

Empowering Communities in Sustainable Fishing Port Management: An Insight from Pondok Dadap Sendang Biru, Indonesia



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ABSTRACT

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The fishing port of Pantai Pondok Dadap Sendang Biru, located in the coastal area of South Malang, East Java Province, Indonesia, serves as an essential hub for sustainable fish management and the primary livelihood source for the local community. This study identifies fish distribution patterns as a crucial aspect of effectively channeling products from fishermen to markets. We adopted a qualitative method for data analysis, utilizing the approach proposed by Miles and Huberman, which encompasses three main activities: data reduction, display, and conclusion drawing. Data reduction involves sorting through data to isolate the most relevant and significant information. The data were subsequently displayed in matrices, graphs, and categorical trees to facilitate a more straightforward analysis. Conclusions were drawn once the data were organized to highlight specific themes and patterns. For qualitative data, we used a Likert scale to gauge the attitudes, opinions, and perceptions of individuals or groups. Our findings reveal three primary distribution channels at the port: The first channel includes fishermen, distributors, and seafood processing companies; the second channel comprises fishermen, Kios Ikan Nelayan, and buyers; the third channel consists of fishermen, Kios Ikan Nelayan, and market sellers. Our results not only provide a framework for the sustainable management of the port but also offer an in-depth understanding of the fish distribution dynamics, which fishermen and port managers can utilize to enhance the productivity and sustainability of their fishing enterprises. Thus, this study contributes to the development of best practices in fisheries resource management and the empowerment of fishing communities in Indonesia.

1. INTRODUCTION

Fishing ports are crucial for the fishing industry as they are the primary locations for the loading, unloading, processing, and distributing of fish products. Successful management of fishing ports significantly affects the sustainability and profitability of the fishing industry in a region. Within this context, the successful management of fishing ports impacts both port operations and the wealth of the surrounding community. Kim [1] demonstrates that sustainable fishing port management can enhance the economic and social potential of coastal communities, ultimately leading to increased wealth. Therefore, our study integrates the concept of community empowerment into its analysis with the premise that the active participation of local communities is key to advancing sustainable and inclusive fishing port practices.

This strategic role spurs the development of the fishing port industry not only on a local scale but also on regional and global levels [2]. Indonesia's Central Bureau of Statistics reports that 69% of the country's fishing ports have a Fish Auction Place. These ports facilitate fish distribution and boost the local economy, including the fishing port of Pantai Pondok

Dadap Sendang Biru (PPP Pondok Dadap) in Malang Regency, East Java Province, Indonesia. PPP Pondok Dadap is a crucial node in the national fish distribution channel and epitomizes the country's efforts toward sustainable development and economic improvement through marine resources [2]. Specifically planned and developed to optimize fishery potential, particularly for tuna as one of the primary marine products in the area, PPP Pondok Dadap serves as the main location for local fishermen to unload fish and as a center for processing and distributing fish to both domestic and international markets.

PPP Pondok Dadap boasts infrastructure adequate for large-scale fishing activities, including mooring and loading facilities, a modern Fish Auction Place, and fish processing and storage facilities designed to maintain the quality of fish products [3]. Efficient and progressive management at PPP Pondok Dadap ensures that perishable fish products are distributed quickly and efficiently while preserving the quality and freshness of the products until they reach the consumers.

Apart from its operational role, PPP Pondok Dadap also contributes to the social welfare of the local fishing community. The port serves as a source of employment and

income for many families, and its successful management has a direct impact on the local economy. However, recent data from the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia indicates a decline in production, highlighting an urgent need for the evaluation and improvement of port management. This issue is consistent with previous studies calling for enhancements in the management of fishing ports in Indonesia [4]. Some fishermen face challenges accessing fishing ports and efficient loading services [5], and there is a recognized need for effective fishing port management [6]. This entails strengthening port capacity to address distribution challenges and expanding market access for catches, which will support the sector's sustainability and elevate the standard of living for fishermen and the surrounding communities [1, 4].

