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The Role of Cooperatives in Fishermen's Empowerment for Sustainable Fisheries Development in Konawe Regency Southeast Sulawesi Indonesia

La Nalefo[1], Yani Taufik[2], Ine Fausayana[3], Abdul Rahman Djuhasin[4]

Abstract

Fishermen's cooperatives play a pivotal role in empowering local fishing communities and advancing sustainable fisheries development. This study examines the contributions of cooperatives toward improving fishermen's welfare and supporting the long-term sustainability of the fisheries sector in Konawe Regency.Using a qualitative research approach, data were collected through interviews, observations, and document analysis involving cooperatives managing fishing facility assistance. The findings reveal that these cooperatives significantly contribute by providing access to production facilities, capital, skills development, and fishery product marketing. Furthermore, they serve as collaborative platforms that promote sustainable fishery resource management by encouraging the use of environmentally friendly fishing gear and overseeing responsible fishing practices.Despite these positive contributions, several challenges hinder the effectiveness of cooperative operations, including limited managerial capacity and restricted access to broader markets. To address these issues, robust support from the government and relevant stakeholders is critical.By strengthening the institutional and operational capacity of fishermen's cooperatives, Konawe Regency can achieve sustainable fisheries development while ensuring meaningful improvements in the livelihoods of its fishing communities.

Keywords: *Fishermen's Cooperatives, Empowerment, Sustainability, Fisheries, Konawe Regency.*

Introduction

Coastal communities frequently contend with a range of social, economic, and environmental challenges, including limited access to essential resources, inadequate education and healthcare services, as well as the adverse effects of climate change and the overexploitation of marine resources. Strengthening the capacity and self-reliance of these communities is therefore critical to fostering resilience and sustainable development. Cooperatives serve not only as economic institutions but also as agents of community empowerment by promoting capacity building and self-sufficiency. They can strengthen fishermen's bargaining power in the market, reduce operational costs, and foster collaboration in resource management and the sustainability of fisheries (MacPherson, 1979; Sanyal, 2000; Cruz-Torres, 2012).

This study aims to assess the role of cooperatives in assisting fishermen during the proposal process for fishing gear assistance, evaluate the effectiveness of such assistance in increasing fishermen's income, and examine how cooperatives manage and oversee the utilization of subsidized fishing vessels to ensure economic, social, and environmental sustainability.

[1] Agricultural Extension Departement of Halu Oleo University Kendari, Southeast Sulawesi, Indonesia, Email: la.nalefo@uho.ac.id, (Corresponding Author)
[2] Agricultural Extension Departement of Halu Oleo University Kendari, Southeast Sulawesi, Indonesia.
[3] Agribusiness Departement of Halu Oleo University, Kendari, Southeast Sulawesi, Indonesia
[4] Dinas Kelautan dan Perikanan Kabupaten Konawe, Indonesia

The Directorate General of Capture Fisheries of the Indonesian Ministry of Fisheries implemented the Fishing Equipment Assistance Program through the 1000 Vessels Program in 2016–2017. This program aimed to strengthen the national capture fisheries fleet and improve the welfare of fishing communities. The initiative was driven by various challenges faced by small-scale fishermen in Indonesia, including: (i) The use of environmentally unfriendly fishing gear that can damage ecosystems, (ii) The reliance of many small-scale fishermen on traditional fishing equipment, which is inefficient and does not meet feasibility and sustainability standards, and
(iii) Reducing fishermen's dependence on middlemen by providing direct assistance in the form of fishing gear.

Konawe Regency is one of the regions that received a fishing equipment assistance package, specifically for fishermen in Soropia and Lalonggasumeeto Districts. Previously, fishermen in these two districts primarily used simple fishing gear, such as fish traps (bubu), scoop nets (serok), and traditional fishing lines.

The proposal for assistance was submitted through a fishermen's cooperative in Konawe Regency, which successfully secured aid in 2017, receiving 3 GT Model V vessels equipped with longline fishing gear and 5 GT Model U vessels. Alfian (2014) stated that capture fisheries assistance programs for traditional fishermen can provide benefits by increasing fish catches. Furthermore, Ardianti, N. Rafidah (2019) emphasized that community participation plays a crucial role in the success of vessel and fishing gear assistance programs. Cooperatives can contribute to empowering small-scale fishermen by helping them access broader markets and adapt to changing fisheries policies (Akbar 2018).

