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Collaboration and Sustainable Catfish (*Claria sp*.) Supply Chain with Data Connectivity Implementation in Jember, Indonesia

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Abtract: Maintaining collaboration across the whole catfish fisheries supply chain to achieve sustainability is difficult. All participants in the activities must prioritize their financial gains while also considering social growth and environmental responsibility. Jember's catfish fisheries actors come from various educational, social, and psychological backgrounds. Because of this diversity, it is challenging to apply traceability to Jember catfish fishery goods, resulting in a lack of competitiveness in the worldwide market. This study aims to examine current research in the catfish business on sustainable supply chains, collaborative models, and traceability on a large scale. The economic, environmental, and social aspects of sustainability are investigated and a model for a sustainable supply chain. Collaboration in the sustainable catfish supply chain is examined from vertical and horizontal perspectives. According to the findings, few studies have focused on integrated collaboration to establish a long-term supply chain system. The best feature of power to develop the drafting of search data is knowledge. The correctness of the meeting point of upstream search data with downstream traceability can be designed using simple and applicable information that spreads across all lines and is imprinted in consumers from an early age

Keywords : sustainable supply chain, collaboration, traceability, catfish fisheries

INTRODUCTION

Sustainable catfish (Claria sp.) supply chains and teamwork are fundamental concepts that must be utilized in the business world, particularly in the agroindustry [1]. This paper aims to examine current research in these areas, highlight limitations, and recommend future research in the catfish (Claria sp.) business on sustainable supply chain collaboration. This research focuses on the economic, environmental, and social aspects of sustainable supply chain management in the catfish (Claria sp.) business. The sustainable supply chain management models were also thoroughly examined. Furthermore, collaboration models in sustainable catfish (Claria sp.) supply chain management is studied by categorizing them as vertical collaboration, horizontal collaboration, or a combination of the two. As a result, this assessment will highlight areas for improvement, leading to recommendations for future work.

Indonesia's fisheries industry players come from various educational, social, and psychological back-grounds [2]. This diversity creates a big obstacle to applying traceability to Indonesian fishery products. Not many fishery products are competitive in the international market due to low consumer confidence abroad. Traceability is easy for fishery business actors to do. The absolute re-

quirement for its implementation is commitment and consistency in transforming product data transferred from one seller to a buyer in the busi-ness chain. Data transformation to compile traceability documents is sufficient in the form of sales notes and purchase notes accompanied by notes in the form of product quality or other records if there are deviations when transferred, so that if there is a risk to food safety, the root cause of the problem can be immediately identified. The application of good traceability in supply chain management can reduce food safety risks and reduce costs due to infectious diseases in consuming food [3].

Catfish (Claria sp.) is one of the local's most important fish in Indonesia. It has an economic, environ-mental, and social impact in several countries. For example, in the United States, the agri-food sector ad-vances national and international economic operations while protecting human life [4]. This industry has a considerable impact on the economy, the environment, and society in Europe [5]. Scotland's food and beverage supply chain has grown into a significant industry that benefits the Scottish economy and employs many people [6]. In addition, the agroindustry has contributed to the growth of emerging countries' economies. Rapid changes in supply chain product and process innovation, for instance, have a significant impact on Thailand's socio-economic development [7]. From farmers and suppliers who offer raw materials to food manufacturers who add value to distributors and retailers who distribute the product to customers through systematic business operations, the supply chain in the catfish (Claria sp.) industry comprises all processes and activities. Each participant in the catfish (Claria sp.) supply chain bears the expense and reaps the profit, even if certain stakeholders are treated unfairly. As a result, supply chains must be maintained to distribute benefits fairly and well throughout the supply chain [8].

The more complicated a supply chain is, the more difficulties the participants will confront [9]. Food quality must be maintained throughout the food chain, from farm to consumer, due to global competition and the unique qualities of catfish (Claria sp.). Otherwise, it will be thrown away because it is unfit to eat [10]. One of the most pressing issues in the food supply chain is maintaining fair collaboration among stakeholders while considering economic, environmental, social, organizational, marketing, food safety, corporate, customer, and societal responsibility [11][12]. One of the perspectives that can be used to keep competitive tactics in economic, environmental, and social aspects when dealing with the complexities of the supply chain is sustainability. Revenue, cost, customer satisfaction, and service level are part of the economic dimension [13][14]. Natural resource use, carbon footprint, environmental regulation, waste management, and hazardous chemicals and materials are all part of the environmental dimension [11] [15]. Working conditions, community development, consumer health and safety, human rights, and child labor are all part of the social component. Optimal competitive advantages can be realized within those three dimensions while supporting social development and reducing environmental consequences [16].