This study centers on the management of PPP Pondok Dadap and its role in the distribution of marine products, taking into account the perceptions of two stakeholder groups, buyers, and sellers. It also examines distribution patterns and the supply chain business at PPP Pondok Dadap. Issues related to the performance management of PPP Pondok Dadap will be evaluated using the concept of fishing port function based on the Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number Per.16/MEN/2006, which includes: (a) docking and mooring services for fishing and fishery monitoring vessels; (b) loading services; (c) implementation of quality development and processing of fish products; and (d) marketing and distribution of fish.

2. LITERATURE REVIEW

2.1 Systems management theory and its application in fishing port management

Systems theory provides a comprehensive framework for understanding complex organizations, such as fishing ports, as interconnected wholes. This theory underscores the importance of viewing organizations not only from their internal functions but also in their interactions with the external environment. In the fishing port management literature, the application of systems theory enables researchers and managers to map and analyze the relationships between port infrastructure, operations, the fishermen's socio-economic ecosystem, and broader market dynamics [7]. However, several important factors must be considered when applying systems theory to fishing port performance. First, there is a need for coordination and integration among parts of the port to achieve common goals. Second, it is essential to monitor and evaluate port performance continuously to enhance future performance. Third, it is crucial to consider external environmental factors, such as fish market conditions and government regulations, in managing fishing ports. Previous studies have applied systems theory to understand the interactions between inputs (e.g., labor, technology, and capital) and outputs (e.g., the number of catches distributed) in the context of fishing ports, shedding light on operational efficiency and effectiveness [8].

2.2 Community empowerment in sustainable fishing port management

In the sustainable fishing port management literature,

numerous empirical studies have examined various models and frameworks. For instance, Oyinlola and Oluwunmi [9] employed simulation modeling to comprehend the factors influencing port competitiveness and the impact of specific strategies on the port's overall performance. Meanwhile, Chien and Shang [10] utilized a systems theory approach to tackle spatial planning issues in fisheries and the effects of changing fishing efforts. This research offers critical insights into how alterations in one component of the port system can have repercussions on its overall performance and sustainability. This review also contrasts how different distribution channels affect the flow of products, information, and finances within the context of fishing ports.

Literature on community empowerment in managing shared resources underscores the significance of involving local communities in decision-making and operational management of fishing ports. These studies highlight that fishing ports are not only physical infrastructures but also social spaces where diverse stakeholders interact. Community empowerment can lead to more effective and sustainable resource management by providing resource owners and users with a more substantial say in how these resources are managed [11].

The existing literature review identifies several gaps to address, which have been the focus of this research. Firstly, there is a scarcity of research integrating systems theory with specific fishing port management practices. Secondly, although studies exist on sustainable port management models, few concentrate on analyzing distribution channels and their impact on port performance. Finally, the literature often overlooks the significance and influence of community empowerment in fishing port management. This research aims to bridge these gaps by offering a more detailed analysis of how systems theory can be applied to manage PPP Pondok Dadap fishing port, with a special focus on distribution channels and community empowerment.

2.3 Fishing port management regulations and their implementation

The Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number Per.16/MEN/2006 is essential for managing fishing ports in Indonesia, influencing various operational aspects vital to port performance.

a. Docking and Mooring Services

This regulation ensures that fishing ports provide adequate docking and mooring facilities for fishing and monitoring vessels, including vessel repair and maintenance facilities. This reflects the recognition that adequate infrastructure is key to supporting smooth operations and security at fishing ports [12].

b. Loading and Unloading Services

Fishing ports must have sufficient facilities for loading and unloading catches, including adequate loading areas, appropriate equipment, and a skilled workforce. These facilities ensure efficiency and reduce vessel waiting times, directly affecting product quality and freshness [13].

c. Development of Quality and Processing of Fish Products

In addition, fishing ports are required to develop the quality and processing of fish products. This includes educating fishermen about good fishing techniques and fish product processing standards to ensure the catch meets established quality standards [14].

d. Fish Marketing and Distribution

This regulation also emphasizes the important role of fishing ports in the marketing and distributing of fish and other marine products. This includes providing facilities for fish auctions and market activities and collaboration with related parties such as fish traders and distributors, which is essential for expanding market reach [15].