Research Method

This study was conducted in Konawe Regency from September 2022 to February 2022, focusing on beneficiaries of 3 GT and 5 GT fishing vessels equipped with longline fishing gear. The study population consisted of 54 fishermen. The research sample included 33 respondents, comprising 3 cooperative leaders, 9 heads of fishermen groups, 18 fishermen, and 3 representatives from the Konawe Regency Fisheries Department.

The primary data collected included respondent characteristics, cooperative profiles, administrative requirements for receiving assistance, data on the types and quantities of proposed fishing equipment assistance programs, fishermen's catch volumes, types of catch, and fish selling prices. Meanwhile, secondary data comprised technical guidelines for the fishing equipment assistance program issued by the Ministry of Marine Affairs and Fisheries, the Department of Marine Affairs and Fisheries of Southeast Sulawesi Province and Konawe Regency, as well as information from previous research studies.

The collected data were described both qualitatively and quantitatively. The quantitative analysis included an investment feasibility assessment, which involved calculating the Net Present Value (NPV) and Internal Rate of Return (IRR), supplemented by an analysis of the Net Benefit-Cost (B/C) ratio. Additionally, the Revenue per Cost (R/C) ratio was also calculated.

Hansen and Mowen (2001) stated that the R/C ratio analysis indicates whether a business is profitable or unprofitable. The revenue-to-cost ratio can be calculated using the following formula:

R-C = Total Revenue / Total Cost

The higher the R/C ratio, the more efficient the capital utilization, indicating greater profitability and feasibility for further development.

Net Present Value

In addition to the **Revenue per Cost (R/C) ratio**, several other formulas are commonly used to analyze investment feasibility in fishing vessel operations, including:

1. **Net Present Value (NPV)**

$$NPV = \sum \frac{Rt - Ct}{(1 + r)^t}$$

Where:

- Rt = Revenue (income) in year t
- Ct = Cost (expenses) in year t
- r = Discount rate
- t = Time period (years)

A positive NPV indicates that the investment is profitable.

2. **Internal Rate of Return (IRR)**

$$\sum \frac{Rt - Ct}{(1+IRR)^t} = 0$$

- IRR is the discount rate that makes the NPV equal to zero.
- If IRR > the required rate of return, the investment is considered feasible.

3. **Benefit-Cost Ratio (B/C Ratio)**

$$B/C = \frac{\sum \frac{Bt}{(1+r)t}}{\sum \frac{Ct}{(1+r)t}}$$

Where:

- Bt = Benefits in year t
- Ct = Costs in year t
- r = Discount rate

If B/C > 1, the investment is considered profitable.

$$NetB/C = \frac{NPV^{(+)}}{NPV^{(-)}}$$

Net B/C

Result and Discussion

The Role of Cooperatives in Obtaining Fishing Equipment Assistance

Cooperatives play a crucial role in facilitating fishermen's groups in preparing proposals to obtain assistance packages for fishing equipment, including 5 GT and 3 GT vessels equipped with longline fishing gear. This achievement reflects the effectiveness of cooperative management. Cooperative leaders and member fishermen worked together to complete administrative requirements and provide field verification during the assessment conducted by the Konawe Regency Marine and Fisheries Department and the Southeast Sulawesi Provincial Government.

FAO (2020), in its study on the empowerment of small-scale fishermen, highlights that the effectiveness of fisheries assistance programs is largely determined by the active participation of fishing communities in planning and management. Cooperatives serve as a bridge between the government and fishermen, ensuring that the assistance provided is optimally utilized and sustainable.

Similarly, Schneider M (2018) states that fishermen’s cooperatives play a vital role in supporting fishermen during transitions caused by changes in government policies. Cooperatives function as platforms for fishermen to organize, access resources, and adapt to regulatory changes. However, the effectiveness of these cooperatives depends significantly on support from local elites and their ability to navigate complex political and economic dynamics.

The following section presents the mechanism for proposal submission carried out by the three cooperatives.

