

POLICY ANALYSIS AND EMPOWERMENT STRATEGY BASED ON DIGITAL COOPERATIVES FOR SMALL-SCALE FISHERS

Analisis Kebijakan dan Strategi Pemberdayaan Berbasis Koperasi Digital untuk
Nelayan Skala Kecil

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ABSTRACT

Small-scale fishers in Indonesia continue to face structural poverty associated with unequal access to markets, financing, information, technology, and economic institutions. The increase in national capture fisheries production has not always been accompanied by improved fisher welfare, as economic benefits within the fisheries value chain remain unevenly distributed. This study aims to identify the structural factors underlying the disempowerment of small-scale fishers, evaluate the limitations of fishers' economic institutions, and formulate an empowerment strategy through digital cooperatives. The study employs a descriptive qualitative approach using literature review and secondary data analysis. Data were obtained from documents published by Statistics Indonesia, the Ministry of Marine Affairs and Fisheries, the Ministry of Cooperatives and SMEs, and relevant scientific literature. The analysis was conducted through issue identification, secondary data synthesis, thematic triangulation, and strategy formulation. The findings show that the disempowerment of small-scale fishers is shaped by their weak bargaining position in the value chain, dependence on market intermediaries and informal financing, and the suboptimal functioning of fishers' cooperatives. Digital cooperatives can serve as an empowerment strategy by strengthening transaction recording, institutional transparency, access to price information, marketing of fish catches, and linkages with formal financial institutions. However, their success requires digital literacy, sound cooperative governance, member trust, digital infrastructure, continuous facilitation, and consistent policy support.

Keywords: Digital Cooperatives; Economic Institutions; Empowerment; Small-Scale Fishers; Value Chain.

ABSTRAK

Nelayan skala kecil di Indonesia masih menghadapi kemiskinan struktural yang berkaitan dengan ketimpangan akses terhadap pasar, pembiayaan, informasi, teknologi, dan

kelembagaan ekonomi. Peningkatan produksi perikanan tangkap nasional belum selalu diikuti oleh peningkatan kesejahteraan nelayan karena manfaat ekonomi dalam rantai nilai perikanan tidak terdistribusi secara merata. Penelitian ini bertujuan mengidentifikasi faktor-faktor penyebab ketidakberdayaan nelayan kecil secara struktural, mengevaluasi keterbatasan kelembagaan ekonomi nelayan, dan merumuskan strategi pemberdayaan melalui koperasi digital. Penelitian menggunakan pendekatan kualitatif deskriptif dengan metode studi pustaka dan analisis data sekunder. Data diperoleh dari dokumen Badan Pusat Statistik, Kementerian Kelautan dan Perikanan, Kementerian Koperasi dan UKM, serta literatur ilmiah terkait. Analisis dilakukan melalui identifikasi isu, sintesis data sekunder, triangulasi tematik, dan formulasi strategi. Hasil penelitian menunjukkan bahwa ketidakberdayaan nelayan kecil dipengaruhi oleh lemahnya posisi tawar dalam rantai nilai, ketergantungan terhadap perantara pasar dan pembiayaan informal, serta belum optimalnya fungsi koperasi nelayan. Koperasi digital dapat menjadi strategi pemberdayaan yang memperkuat pencatatan transaksi, transparansi kelembagaan, akses informasi harga, pemasaran hasil tangkapan, dan hubungan dengan lembaga pembiayaan formal. Namun, keberhasilannya membutuhkan literasi digital, tata kelola koperasi, kepercayaan anggota, infrastruktur digital, pendampingan, dan dukungan kebijakan yang konsisten.

Kata Kunci: Kelembagaan Ekonomi; Koperasi Digital; Nelayan Kecil; Pemberdayaan; Rantai Nilai.

INTRODUCTION

Small-scale fishers in Indonesia face complex and multi-layered structural challenges. Their poverty is not solely caused by low productivity but also influenced by unequal access to economic resources, information, technology, markets, and institutions. From a livelihood perspective, the vulnerability of small-scale fishers is related to access to assets, livelihood strategies, and their position within the socio-economic structure of fisheries (Allison & Ellis, 2001; Satria, 2009; Stacey et al., 2021). The socio-economic conditions of coastal communities also indicate that small-scale fishers are often in a weaker position compared to capital owners, traders, middlemen, and other actors in the fisheries chain (Ardila & Hayat, 2023).

Although national capture fisheries production has shown an increasing trend, this increase has not always been reflected in improved welfare for fishers. The Fishermen's Exchange Rate (NTN), for example, continues to fluctuate, influenced by pressures on production costs, household consumption needs, and the dynamics of catch prices (Central Statistics Agency [BPS], 2026). Thus, growth in fisheries production alone is not a sufficient indicator of success in improving fishers' welfare. Increased fisheries output must be interpreted in conjunction with the distribution of value within the fisheries economic chain, the bargaining position of fishers, and their ability to access markets and financial institutions more independently.

One of the key issues facing small-scale fishers is limited direct access to markets and formal financing. In many coastal communities, dependence on middlemen remains the dominant pattern in marketing their catch and financing fishing operations. This relationship cannot always be understood simply as entirely exploitative, as middlemen often provide capital, purchase certainty, and market access for fishers. However, this relationship can perpetuate dependency if fishers lack strong institutional alternatives for obtaining financing, price information, and market access more independently (Adhuri et al., 2016; Bassett et al., 2022; Orach et al., 2024). Weak local economic institutions, including fisherman cooperatives, further limit the ability of small-scale fishers to strengthen their bargaining position.

