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The Impacts of Striped Snakehead (*Channa striata* Bloch) Fish Farming in Net Cages on Social, Economic and Environmental aspects in Bangkau Village, Hulu Sungai Selatan

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Abstract*—The purpose of this study was to analysis and identify the impacts of striped snakehead (Channa striata Bloch) fish farming in net cages on socio economic and environmental aspects. This study was a survey research. Location determination in Bangkau Village, Hulu Sungai Selatan Regency, South Kalimantan Province, Indonesia was done purposively because this area was a center for cultivating striped snakeheads in Hulu Sungai Selatan Regency. The collection of respondent data in this village was carried out in a census of 20 people from the whole population of cultivated striped snakeheads in net cages. The effect on social was done by identifying the effect of social aspect, the economic aspect determined by analysis used was the calculation of profit (π) and payback period (PP), while the environmental aspects, it was done by identifying the measurement of water quality. The results showed that from the social aspect, this business influenced the use of labor in its business, benefits obtained from the business of cultivating this striped snakeheads varied between 627,433.33 IDR to 9,789,533.33 IDR per year, while the payback period was 2.23 years. This cultivation effort from the environmental aspects of water quality is still within the class 3 water quality classification tolerance limit.*

Keywords*—*Striped Snakehead, Net Cages, Social Economic and Environmental Effect.

I. INTRODUCTION

Marine and fisheries development in Indonesia is an inseparable part of overall economic development and must support the realization of an advanced, resilient and efficient economy characterized by the ability to prosper the lives of fish farmers and fishermen while at the same time enhancing their ability and independence in promoting the development of the fisheries sector and marine. Bangkau Village is one of the villages in Kandangan Subdistrict, Hulu Sungai Selatan Regency, South Kalimantan Province Indonesia. Livelihoods in general are as fishermen and farmers and a small part as fish farmers in net cages, Bangkau village is geographically classified as swamp area.

One effort to realize an increase in the welfare of fish farmers and fishermen is to increase the production and productivity of fisheries businesses to achieve self-sufficiency in protein-sourced food so as to increase income while improving nutrition for all family members. In this case, Striped snakehead (*Channa striata* Bloch) fish farming can be an option in increasing family income.

*Channa stirata*in local fish known as “haruan and gabus”. English is known as the common snakehead, snakehead murrel, chevron snakehead and striped snakehead. The snakehead name refers to the shape of the head that resembles a snake's head. While the scientific name is *Channa striata* Bloch (Weber, M & Beaufort, 1912).

The potential of aquaculture resources is quite large with various types of fish and economically valuable biota that allow it to be cultivated, but its utilization has not been fully maximized so that the contribution to development and the economy in general and the improvement of living standards of fish farmers in particular is not optimal. The potential that is so broad should be used effectively and efficiently in fish farming.

Utilization of swamp land for fisheries is still dominated by capture fisheries activities whose productivity tends to decrease, along with the increasing population growth, the need for protein sourced from fish also increases while the production of fragrant fish tends to continue to even decline in production. Capture fisheries production,

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especially the production of fragrant cork fish in Hulu Sungai Selatan Regency can be seen in table 1 as follows:

Table 1. Data on Haruan Fish Production in Hulu Sungai Selatan Regency in 2011-2017

Description	Production year						
	2011	2012	2013	2014	2015	2016	2017
Total Production (Tons)	1.126,7	1.105,5	1.094,8	1.211,2	1.107,3	1.099,3	1.089,4

Source: Processed Capture Fisheries Statistics Report (2018)

Destructive fishing is one of the causes of reduced stock of cork fish in public waters. Fresh fish in this area is a type of fish that has a high economic value so that the demand for fish availability will be directly proportional to the selling price in the market, the higher the demand with the decreasing stock will increase the selling price, but when the stock is high, the price also down, this results in haruan fish being one of the fish that causes inflation in the South Kalimantan area (BPS, 2018).

To find out the social, economy and environmental impacts from the cultivation activity of striped snakeheads fish farming in net cages, it is necessary to carry out this research.

II. METHODOLOGY

2.1 Place and Time of research

The location of this research was conducted in Bangkau Village, Kandangan Subdistrict, Hulu Sungai Selatan Regency, South Kalimantan Province, Indonesia, selected purposively or deliberately by considering the villages that had the most cultivators of striped snakehead in stepped net cages. This research was conducted starting from November 2018 to February 2019.

2.2 Population and Sample

The population of this research was fish farmers who carried out of striped snakeheads fish farming in net cages who also worked as fishermen in Bangkau village, Kandangan Subdistrict, Hulu Sungai Selatan Regency, South Kalimantan Province, Indonesia.

2.3 Data Collection Technique

Data collection methods used in this study was survey and interview methods using questionnaires (Sugiyono, 2008). Primary and secondary data were recorded both in the form of the results of interview questionnaires with respondents as well as existing data on government agencies or institutions associated with this research.