Existing literature often ignores how these regulations are implemented and how their implementation affects overall port performance. This research will explore the implementation of these regulations at PPP Pondok Dadap to assess how these regulations affect the efficiency and effectiveness of port operations and how they can be improved to support sustainable fishing port management principles. In addition, we would also examine the role of community empowerment in the context of this regulation, particularly in managing shared resources and ensuring the long-term sustainability of the local fishing industry.

3. RESEARCH METHOD

Interviews in this research were designed to obtain in-depth and relevant information from informants with special experience and knowledge about the management of PPP Pondok Dadap. Key informants, including the Head of PPP Pondok Dadap and a port analyst, were selected using a purposive sampling technique, allowing researchers to target individuals with the insight needed to answer the research questions. Next, to contact informants, we identified and selected them based on their role and involvement in port management. Afterward, we sent an interview request that included the research objectives, the importance of the informant's contribution, and guaranteed confidentiality and anonymity. Interviews were scheduled at the informant's convenience and conducted in an environment that permitted open and honest discussion.

Semi-structured interviews were conducted using a pre-developed interview guide containing open-ended questions to facilitate in-depth conversations regarding port management and fish distribution. These questions were developed to explore informants' experiences, perceptions, and opinions regarding existing port management policies and collect suggestions and input for improvements. We also applied direct observation techniques during interviews to gain additional context regarding auction activities and fish distribution. This provided further insight into the practices in ports and how these practices influence the management and distribution of fish products. Then, to ensure the accuracy of the information obtained, we used a recording device with the informant's consent. Interview transcriptions were then made for further analysis. These procedures were designed to respect research ethics, ensure data integrity, and enable comprehensive and responsible research.

Meanwhile, a quantitative approach was used to look at the phenomenon in general. We employed a survey method by distributing questionnaires designed based on research variables, namely perceptions of PPP Pondok Dadap operations. Variables were measured using a Likert Scale Analysis. Two sets of Likert Scales were applied, one to measure fishermen's perceptions and the other for fish sellers. This allowed us to capture the nuances of their satisfaction and perceptions of various aspects of port management and distribution effectiveness. The Likert Scale is calculated using the following formula.

$$Final\ Result = \frac{Total\ Score}{\frac{The\ highest\ score \times Number\ of\ respondents}{100\%}} \times 100\%$$

The criteria are as follows:

0-19.99% = very dissatisfied

20-39.99% = dissatisfied

40-59.99% = unsure

60-79.99% = satisfied

80-100% = very satisfied.

The accurate sample size was determined using the Slovin formula with a critical value of 15% to estimate the acceptable margin of error in research. From the available population, 44 fishermen and 20 fish sellers were selected as samples. Each respondent was interviewed and asked to complete a questionnaire, providing data that would be analyzed to understand their views on port management and operations. Data collected from both methods is expected to provide a comprehensive view of the port's current effectiveness and potential areas for improvement.

In this research, qualitative data analysis was carried out following the method developed by Huberman and Miles [14], which guides the analytical process through three main stages: data reduction, data presentation, and conclusion drawing or verification. The data reduction process involves sorting and refining the data that has been collected, allowing researchers to identify and focus on the information most relevant to the research question. This technique facilitates organizing complex data into more straightforward themes and patterns to be coded for further analysis [14]. Furthermore, data presentation is carried out in a way that facilitates interpretation and analysis. This may include the development of matrices, tables, or flow diagrams, all of which aim to visualize relationships and patterns among data, clarify findings, and prepare for the conclusion-drawing stage [16]. The final stage, drawing conclusions, involves interpreting the data that has been reduced and presented. At this point, a researcher tests the consistency and plausibility of the findings, often involving a re-verification process with informants to ensure the validity of the interpretation. This process ensures that the conclusions drawn genuinely reflect the reality experienced by the research subjects [14].