The government has implemented various empowerment programs to improve fishers'

welfare, including assistance with boats, fishing gear, revolving funds, training, and institutional support. However, the effectiveness of these programs still faces various obstacles, such as a top-down approach, ineffective aid distribution, weak monitoring and evaluation, and limited capacity building for local institutions. Several studies indicate that small-scale fisher empowerment programs need to be implemented more holistically, not only through assistance with production facilities, but also through capacity building, access to technology, cooperative institutions, and the involvement of local stakeholders (Ernawati, 2025; Yuliana, 2021).

In the modern context, digital transformation opens up new opportunities for the economic empowerment of fishermen. Access to digital platforms can help small business owners, including fishermen, obtain price information, expand marketing networks, improve transaction recording, and connect with financial institutions. However, digitalization cannot stand alone. Digitalization will only be meaningful if supported by trusted economic institutions, transparent governance, and the capacity of members to use technology productively. Therefore, digitalization needs to be linked to strengthening fishermen's economic institutions.

Cooperatives remain relevant as instruments for people's economic empowerment because they are based on the values of togetherness, member participation, economic democracy, and a more equitable distribution of benefits. In the context of small-scale fisheries, cooperatives can act as collective institutions to strengthen market access, financing, input procurement, business record keeping, and fishermen's bargaining position. However, many fishermen's cooperatives are not functioning optimally due to limitations in capital, management, transparency, member participation, and adaptability to market changes. Therefore, the development of digital cooperatives can be understood as an effort to combine the institutional functions of cooperatives with the opportunities of digital technology to strengthen the economic position of small-scale fishermen (García-Lorenzo et al., 2024; Gladstone et al., 2025).

Based on this description, an alternative strategy is needed that is not only technical, but also touches on institutional, social, and digital aspects. This study aims to: (1) identify the factors that cause the structural powerlessness of small-scale fishermen; (2) evaluate the limitations of fishermen's economic institutions, especially cooperatives, in supporting empowerment; and (3) formulate an empowerment strategy for small-scale fishermen through the development of digital cooperatives. This study is based on the argument that digital cooperatives can be an empowerment strategy that has the potential to strengthen fishermen's bargaining position, shorten the distribution chain, and expand access to markets and financial services, as long as they are supported by digital literacy, cooperative governance, and adequate institutional policies.

RESEARCH METHODS

This research uses a descriptive qualitative approach using library research and secondary data analysis. This approach was chosen because the problem being studied is structural and multidimensional, requiring a contextual understanding of the relationship between fisher poverty, market access, economic institutions, empowerment programs, and opportunities for digital transformation of cooperatives. Descriptive qualitative research is used to develop a systematic understanding of socio-economic phenomena based on documents, secondary data, and relevant literature, rather than to statistically test causal relationships (Moleong, 2019; Creswell & Creswell, 2018).

The data sources in this study consist of secondary data and scientific literature. Secondary data were obtained from the Central Statistics Agency (BPS), the Ministry of Maritime Affairs and Fisheries (KKP), the Ministry of Cooperatives and SMEs, as well as

policy documents related to small-scale fishers, fisheries production, fisher exchange rates, government assistance programs, cooperatives, and digital transformation. Scientific literature was obtained from books, journal articles, and research findings discussing fisher poverty, small-scale fisheries livelihoods, the fisheries value chain, the role of middlemen, cooperative institutions, coastal community empowerment, and the digital economy.

Literature selection was conducted purposively based on relevance to the research focus. Literature was selected if it addressed one of four main themes: (1) structural poverty and the livelihoods of small-scale fishers; (2) market access, financing, and the position of fishers in the fisheries value chain; (3) the effectiveness of empowerment programs and economic institutions in coastal communities; and (4) cooperatives, digitalization, and the transformation of local economic institutions. The literature used included classic conceptual references that are still relevant, such as Allison & Ellis (2001) and Satria (2009), and more recent journal articles to strengthen the contemporary context, such as Stacey et al. (2021), Bassett et al. (2022), Orach et al. (2024), García-Lorenzo et al. (2024), and Gladstone et al. (2025).

The analysis was conducted in four stages. The first stage was issue and problem identification. In this stage, researchers mapped the main problems faced by small-scale fishers, such as unequal market access, dependence on middlemen, limited access to formal financing, weak fisher cooperatives, and the limited effectiveness of government assistance programs. Issue identification was conducted by reviewing secondary data and literature discussing the socio-economic conditions of fishers, fisheries market structures, and coastal community empowerment programs.

The second stage was secondary data synthesis. Data from various sources were compiled and categorized based on dimensions of production, welfare, distribution, institutions, and policies. Data on fisheries production and the Fishermen's Exchange Rate (RET) were used to examine the relationship between increased fisheries output and fishers' welfare. Data and information on market access, cooperatives, financing, and assistance programs were used to understand structural constraints to fisher empowerment. This synthesis was conducted to identify gaps between fisheries sector growth and the economic benefits received by small-scale fishers.

