PROSPECT OF THE COMMON CARP (*Cyprinus carpio* L.) CAGE CULTURE IN MURUNG RAYA REGENCY

A. Syafi'i

Master of Fisheries Science, Fisheries and Marine Faculty
Lambung Mangkurat University, Banjarbaru, South Kalimantan, Indonesia
Jl. A. Yani Km. 36 PO Box 6 Banjarbaru 70714

Email**:** h.a.syafii97@gmail.com

ABSTRACT

This study aimed to (1) find out the water quality parameters of the river where the common carp cage cultures are located at Murung Raya Regency, either adjacent or far from the gold mine site, including water temperatures, pH, dissolved oxygen, carbon dioxide, ammonia and water clarity; (2) to compare the common carp cage culture profits in the river either adjacent or far from the gold mine sites; and (3) to determine the common carp cage culture development strategies at Murung Raya Regency. This study was carried out in Murung Raya Regency, Central Kalimantan, with the common carp cage farmers at Muara Supoi and Muara Bumban Villages, Murung Regency as the object. The collected data were primary and secondary data. The data analysis used were descriptive analysis, *t* statistical test, and a SWOT analysis. The results of the study showed that condition of the water where the common carp cage cultures are located at Murung Raya Regency, either adjacent or far from the gold mine sites, still in the range of the quality standards required, namely the temperature of 29.73 - 29.78^{o}C; water clarity of 10 - 11 cm; pH of 6.58 - 6.65; dissolved oxygen of 6.11 - 6.73 mg /l; carbon dioxide of 0.02 - 0.03 mg/l; and ammonia of 0.02 mg/l, so that the common carp cage culture activities at Murung Raya Regency were still very feasible to carried on. The average profits of the common carp cage cultures, either adjacent or far from the gold mine sites, were relatively similar, with the *t* statistical test result showed that the profits at both locations did not differ significantly at 95% test level. The development strategy of common carp cage cultures at Murung Raya Regency was in quadrant II or *S - T*, namely utilizing the strengths to overcome the threats. It was implemented by establishing two alternative solutions, namely (1) by taking advantage from the fish culture development programs and supports by the government; and (2) optimized the development function of the of seed center for supplying the high-quality seeds. One of them was by utilizing the special allocation fund (Dana Alokasi Khusus - DAK) from the Ministry of Marine Affairs and Fisheries.

Keywords: the common carp cage culture, prospect, and gold mine in the river

INTRODUCTION

Fisheries is one of the areas that experienced development and changes in utilizing natural resources and improve the quality of life of the fish farmers, both in fishing and in aquaculture. Associated with the aquaculture business, in Indonesia, there are various types of fishes that have been cultivated, one of them is the common carp (*Cyprinus carpio L*.). The common carp is a type of fish that is easy to develop and does not require a large area, but there must be a guaranteed quantity and quality source of water (Suseno, 2002).

A good water quality that meets the criteria for aquaculture business is expected and guarantee a successful business. Water quality parameters for freshwater aquaculture include three characteristics, namely physical characteristics (such as temperature, water discharge, brightness and salinity), chemical characteristics (such as pH, alkalinity, dissolved oxygen, carbon dioxide, ammonia, nitrite and phosphate), and biological characteristics (such as the abundance of plankton and benthos).

The development of common carp aquaculture business continues to increase due to the increased demand, both for consumption and for fishing pond recreations, such as in Murung Raya Regency, Central Kalimantan Province. The development of the aquaculture business in Murung Raya Regency, especially the common carp business, tends to increase, both in the number of farmers and in their production. The increased of the common carp cage culture farmers in Murung Raya Regency indicate that this business can contribute positively to household income. However, it

feared that with the existence of gold mining activities in the downstream river would affect the productivity. Therefore, this study was intended to look at the possibility of the gold mining activities impact viewed from an economic standpoint, such as production and business profits achieved, by comparing the common carp cage cultures in the far (upstream) and adjacent (downstream) areas from the gold mining location, and also to observe the production factors that may affect the common carp production in the Murung Raya Regency.