2.4 Data Analysis Method

Primary and secondary data that had been collected were made in the form of tabulation, then the data were processed using several quantitative descriptive analysis tools to explain the social, economic and environmental effects wich include financial anaysis and payback period analysis, and qualitative descriptive analysis tools to explain the general description social, economic and environmental influences.

2.4.1. The Influence of Striped Snakehead Fish Farming on Social Effects.

The social effect of striped snakehead fish farming in net cages is identifying how much labor is used and its to have were recorded in the form of the results of interview questionnaires.

2.4.2. The Influence of Striped Snakehead Fish Farming on Economic Effects.

The economic effects of striped snakeheads fish farming in net cages is said to have a profit if the total value of revenue is greater than the total expenditure. This profit analysis (Izmaniar, H,.et. al, 2018) can be formulated by:

$\Pi = TR - TC$

where: π = Profit (IDR)

TR = Total Revenue (IDR)

TC = Total Cost (IDR)

Whereas to calculate the Payback Periodthe formula is:

$$PP = \frac{investment}{Profit}$$

2.4.3.The Influence of Striped Snakehead Fish Farming on Environmental Aspects.

The environmental effects caused by striped snakehead fish farming activities in net cages were in the form of impacts environmental aspects and for the striped snakehead populations were carried out by measuring in situ water quality wich includes pH, temperature and dissolved oksygen (DO), fiber water quality measurement compared to water Quality Classification Class 3 based on PP No. 82 Year 2001.

III. RESULTS AND DISSCUSION

3.1 Characeristics of Respondents

The characteristics of respondents were showed in table 1 as follow :

Table.1: The Characteristics of Respondents

No	Respondent	Ages (Years)	Fish Farming Experiences (Years)
1	Ambri	53	10
2	Pidi	45	8
3	Ahmad Kusasi	53	10

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4	Abdu Samad	43	8
5	Kaspul Anwar	55	20
6	M. Arifin	25	3
7	Lasa	55	10
8	Sarman	45	13
9	Ipin	34	4
10	Abd. Rahman	45	10
11	Samsuri	50	10
12	Raslan	60	15
13	Jadri	50	10
14	Rusdi	50	15
15	Abdul Azis	45	10
16	Jakfar	56	15
17	Nayan	55	20
18	Ruslan A	60	20
19	Ruslan	53	18
20	Darkani	40	5

Experience of Fish Cultivation. Cultivated striped snakehead farmers who had longer experience tended to be more successful than those who were not experienced. The relationship of experience with the amount of profit can be seen in the following graph:

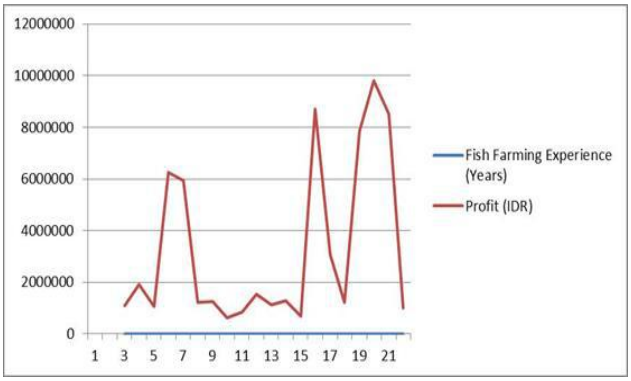

Fig.1: Graph of Comparison of Experience Relationships with the Number of Profit (Processed Primary Data, 2019)

Figure 1 above shows that there is a tendency for the longer the experience of the fish farmers in carrying out the business, the greater the profit generated, therefore the experience of the striped snakehead cultivation business is one of the supporting factors in the business, the longer a person conducts fish farming business, the better to overcome and anticipate problems that arise in fish farming.

3.2 The Influence of Striped Snakehead Fish Farming on Social Effects

The social effects were taken from data interviews with the use of labor as following table :

Table.2: The use of labors in striped snakehead fishfarming

No.	Respondent	Use of Labor
1	Ambri	1
2	Pidi	1
3	Ahmad Kusasi	1
4	Abdu Samad	1
5	Kaspul Anwar	1
6	M. Arifin	1
7	Lasa	1
8	Sarman	1
9	Ipin	1
10	Abd. Rahman	1
11	Samsuri	1
12	Raslan	2
13	Jadri	1
14	Rusdi	1
15	Abdul Azis	1
16	Jakfar	1
17	Nayan	1
18	Ruslan A	2
19	Ruslan	3
20	Darkani	1

Source: Results of Primary Data Processing (2019)

Table.3: The use of labors in striped snakehead fishfarming

No	Type	TotalUse of Labors (persons)	Total Wages (IDR)
1.	The Use of Labors	24	2.400.000,00

From the social aspect, this business influenced the use of labor in its business, both in the form of its own labors and family member labors. The use of labors started from the preparation, maintenance and harvest stages.

