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Analysis of Fishing Business in the Biosphere Reserve of Giam Siak Kecil-Bukit Batu Village, Lubuk Gaung Sub-District, Bengkalis District, Riau Province

Analisa Usaha Penangkapan Ikan di Cagar Biosfer Giam Siak Kecil-Bukit Batu Desa Lubuk Gaung Kabupaten Bengkalis Provinsi Riau

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Abstract

The Giam Siak Kecil—Bukit Batu Biosphere Reserve (GSKBB) is a UNESCO-designated protected area in Riau Province, Indonesia. Located within Bengkalis and Siak Regencies, GSKBB is renowned for its diverse ecosystems, including coastal wetlands, mangrove forests, and peatlands. To understand the economic viability of fishing activities within this biosphere reserve, a study was conducted in November 2023 in Siak Kecil District. The research focused on local fishermen using traditional fishing methods such as cast nets, lukah (traps), and hambat (scoops). Data analysis revealed that despite the environmental challenges faced by GSKBB, fishing remains a significant source of income for many local communities. The average investment made by fishermen was IDR 34,667,375, while annual revenue reached IDR 76,052,500. After accounting for costs such as fuel, equipment maintenance, and bait, fishermen realized an average profit of IDR 52,989,502 per year. The calculated revenue cost ratio (RCR) of 3.29, greater than 1, indicates a favorable financial performance for the fishing businesses in GSKBB. This suggests that the region's natural resources can sustainably provide a viable livelihood for local communities. However, it is essential to monitor the long-term sustainability of fishing practices to ensure the preservation of GSKBB's ecosystems and the continued economic well-being of its inhabitants.

Keywords: Biosphere Reserve, Business Analysis, Cast Nets, Lukah

Abstrak

Cagar Biosfer Giam Siak Kecil - Bukit Batu (GSKBB) di Provinsi Riau, Indonesia, ditetapkan oleh UNESCO pada 26 Mei 2009. Berdasarkan Proposal *Management Plan* Cagar Biosfer GSKBB, luas kawasan Cagar Biosfer GSKBB ±705.271 ha, terletak di Kabupaten Bengkalis dan Kabupaten Siak. Penelitian ini dilakukan pada bulan November 2023 di Kecamatan Siak Kecil, Kabupaten Bengkalis, Provinsi Riau. Penelitian ini memiliki dua tujuan yaitu untuk mendeskripsikan kondisi eksisting sumber daya perairan di Cagar Biosfer Giam Siak Kecil-Bukit Batu (GSKBB) dan menghitung pendapatan usaha, total biaya usaha, keuntungan serta *revenue cost ratio* (RCR) usaha penangkapan ikan di Cagar Biosfer GSKBB dengan menggunakan alat tangkap jala, lukah dan hambat. Metode penelitian ini menggunakan metode survei dengan menggunakan pendekatan deskriptif kuantitatif. Penentuan responden berdasarkan *purposive sampling* dan berjumlah sebanyak 12 responden. Pengumpulan data dilakukan dengan observasi, wawancara dan dokumentasi.

Selanjutnya data yang diperoleh dianalisis secara deskriptif dan dianalisis secara inevstasi, pendapatan, total biaya, keuntungan dan *Revenue Cost Ratio* (RCR). Hasil Penelitian para nelayan telah menjalankan kegiatan penangkapan ikan dengan tertib sesuai eksisiting yang berlaku di kawasan Cagar Biosfer GSKBB. Rata-rata total investasi yang dikeluarkan sebesar Rp 34.667.375. Rata-rata penerimaan nelayan dari usaha penangkapan ikan di Cagar Biosfer GSKBB adalah sebesar IDR 76.052.500/tahun. Untuk rata-rata total biaya usaha penangkapan ikan di Cagar Biosfer GSKBB sebesar IDR 23.062.998. Rata-rata keuntungan yang didapat oleh nelayan dari usaha penangkapan ikan di Cagar Biosfer GSKBB sebesar IDR 52.989.502/Tahun. Serta untuk rata-rata *Revenue Cost Ratio* (RCR) sebesar 3,29 dimana RCR > 1.