Collaboration can aid in achieving strong commitment among the many parties. Supply chain cooperation is a collaborative effort that spans multiple phases of the supply chain and its external environs to maximize its competitive advantage throughout the process. Collaboration is essential for long-term partnerships and dispersing benefits throughout the supply chain system, from strategic to operational levels. Collaboration allows stakeholders to pool their resources (materials, labor, infrastructure, facilities and equipment, and machinery) and their skills (technology, business processes, policy and legislation, and money). As a result, they may reduce uncertainty, share risk and

expense, and serve customers at the right time, in the right amount, and in quality without sacrificing other stakeholders' interests.

Vertical collaboration is the link between stakeholders in the supply chain from upstream to down-stream. Horizontal collaboration is between competitors and external parties such as the government, NGOs, associations, and universities. These two types of collaboration must be investigated to establish a more sustainable system for all stakeholders while avoiding affecting other stakeholders such as local farmers and small enterprises. Consumers will pay a higher price without collaboration since each stakeholder will raise their pricing to get a bigger advantage and avoid risk. As a result, teamwork is critical to increasing product value and ensuring food production flexibility while adhering to environmental policy integration [17].

In the recent decade, food industry stakeholders have become concerned about collaboration in achieving supply chain goals since it maximizes profit and decreases risk for all parties involved. However, maintaining supply chain coordination throughout all levels of the sugar supply chain is difficult. The collaboration system becomes more sophisticated as more parties participate in it. Lack of stakeholder support, insufficient assessment methods, restricted information systems, corporate culture, and unwillingness to change are obstacles to implementing collaborative systems in the supply chain [18]. To facilitate collaboration, however, proper technology and information are required. Furthermore, both sides must be motivated to commit to a fruitful collaboration in order for partners to create mutual trust [19].

Traceability reduces costs due to the risk of damaged products due to incorrect handling time planning and can obtain additional economic incentives from consumers [20][21]. The implementation of traceability among fishery businesses in Indonesia is still limited, so it needs to be improved, developed, and continuously disseminated as a quality culture for all people in Indonesia. Upstream traceability of the fisheries sector is mostly played by the activities of fishers in the fishing subsector and farmers in the aquaculture sub-sector. These fishery business actors are producers of raw materials, entering the processing unit through intermediaries of small collectors, collectors, and warehouses who run postharvest businesses. The business actors on the producer side know with certainty and detail the origin of raw materials for consumption or fishery processing. The openness of business actors in these multi-sectors to data and information on how fish or shrimp are produced, what happens during the production process, whether it is good or bad in quality, as well as postharvest treatment; is very important information in ensuring the creation of a food safety system for fishery products for consumers.

Downstream traceability of the fishery sector is played by fish collectors, intermediaries, processors, and marketers of processed fishery products. These downstream business actors play an important role in maintaining the quality of raw materials by applying the correct postharvest technology, for example, biofloc system [22], having to avoid malpractices by adding certain ingredients that can pose a risk to food safety, as well as playing technical efforts to gain business profits by reasonable. Collectors and intermediary traders who enter the downstream network; also have an important role as a data transformer for tracking fish produced (catch or aquaculture) to the processing unit. Thus, the upstream traceability reflects the traceability document for the upstream sector and the downstream traceability reflects the traceability document for the downstream sector.

The basic and simple problem that often arises when preparing traceability documents is dishonesty between business actors in the chain production for profit reasons [2]. Some key data and

information are sometimes hidden or covered to profit without considering the risk to food safety if fish is processed in a processing unit and marketed to contain certain ingredients that are suspected to be harmful to consumers. Another problem is that traceability implementation is still seen as a condition required by the buyer. When fish are marketed locally for local consumption, the requirements for accurate and honest data transformation between fish owners in the fishery product trade chain are often ignored. As a result, a design must establish the correctness of the point where upstream and downstream traceability data meet [23]. In the context of the widespread application of traceability in various fishing production centers, the research intends to uncover numerous simple, practical, and simply understood schemes by the Indonesian fishery business community.

METHOD

This research used a descriptive research method through a literature review. The literature review re-sults are presented in a simple matrix to determine the compatibility of conduct in the downstream sector between aquaculture business players, catch fisheries, and processing fisheries enterprises. The traceability implementation design is sequenced based on accurate initial data sources, detailed in the traceability docu-ment, since the fish is harvested (from ponds or ponds) or off the ship, postharvest, auctioned, brought to the processing unit, processed, until ready to be marketed.