The third stage was thematic triangulation. Triangulation was conducted by comparing findings from official data, policy documents, and scientific literature. For example, data on fisheries production and the fishermen's exchange rate were compared with literature on fishers' livelihoods and the fisheries value chain. Information regarding government assistance programs was compared with studies on the effectiveness of empowerment, cooperative institutions, and fishermen's dependence on market intermediaries. This triangulation aimed to ensure that conclusions were not based solely on a single data source, but were built on consistent patterns across sources.

The fourth stage was the formulation of an empowerment strategy. At this stage, the synthesis results were used to formulate a digital cooperative-based empowerment strategy. The strategy formulation was carried out by linking the structural problems of fishermen with the institutional functions of cooperatives and the opportunities of digital technology. The strategies formulated included strengthening cooperative governance, increasing digital and financial literacy, recording transactions, expanding market access, integration with financial institutions, and supporting government policies. Thus, digital cooperatives were positioned not merely as a technological solution, but as an institutional strategy to strengthen the bargaining position of small-scale fishermen in the fisheries economic chain.

RESULT

Fisheries Production and Distribution Inequality

Secondary data shows that national capture fisheries production has increased in the last decade. Based on data from the Ministry of Maritime Affairs and Fisheries (2025) used in this research, national capture fisheries production increased from around 5.42 million tons in 2011 to around 7.68 million tons in 2023. This increase shows that the capture fisheries sector continues to have an important contribution to food supply and the national economy (Figure 1). However, increasing production cannot be directly used as an indicator of increasing the welfare of small fishermen.



Figure 1. National Capture Fisheries Production Trends 2011–2023

Source: Processed from data from the Ministry of Maritime Affairs and Fisheries (2025).

One indicator frequently used to assess the economic condition of fishermen is the Fishermen's Exchange Rate (NTN). The NTN is the ratio between the price index received by fishermen and the price index paid by fishermen. Thus, the NTN indicates the exchangeability of captured fishery products for goods and services consumed by fishermen, as well as production costs incurred in fishing activities. However, conceptually, the NTN is more appropriately understood as an indicator of exchangeability or relative purchasing power, rather than as a measure of fishermen's overall welfare.

National NTN data shows a pattern that does not entirely align with increases in capture fisheries production. In 2020, the average national NTN was around 100.27. This value increased in 2021 and 2022, but then declined in 2023 and 2024, before rising again in 2025 (Table 1). This pattern indicates that increases in capture fisheries production do not automatically translate into consistent increases in fishermen's exchange rates. The NTN is influenced not only by production output, but also by the price of fish received by fishermen, production costs, prices of household consumer goods, inflation, and market dynamics at the local and national levels. Amandra et al. also show that the NTN is influenced by various economic factors, including the household consumption index of fishermen, prices, and other fisheries economic variables.

Table 1. National Fishermen's Exchange Rate (NTN) 2020–2025

Years	NTN Nasional	Interpretation notes
2020	100,27	Fishermen's purchasing power was relatively low during the pandemic; national average January–December 2020.

Years	NTN Nasional	Interpretation notes
2021	104,69	Increase compared to 2020.
2022	106,45	Increased and became the highest value in the 2020–2025 period.
2023	105,40	Down compared to 2022.
2024	101,76	Decreased quite sharply compared to 2023.
2025	103,86	It has increased again, but is still below the achievements of 2022 and 2023.

Source: 2020 from Amandra et al. (2021) based on BPS data; 2021–2025 from the KKP One Data Portal (Ministry of Maritime Affairs and Fisheries, 2025).

The table shows that the National Net Price Index (NTN) remained above 100 throughout the 2020–2025 period, but fluctuated. A value above 100 indicates that the price index received by fishers is higher than the price index paid by fishers. However, this does not automatically mean that fishers are prosperous. The NTN does not directly capture income distribution within fisher households, asset ownership, market access, debt relations with traders or middlemen, job quality, seasonal vulnerability, job safety, or business sustainability. Therefore, the NTN should be understood as one indicator of fishers' economic well-being, not as a sole measure of well-being.

Literature findings support this understanding. Studies on the livelihoods of small-scale fishers indicate that fisher welfare is determined not only by catch yields, but also by access to assets, markets, technology, financing, economic institutions, and position within the fisheries value chain (Allison & Ellis, 2001; Satria, 2009; Stacey et al., 2021). In the Indonesian context, the increased economic value of fisheries may be less felt by small-scale fishers if they remain primary producers with limited market access and a weak bargaining position in the value chain (Adhuri et al., 2016).

Thus, the synthesis results indicate a gap between increased production and the distribution of economic benefits. Fisheries production may increase, but the benefits of this increase do not always flow proportionally to small-scale fishers. The NTN helps demonstrate the dynamics of fishers' exchange power, but it is insufficient to fully explain fishers' welfare if not interpreted in conjunction with other indicators, such as net income, operating costs, market access, access to financing, asset ownership, dependence on intermediaries, and the strength of local economic institutions. Therefore, the issue of fishers' welfare needs to be viewed not only as a matter of productivity, but also as a matter of market structure, value distribution, bargaining power, and economic institutions.

