries	56.7	6,733.3±1,599.8
Cage aquaculture	20.7	4,020.3±1,560.0
Para rubber plantation	9.2	9,854.0±1,294.4
Labour	7.3	4,416.0±2,997.4
Own business	6.1	7,066.6±1,985.0
Total	100.0	

Another important issue influencing the livelihood of the farmers is the ownership of land, house and aquaculture farm area. The immovable property statuses of these ownerships are shown in Table IV. The study also identified that some of farmers had no own land and house, and some of them had ownership under installment purchase situation. However, all of them had own aquaculture farm area.

Table IV: The ownership of immovable property

Immovable property	Ownership		
	Owner	Lack	Installment
Land	58.5	40.2	1.2
House	91.5	7.3	1.2
Cage culture farm area	100.0	-	-

The results of this study also identified the importance of credit/loan program to households' livelihood and economic. Most of farmers rely on loan for household livelihood and farm investment. Figure 3 shows the percentage of farmers who took on loan separated by source of loan.
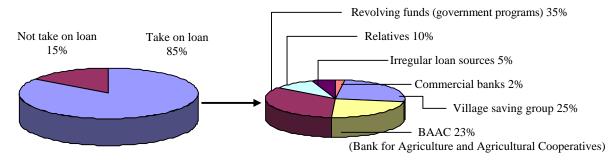

Figure 3 Loaning money and sources of loan

Preliminary surveys on cage culture operation

Based on survey, aquacultural cages in the study area typically locate at the estuaries, mangrove areas, and seaward parts near the shoreline. These areas are closed to the cultured sites of the pre-tsunami period that is quite exposed to the rapid rising water and wave of the tsunami. Therefore, the cultural farm areas, equipments and stocks still damaged easily. The main five cultured species in the study area are Grouper, Sea bass, Red snapper, Cobia, and Green mussel. Sizes of fish cage range from 6.25 to 25 square meters, however, nine square meter size was commonly used. The number of fish cage per farm is different from farm to farm, but more than a half of the farm have from one to four cages. The culture seasons are also different from specie to specie (see Table V).

Table V: Cage culture operation parameters

Species	Grouper	Sea bass	Red snapper	Cobia	Green mussel
Cage size (m)					Raft
- 2.5x2.5x2	8.9	5.7	14.3	13.3	-
- 3x3x2	82.3	74.5	82.9	76.7	76.9
- 3x4x2	4.4	5.7	2.9	10.0	23.1
- 5x5x2	4.4	14.2	-	-	-
Number of Cage					Raft
- 1-4	57.0	60.0	61.8	56.7	25.0
- 5-8	19.7	27.6	35.3	20.0	8.4
- 9-12	9.0	8.6	-	10.0	-
- More than 12	4.4	3.9	2.9	13.3	66.6
Culture period (Month)	10-12	6-12	6-12	10-12	8-12

Acquired supports

Financial support
Main financial sources supporting the farmers in the study area come from government organizations, 69.7 percent of the farmers assisted by government organizations such as:
- Department of Fisheries (DOF) assists in the national level, each affected farm obtained 20,000 baht, approximately.
- Tambon (Sub-district) Administrative office (TAO) assists in the local level, most of affected farm received 2,000 baht, approximately.
- Education institutes assist in the local level, some affected farm obtained 15,000 baht, approximately

Both non-government organizations from Thai national and international levels organizations also play an important role in assisting the affected farmers. About 31.3 percent of farmers received the assistance and donated 30,000 baht for each from these organizations.

Articles support
DOF is the main body supporting articles to the farmers, more than half of the farmers received the articles such as materials for cage re-construction, seeds, fishing gears, and boats from DOF. Non-government organizations are also important bodies involving to articles support. Many farmers received the mentioned articles from Non-government organizations too. The percentage of number of farmers who gained the articles from DOF and non-government organizations are presented in Table VI.

Table VI: Source of articles support separated by type of the articles

Articles	Sources	
	DOF (57.1%)	Non-government organizations (42.9%)
Material for cage construction	55.6	47.6
Seed	11.1	18.3
Fishing gear	31.1	13.4
Fishing boat	2.2	20.7
Total	100.0	100.0

Large numbers (81.9 percent) of farmers are satisfactory of these supports as mentioned above. The high score (3.88) of WAI indicates that the farmers were satisfaction to the supportable programs. However, they need more supports, particularly materials for cage construction/financial support, and aquaculture knowledge (marketing system)/techniques/technology transfer. In addition, the farmers suggested that DOF should play the major role in future support followed by private sector, BAAC, and TAO.