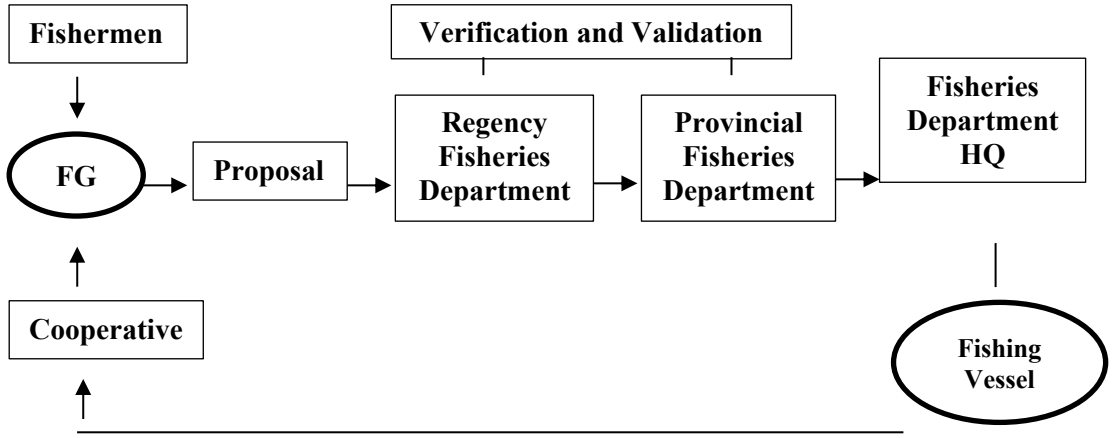

Figure 1. Scheme for Fishing Vessel Assistance Proposal

After receiving information about the 1000 Fishing Vessels Assistance Program, the Fishermen's Cooperative in Konawe Regency socialized the assistance package to local fishermen. All necessary requirements for submitting the assistance proposal were discussed through multiple Focus Group Discussions (FGDs) with fishermen's groups.

These FGDs allowed cooperative leaders and fishermen's groups to build stronger relationships, understand the technical and managerial capacities of the fishermen, and foster mutual trust. The discussions covered various aspects, including filling out the assistance application form, obtaining a Fisherman's Card, securing a recommendation letter from the village head, and signing an integrity pact. This pact outlined the fishermen's commitment to managing the assistance responsibly and their agreement not to sell the fishing equipment they would receive. The proposal was then jointly prepared with the fishermen's groups. The assistance proposal and the cooperative's integrity pact were submitted to the Head of the Konawe Regency Marine and Fisheries Department for further processing.

The completed proposal was then submitted to the Regency Fisheries Department for data verification. At this stage, the department conducted a thorough review of each cooperative's submission to ensure that the data presented in the proposal matched actual conditions.

If any errors or manipulation of fishermen's data were found, the proposal would not proceed to the Provincial Fisheries Department. However, if the errors were due to misinterpretation in proposal preparation, the Regency Fisheries Department would assist in making necessary corrections and improvements. The purpose of this verification process was to confirm the accuracy of field information and assess the capacity of fishermen's groups and cooperatives to manage the assistance effectively.

After verification, proposals from each regency were forwarded to the Provincial Fisheries Department for validation. The validation process focused on aligning the proposals with fisheries development programs in Southeast Sulawesi Province as well as national fisheries development plans. Finally, all proposals from fishermen's cooperatives across the province were submitted to the Indonesian Ministry of Fisheries for final approval and implementation.

Based on the verification and validation results conducted by the Southeast Sulawesi Marine and Fisheries Department, as stated in Letter No. 523/112/DKP/2016, the proposed recipient cooperatives for the 2016 Fishing Equipment Assistance Program in Konawe Regency included the following three cooperatives:

- Koperasi Nelayan Mandiri – Legal Entity Number 34a/BH/XXI.I/VIII/2008, dated August 14, 2008
- Koperasi Nelayan Bahari – Legal Entity Number 204/BH/DKP/III, dated March 23, 2005
- Koperasi Nelayan Tanepa – Legal Entity Number 502/BH/XX, dated September 14, 1976

No	Vessel Size (GT)	Number of Vessel		
		Koperasi Nelayan Mandiri	Koperasi Nelayan Bahari	Koperasi Nelayan Tanepa
1	20 GT	1	1	3
2	10 GT	2	2	3
3	5 GT	5	5	3
4	3GT	7	7	3
	Amount	15	15	12

Table 1. Summary of Proposals Submitted by Each Cooperative

The proposed vessel construction features a "V-shaped" hull. This model is considered suitable for the marine conditions of Sulawesi, particularly the fishing grounds of Konawe Regency, Southeast Sulawesi, which are located around the Banda Sea, an area known for relatively large waves. The V-shaped hull design is believed to enhance the vessel's ability to cut through waves, making it more capable of handling rough sea conditions in the fishing area.

The three cooperatives that submitted the proposals also followed up by establishing partnership agreements with fisheries companies operating at the Oceanic Fishing Port (PPS) in Kendari City. These fisheries companies agreed to support the cooperatives by covering operational costs that the cooperatives could not fully manage and assisting in marketing the catch.