Evaluation of Government Assistance Programs

The government has implemented various assistance programs to improve the welfare of fishermen, including assistance with boats, fishing gear, machinery, revolving funds, training, and institutional strengthening programs. Literature synthesis indicates that this assistance can help fishermen, particularly in providing production facilities, increasing fishing capacity, and reducing some business costs. However, various case studies also demonstrate that the success of assistance cannot be judged solely by the number of packages distributed. The effectiveness of assistance is greatly influenced by targeting accuracy, the suitability of the assistance to fishermen's needs, the quality of recipient data collection, transparency of selection mechanisms, sustainable asset utilization, and post-aid monitoring and evaluation. This is evident in studies by Tuhumena et al. (2022) in Ambon City, Utari (2021) in Sebong Lagoi Village, Fahiya and Nasir (2022) in Muara Badak Ilir, and Putri et al. (2021) in Kuala Jambi

District.

Several studies indicate that physical assistance, such as boats and fishing gear, can provide direct benefits to fishermen if it aligns with the needs of their fishing business. Fahiya and Nasir (2022) evaluated the assistance provided by boats and fishing gear to fishermen in Muara Badak Ilir Village and showed that the program was aimed at supporting fishermen's business activities, although implementation still faced challenges. Putri et al. (2021), in a study of gillnet fishing gear assistance in Kuala Jambi District, also considered the impact of assistance on fishermen's income as an evaluation measure, so that assistance was not merely seen as an asset that had been distributed, but as an instrument that should impact the fishermen's household economy. Utari (2021) also showed that the assistance program for fishermen in Secong Lagoi Village was running, but was not yet optimal and had not fully achieved the expected results.

On the other hand, various studies indicate that physical assistance is often insufficient to generate sustainable empowerment. Ernawati (2025) noted that small-scale fishermen still face unequal access to resources, limited market access, lack of access to modern technology, and challenges in implementing empowerment programs. The study recommended improving access to technology, technical skills training, developing fishermen's cooperatives, and utilizing digital technology for marketing. These findings align with Yuliana (2021), who emphasized that improving the welfare of coastal communities requires socio-cultural transformation, increased knowledge of fishermen, sustainable development, economic management of fishermen, and government policy support. Therefore, government assistance is insufficient if it focuses solely on the distribution of vessels, fishing gear, or production facilities; it must be linked to capacity building, institutional strengthening, and changes in the way fishermen manage their businesses.

The issue of aid delivery mechanisms has also been a key theme in several studies. Tuhumena et al. (2022) noted that total capture fisheries assistance in Ambon City from 2013–2016 reached IDR 32,984,000,000, consisting of 44 1.5 GT trolling rods, 6 15 GT purse seine vessels, and 3 30 GT purse seine vessels spread across five sub-districts. The same study indicated that the Maluku Provincial Marine Affairs and Fisheries Department still lacks data on the success rate of aid policies and has not conducted an in-depth evaluation of the impact of aid on fishermen. Based on respondents' assessments, the mechanism for providing and managing 1.5 GT trolling rods in Ambon City was deemed "not yet good" by 28 respondents, or approximately 64%, while 16 respondents, or approximately 36%, rated it "good." Issues identified included interference by certain parties in obtaining aid and suboptimal initial data collection. These findings align with Utari (2021), who noted that the fisherman assistance program is operational but not yet optimal due to ongoing management and oversight challenges.

A synthesis of these various studies shows that government assistance to fishermen has had mixed results. On the one hand, assistance with boats, fishing gear, and production facilities can help fishermen increase their fishing capacity and improve their chances of obtaining a catch. On the other hand, such assistance may not necessarily improve fishermen's bargaining position if it is not accompanied by institutional strengthening, market access, access to financing, business mentoring, and a post-assistance evaluation system. A study by Tuhumena et al. (2022) emphasized the importance of selection, data collection, and monitoring mechanisms; Utari (2021) showed that assistance implementation can be effective but is not yet optimal; Fahiya and Nasir (2022) highlighted the need to address obstacles to program implementation; while Ernawati (2025) and Yuliana (2021) emphasized that fisherman empowerment must encompass social, economic, technological, institutional, and ongoing development aspects.

Thus, fisherman assistance programs should not be understood solely as asset distribution activities, but as part of a broader institutional empowerment strategy. Assistance with boats, fishing gear, machinery, or revolving funds remains important, but must be integrated with strengthening cooperatives, financial literacy, digital literacy, business record-keeping, collective marketing, access to formal financing, and monitoring and evaluation that assesses changes in fishermen's welfare and bargaining position. This approach better aligns with the nature of small-scale fishers' problems, which are not only related to limited production facilities but also to market access, economic institutions, business management skills, and dependency relationships within the fisheries value chain.

Table 2. Synthesis of study findings on fisher assistance and empowerment programs