Kata kunci: Cagar Biosfer, Analisa usaha, Jala, Lukah,

1. Introduction

The Giam Siak Kecil-Bukit Batu Biosphere Reserve (GSKBB) in Riau Province is a conservation area designated by UNESCO on May 26, 2009. With an area of approximately 705,271 ha, this biosphere reserve is unique in the form of a wetland ecosystem with two lake complexes connected by the Siak Kecil River and Bukit Batu River. The area also includes around 105,500 ha of peat swamp forest, home to various rare species of flora and fauna (Titisari, 2018).

In addition to its conservation function, the GSKBB Biosphere Reserve is also a source of livelihood for the surrounding community, primarily through fishing activities in the biosphere reserve's core area. Most fishermen live in huts (Bagan) on the banks of the Siak Kecil River and Bukit Batu River. However, overfishing is characterized as the cause of declining fish populations, threatening the sustainability of fisheries resources in the area. Lubuk Gaung Village in Siak Kecil Sub-district is one of the villages with the most significant proportion of fishers in the waters of the GSKBB Biosphere Reserve, which is around 8.98% of the total village population (Qomar, 2017). In 2021, 32 households were working as fishermen in this village. They use traditional fishing gear such as nets, lukah, and hambat to catch local fish (BPS Bengkalis, 2021).

Although fishing is one of the primary sources of income for Lubuk Gaung Village fishermen, not many studies have analyzed the financial aspects of this activity. Business analysis is needed to determine income, costs, and profits and assess the sustainability and prospects for developing capture fisheries businesses in the GSKBB Biosphere Reserve area.

This study aims to describe the existing condition of aquatic resources in the GSKBB Biosphere Reserve and to calculate the fishing business's investment, revenue, cost, and profit using the net, lukah, and hambat fishing gear. The study results are expected to provide input for fishermen in managing their business more efficiently and for stakeholders in formulating sustainable fisheries resource management policies in the GSKBB Biosphere Reserve.

2. Material and Method

2.1. Time and Place

This research was conducted in November 2023 in Siak Kecil District, Bengkalis Regency. The research location was determined purposively, considering that fishermen comprise a substantial proportion of Lubuk Gaung Village, Siak Kecil District, Bengkalis Regency, and Riau Province.

2.2. Methods

This research uses a survey method with a quantitative descriptive approach. The survey method collects data or information on a large population using a relatively minor sample (Sugiyono, 2018). Researchers made direct observations in the field (observation) and interviewed GSKBB Biosphere Reserve fishermen from Lubuk Gaung Village. Descriptive research is conducted to determine the value of independent variables, either one or more variables, without making comparisons with other variables. Quantitative research is a research method based on the philosophy of positivism, data collection, and statistical data analysis with the aim of testing predetermined hypotheses (Sugiyono, 2018).

2.3. Procedures

The respondents in this study were fishermen of the Giam Siak Kecil-Bukit Batu Biosphere Reserve in Lubuk Gaung Village, Bengkalis Regency, Riau Province. The sampling technique used purposive sampling, which is a sampling technique with specific considerations (Sugiyono, 2018). In this study, the authors used the survey

method to determine the number of respondents, namely GSKBB Biosphere Reserve fishermen who live in Lubuk Gaung Village and fishermen who use fishing nets, lukah, and Bubu. From the survey conducted, the total number of fishermen from Lubuk Gaung Village was 61 people. The number of respondents taken were fishermen who used the three fishing gears in the form of cast nets, lukah, and hambat in Lubuk Gaung village, totaling 12 people because the three fishing gears had a high level of efficiency, were easy to use and were able to get maximum results.