This analysis is not only the final step in the qualitative research process but also an ongoing iterative component throughout the entire research. This ensures that this research reaches a deep understanding of port management and distribution of fish products at PPP Pondok Dadap while confirming the reliability of the findings in the broader context of existing theory and practice [16].

4. RESULTS AND DISCUSSION

4.1 Fishermen's perception

Fishermen's perceptions refer to how the fishing port management affects fishermen's decisions in choosing a fishing port and how to unload their catch; this means that fishing port management and fishery distribution must also consider fishermen's perceptions. Management of fishing ports and fishery distribution is essential for the sustainability of marine resources and for helping fishermen earn a stable income. Fishermen may also have different perceptions about the distribution, such as fair prices, access to fair markets, and better catch distribution.

Table 1. The results of the Likert scale analysis on fishermen's perceptions

Items	Percentage	Criteria
Smooth distribution of ocean fish products to sellers	68%	Satisfied
Distribution systems of ocean fish products from fishermen to sellers	65%	Satisfied
Communication between fishermen and sellers	95%	Very satisfied
Information exchange between fishermen and sellers	90%	Very satisfied
Information exchange with port managers	64%	Satisfied
Price agreement	81%	Very satisfied
Level of trust in intermediaries	82%	Very satisfied
Facilities and infrastructure	64%	Satisfied
Smooth payment by intermediaries/sellers	70%	Satisfied
Transaction/payment system by intermediaries/sellers	86%	Very satisfied
Agreement with intermediaries/sellers	85%	Very satisfied
Policy implementation in the fishing port	86%	Very satisfied
The performance of officers in managing the arrival and departure of ships	65%	Satisfied
The attitude and performance of officers in technical inspection	58%	Unsure
The attitude and performance of officers in managing ship traffic	73%	Satisfied
The performance of officers in supervising the preparation of raw materials	63%	Satisfied
The attitude of officers in protecting the maritime environment	79%	Satisfied
The attitude of the officer in examining ship manning requirements	93%	Very satisfied
The performance of administrative service officers	85%	Very satisfied
The speed of officers in providing administrative services	84%	Very satisfied
Port facilities and infrastructure	75%	Satisfied
Convenience and safety when loading and unloading	72%	Satisfied
Services provided by officers before fishermen go to the sea	65%	Satisfied
The speed of handling catch	70%	Satisfied
A pier for loading and unloading fuel	66%	Satisfied
Fuel loading and unloading service time	71%	Satisfied
The performance of fuel loading and unloading service officers	69%	Satisfied
A dock for landing catch	58%	Unsure
Quality control of catch by port management	61%	Satisfied
Marketing systems applied at the port	92%	Very Satisfied

The Likert survey results (Table 1) provide an in-depth picture of the PPP Pondok Dadap's performance from the perspective of fishermen and sellers. The high level of satisfaction with communication and trust indicates that stakeholders at this port build effective communication, leading to trust. This is important because trust and good communication are keys to ensuring the smooth distribution of fish products. With 95% of fishermen feeling very satisfied with communication with sellers and 90% very satisfied with the exchange of information, this reflects an open and transparent flow of information, which allows for efficient negotiation and transaction processes. High satisfaction with implementation policies at the port and administrative performance indicates that the procedures and regulations established by the port support professional operations.

However, some areas require attention, such as port infrastructure and the attitude and performance of officers in technical inspections and ship traffic management, which result in uncertainty and low satisfaction. This shows the need for port officers' skill improvements, investment in port facilities, and further training and development. As 92% of fishermen feel very satisfied with the marketing system implemented at the port, this confirms that existing strategies support strong marketing and distribution activities, which benefit not only the port but also the fishermen and sellers who depend on the port for their livelihoods.

The management of PPP Pondok Dadap emphasizes some crucial aspects, including:

- a. Fair and open access to ports and their use
Fishermen have equal and non-discriminatory access to ports, whether to dock, repair, or load ships. Regular and coordinated use of ports is essential to avoid conflicts between fishermen. This is in accordance with shared

resource theory, which emphasizes the importance of utilizing resources fairly and sustainably.