In addition to the vessel proposals submitted by the three cooperatives, fishing gear such as gillnets, bottom longlines, and fish traps (bubu) were also proposed. However, as the program progressed, not all vessels and fishing gear requested were approved by the central government. The types and number of vessels that were approved for each cooperative are detailed in Table 2 below.

No	Vessel Size (GT)	Number of Vessel		
		Koperasi Nelayan Mandiri	Koperasi Nelayan Bahari	Koperasi Nelayan Tanepa
1.	5 GT	1 (“V”)	4 (“U”)	3 (“U) & 1 (“V”)
2.	3GT	5 (“V”)	4 (“V”)	2 (“V”)
	Amount	6	8	6

Table 2. Realization of Fishing Vessel Assistance for Each Cooperative

Based on the data presented in Table 2, it is evident that only around 50% of the proposals from each cooperative were approved by the central government. Out of 42 vessels proposed, only 20 vessels were realized—11 vessels were 3 GT with a V-shaped hull, while 9 vessels were 5 GT, of which 7 had a U-shaped hull and 2 had a V-shaped hull. The government did not approve any 10 GT or 20 GT vessels.

The assistance vessels provided were also equipped with bottom longline fishing gear made of PA monofilament ø 5 mm. The limited realization of the assistance program was due to budget constraints and considerations regarding human resources and the number of fishermen capable of operating the vessels. Each cooperative had only 30 fishermen, which influenced the government's decision on the number of vessels allocated.

The assistance vessels were managed by cooperatives and operated by cooperative member fishermen on a rotational basis. Each cooperative formed fishing groups, with five fishermen per group, where each group was responsible for managing one vessel. The cooperative leaders facilitated discussions involving all fishing groups to establish rules and regulations for vessel use. If a group failed to maintain the vessel and its equipment properly, the cooperative had the authority to reassign the vessel to another group.

The economic empowerment program for coastal communities through the provision of fishing vessels and gear aimed to:

1. Increase fisheries productivity – With better and more seaworthy vessels, fishermen could increase their catch and expand their fishing areas.

2. Improve fishermen’s welfare – Better-equipped vessels allowed fishermen to achieve more stable income, reduce the risk of maritime accidents, and enhance their families' living standards.

3. Strengthen food security – Increased fisheries production ensured greater availability of fish as a protein source for communities and reduced reliance on imported seafood.

4. Enhance the competitiveness of small-scale fishermen with environmentally friendly technology – Small-scale fishermen often struggle to compete with larger fishing fleets. This assistance aimed to enhance their capacity to compete in local and export markets using sustainable fishing technologies, such as eco-friendly fishing gear that preserves marine ecosystems and supports fish stock sustainability.

5. Support economic empowerment in coastal communities – Beyond benefiting fishermen, the vessel assistance program contributed to the coastal economy by creating jobs in related sectors, such as fish processing and fisheries logistics (Johannes 1978; Schaefer 1954; FAO 2020; Kementerian Kelautan dan Perikanan Republik Indonesia 2023).

The Role of Cooperatives in Management and Income Distribution

Schneider (2018) stated that cooperatives can strengthen the collective bargaining power of small groups, including fishermen. He highlighted how cooperatives can reduce fishermen’s dependence on middlemen, increase their income, and provide greater economic stability. Cooperatives as economic organizations with the potential to support members in enhancing their economic capacity. In the context of fishermen, cooperatives can facilitate their access to fishing technology, education, and broader markets.

The success of cooperatives in organizing fishermen to obtain fishing facilities assistance, such

as boats equipped with longline fishing gear, has proven to increase the catch of cooperative members. This is especially true for fishermen who previously fished without motorized boats, limiting them to a restricted fishing ground.

In managing these boats, the cooperative establishes agreements with fishing groups regarding operational financing mechanisms and profit-sharing arrangements between the cooperative, fishing groups, and other stakeholders, including local fish traders (juragan) who contribute to operational costs. The profit-sharing system between the cooperative, juragan, and fishermen can be outlined as follows.