Studi	Location/focus of study	Main findings	Implications for empowering fishermen
Tuhumena et al., (2022)	Ambon City; mechanism for providing and managing capture fisheries aid packages	Capture fisheries aid has been distributed in large quantities, but the Ministry of Marine Affairs and Fisheries still lacks data on success rates and has not conducted in-depth evaluations. Approximately 64% of respondents assessed that the mechanisms for providing and managing aid were inadequate.	Selection, data collection, transparency and monitoring mechanisms need to be strengthened so that assistance truly supports the empowerment of fishermen.
Utari, (2021)	Sebong Lagoi Village, Bintan; evaluation of the fishermen assistance program	The fishermen assistance program is already running, but it is not yet optimal and has not yet fully achieved the expected results.	Assistance needs to be accompanied by monitoring, asset management and local policies so that the benefits are sustainable.
Fahiya & Nasir, (2022)	Muara Badak Ilir Village, Kutai Kartanegara; assistance with boats and fishing gear	Assistance with boats and fishing gear is aimed at supporting fishermen's businesses, but program implementation still faces obstacles.	Physical assistance needs to be accompanied by strengthening recipient groups, mentoring, and evaluation of asset utilization.
Putri et al., (2021)	Kuala Jambi District: Impact of gillnet fishing gear assistance on fishermen's income	Evaluation of aid is directed at changes in the income of fishermen receiving aid, not just the amount of fishing gear distributed.	The success of assistance needs to be measured by the economic impact on fishermen, including income and business sustainability.
Ernawati (2025)	Empowerment of small fishermen;	Small-scale fishers face unequal access to resources, markets,	Assistance needs to be integrated with capacity

Studi	Location/focus of study	Main findings	Implications for empowering fishermen
	access to technology, markets, and cooperatives	technology, and program implementation constraints. Recommendations include training, cooperative development, and digital marketing.	building, strengthening cooperatives, technology access, and digital marketing.
Yuliana, (2021)	Socio-cultural dynamics of coastal communities	Improving the welfare of fishermen requires socio-cultural transformation, increased knowledge, continuous development, and policy support.	Physical assistance needs to be supplemented by strengthening socio-cultural, business management, knowledge and local institutions.
General synthesis	Assistance with boats, fishing gear, machinery, revolving funds, training and institutions	Assistance can help production capacity, but it will not necessarily improve fishermen's bargaining position if it is not accompanied by market access, formal financing, and strong economic institutions.	Aid programs need to be positioned as part of an institutional empowerment strategy: cooperatives, financial literacy, digital literacy, collective marketing, and post-aid evaluation.

Economic Inequality and Structural Disempowerment

The results of the literature synthesis indicate that small-scale fishers are in a relatively weak position within the fisheries economic structure. This weakness manifests itself in several forms, including limited access to formal markets, dependence on middlemen or brokers, limited access to formal financial institutions, and weak local economic institutions such as fishermen's cooperatives. This situation indicates that the powerlessness of fishers occurs not only at the individual level but also at the structural level.

In many coastal communities, middlemen or brokers act not only as buyers of the catch but also as providers of operating capital, informal lenders, and liaisons between fishermen and markets. Ardila and Hayat (2023), in their study of the coastal community of Karangantu, demonstrated that the socio-economic structure of coastal communities includes strata such as fishing leaders, bosses or brokers, boat owners, and fishing laborers. They also demonstrated that natural factors, infrastructure, capital, policies, and market prices influence the economic life of coastal communities.

The relationship between fishers and middlemen needs to be carefully understood. On the one hand, middlemen can assist fishers by providing capital, purchasing certainty, and market access. On the other hand, excessive dependence on middlemen can weaken fishermen's bargaining position because they lack alternative financing and marketing options. Literature on small-scale fisheries supply chains indicates that intermediaries play a crucial role in maintaining product flow and liquidity, but they can also perpetuate dependency relationships when fishermen lack access to stronger institutions (Bassett et al., 2022; Orach et al., 2024). The weaknesses of fishermen's cooperatives exacerbate this situation. Cooperatives, which should serve as collective platforms for strengthening marketing, financing, and benefit

distribution, often do not function optimally. Common obstacles include limited capital, management, transparency, member participation, transaction recording, and organizational capacity. As a result, cooperatives are unable to provide a strong alternative to the informal marketing and financing systems currently dominated by intermediaries.

Thus, the results of this synthesis indicate that the powerlessness of small-scale fishermen is structural. Fishermen not only face limited capital or technology but also find themselves in market relationships that limit their ability to determine prices, obtain formal financing, and maximize the added value of their catch. Therefore, empowerment strategies need to be directed at strengthening economic institutions that can improve market access, financing, information, and fishermen's bargaining position.

Table 3. Small-Scale Fishermen's Access to Markets and Financial Institutions

Forms of inequality of access	Literature synthesis findings	Implications for small-scale fishermen
Market access	Many fishermen still depend on middlemen or intermediaries	Low price bargaining position and limited direct market access
Access to financing	Operational financing is often obtained from informal sources.	Economic dependence on local capital providers
Cooperative institutions	Cooperatives are not always active and are not yet managerially strong.	Collective alternatives to middlemen have not yet been formed
Price and market information	Market information is not always easily accessible to fishermen	Fishermen find it difficult to determine a more profitable sales strategy.

Digital Cooperative-Based Empowerment Strategy

Based on a synthesis of data and literature, digital cooperatives can be formulated as an alternative strategy for empowering small-scale fishers. This strategy stems from two primary needs. First, fishers require collective economic institutions capable of strengthening their bargaining position in marketing, financing, and managing their catch. Second, fishers need access to digital technology to improve market information, transaction recording, institutional transparency, and connections with financing institutions or buyers.