3.3 The Influence of Striped Snakehead Fish Farming on Economic Effects

The economic effects were taken form data as following tables. The analysis of the profitability of the business of enlarging embedded net cage can be calculated by several components as follows:

Table.4: Components and Average Total Cost of striped snakehead Fish Farming In Net Cages

No	Type of Cost	Average Cost (IDR/ person / year)	Percentage (100%)
1.	Fixed Cost	852,066.67	65.60

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2.	Variable Cost	389,300.00	34.40
	Total	**1,298,841.67**	**100.00**

Source: Results of Primary Data Processing (2019)

The Average farmers profits can be seen in the table as follow :

Table.5: Profit and Payback Period of Fish Farmers

No.	Components	Value (IDR/Fish Farmer
1.	Income	4.162.500,00
2.	Costs	1.608.265,48
3.	Profit per Year	2.554.234,52
4.	Payback Period	2,23

Source: Results of Primary Data Processing (2019)

In Table 4 , it is explained that the average total cost incurred for the cultivation business of striped snakehead in the cage is 1,298,841.67 IDR per year, which consists of the average fixed costs of 852,066.67 IDR / farmer / year and the average amount of the variable cost of 389,300.00 IDR / farmer / year. In Table 5, it is explained the average profit and payback period from the bussines of this fish farming. This business produced profits that varied between 627,433.33 IDR (lowest) up to 9,789,533.33 IDR (highest), and the return period of capital for both investment and fixed costs was 2.23 years. According to the Decree of the Governor of South Kalimantan Number 188.44 / 0570 / KUM/2018 concerning the Determination of the Minimum Wage of the Province of South Kalimantan in 2019, the Minimum Wage of the Province of South Kalimantan is 2,651,781.95 IDR if it is compared to the Provincial Minimum Wage there are still 13 people below the standard, while those above the Minimum Wage are as many as 7 respondents (Table 6), this is related to the level of experience of farmers who have been explained in the previous sub-chapter (Figure 1), that the higher the experience in cultivating striped snakehead then the higher the tendency to increase profits / income is. The average payback period of investment in striped snakehead cultivation in this embeded net cage is 2.23 indicating that this business can return capital with a minimum business average of 2.23 years. In the third year there will be real returns from the return on investment costs incurred during maintenance, there are even 6 farmers who have a payback period of under 1 year, meaning that there is a possibility that this business can be returned in just one production period and the farmers have even obtained the real benefit of this business if they are able to manage the business of cultivating the striped snakehead diligently and seriously.

3.4 The Influence of Striped Snakehead Fish Farming on Environment Effects

The environment effects (Muslim, et. al., 2018) were showed in Table 6 as follow :

Table.6: Measurement Results of In Situ Water Quality in Maintenance Media

No	Location	pH		Temperature (°C)		DO (mg/l)	
		Outside	Inside	Outside	Inside	Outside	Inside
1.	RT.01	6,7	6,68	28,4	27,6	4,06	4,10
2.	RT.02	6,76	6,71	28,9	28,5	3,95	3,97
3.	RT.03	6,8	6,75	28,0	28,3	4,51	4,50
Average		6,75	6,71	28,43	28,13	4,17	4,19
Standard Class 3*)		6 – 9		Deviation 3		Min 3	

*) Water Quality Classification Based on PP No. 82 of 2001

Whereas from the aspect of the business environment this did not have a harmful and polluting effect on the environment, because all inputs did not use hazardous materials and the products are fish that are safe for public consumption. This business utilized fish stomach waste which was used as alternative feed so that it was no longer wasteful but could also reduce production costs.

Measurement of in situ water quality both from the parameters of temperature, pH and DO did not show a significant difference between the quality of water that was in maintenance media and outside the maintenance media, and still within the tolerance limit of Class 3Water Quality required according to its designation, namely for fishery, agriculture and livestock activities

IV. CONCLUSION

Based on the results of the research, conclusions can be taken as follows:

1. Based on the results of the profit analysis, the stiped snakehead fish farming proved to be profitable. The benefits obtained by farmers varied between 627,433.33 IDR to 9,789,533.33 IDR per cultivating season, compared to the South Kalimantan Regional Minimu Wage 7 people were above the South Kalimantan Minimum Wage of 2,651,781.95 IDR, while 13 people were still below the Provincial Minimum Wage. While the results of the calculation of Payback Period (PP) of 2.23 indicated that to be able to return the cost of investment mode this business must run at least 2.23 years.
2. The striped snakehead fish farming in stepped net cages influenced the socially, economically, and from environmental aspects in the form of water quality of save the striped snakehead the maintenance media is

still within the tolerance limit of Class 3 Water Quality Classification for fishery, agriculture and livestock activities..

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