The purposes of this study are as follows:

1. To find out the water quality parameters of the river where the common carp cage cultures are located in Murung Raya Regency, either adjacent or far from the gold mine sites, including water temperature, pH, dissolved oxygen, carbon dioxide, ammonia, and brightness,
2. To compare the common carp cage cultures profits in the river either adjacent and far from the gold mine sites,
3. To determine the common carp cage culture development strategies at Murung Raya Regency.

MATERIALS AND METHODS

This study was conducted in Murung Raya Regency, Central Kalimantan Province, with common carp cage cultures in Muara Supoi and Muara Bumban Village, Murung Regency as the object. The data were collected in the form of primary data and secondary data. The data were analyzed using descriptive analysis, statistical *t*-test and SWOT analysis.

Observations were done to:

1. Physical and chemical water quality parameters of the river where the common carp cage cultures located in Murung Raya Regency, either adjacent or far from the gold mine location.
2. Common carp cage culture business investment/production facilities and infrastructures.
3. Volume and input values, as well as the production output values of the common carp cage culture business.
4. Potential, problems and constraints data that exist in the research location related to common carp cage cultures.

The data analyzed included:

1. Water quality analysis of the common carp cage cultures location in Murung Raya Regency, both adjacent and far from the gold mine location, including water temperature, pH, dissolved oxygen, carbon dioxide, ammonia, and brightness.
2. Common carp cage cultures profit analysis in the river area adjacent and far from the gold mine locations.
3. Strategy development analysis of common carp cage cultures in Murung Raya Regency.

RESULTS AND DISCUSSION

Water Quality

Water quality measurements were conducted in adjacent waters to the gold mine sites, in the Muara Bumban Village, and in the water far from the gold mine site, in the Muara Supoi Village. Measurements were made to several water quality parameters, including temperature, brightness, pH, dissolved oxygen, carbon dioxide, and ammonia, with results as shown in Table 1.

Table 1 shows that the average values of each water quality parameters observed in both locations are relatively similar. Government Regulation No. 82/2001 on Water Quality Management and Water Pollution Control and SNI (2013) stipulates the quality standard of water quality requirements for the production of common carp in cages or floating net cages, including temperature 25 - 32^{o}C; brightness 10 - 30 cm; pH 6.5 - 8.6; dissolved oxygen > 3 mg/l; carbon dioxide < 12 mg/l; and ammonia < 0.02. Referring to the Indonesian National Standard (Standar Nasional Indonesia – SNI) criteria, the average value of each observed parameters seen in Table 1 is still entirely within the set range.

Table 1. Water quality parameter's values at common carp cage culture locations

Locations	Observations	Water Quality Values					
		Temperature (°C)	Brightness (cm)	pH	DO (mg/l)	CO_2 (mg/l)	NH_3 (mg/l)
Muara Bumban	I	29.95	9.50	6.60	6.13	0.03	0.02
	II	29.78	10.50	6.55	6.10	0.03	0.02
Average		29.86	10.00	6.58	6.11	0.03	0.02
Muara Supoi	I	29.80	11.50	6.68	6.80	0.01	0.02
	II	29.65	10.50	6.63	6.65	0.02	0.02
Average		29.73	11.00	6.65	6.73	0.02	0.02
Quality Standard (SNI, 2013)		25 - 32	10 - 30	6.5 – 8.6	≥ 3	≤ 12	≤ 0,02
Parameters		Hg	TSS	Nitrate/ NO_3-N	DO	BOD	COD
BLH (Murung R.-2014) Hulu, S:00°07'16.6", E:114°06'07.7"		0.008	42	0.9	6.4	3.7	26.8
BLH (Murung R -2014) Bt. Makap S:00°24'16.8", E:114°04'29.7"		ttd	49	0.7	7.7	0.8	<13.1#
BLH (Murung R -2014), J. Sopan S:00°39'13.8", E:114°15'39.2"		ttd	143	0.6	6.5	0.9	46.5
BLH (Murung R -2014) Bahitom, S:00°40'33.2", E:114°34'55.4"		ttd	143	1.0	6.5	0.4	46.5
BLH (Murung R -2014) Bumban, S:00°36'15.1", E:114°37'46.8"		ttd	107	1.0	6.1	0.4	73.1
BLH (Murung R -2014) M. Laung S:00°35'46.5", E:114°44'49.9"		ttd	116	1.1	6.1	1.3	56.5
Government Regulation on Quality Standard No.82 Year 2001	I	0.001	50	10	6	2	10
	II	0.002	50	10	4	3	25
	III	0.002	400	20	3	6	50
Class	IV	0.005	400	20	0	12	100