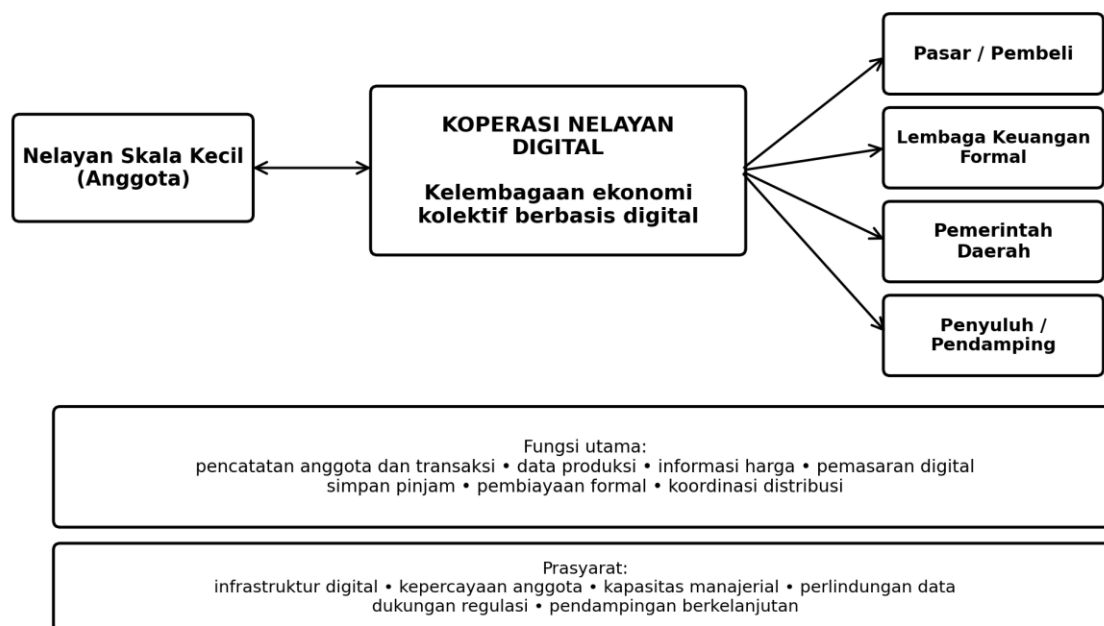
Digital cooperatives do not simply mean the use of online applications or platforms. They should be understood as strengthening cooperative institutions with the support of digital technology. Their primary functions include member registration, transaction recording, production data collection, price information, catch marketing, savings and loan management, access to formal financing, and distribution coordination. With these functions, digital cooperatives can help reduce fishers' dependence on a single intermediary and open up broader marketing options.

Literature on the social economy and solidarity in small-scale fisheries indicates that collective institutions can strengthen the position of small-scale producers if managed participatory and oriented towards a more equitable distribution of benefits (García-Lorenzo et al., 2024). Meanwhile, studies on collective governance in small-scale fisheries indicate that fisher organizations can influence a community's adaptive capacity, access, and ability to cope with socio-economic changes (Gladstone et al., 2025). Therefore, digital cooperatives need to be positioned as an institutional strategy, not merely a technological one.

The synthesis of these findings reveals four main components of a digital cooperative strategy. First, transforming fisher cooperatives into institutions with a more transparent system for recording members, transactions, and business activities. Second, strengthening the capacity of cooperative administrators and members in governance, financial literacy, digital literacy, and business management. Third, developing a digital marketing function to expand market access and improve price information. Fourth, integrating cooperatives with formal financial institutions, local governments, and market partners so that cooperatives serve not merely as administrative platforms but as truly economic institutions for fishermen.

However, a digital cooperative strategy cannot be considered a single solution. Its implementation requires prerequisites, such as the availability of digital infrastructure, member trust in the cooperative, managerial capacity, data protection, regulatory support, and ongoing mentoring. Without these prerequisites, digitalization risks becoming merely a change in administrative form without improving fishermen's bargaining position. Therefore, the development of digital cooperatives must be placed as part of the institutional transformation of the small fishermen's economy.

Model Konseptual Koperasi Digital untuk Nelayan Skala Kecil



Sumber: Sintesis penulis.

Figure 2. Conceptual Model of Digital Cooperatives for Small-Scale Fishermen

Figure 2 depicts digital cooperatives as collective economic institutions that connect small-scale fishers with markets, formal financial institutions, local governments, and facilitators. Through member registration, transactions, production data, price information, digital marketing, savings and loans, and distribution coordination, digital cooperatives have the potential to strengthen fishermen's bargaining position in the fisheries value chain. However, this model can only be successful if supported by digital infrastructure, member trust, managerial capacity, data protection, regulatory support, and ongoing support. Therefore, digital cooperatives must be positioned as a strategy to strengthen fishermen's economic institutions, not simply the use of digital technology.

DISCUSSION

Fisheries Production and Fishermen's Welfare Inequality

The synthesis results show that increasing national capture fisheries production has not automatically improved the welfare of small-scale fishers. This situation demonstrates that fishers' problems cannot be interpreted solely from the production perspective. Within the fisheries economic structure, increased catch volume can increase the sector's economic value, but the benefits are not necessarily received proportionally by fishers as primary producers. Therefore, increased production needs to be analyzed along with the distribution of value, operating costs, market access, and fishermen's bargaining position within the fisheries economic chain.