- b. Availability of adequate infrastructure
The PPP Pondok Dadap management policy ensures the availability of adequate infrastructure, such as docks, roads, parking areas, electricity, clean water, and sanitation, to meet the needs of fishermen who dock at the port. This aligns with systems theory, which states that good infrastructure is the basis for effective system operations.
- c. Fair selling price policy
The PPP Pondok Dadap management policy ensures that the selling price of fishermen's catch is fair. This policy protects fishermen from monopolistic practices by intermediaries so that fishermen get a fair and stable selling price for their catch. This describes the theory of distributive justice, which emphasizes the equitable allocation of outcomes in society.
- d. Involvement of fishermen in decision-making
Fishermen at PPP Pondok Dadap are involved in decision-making related to fishing port management. This involvement must be structured and coordinated so fishermen can provide valuable input and suggestions in formulating port management policies. This approach describes community participation theory, which encourages stakeholder involvement in decision-making.
- e. Strict law enforcement
Good fishing port management policies must be supported by strict law enforcement to prevent violations or abuse by irresponsible parties. This is in accordance with legal reinforcement theory, which argues that effective law enforcement is key to ensuring compliance and good governance.

Table 2. The results of the Likert scale analysis on sellers' perceptions

Item	Percentage	Criteria
Smooth distribution of fish from fishermen to sellers	88%	Very satisfied
Distribution systems of fish from fishermen to sellers	92%	Very satisfied
Communication between fishermen and sellers	85%	Very satisfied
Information exchange between fishermen and sellers	84%	Very satisfied
Information exchange between sellers and port managers	82%	Very satisfied
Agreement between fishermen and sellers	86%	Very satisfied
Trust between fishermen and sellers	83%	Very satisfied
Sellers' satisfaction with port facilities and infrastructure	77%	Satisfied
Payment to fishermen	81%	Very satisfied
Transaction systems with fishermen	83%	Very satisfied
Agreement with fishermen	86%	Very satisfied
Satisfaction with government policy	81%	Very satisfied
Satisfaction with fish quality	72%	Satisfied
Satisfaction with the information system at the port	83%	Very satisfied
Fish auction or selling systems at the port	89%	Very satisfied
Fish quality control at the port	74%	Satisfied
Satisfaction with the quality of fish auctioned or sold at the port	70%	Satisfied
Satisfaction with the ease of building partnerships with port management	77%	Satisfied
Satisfaction with the service provided at the port	81%	Very satisfied
Satisfaction with the payment system at the port	83%	Very satisfied

This discussion highlights that effective port management is essential in terms of infrastructure and services, empowering and protecting fishermen, and making inclusive and fair policies. It also shows the importance of integrating management principles and social theory in managing shared resources such as fishing ports to achieve sustainability.

4.2 Sellers' perception

Sellers' perceptions of market demand, stock availability, and shipping infrastructure greatly influence their decisions in choosing fishing ports and types of fish to sell [16]. Fishing port management that considers sellers' perceptions can improve fishery distribution efficiency and sellers' income [17].

Table 2 describes sellers' perceptions regarding the management and operations of PPP Pondok Dadap. The results of the Likert Scale analysis show that sellers are very satisfied with most aspects of port management, with a high percentage in distribution, communication, and transaction systems. This reflects an efficient and effective distribution system from fishermen to sellers formed in this port. Regarding fish distribution from fishermen to sellers, the high satisfaction levels (88% and 92%) indicate that the distribution process is carried out smoothly. This supports the supply chain theory, emphasizing the importance of efficient product flow from producers to consumers. Communication and information exchange between fishermen and sellers, as well as with port managers, also received high percentages (85%, 84%, and 82%), indicating openness and effectiveness in sharing information, which is in line with organizational communication theory, which underlines the importance of communication in operations effective.

Trust and agreement between fishermen and sellers were also high (86% and 83%), reflecting a good relationship between both parties, as the theory of trust and social contract mentions that trust is the basis of productive cooperation. Sellers also expressed satisfaction with port facilities and infrastructure (77%), indicating that the port provided adequate support for trade activities in accordance with institutional theory, which emphasizes the importance of infrastructure in supporting business practices.