2.4. Data Analysis

2.4.1. Investment

Investment is placing funds in one or more types of assets within a specific time frame to achieve greater returns. It can be known by the formula (Maulana et al., 2020).

$$TI = MT + MK$$

Description:

TI = Total investment
MT = Fixed Capital (IDR)
MK = Working Capital (IDR/trip)

2.4.2. Revenue

Income is the result of business, namely the gross results with production valued in money, then reduced by production and marketing costs to obtain net farm income (Mubyarto, 2003):

$$TR = P.Q$$

Description:

TR = Total income (IDR)
P = Total sales (kg)
Q = Selling price (IDR)

2.4.3. Total Cost

Total costs (operational costs) are all incurred due to the ongoing production process, which consists of fixed and variable costs. To find out the total cost of a fishing business using fishing nets, bubu, and splints can be calculated using the formula (Damayanti, 2017):

$$TC = TVC + TFC$$

Description:

TC = Total Cost
TVC = Total Variable Cost
TFC = Total Fixed Cost

2.4.4. Profit

Profit is obtained from the difference between revenue (TR) and total costs (TC) and written as follows (Cipta et al., 2020):

$$\pi = TR - TC$$

Description:

π = Profit
TR = Total income
TC = Total cost

With the following business criteria: If TR > TC, the business is said to be profitable; If TR = TC, then the business is said to be neither profitable nor loss-making; and If TR < TC, then the business is said to be loss-making.

2.4.5. Revenue Cost Ratio (RCR)

R/C Ratio analysis is a comparison between total revenue and total costs. The greater the R/C value, the greater the profit obtained from the business.

$$a = R/C$$

Description:

a = R/C ratio
R = Total income
C = Total cost

If the value of RCR is 1, it means that there is no profit or loss or break-even; if RCR is less than 1, it indicates that the business is not feasible to run, and if RCR > 1, then the business is feasible to run (Munawir, 2010):

3. Result and Discussion

3.1. General Description of Giam Siak Kecil-Bukit Batu Biosphere Reserve

The Giam Siak Kecil-Bukit Batu Biosphere Reserve (GSKBB) is located in Riau Province, Indonesia, and covers an area of approximately 705,271 ha. The area consists of peat swamp forest, tropical rainforest, and the rivers that cross it. The GSKBB Biosphere Reserve is home to a variety of rare and protected flora and fauna, such as Sumatran tigers, Sumatran elephants, Sumatran orangutans, Arowana fish, as well as various species of birds and reptiles. One of the distinctive features of the GSKBB Biosphere Reserve is the presence of a peat ecosystem covering an area of around 105,500 ha, which is essential for ecological balance and carbon storage. Peat forests are spread across Siak Kecil Sub-district (84,000 ha) and Bukit Batu Sub-district (21,500 ha) with depths ranging from 0.5-4 m (Titisari, 2018).

The GSKBB Biosphere Reserve also has a large water area traversed by large rivers, such as the Siak Kecil River and Bukit Batu River, which are the source of life for the surrounding community. The water area in the GSKBB Biosphere Reserve is around 99,858 ha, with a river length of 151.3 km and eight lakes. Communities in the GSKBB Biosphere Reserve area are spread across nine sub-districts in Bengkalis Regency and Siak Regency. They utilize the area for activities such as fisheries, agriculture, forestry, industry, and tourism. Most of the buffer and transition area population works as farmers and fishermen (Qomar, 2017).

The GSKBB Biosphere Reserve area has 304,327 people and nine sub-districts in Bengkalis Regency and Siak Regency. The highest community density is in Mandau District, with 104,125 people. However, most of the Mandau District area is outside the GSKBB Biosphere Reserve area, and Sungai Mandau District has the lowest community density, 6,301 people (Syah, 2017).