The fluctuating Fishermen's Exchange Rate (NTN), which hovers around 100, indicates that fishermen's income is often only sufficient to cover consumption needs and production costs. This indicates that increased production does not always result in increased purchasing power. From a livelihood perspective, fishers' welfare is influenced by access to assets, capital, markets, information, and institutions, not solely by catch volume (Allison & Ellis, 2001; Satria, 2009; Stacey et al., 2021). Therefore, policies to increase fisheries production need to be accompanied by strategies that improve fishermen's access to markets, financing, price information, and economic institutions.

This situation aligns with studies of the fisheries value chain, which show that small-scale fishers are often in the weakest position in the distribution system. They bear high production risks, such as weather, fuel costs, seasonal changes, and uncertainty about catches, but do not always have the ability to determine selling prices. In the Indonesian context, opportunities to improve the welfare of small-scale fishers are strongly influenced by their ability to gain better market access and move up the fisheries value chain (Adhuri et al., 2016). More broadly, studies of small-scale fisheries markets also show that weak market access can limit business sustainability and value-added opportunities for small-scale fishers (Penca et al., 2021). Therefore, increasing production without improving market structures will only result in sectoral growth that does not necessarily have a direct impact on fishing households.

These findings reinforce the importance of an empowerment approach that goes beyond increasing output. Fishermen's empowerment must be directed at changing the structure of economic relations that determine who derives the greatest benefits from fishing activities. Therefore, indicators of the success of the fishermen's program should not only include the amount of assistance, increased production, or additional fishing equipment, but also improved bargaining position, increased market access, reduced dependence on informal financing, and increased local institutional capacity in managing the economic value of fisheries.

Effectiveness of Government Assistance Programs

Various government assistance programs have played a role in supporting small-scale fishers, primarily through the provision of fishing gear, boats, training, revolving funds, and institutional support. However, the synthesis of these programs suggests that physical asset-based assistance is insufficient to address structural issues in fishers. Assistance with fishing gear or boats can increase production capacity in the short term, but its impact on welfare will be limited if fishers remain dependent on middlemen, lack direct market access, and are not supported by strong economic institutions.

The limited effectiveness of aid programs is also related to their often top-down design. Programs designed without adequately understanding local needs risk not being appropriate to the conditions of recipient fishers. Ernawati (2025) demonstrated that empowering small-scale fishers faces challenges such as unequal access to resources, limited technology, limited market access, and obstacles to program implementation. The study also emphasized the need for

technical training, the development of fisher cooperatives, the use of digital technology for marketing, and the involvement of various stakeholders in the empowerment process.

Another problem is weak monitoring and evaluation. Government assistance is often assessed based on program distribution, rather than on the sustainability of benefits after the assistance is received. In fact, empowerment programs should not stop at asset distribution, but should continue with mentoring, capacity building, and evaluating whether the assistance truly improves the economic position of fishermen. Without institutional support, physical assistance can be a short-term intervention that does not change fishermen's dependence on market intermediaries and informal financing sources.

Yuliana (2021) emphasizes that improving the welfare of coastal communities requires socio-cultural transformation, increased knowledge of fishermen, ongoing development, and government policy support. This demonstrates that empowering fishermen is not simply about providing tools, but also a process of building social, managerial, and institutional capacity. Thus, the effectiveness of assistance programs is largely determined by the extent to which they strengthen fishermen's ability to manage their businesses, access markets, work collectively, and reduce dependence on actors who currently control capital flows and distribution.

Therefore, policies on assistance to fishermen need to shift from an asset distribution approach to a systems strengthening approach. Assistance in the form of fishing gear, boats, or revolving funds can still be provided, but must be integrated with strengthening cooperatives, business management training, financial literacy, market access, and transaction recording systems. In this way, government assistance not only increases production capacity but also strengthens fishermen's position in the fisheries economic chain.

Inequality in the Fisheries Economic Structure

Fishermen's dependence on middlemen indicates an imbalance in the economic structure within the fisheries chain. Middlemen not only serve as fish buyers but also often serve as capital providers, lenders, market intermediaries, and guarantors of catch purchases. In situations where fishers lack access to formal financial institutions and direct markets, the presence of middlemen is part of the economic mechanism that helps them maintain their businesses. However, this relationship can also perpetuate dependency, as fishers have few options in determining capital sources and marketing channels.

A study of the coastal communities of Karangantu revealed a socio-economic structure that differentiates fisher leaders, bosses or middlemen, fisherman boat owners, and fisher laborers. Natural factors, infrastructure, capital, policies, and market prices also influence the economic life of coastal communities (Ardila & Hayat, 2023). This finding is important because it demonstrates that fishers do not operate on an equal economic level. Some actors have greater access to capital, market networks, and price information, while small-scale fishers often have a lower bargaining position.

The relationship between fishers and market intermediaries requires careful understanding. Small-scale fisheries supply chain literature shows that traders and intermediaries can provide liquidity, streamline product flow, and help fishers navigate market uncertainty. However, these relationships can also be a source of vulnerability if there are no institutional alternatives that enable fishers to obtain capital and sell their catch more independently (Bassett et al., 2022; Orach et al., 2024). Thus, the primary problem is not simply the presence of middlemen, but rather the lack of equitable economic options for small-scale fishers.

The weakness of fishers' cooperatives exacerbates this inequality. Cooperatives should be a collective platform for strengthening bargaining power, managing marketing, providing

financing, and improving the distribution of economic benefits. However, many fishers' cooperatives are not functioning optimally due to limitations in capital, management, transparency, member participation, and organizational capacity. As a result, cooperatives are unable to provide a strong alternative to long-entrenched informal financing and marketing systems.