Satisfaction with government policies (81%) and information systems at PPP Pondok Dadap (83%) indicate that the policies and systems implemented by the government and port managers are perceived as supportive by sellers, which is consistent with public policy theory, which assesses the success of policies from how well stakeholders respond to the policy. Fish quality control at the port and satisfaction with the quality of fish auctioned or sold (74% and 70%) may be slightly lower than other aspects but are still in the satisfied category. This may indicate room for improvement in quality control, an important part of quality management and quality control theory. Overall, these results indicate that PPP Pondok Dadap has successfully created a conducive environment for sellers to operate, which positively impacts their satisfaction and illustrates the excellent implementation of various management and operational theories in a natural context. Some of the main factors considered by sellers in choosing PPP Pondok Dadap as a place for buying and selling fish are as follows:

- a. Market demand
Sellers' perceptions of market demand can influence the type of fish they choose to sell. For example, if the need for fresh fish increases, sellers will buy and sell fresh fish at PPP Pondok Dadap due to the ease of access and the clarity of the payment system.
- b. Availability of stock
The availability of fish stocks at PPP Pondok Dadap is stable, and there is a guarantee of fresh fish from the fishermen.
- c. Condition of shipping infrastructure
The state of shipping infrastructure, such as roads, public transport, and distribution networks, also influences sellers' decisions in selecting fishing ports. The existing shipping infrastructure at PPP Pondok Dadap facilitates fish transportation from the fishing port to the market.

4.3 Discussion

4.3.1 Fish distribution pattern at PPP Pondok Dadap

The pattern of fish distribution channels in fishing ports refers to a series of actions involving the movement of fish from producers to final consumers through various

intermediaries, such as sellers, distributors, and retailers. Some things that need to be considered are:

- a. Market availability
Sellers and distributors need to consider market availability and demand for fish.
- b. Infrastructure
The availability of adequate infrastructure, such as roads, public transportation, and storage facilities, is critical in fish distribution channels in fishing ports.
- c. Fish distribution
Some sellers and distributors consider fish processing as part of the fish distribution channel pattern. The flow of fish distribution in PPP Pondok Dadap can be seen in Figure 1.

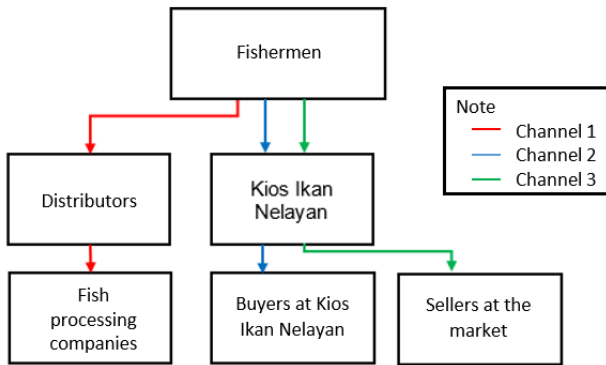


Figure 1. Fish distribution pattern at PPP Pondok Dadap

- 1) Channel One
 - a. Fishermen
PPP Pondok Dadap is visited by fishermen from the surrounding and faraway areas, such as Sulawesi and Sumatera, who have a permit to unload their catch at the fishing port. Most catches are tuna and skipjack tuna. However, in certain seasons, fishermen also catch other kinds of fish, including parrotfish, grouper, and snapper. The catch is then sold to distributors.
 - b. Distributors
Distributors join the fish auction. They are community members around the area; this represents a community empowerment effort. These distributors buy the fish regularly based on partnership agreements with food processing companies or customer orders.
 - c. Fish processing companies
These companies come from East Java. Most fish are sent to companies in Muncar, Banyuwangi. It is also sent to Jember, Malang, and Bali.
Strength: Fishermen can have a big deal only with one distributor so that fishermen can sell all their catch.
Weakness: Fishermen have weak bargaining power.
- 2) Channel Two
 - a. Fishermen
Fishermen are also an important factor in Channel Two. They bring their catch to the port to be distributed.
 - b. Kios Ikan Nelayan
Kios Ikan Nelayan is a fish market in the port area. It sells fish from the auction and the fishermen. The price of fish from fishermen is lower, around IDR 2,000, than that of the auction.
 - c. Buyers at Kios Ikan Nelayan
People coming to Kios Ikan Nelayan are the local

community of the surrounding areas and tourists. They buy fish for household consumption.