3.2. Existing Conditions in the GSKBB Biosphere Reserve

The Giam Siak Kecil-Bukit Batu Biosphere Reserve (GSKBB), which was designated by UNESCO in 2009, has a unique characteristic in the form of a wetland ecosystem with two lake complexes connected by the Siak Kecil River and Bukit Batu River. The existence of this lake not only enriches natural diversity but also becomes a place of interest to the local community for various business activities, including fishing by fishermen. With a water area of 99,858 ha, the GSKBB Biosphere Reserve is an essential stronghold for biodiversity and a basis for the sustainability of the fishing profession and various economic activities of the surrounding community.

Aquatic resources in the GSKBB Biosphere Reserve are managed with various mechanisms to maintain the sustainability of the environment and life in it. Some management mechanisms implemented include zoning with different levels of protection (core, buffer, transition zones), research and monitoring of aquatic ecosystems, involvement of local communities in conservation, implementation of regulations and law enforcement, environmental education, and collaboration between institutions.

Generally, fishermen's activities in the GSKBB Biosphere Reserve are regulated by rules and regulations set by the government and related agencies based on Law Number 5 of 1990 and Government Regulation Number 28 of 2011. However, there are no specific regulations yet. Some general provisions governing fishermen include the obligation to comply with zoning, the use of environmentally friendly fishing gear, the prohibition of damaging ecosystems, catch restrictions, and the protection of certain species, as well as supervision and law enforcement by the authorities.

With this existence and its implementation by fishermen, fishing activities in the GSKBB Biosphere Reserve have become better and more orderly. Although some people still violate, the responsible party can act decisively by imposing sanctions on violators. It is vital to maintain a balance between the utilization of aquatic resources and the preservation of the ecosystem of the GSKBB Biosphere Reserve for future generations.

3.3. Total Investment in Fisheries Business in the GSKBB Biosphere Reserve

Investment costs are the initial capital fishermen spend to start a fishing business in the form of money, goods, and equipment used when conducting fishing business activities (Hendrik, 2013). Fixed capital is the amount of money invested in buying fishing equipment that will not run out after one use and can be used repeatedly over a long period. Meanwhile, working capital is the operational costs incurred in fishing business activities and will run out in one use (Halim, 2022).

The average fixed capital spent by each fisherman in Lubuk Gaung Village is IDR 31,491,667/year. The most considerable fixed capital was spent on the hut of IDR. 14,666,667/year, and the smallest fixed capital spent was for the headlamp of IDR 119,167/year. Of the three fishing gears, the fishing net has the most significant fixed capital because the average use is 16 units per person, with an average fixed capital of IDR 247,500/unit. For Lukah fishing gear, the average fixed capital spent is IDR 160,833/unit, and each fisherman has an average of 13 units. The average fixed capital for handline fishing gear is IDR 2,433,333/unit; each fisherman has an average of 1 unit. For fish box and spotlight fishing gear, the average fisherman owns four fish box units and two spotlight units with a fixed capital of IDR 60,000/unit and IDR 72,083/unit.

The average working capital spent by Lubuk Gaung Village fishermen is IDR 3,175,708/month. The labor costs incurred the most were for food, drink, and cigarette consumption, amounting to IDR 1,800,000/month. Fuel

costs amounted to IDR 1,295,708/month with an average fuel consumption of 720 L per period or 117 L/month at IDR 11,000/L. This is because going from the village to the fishing location (lake) and vice versa requires 20 L. Each fisherman must pay IDR 80,000/month for electricity in the hut, which comes from a generator the local government provides.

Table 1. Total investment

No	Component	Total (IDR)
1	Fixed capital	31.491.667
2	Working capital	3.175.708
	Average (IDR/Trip)	34.667.375

The total investment invested in fishing businesses in Lubuk Gaung Village was IDR 34,667,375, with a fixed capital of IDR 31,491,667 and a working capital of IDR 3,175,708. The most significant investment cost incurred is fixed capital. This is influenced by the capital spent by fishermen to procure boats, nets, lukah, hambat, fish boxes, headlights, and huts.

3.4. Income from Fisheries Business in Lubuk Gaung Village

Income is the gross result of production valued in money, then reduced by production and marketing costs to obtain the business's net income (Mubyarto, 2013). The following is data on the fisheries' business income for Lubuk Gaung Village fishermen.