Cooperative		Number of Groups	**Profit-Sharing System**							
			Boat Maintenance		Cooperative		Financier/Boss (Juragan)		Crew Members	
			Portion (%)	Value (Rp)	Portion (%)	Value(Rp)	Portion (%)	Value (Rp)	Portion (%)	Value (Rp)
1	Karya Bahari	6 Groups	7	5.766.981	15	12.357.816	20	3.295.418	58	60.965.226
		1 Group In the fishing operation, the expenses are covered by the juragan (financier).								
		5 Groups In the operation, the expenses are shared by the members who go out to sea.								
2	Nelayan Tanepa	3 Groups	7	2.814.970	15	6.333.681	0	0	78	33.075.892
		In the operation, the expenses are shared by the members who go out to sea.								
3	Sinar Nelayan Mandiri	5 Groups	7	3.564.459	15	10.693.376	20	14.257.834	58	42.773.503
		In the fishing operation, the expenses are covered by the juragan (financier).								

Table 3. Profit-Sharing System of Revenue in One Year After Deducting Operational Costs

Source: Processed primary data, 2023.

In the first year of operation of the assisted fishing boats, out of the 20 boats received by the three cooperatives, 14 boats were the focus of this study. In Karya Bahari Cooperative, six boats were studied, with operational costs for five of them covered by the cooperative and group members, while one boat was financed by a "juragan" (a local fish trader or financier). In Tanepa Cooperative, where three boats were studied, all operational costs were borne by the fishermen themselves. Meanwhile, in Sinar Nelayan Mandiri Cooperative, which had five boats under study, all operational costs were fully financed by the "juragan."

Each of the three cooperatives received 15% of the profits, plus an additional 7% allocated for boat maintenance. The *juragan* received 20% of the revenue from each boat. The remaining 58%

was distributed among the fishermen involved in fishing activities. However, in the case of Tanepa Fishermen's Cooperative, the fishermen received a larger share, amounting to 78%, as they covered the operational costs themselves without involving a *juragan*.

Of the 15% allocated to the cooperative, the funds were used for investment in additional fishing gear, procurement of new fishing equipment, boat repairs, and compensation for cooperative administrators, with the remaining amount deposited into the cooperative's cash reserves. The *juragan* played a role in financing operational costs such as fuel and fishermen's logistics. Mubyarto (1984) and FAO (2015) emphasized that fisheries cooperatives play a crucial role in supporting the economic activities of small-scale fishermen, including managing revolving funds, marketing fish catches, and procuring daily necessities at affordable prices.

Besides assisting with the operational costs of the boats, juragan also played a role in selling the catch. Most juragan also acted as fish collectors in the study area. Although juragan only received 20% of the profits from fishing activities, their primary goal was to establish cooperation in marketing the products. The profit-sharing system and role distribution among cooperative administrators, juragan, and crew members functioned well, as indicated by the absence of conflicts among them.

Suadi and Ratih Ineke (2019) stated that effective collaboration within fishing groups as both production and business units has significant implications. It enhances knowledge, skills, and access to productive resources, including capital, markets, technology, and networks. This, in turn, positively impacts the productivity of the fisheries sector.

The share received by fishermen (*ABK*) ranged from IDR 39,889,527 per year to IDR 78,842,868 per year. A 5 GT boat had a crew of 4 *ABK*, while a 3 GT boat had a crew of 3 *ABK*. Therefore, each *ABK* earned an average income from fishing activities using the subsidized boats of approximately IDR 13,296,509 to IDR 19,710,717 per year or around IDR 1,108,042 to IDR 1,642,560 per month. In addition to their fishing income, most fishermen's families also engaged in side businesses, such as farming and selling basic necessities, to supplement their household earnings.

The utilization of the boat assistance program by fishermen has helped communities maximize the potential of marine resources to increase their income. Similarly, in this study, group members who joined cooperatives were able to make use of the subsidized boats, particularly those who previously lacked adequate fishing equipment to fully leverage the capture fisheries potential in Konawe Regency.

The Role of Cooperatives in Sustaining the Utilization of the Boat Assistance Program

Cooperatives play a crucial role in ensuring the sustainability of the boat assistance program by facilitating proper management, maintaining the boats, and organizing fair distribution among fishermen. The cooperatives in Konawe Regency have implemented several strategies to ensure the long-term benefits of the program, including:

Management and Maintenance – Cooperatives regulate the use of the boats by forming fishing groups that take turns operating the vessels. They also allocate funds from their earnings for regular maintenance to keep the boats in good condition.

Financial Sustainability – A portion of the revenue generated from fishing activities is reinvested into the cooperative for future improvements, such as acquiring new fishing equipment and covering operational costs.

Fair Profit-Sharing System – The profit-sharing arrangement between cooperatives, fishing groups, and financiers (juragan) helps maintain financial stability and ensures that all parties involved benefit from the program.