Strength: Fishermen can sell their catch to many stalls.

Weakness: Fishermen must have a deal with more than one stall to sell all their catch.

- 3) Channel Three
 - a. Fishermen
The catch is taken to PPP Pondok Dadap for distribution.
 - b. Kios Ikan Nelayan
Kios Ikan Nelayan is a wholesale market or intermediary because the fish bought from the fishermen will be sold again to market sellers around the region.
 - c. Fish Market Sellers
These sellers sell fish at the markets around PPP Pondok Dadap. They come to Kios Ikan Nelayan to buy fish in large amounts to be sold again. They do not make any orders before coming to Kios Ikan Nelayan; they buy whatever is available.
Strength: Fishermen can sell their catch to whomever they want.
Weakness: Fishermen may have to make a deal with many sellers at Kios Ikan Nelayan. They also make a lower profit.

Supply Chain Business

Product, financial, and information flows at fishing ports are interrelated and influence each other in the fish supply chain business process. Cunningham [17] shows that the fish supply chain at the port consists of several stages: fish collection from fishermen, processing and storage at the processing plant, transportation to the port, inspection, and packing at the port, and distribution to local and export markets. It involves many actors and processes from the beginning to the end of the supply chain, from fishermen, ship owners, fish collectors, distributors, fish traders, fish processors, and transporters to the final consumer [18]. Perdana et al. [19] show that the shrimp supply chain at fishing ports involves many actors, such as fishermen, collectors, traders, and processing factories. Business activities at PPP Pondok Dadap involve various actors with their respective roles and interests. Linking it to systems theory, the flow of products, finances, and information at PPP Pondok Dadap represents interconnected subsystems in a larger fishing port system. Systems theory teaches that understanding the relationships between subsystems can help predict and improve the system's performance.

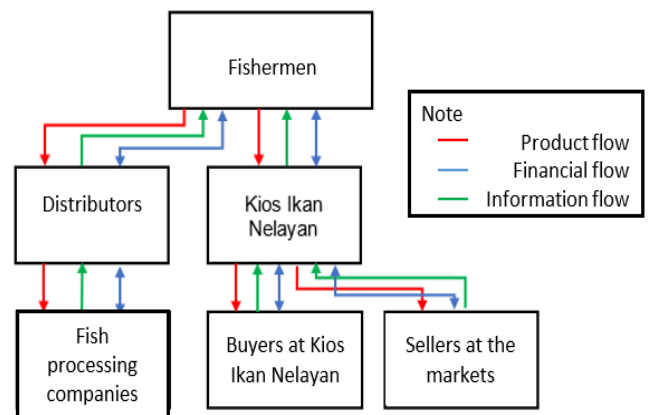


Figure 2. Supply chain distribution pattern at PPP Pondok Dadap

Sistani et al. [20] analyze the performance of the fish supply chain at Pelabuhan Perikanan Nusantara (PPN) Tanjung Priok, Jakarta. The research shows that the accurate and timely flow of information is one of the factors affecting the performance of the fish supply chain at the port. In addition, other problems found were the low quality of fish stored and the need for coordination between stakeholders in the fish supply chain at the port. The following is Figure 2 of the supply chain business process at PPP Pondok Dadap, including product, financial, and information.