Source: Data Processing Result (2016)

Based on the monitoring/water quality measurements conducted by the environmental agency (Badan Lingkungan Hidup – BLH) of Murung Raya Regency in 2014, the average water qualities are still good/feasible enough for aquaculture activities at each measurement location, namely Batu Makap Village, Juking Sopan, Bahitom, Muara Bumban and Muara Laung, except the upstream part that detected containing 0.008 mg/l of mercury. This is because in the upstream there are gold mining activities that are using mercury to bind/catch the gold.

This fact indicates that the condition of the water of the common carp cage cultures in Murung Raya Regency, based on the water quality parameters observed, still fulfill the requirements as the location of freshwater aquacultures, although in the vicinity of these waters there are gold mining activities. In other words, the gold mining business in the Barito River water body does not pollute the locations of the common carp cage cultures in Murung Raya Regency, neither adjacent nor far from the mine sites.

Advantages of Common Carp Cage Culture Business

The production cost is the input value amount issued by each respondent (common carp aquaculture farmers). Production inputs used include seeds, feed, labor and capital cost or depreciation value of physical investments. Physical investments used to run this business include cages (karamba), floating rafts and equipment, as well as other equipment such as floating nets (hapa), bucket, scoop, and fishnets. The profit is the difference between the production value and the total production cost incurred.

Table 2. The production cost and the average profit of common carp cage culture business in Muara Supoi Village

Description	Volume		Unit Cost (IDR)	Total (IDR)
Seed	3,034	fishes	300	910,125
Feed	633	kg	7,000	4,427,500
Labor	127	hours	12,500	1,593,125
Depreciation				205,344
Total Production Cost				7,136,094
Production	422	kg	30,000	12,666,000
Net income				5,529,906

Source: Results of data processing (2016)

Table 3. The production cost and the average profit of common carp cage culture business in Muara Bumban Village

Description	Volume		Unit Cost (IDR)	Total (IDR)
Seed	3,050	fishes	300	915,000
Feed	622	kg	7,000	4,354,000
Labor	122	hours	12,500	1,527,500
Depreciation				191,875
Total Production Cost				6,988,375
Production	418	kg	30,000	12,534,000
Net income				5,545,625

Source: Results of data processing (2016)

Table 2 and 3 of this production cost are not much different. Of the total production costs incurred, the largest cost component of both sites was absorbed in feed costs, which was about 62% of the total cost. This shows that the profit from this business very much depends on the efficiency of input allocations and feed price. This is because, in the chain of commerce, the farmers as a producer only act as a price taker and not as a determinant of the price, so to raise the selling price of the fish is not easy. The average feed input allocation is 622 - 633 kg or about 155 kg per cage unit, so with an average production of 104 kg per cage unit, we get feed conversion rate of 1.5. It means, to change the weight of common carp meat as much as one kilogram required feed in the amount of 1.5 kg. In this case, the feed used was the pellet type from CP Prima brand with an average price of IDR 7,000. - per kg.

The other production cost component is the seeds, which absorbs about 13% of the total cost, at a price of IDR 300/fish. Furthermore, the labor cost absorbs about 22% of the total cost. The size of the cost of this input depends on the amount of time allocated during the business period, and this is a benefit for the farmers because the labor is not issued in real terms. This is because this business for most of them is only a secondary business (secondary effort), so in carrying out this business, they do it alone and/or assisted by their family.

Then, the depreciation cost as a fixed cost absorbs about 3% of the total cost. The size of the depreciation cost depends on the size of the value and the length of the economic life of the means used, in this case, the cages, rafts and other equipment.