Capacity Building – Cooperatives provide training and technical assistance to fishermen, improving their fishing techniques, financial management skills, and knowledge of sustainable fishing practices.

Market Access and Partnerships – By establishing partnerships with fish processing companies and local markets, cooperatives help fishermen secure stable buyers and fair prices for their catch, ensuring long-term economic viability.

Through these measures, cooperatives not only help sustain the government's boat assistance program but also enhance the livelihoods of small-scale fishermen, reduce economic dependence on middlemen, and promote sustainable fisheries management.

The cooperative plays a role in managing the aid vessels to ensure their sustainable utilization. Pratiwi (2016), based on her research findings, stated that the success of cooperatives can be viewed from two perspectives: social and economic aspects.

Furthermore, she explained that success in the social aspect is indicated by cooperation among members, willingness to provide mutual assistance, and resource utilization. Meanwhile, the economic aspect relates to increasing business capital, equitable income distribution, and the effective management of profits.

Economic Sustainability

(Mubyarto 1984) emphasized that cooperatives are a form of people's economy that play a crucial role in improving the living standards of communities, including fishermen. According to him, cooperatives can assist fishermen by providing production facilities, marketing their catch, and granting access to low-interest capital loans. Sustainability of the boat assistance program is aimed at increasing the economic income of coastal communities (fishermen). Koperasi Nelayan Bahari received 4 units of 3 GT boats and 4 units of 5 GT boats. Koperasi Tanepa received 2 units of 3 GT boats and 4 units of 5 GT boats. Meanwhile, Koperasi Sinar Nelayan Mandiri received 5 units of 3 GT boats and 1 unit of 5 GT boat.

The difference in boat sizes resulted in varying operational costs. The 5 GT boats had higher operational costs, so Koperasi Bahari was only able to operate 2 out of the 4 units, and Koperasi Tanepa operated only 1 unit. Besides the high operational costs, the "U"-shaped 5 GT boats were not suitable for waters with large waves, where a "V"-shaped hull was more appropriate. Among the 9 units of 5 GT boats, only 1 unit with a "V"-shaped hull was operated by Koperasi Tanepa.

The fishing grounds for fishermen in Koperasi Karya Bahari and Sinar Nelayan Mandiri are in the waters of Lalonggasumeeto, Labengki Island, and Sambori. Meanwhile, fishermen in Koperasi Tanepa operate in the waters of Toronipa, Saponda, and Menui Island. The distance to the fishing locations is approximately 10–30 km from the fishermen's settlements, making it relatively close and not requiring excessively high operational costs.

The results of the investment analysis calculations indicate that the NPV value of operating both 3 GT and 5 GT vessels varies across cooperatives. This is highly influenced by the vessel's weight type and hull shape. A detailed calculation of the investment analysis based on the NPV value for each cooperative is presented in Table 4 below.

No	Cooperative	Economic Sustainability	Unit	Amount	Criteris	Feasibility Criteria
1	Karya Bahari	Total Catch	Kg	2.689,20		
		Revenue	Rp	235.745.440,00		
		Income	Rp	82.385.440,00	Feasible	Positif
		R/C		1,01	Feasible	> 1
		NPV	Rp	-692933787,98		
		Net B/C		0,42	Not Feasible	< 1
2	Tanepa	Total Catch	Kg	511,3		
		Revenue	Rp	119.012.542,90		
		Income	Rp	42.224.542,90	Feasible	Positif
		R/C		1,02	Feasible	> 1
		NPV	(Rp)	-334.402.764,41	Not Feasible	(14%)
		Net B/C		0,44	Not Feasible	> 1
3	Sinar Nelayan Mandiri	Total Catch	Kg	3.330,10		
		Revenue	Rp	232.485.171,90		
		Income	Rp	71.289.171,90	Feasible	Positif
		R/C		1,30	Feasible	> 1
		NPV	(Rp)	130.915.038,34	Feasible	(14%)
		IRR	(%)	0,24	Feasible	>14 %
		Net B/C		1,01	Feasible	> 1

Table 4. Economic Sustainability Analysis of Fishing Enterprises Receiving Boat Assistance

Source: Processed primary data, 2023

Based on the results of the economic sustainability analysis of the three fishermen's cooperatives that received assistance for 3 GT and 5 GT boats, it was found that the cooperative that is economically sustainable is Sinar Nelayan Mandiri Cooperative. Sinar Nelayan Mandiri Cooperative is considered viable because all the boats operated by the fishermen are 3 GT boats with a "V" model, which is suitable for the fishing ground in terms of both operational costs and fishing range. Meanwhile, the fishing operations utilizing the assisted boats in Karya Bahari Cooperative and Tanepa Cooperative are not viable. Even though Karya Bahari Cooperative recorded the highest sales revenue among the three cooperatives that received assistance, with total annual sales reaching IDR 235,745,440, its fishing operations are not economically sustainable. This conclusion is based on the calculation of the Net Present Value (NPV), which resulted in a negative value at a 14% interest rate (bank interest), and a Net B/C ratio of less than 1.