The imbalance in the fisheries economic structure is also related to limited information. Small-scale fishers often lack adequate access to information on prices, market demand, product quality, or alternative buyers. When market information is controlled by intermediaries, fishers struggle to determine more profitable sales strategies. This situation weakens fishermen's position in price negotiations and limits opportunities to gain added value.

Thus, the powerlessness of small-scale fishermen is a structural problem. Fishermen not only lack capital or technology, but also exist within an economic system that limits access to markets, financing, information, and institutions. Therefore, empowerment strategies must be directed at expanding fishermen's economic options. These options can be built through functioning cooperatives, access to formal financing, more transparent price information, collective marketing, and digital technology support.

Digital Cooperatives as an Alternative Empowerment Strategy

Digital cooperatives can be an alternative empowerment strategy because they combine two key needs of small-scale fishers: strengthening collective institutions and utilizing digital technology. Cooperatives provide an organizational basis for collective action, while digital technology can help improve record-keeping, transparency, access to information, marketing, and relationships with financial institutions. Therefore, digital cooperatives should not be understood simply as applications or platforms, but as a transformation of cooperative institutions to better address market, capital, and value distribution issues in the fisheries economy.

As collective institutions, cooperatives can strengthen fishermen's bargaining position through product pooling, joint input purchasing, collective marketing, transaction recording, and the provision of internal financial services. From a social and solidarity economy perspective, cooperatives and other collective organizations can help small-scale producers strengthen economic solidarity, improve benefit distribution, and reduce market inequality (García-Lorenzo et al., 2024). In small-scale fisheries, collective institutions are also crucial because fishers face risks that cannot be borne individually, such as catch fluctuations, price changes, operating costs, and weather uncertainty.

Digitalization can strengthen the function of these cooperatives. Digital recording of members and transactions can increase the transparency and accountability of cooperatives. Price and market demand information can help fishermen make better sales decisions. Marketing platforms can open access to a wider range of buyers, including end consumers, wholesalers, restaurants, or online marketplaces. Meanwhile, business records and transaction histories can serve as the basis for expanding fishermen's access to formal financing institutions.

However, digital cooperatives should not be treated as a single solution that automatically solves fishermen's problems. Key barriers to their implementation include fishermen's digital literacy, the quality of cooperative governance, member trust, internet network availability, data management capabilities, transaction security, and policy support. Without these prerequisites, digitalization risks merely transferring cooperative administration to a digital format without improving the economic relations that weaken fishermen.

Furthermore, digital cooperative strategies need to avoid a top-down approach. Digital cooperative development must be built on the real needs of fishermen and local capacity.

Fishermen need to be involved from the planning stage, not just as end-users of applications. Mentoring is also needed to ensure that the introduced technology is truly understood, used, and trusted by cooperative members. Thus, digital cooperatives must be positioned as a process of institutional empowerment, not simply a technological innovation.

Digital cooperative strategies also need to be linked to regional and central government policies. The government can support this by providing digital infrastructure, digital and financial literacy training, facilitating market partnerships, providing access to financing, and providing regulations that protect fishermen's data and transactions. Universities and supporting institutions can play a role in capacity building, developing business models, and evaluating institutions. Meanwhile, the private sector can be involved as a market partner or technology provider, as long as such collaboration does not create new dependencies that are detrimental to fishermen.

Thus, digital cooperatives can be a promising empowerment strategy when placed within the framework of transforming fishermen's economic institutions. The goal is not simply to create "app-based" cooperatives, but to build collective economic institutions capable of expanding market access, improving transparency, strengthening bargaining power, and ensuring that the economic benefits of fisheries reach more small-scale fishermen.

CONCLUSION

The poverty and powerlessness of small-scale fishers is a structural problem caused not only by low fishing productivity but also by unequal access to markets, capital, information, technology, and economic institutions. Increases in national capture fisheries production have not always been accompanied by improvements in fishers' welfare because the economic benefits of the fisheries sector are not distributed evenly. Small-scale fishers remain in a weak bargaining position in the fisheries value chain, especially when access to markets and financing remains dependent on intermediaries or informal sources.

The limitations of economic institutions for fishers, particularly cooperatives, are one factor reinforcing this dependency. Fishermen's cooperatives should be able to serve as collective platforms to strengthen market access, financing, input procurement, business records, and the distribution of economic benefits. However, in practice, many cooperatives do not function optimally due to limitations in capital, management, transparency, member participation, and organizational capacity. This situation prevents cooperatives from becoming a strong institutional alternative to the informal marketing and financing systems that have both supported and limited the position of fishers.

Empowerment strategies through digital cooperatives can be an alternative to strengthen the economic position of small-scale fishers. Digital cooperatives have the potential to integrate cooperative institutional functions with digital technology to improve transaction recording, transparency, access to price information, catch marketing, and relationships with formal financial institutions. However, digital cooperatives cannot be understood as a purely technological solution. Their success requires digital and financial literacy, good cooperative governance, member trust, digital infrastructure, ongoing mentoring, and policy support from the central and regional governments. Therefore, digital cooperatives need to be positioned as part of the institutional transformation of the fishing economy, not simply the use of digital applications or platforms.

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