Post-rehabilitation mean quality of parameters related to the livelihood and farm of the farmers.

The parameters related to household livelihood such as house and area, household consumption, electricity and water supply, health care, and education in post-rehabilitation period were analyzed by using WAI. The results show that the mean quality of house and area ordered in high level (3.71) while other parameters were pointed in the middle level. However, mean quality of all mentioned parameters of the post-rehabilitation period were significantly (P<0.01) increased comparison to pre-rehabilitation period. Regarding to the parameters related to aquacultural farms, mean quality of culture equipment ordered in high level (3.75) and the other parameters such as farm area, seed, feed, growth rate, amount of product, marketing, price of cultured species, and revenue from farm were ordered in the middle level. Additionally, the mean quality of equipment, seed and feed invested in aquaculture farms were increased (P<0.01), and the farm area, growth rate, amount of product and revenue from farm were also improved

(P<0.05) during the post-tsunami rehabilitation period (see Table VII). These results indicate that the immediate and mid-term rehabilitation actions by the supporters are quite successful.

Table VII: Mean quality of parameters related to the livelihood and farm of the farmers

Parameters	WAI		t
	Pre-rehabilitation	Post-rehabilitation	
Livelihood			
- house and area	3.40	3.71	5.598**
- household consumption (the necessaries of life, consumer goods)	3.39	3.62	4.195**
- electricity and water supply	3.28	3.51	3.693**
- health care	3.39	3.58	3.427**
- education	3.39	3.64	4.933**
Farm			
- farm area	3.40	3.58	2.303*
- culture equipment	3.23	3.75	6.501**
- seed	3.24	3.65	4.606**
- feed	3.22	3.46	2.701**
- growth rate	3.27	3.41	1.995*
- amount of product	3.25	3.43	2.179*
- marketing	3.21	3.26	0.444ns
- price of cultured species	3.18	3.17	0.069ns
- revenue	3.23	3.42	0.266*

Note: ** indicated to the difference of mean among 2 variables in highly significant level (P<0.01)

* indicated to the difference of mean among 2 variables in significant level (P<0.05)

ns indicated to no difference of mean among 2 variables (not significance; P>0.05)

CONCLUSION AND RECOMMENDATION

● The results on household demographic are important for developing farmer participation in the future rehabilitation program and management. There are diversity in age structure, education level, and religious groups, these diverse provide the different perceptions and requirements among farmers. Importantly, occupational structure and economic activities in the study area may affect to the management strategies, especially for improving the alternative income sources for the farmers. However, over 50% and 20% of the community considers small-scale fishing and cage culture a main source of income. This explains a high community dependence on small-scale fishing and cage culture, and consequently on the coastal resources.

● Most of farmers depended on loan, this indicates that households' economic activities cannot generate enough income and the farmers need the revolving funds to subsidize their livelihood and maintain their farm. Therefore, the good implementation and management of credit programs should be promoted.

● The differences of cage culture operations from species to species are important for preparing proper operational techniques of each species at each household individually. Based on this result, the methodology of maximizing profit and minimizing cost of operation in each cultured species should be studied.

● Most of parameters related to the livelihood, farm and culture operation of the post-rehabilitation period are improved comparison to pre-rehabilitation period. The satisfaction of farmers to the rehabilitation programs was quite high. However, the farmers need more effective supports of both financial and

non-financial supports therefore building the capacity of farmers to help themselves may the good way for sustainable support.

ACKNOWLEDGMENT

REFERENCES

Adhinand Indrapim, 2005, Post-Tsunami Economic Rehabilitation of Fisheries Sector in Thailand, Department of Fisheries, Ministry of Agriculture and Cooperatives, Thailand.

Bunce, L., P. Townsley, R. Pomeroy and R. Pollnac, 2000, Socioeconomic Manual for Coral Reef Management, Australian Institute of Marine Science, Australia. 251 p.

FAO, 2007, Tsunami Reconstruction, Thailand Status Report, Available online: ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/thailand/latestFAOAgencyReport/FAOAgencyReport-Thailand.pdf [Download 17, 01, 08]