This issue arises because Karya Bahari Cooperative operates two 5 GT boats, which have higher operational costs while fishing in the same areas as the 3 GT boats, namely the Labengki and Sambori waters. The 5 GT boats with a "U" model hull cannot move quickly in the wave conditions of Labengki and Sambori waters, requiring more fuel consumption. Additionally, the 5 GT boats are inefficient for fishing in nearshore areas, such as Soropia and Toronipa waters, because the operational costs are too high compared to the targeted fish catch. At the same time, they are also unsuitable for offshore fishing due to their relatively small size.

Since the operational costs of using 5 GT boats are significantly higher than those of 3 GT boats in the same fishing grounds, with relatively similar catch volumes, the fuel cost for 5 GT boats is twice as high. On average, a 3 GT boat consumes 30 liters of fuel per trip, whereas a 5 GT boat requires 65 liters per trip.

Tanepa Cooperative operates both 3 GT and 5 GT boats with a "V" hull design, which is suitable for the fishing ground conditions. This hull shape allows the boat to cut through waves efficiently, enabling smooth navigation. However, since the 3 GT boats operate only in the Toronipa waters, the total catch volume and fish species diversity are limited.

According to Alian et al. (2014), boat aid programs have not been effectively managed at the fisher group level, as not all traditional fishers within these groups equally benefit from the provided fishing equipment.

Social Sustainability

Social sustainability in the implementation of the fishing boat assistance program is reflected in the role of cooperatives in organizing and managing the boats to ensure equitable distribution among their members. The cooperative system allows fishers to take turns operating the boats, ensuring that all members have access to fishing opportunities. Additionally, cooperatives facilitate discussions among fishers to establish fair operational rules, including maintenance responsibilities and revenue-sharing agreements.

The social sustainability of this program is also evident in the strengthened cooperation among fishers, as well as their increased sense of responsibility in managing shared assets. According to Pratiwi (2016), the success of cooperatives can be assessed from both social and economic aspects. Social success is indicated by factors such as collaboration among members, willingness to assist each other, and optimal utilization of available resources.

Furthermore, the program has contributed to the well-being of fisher families by ensuring stable

income sources and improving their living standards. Through cooperative-led initiatives, fishers also gain access to training programs, market information, and financial assistance, enhancing their overall resilience and capacity to sustain their livelihoods in the long run.

The success of fisher cooperatives heavily depends on the ability of cooperative managers to plan, manage, and oversee various economic activities effectively. Poor or non-transparent management can lead to cooperative failure (Mubyarto 1984). Furthermore, Sutaryo (2007) stated that empowering cooperative members through skill training, increased knowledge of cooperative management, and access to new technology is a crucial aspect. Cooperative members with adequate knowledge and skills can be more effective in improving productivity and managing their catch.

Overall, during the study, there were no conflicts among fishermen or between fishermen and the cooperative. The management of the assisted fishing vessels operated smoothly, although some aspects had not yet been fully implemented. The assisted vessels were used by members who did not own private fishing boats or only had non-motorized boats. Additionally, the vessels were shared on a rotational basis among cooperative members who wished to go fishing together. Agreements facilitated by the cooperative and all fishermen regarding vessel operations were successfully implemented.