Product flow is the movement of products from raw material providers to final consumers. The product flow will return to the raw material provider if there is a discrepancy in the order from the consumer or product damage during the delivery process [21]. The product at PPP Pondok Dadap flows from upstream to downstream or from fishermen to fish processing companies, buyers at Kios Ikan Nelayan, fishermen, and market sellers. Fishermen unload fish catches at the port and then auction them to be purchased by fish distributors and sellers at Kios Ikan Nelayan. Fishermen can also sell their fish directly to Kios Ikan Nelayan. After the fish distributors win the auction, the fish will be sent to the processing company.

Financial flows are related to transactions and payments, including schedules for payments or transfers. Financial flows represent an income from products sold to end consumers. Financial flows include the cost and profit received in each supply chain and flow from the final consumer to the raw material provider [22]. Financial flows at PPP Pondok Dadap move from downstream to upstream or from fishermen to fish processing companies, visitors of Kios Ikan Nelayan, fishermen, and fish market sellers. This flow relates to payments for buying and selling products between marketing agencies.

Information flow is essential in the supply chain because it expedites the product and financial flow process. Information flow is necessary throughout the supply chain activities from raw material providers to final consumers and vice versa. The information available is usually capacity information in each part of the supply chain [21]. Information flow at PPP Pondok Dadap moves in two directions, from upstream to downstream or downstream to upstream. Each marketing agency exchanges information on prices, fish markets, weather, port information, and other information with the previous or next marketing agency.

The supply chain distribution pattern at fishing ports includes product flows, financial flows, and information flows, in which each stage must be appropriately regulated to ensure the smooth running of the fish supply chain [23]. One of the challenges in product flow is maintaining good fish quality during the transportation and storage process. Financial flows include transactions in the fish supply chain, such as payments and remittances. Each stage of a financial transaction must be carried out transparently and effectively so that the fish supply chain can run well [24]. Financial problems can occur if transactions are not recorded correctly or if there are errors in the payment process. Information flow includes exchanging information necessary to manage fish supply chains effectively, such as information on market demand, fish stocks, and delivery times. Accurate and timely information is essential in assisting stakeholders in making the right decisions in the fish supply chain. One of the challenges in information flow is information gaps between stakeholders in the fish supply chain.

5. CONCLUSIONS

This study was initially done to understand the management and distribution patterns at PPP Pondok Dadap, a fishing port located in the coastal area of South Malang, East Java Province, Indonesia. It also aimed at revealing the perceptions of fishermen and sellers regarding this management. Furthermore, the study explored product, financial, and information flows and their impact on the distribution of fish and fish products. In practice, distribution channel patterns at fishing ports can vary depending on market conditions, characteristics of fish products, and consumer needs. However, fish distribution channels at fishing ports generally have a relatively linear pattern, from producers or fishermen to collectors, large traders, small traders, and consumers. PPP Pondok Dadap was identified as having three distribution channel patterns. The first distribution channel pattern involves fishermen, distributors, and fish processing companies. The second distribution pattern involves fishermen, Kios Ikan Nelayan, and visitors of Kios Ikan Nelayan. The third distribution channel pattern involves fishermen, Kios Ikan Nelayan, and fish sellers in markets. Each distribution channel has its own advantages and disadvantages.

Three aspects influence the smooth distribution of fish at PPP Pondok Dadap. The first is product flow, related to quality assurance, which must be guaranteed in every distribution chain. The next is financial flow, related to the certainty and security of transactions of stakeholders involved in each distribution channel. The last is information flow, related to the creation of active communication and the exchange and transfer of information between stakeholders involved.

Our study has several limitations to note. First, the limited sample size and uneven sample composition may affect the strength and relevance of the findings. This sample limitation means the results may not reflect the situation in other fishing ports in Indonesia or the wider geographical area. Second, this study uses a case study approach at PPP Pondok Dadap, which limits the ability to generalize the findings to other ports with different conditions. Third, the methods used, although comprehensive, may not cover all aspects affecting the distribution and management of fishing ports. Fourth, some data comes from stakeholders' perceptions, which can be subjective and influenced by various biases. Consequently, further research with larger samples and more varied methods is needed to strengthen the findings and develop a deeper understanding of sustainable fishing port management.

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