Table 2. Total Income

No	Month	Total income (IDR)			Average total (IDR)
		Tuakang *(Helostoma temminckii)*	Tapah *(Wallago leeri)*	Asian redtail catfish *(Mystus nemurus)*	
1	May	5,028,333	4,545,000	3,440,000	13,013,333
2	June	4,634,583	4,510,000	3,440,000	12,584,583
3	July	4,631,667	4,365,000	3,340,000	12,336,667
4	August	4,707,500	4,610,000	3,483,333	12,800,833
5	September	4,675,417	4,520,000	3,526,667	12,722,083
6	October	4,701,667	4,530,000	3,363,333	12,595,000
Total (IDR)		28,379,167	27,080,000	20,593,333	76,052,500

Income is defined as the gross result of production valued in money, then reduced by production and marketing costs to get net farm income. Each fisherman's average income in Lubuk Gaung Village is IDR 76,052,500/year. The most dominant catches obtained in large quantities include tuakang, Tapah, and Asian redtail catfish. These fish are caught from three fishing gear types: tancap, lukah, and hambat nets. Each Tuakang is valued at IDR 35,000/kg, tapah IDR 60,000/kg, and Asian redtail catfish IDR 40,000/kg. The average catch of tuakang is 135 kg/month, tapah fish 75 kg/month, and Asian Redtail catfish 86 kg/month. This income results from selling fish caught by fishermen to tauke or collecting traders.

3.5. Total Cost of Fishing Business

Total costs are the costs incurred by fishermen, including fixed costs plus variable costs (Sururi & Hammam, 2020). Fixed costs are incurred by fishermen whose amount does not depend on the catch, such as depreciation and maintenance (Purwaji et al., 2018). The average total depreciation cost for fishing businesses is IDR 2,788,748/year, with the most considerable depreciation cost being the hut at IDR 1,000,000 and the smallest being the fish box at IDR 25,714. Meanwhile, the average total maintenance cost is IDR 1,700,000/year, covering boat, engine, and hut maintenance. For fishing equipment such as lukah, jala, shaved, fish boxes, and headlamps, fishermen prefer to make or buy new ones rather than repair them.

The average fixed cost of fishing for fishers is IDR 4,488,748/year, which is the sum of depreciation and maintenance costs. Meanwhile, variable costs are incurred by fishermen that vary according to the amount of catch obtained. These variable costs are conditional and depend on the volume of business. The average total variable cost of Lubuk Guang Village fishermen is IDR 18,574,250/year.

Table 3. Total cost

No.	Component	Average cost (IDR/year)
1	Fixed cost	4.488.748
2	Variable cost	18.574.250
	Average total cost (IDR/Year)	23.062.998

The average cost incurred by fishermen in Lubuk Gaung Village for fishing activities amounts to IDR 23,062,998. These costs are attributed to variable expenses, which account for IDR 18,574,250. This

predominance of variable costs is primarily due to the essential nature of expenditures such as fuel and daily provisions required to sustain fishing operations.

Analysis of the total cost of the fishing business is vital to determine the total fees that fishermen must bear in carrying out their business activities. By understanding the components of fixed and variable costs, fishermen can carry out better financial planning and management and make the right decisions to optimize the profits and sustainability of fishing businesses in the Giam Siak Kecil-Bukit Batu Biosphere Reserve.

3.6. Profit from Fish Revenue Business

Profit is the excess income a business entity or individual obtains from the initial capital spent (Komaryatin & Roosdhani, 2015). The greater the profit obtained, the better the condition of the business and the more excellent the opportunity to continue and develop it. The profit obtained by fishermen from the Lubuk Gaung village fishing business is the difference between total revenue and total costs.