No	Cooperative	Fishing Groups Operating the Vessels	Criteria for Members Operating the Vessels	Profit-Sharing System (%)		
				Cooperative	Middleman / Financier	Crew Member
1	Karya Bahari	KUB. Mandara	- Cooperative members who do not own their own boats - - Members who want to go fishing with a larger boat than their personal one. -	15	20	60
		KUB. Meohai		15	0	80
		KUB. Mepokoaso		15	0	80
		KUB. Kerapu Tikus		15	0	75
				15	0	75
2	Tanepa	KUB. Fajar Indah		15	0	80
		KUB. Sinar Purnama		15	0	80
		KUB. Sinar Telaga		15	0	75
3	Sinar Nelayan Mandiri	KUB. Cahaya Batu Gong		15	20	60

		KUB. Sinar Purnama		15	20	60
		KUB. Bintang Laut		15	20	60
		KUB. Harmoni		15	20	60
		KUB. Tuna Medulu		15	20	60

Tabel 5. Social Sustainability

Source: Processed primary data, 2023

The profit-sharing system is also adjusted to the customary practices that have developed within the community before the arrival of the aid vessels. The common system among local fishermen states that if operational costs are covered by the boat owner (juragan), the profit-sharing ratio is 40% for the juragan and 60% for the fishermen. However, if the costs are shared among the fishermen, the profits are evenly distributed among the crew after deducting operational and maintenance costs for the boat and fishing gear.

Since the aid vessels are owned by the cooperative, the profit-sharing follows the cooperative's Articles of Association. Fishermen utilizing the aid vessels allocate 10% of their earnings to the cooperative fund and 5% for vessel maintenance or the procurement of fishing gear.

Environmental Sustainability

Coastal and marine areas have high biodiversity, and most coastal ecosystems, such as coral reefs, mangroves, and seagrass beds, are highly dependent on environmental sustainability. Unsustainable coastal management can threaten biodiversity and destroy critical habitats for many species. Johannes (1981) stated that effective conservation and management of coastal areas are essential to ensuring the sustainability of marine ecosystems and supporting the livelihoods of people who depend on coastal resources.

In general, the fishing communities in Soropia and Toronipa Districts, particularly in Toronipa Village, use simple fishing gear that does not harm the environment. The fishing gear used by cooperative member fishers includes hand lines with hook sizes 6 and 8, bottom longlines, collapsible traps, wire traps, and spears. Bottom longlines are classified as environmentally friendly fishing gear because their catch is selective in terms of size (Rahmat and Yahya, 2019). Environmentally friendly fishing methods include hand lines, longline fishing, gillnets, and purse seines. The environmental sustainability of fish traps depends on the mesh size of the net or wire. The types of traps used by fishers include wire traps with a 2 cm mesh size and collapsible traps with a 3.5 cm mesh size. These mesh sizes are intended to prevent small fish from being trapped inside.

Nevertheless, increasing community and fisher awareness of the importance of preserving coastal environmental sustainability is crucial. Environmental education programs that inform coastal communities about the significance of protecting coastal ecosystems can help foster behavioral changes that support conservation.

No	Fishing Gear Names	Hook Size	Mesh Size (Inc)	Jenis Umpan	Lokasi Penangkapan
1	Hand Line	6 and 8		Artificial Bait	Coastal Waters Column
2	Gill Net				Coastal Waters Column
3	Foldable Trap Wire Trap		3,5 2,0		Coral Reef Area Seabed Coral Reef Area Seabed
4	Spear				Coral Reef Area Seabed On the Seabed and in the Water Column
5	Bottom Longline			Artificial Bait and Small Fish	On the Seabed and in the Water Column

Table 6. Enviromental Sustainability

Source: Processed primary data, 2023

The fishing activities carried out by fishermen in the study area have adhered to regulations that consider environmental sustainability. The monitoring of fishing operations in the study area is conducted through the supervision of the fishing gear used. This monitoring is carried out periodically by the district and provincial Fisheries Department. Additionally, local communities also participate in surveillance efforts. The dominant fish species caught by fishermen are demersal fish such as grouper, coral trout, and snapper, as well as pelagic fish such as white fish, skipjack tuna, and yellowtail.

Conclusion

Cooperatives not only function as economic institutions but also serve as organizations for community empowerment. They play a crucial role in enhancing capacity, improving skills, and strengthening cooperation among fishing communities, ultimately contributing to their overall well-being.

To ensure the sustainability of community-based enterprises, agreements must be established through various stages of discussion. This process ensures that all stakeholders involved in economic activities understand and accept the agreed-upon terms. These agreements should align with existing customs and practices within the community to ensure smooth implementation.

From a technical perspective, providing fishing gear assistance must take into account the fishermen's skill levels as well as the conditions of the fishing grounds. This ensures that the equipment is suitable and can be effectively operated by the fishermen. Furthermore, government assistance programs should be complemented by technical training and involve relevant stakeholders. Facilitating negotiations between fishermen and market players is also essential to prevent market exploitation and ensure fair economic opportunities for fishermen.

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