Based on the data in Tables 2 and 3, the production of common carp from the resulting cages averaged 422 kg per production cycle for Muara Supoi Village and 418 kg per production cycle for the Muara Bumban Village. At the price of IDR 30,000/kg applicable at the level of farmers during the study took place, the production value of IDR 12,666,000 for the Muara Supoi Village and IDR 12,534,000 for the Muara Bumban Village. Thus, at the prevailing price, after the production value was reduced by the total production cost, the average profit from the business is IDR 5,529,906 for the Muara Supoi Village and IDR 5,545,625 for the Muara Bumban Village.

The result of the difference test of two average based on the distribution of *t*-student (Sudjana, 1992) shows that the average profit of common carp cage culture in both locations is relatively not significantly different, as shown in Table 4.

Table 4. Difference test result of average business profit common carp cage culture bussines

Analysis Components	Muara Supoi Village	Muara Bumban
Mean	5,529,906	5,545,625
Variance	8.21E+12	5.58E+12
Observations	20	5
df	23	
t Stat	0.01	
P(T<=t) two-tail	0.99	
t Criticaltwo-tail	2.07	

Source: Results of data processing (2016)

Table 4 shows that in absolute terms the average profit of the common carp cage cultures in the Muara Bumban Village adjacent to the gold mine location is relatively similar to that achieved by farmers in the Muara Supoi village which is far from the gold mine sites. This fact is reinforced by statistical test results where the value of t-count is 0.01 with a probability of 0.99, which is greater than □□0.05, which means there is no significant difference of business profit between the two locations at 95%.

Analysis of Aquaculture Business Development Strategy

The development strategy of common carp aquaculture in Murung Raya Regency was analyzed by SWOT (Rangkuti 2009) starting from the gathering of information or of potentials and problems data, as well as external factors that may support and hinder the development plan. The results of the data collection include the results of the identification of internal factors (strengths and weaknesses) and external factors (opportunities and threats) as in Table 5.

For each subsequent element data in table 5 matrices, two factors were chosen which were considered to have more urgent weight and more pressing to solve, as presented in Table 6.

Table 5. The matrix of internal and external factors in SWOT analysis

	Internal Factors		
	Strengths	*Weaknesses*	
Driving Force	The presence of extensive Barito water body Aquaculture technology is easy to master Wooden material for cages is available Labor is available	High feed prices Superior seeds are limited and expensive Community/farmers knowledge about GHP is still low Low capital access	Inhibiting Force
	External Factors		
	Opportunities	*Threats*	
	The existence of local government programs in the context of developing aquaculture businesses The development of Fish Seed Center to provide superior seeds There are coaching and counseling from relevant agencies The existence of business loans for fish farmers	The existence of gold mining activities in the river Fish Seed Center production is not yet optimal Supply of fish from outside the area High transportation costs	

Source: Results of data processing (2016)

Table 6. Evaluation of internal and external factors in problem-solving

Evaluated Factors	Weight (%)	Rating	Weight x Rating	Ranking
Internal factors				
Strengths				
Available wooden material for cages	10	4	0.4	2
Cultivation technology is easy to master	10	3	0.3	3
The existence of extensive water body	20	4	0.8	1
Labor is available	10	4	0.4	2
Total	50		1.9	
Weaknesses				
High feed prices	20	3	0.6	1
Community/ farmers knowledge about GHP is still low	10	2	0.2	2
Superior seeds are limited and expensive	10	2	0.2	2
Low capital access	10	2	0.2	2
Total	50		1.2	
Total of Internal Factors	100		3,1	
External Factor				
Opportunities				
The existence of local government programs in the context of developing aquaculture businesses	20	3	0.6	1
The development of Fish Seed Center to provide superior seeds	10	3	0.3	2
There are coaching and counseling from relevant agencies	10	2	0.2	3
The existence of business loans for fish farmers	10	2	0.2	3
Total	50		1.3	
Threats				
The existence of gold mining activities in the river	10	2	0.2	3
Fish Seed Center production is not yet optimal	10	2	0.2	3
Supply of fish from outside the area	10	4	0.4	2
High transportation costs	20	3	0.6	1
JumlahTotal	50		1.4	
Total of External Factors	100		2.7	

Source: Results of data processing (2016)

The evaluation results in Table 6 show the number of each strategy:

1. *S - O* Strategy : 1.9 + 1.3 = 3.2
2. *S - T* Strategy : 1.9 + 1.4 = 3.3 (the largest number means *S-T* strategy)
3. *W - O* Strategy: 1.2 + 1.3 = 2.5
4. *W – T* Strategy: 1.2 + 1.4 = 2.6

The result of this evaluation is not different if using a quadrant system calculation, where the subtraction result of (S) and (W) numbers 1.9 – 1.2 = 0.7 is positive (+) as the coordinate *x*; and the subtraction result of (O) and (T) numbers 1.3 – 1.4 = - 0.1 is negative (-) as the *y* coordinate; with the quadrant as follows:

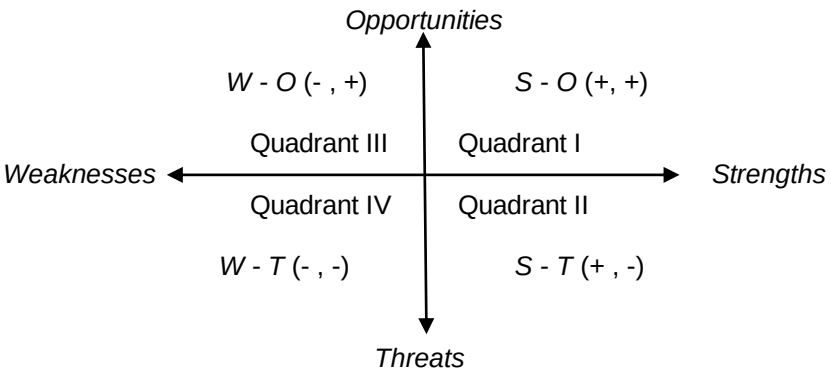

Figure 1. Quadrants of aquaculture development strategy

Figure 1 shows that in the quadrant system calculation, the development strategy of common carp cage cultures in Murung Raya Regency is in quadrant II, that is of *S - T* strategy.

Thus, the selected strategy for developing the common carp cage cultures is the strategy with the largest number, which is S - T (3.3) or the strategy in quadrant II (+, -). In this case, the strategy applied is to utilize the existing strengths such as the presence of the extensive water body, the availability of labors and wood for cages to overcome the threat, such as the high cost of transportation and the supply of fish from outside the region, and the not yet optimal production of Fish Seed Centers. The strategy then implemented by setting two alternative troubleshooting, namely (1) exploiting government aquaculture development and support programs; and (2) optimize the function of seed centers development for the provision of superior seeds, one of which is by utilizing special allocation fund from the Ministry of Marine Affairs and Fisheries.

CONCLUSIONS

1. The water condition of the common carp cage culture area in Murung Raya Regency, either adjacent or far apart from the gold mine location, is still within the required quality range, with temperature of 29.73 - 29.78ºC; 10 - 11 cm brightness; 6.58 - 6.65 water pH; 6.11 – 6.73 mg/l dissolved oxygen; 0.02 – 0.03 mg/l carbon dioxide; and 0.02 mg/l ammonia, so that the common carp cage culture in Murung Raya Regency still very feasible to cultivate.
2. The average profit of the common carp cage culture business in a location both adjacent and far apart from the gold mine location is relatively not much different, with the result of the *t* statistic test which shows that business profit in both locations is not significantly different at the 95% test level.
3. The development strategy of the common carp cage culture business in Murung Raya Regency is in quadrant II or *S - T*, which is utilizing the strengths to overcome the threats, which then implemented by setting two alternative problem solving, namely (1) utilizing the programs and supports of aquaculture development by the government; and (2) optimize the function of the seed center development for the provision of superior seeds, one of which is by utilizing Special Allocation Fund (*Dana Alokasi Khusus* - DAK) from the Ministry of Marine Affairs and Fisheries.

REFERENCES

Rangkuti, F. (2009). Creative Promotion Strategy and Case Analysis. Gramedia Pustaka Utama. Jakarta.

Sudjana (1992). Statistical Method. Publisher Tarsito. Bandung.

Suseno, D. (2002). Common Carp Fish Hatchery Business Management. PT. Penebar Swadaya. Jakarta.