Table 4. Average profit

No.	Description	Total average (IDR/year)
1	Total revenue	76.052.500
2	Total cost	23.062.998
	Average profit (IDR/Year)	52.989.502

Based on the results of the study that is shown in Table 4, it is known that the average profit obtained by fishermen from the fishing business in Lubuk Gaung village from total revenue of IDR 76,052,500, deducted by total costs of IDR 23,062,998 obtained a result of IDR 52,989,502/ year. Compared to the Bengkalis Regency minimum wage in 2024, which is IDR 3,693,540, the average profit earned by fishermen is IDR 4,415,792/month, slightly above the minimum wage of Bengkalis Regency. The profits generated by fishermen from the fishing business in Lubuk Gaung Village are used to fulfill their family needs.

3.7. Revenue Cost Ratio (RCR)

Revenue Cost Ratio (RCR) is an essential indicator in assessing a business's feasibility, including fishing (Munawir, 2010). RCR is calculated by comparing total revenue with costs incurred in a certain period. The greater the RCR value, the greater the profit obtained from the business will be. Calculating the Revenue-Cost Ratio (RCR) evaluates a business's ability to generate profit over the short term (Ramadhani et al., 2021). By analyzing the RCR, business owners can gain insight into the financial health of their operations. A value greater than 1 signifies that the revenue exceeds the costs, indicating that the business is profitable and should be sustained. Conversely, an RCR value of less than 1 suggests that the business is operating at a loss, necessitating a thorough re-evaluation of its strategies, cost structures, or market conditions to improve financial viability.

Table 5. Cost revenue ratio

No.	Description	Total average (IDR/year)
1	Average total income	76.052.500
2	Average total cost	23.062.998
	Average cost-revenue ratio	3,29

Table 5 shows the RCR ratios, reflecting the revenue from selling fish catches. On average, fishing operations in the Giam Siak Kecil Bukit Batu Biosphere Reserve (GSKBB) generate an annual income of IDR 76,052,500, primarily from harvested fish sales. In contrast, the average yearly expenses for running these operations amount to IDR 23,062,998. These expenses include operational costs, such as fuel, gear maintenance, labor, and other expenses directly tied to fishing activities.

The Revenue Cost Ratio (RCR) was calculated at 3.29 by comparing average total revenue and average total cost. This RCR value, exceeding 1, suggests that the fishing enterprises in the GSKBB Biosphere Reserve are highly sustainable. For each rupiah invested in operational costs, there is a return of 3.29 in revenue. This finding underscores the potential for significant profitability for fishery operators.

The feasibility of fishing in the GSKBB Biosphere Reserve, as indicated by the RCR value, provides a positive picture of the economic potential of the fisheries sector in the area. These results also suggest that fish resources in the waters of the GSKBB Biosphere Reserve are still abundant and can be utilized sustainably with proper management. However, it is also necessary to consider aspects of ecological sustainability in fishing activities to maintain the sustainability of fish resources in the long term.

Although the RCR results show high business feasibility, efforts are still needed to maintain and improve the performance of fishing businesses in the GSKBB Biosphere Reserve. This can be done through various strategies, such as using more efficient and environmentally friendly fishing technology, improving catch quality, diversification of catch types, and broader market development. In addition, support from the government and related stakeholders is also needed in the form of conducive policies, provision of infrastructure, and mentoring and training programs for fisheries business actors

4. Conclusions

The study concludes that several regulations govern fishing activities within the GSKBB Biosphere Reserve. These include adhering to permits and guidelines, operating within designated zones, utilizing environmentally sustainable fishing gear, protecting specific species, and ensuring compliance through monitoring and law enforcement. The average investment made by fishers is IDR 34,667,375. Their average annual income from fishing in the GSKBB Biosphere Reserve is IDR 76,052,500, while the average operational costs amount to IDR 23,062,998 per year. Consequently, the average yearly profit earned by fishers is IDR 52,989,502. Furthermore, the average Revenue Cost Ratio (RCR) is 3.29, with an RCR value greater than 1 indicating a profitable operation.

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