The strategy employed in this study was to choose a cooperation model from a large number of options in order to establish a collaboration model for a long-term catfish (Claria sp.) supply chain. The broad inputs and ideas from the selected collaboration models will provide a better grasp of the construction, elements, and systematic collaboration process. Many studies produced collaboration models in various contexts, such as supply chains, logistics, multinational corporations, and rural community development. Each model serves a certain purpose and has its own set of constraints. The existing collaboration models were compared to choose one as the starting point. Most of these collaboration models are not confined to a supply chain collaboration model to have a larger concept of the proposed collaboration model's structure. These models have been used in various situations, but most of them could not be adopted and adjusted for collaboration in a long-term catfish (Claria sp.) supply chain. These models have flaws, such as failing to reflect all aspects of sustainability, failing to include stakeholders in the cooperation, and failing to cover the elements that will collaborate. The approach for establishing stronger communities was chosen as the collaboration model [11]. This model is the most appropriate to adopt in the current study since it is similar to the current study, which focuses on sustainability and involves multiple stakeholders. It also features significant parts linked and interconnected to support its major purpose: the growth of community support. The stakeholders' synergies for cocreation values are captured in this approach. The following part will go through this model in greater depth.

RESULTS AND DISCUSSION

Sustainable catfish supply chain management

Sustainability is essential for sustaining value, awareness, society, and corporate reputation and improving the business environment and supply chain collaboration [24]. It is designed to respond to the dynamic food supply chain environment, including high food safety demands, food

regulation, and environmental legislation, including economic, environmental, and social factors [25].

There are two economic dimensions: macroeconomic and microeconomic [26]. Macroeconomic considerations focus on labor productivity, market concentration, and import dependency in economic sustainability to achieve a range of goals, including enhancing economic growth, expanding competitiveness, and changing customer preferences in food items [27]. As economic indicators, microeconomic factors include revenue, manufacturing and transportation expenses, and overtime charges. Energy and fuel costs, delivery methods, inefficient operation processes (internal operations), packaging materials, and packaging and product requirements appropriateness when evaluating the economic factors (product development and stewardship) [28]. They suggested that having a suitable business plan, determining the trade-off between quality and cost-effectiveness, and locating mature sourcing can help the food industry achieve sustainability [29].

Decision-makers must consider economic and environmental factors when running a business [30]. Both input (energy and natural resources) and output (waste and pollution) indicators are in-cluded in the environmental dimensions [26]. Environmental supply chain issues were divided into three categories: procurement (raw materials, long and short-term supply, waste, and packaging), internal operations (water, air, and soil pollution, health impacts, and waste management), and product development and stewardship (product impact, substitute product, disposal, and traceability). Climate change and eco-efficiency, green production, and food safety, and animal welfare, are the three key areas of the environmental issue.

Even though these are the most difficult to quantify in comparison to others since they are linked to intangible factors such as culture, social communities, lifestyle, politics, health, human rights, and community aspiration, they are the most difficult to quantify [31], They must be considered in all supply chain strategic management processes. However, the catfish supply chain primarily ignores social standards such as ISO 26000 and Social Accountability SA8000 [29]. The social purpose of the catfish supply chain may be traced back to collecting raw materials from local fishers and enhancing local revenue by supplying healthy and affordable local items [29]. These social factors contribute to community development, job opportunities, and human well-being. Labor standards, life balances, working hours, consumer demands, and inflation as indicators used in the social dimensions. Furthermore, quantitative indicators have been developed to track social aspects such as the number of employees who have been trained, management levels with special environmental responsibilities, and the number of employee development ideas.

Collaboration in catfish supply chain management

In order to cut costs, increase revenues, achieve quality assurance criteria, and earn consumer trust, collaboration is essential in the catfish supply chain system. Fishermen, producers, distributors, retailers, consumers, government, NGOs, and financial providers interact on production methods, information and infrastructure, skills, and expertise in the catfish supply chain. Each stakeholder has a constraint that can be overcome by working together. This collaboration requires tremendous commitment from all organizations to achieve the common goal. Trust, commitment, and willingness to share risks are essential components for achieving a long-term goal of a strong partnership. Unfortunately, convincing stakeholders to address these characteristics is challenging, particu-

larly in the complex catfish supply chain [32]. Furthermore, the collaborative system is threatened by global norms, global trading, and altering consumer preferences [33].

Numerous research on vertical collaboration in the catfish supply chain has been conducted. Commitment, trust, and collaboration are critical organizational behaviors in building the contractual relationship between producers and millers in the supply chain [34]. According to their findings, individual trust is more important than sanctioned ties. However, in the fresh product and food processing supply chain, both macro (globalization, consolidation, consumer attitudes, and rigid norms) and micro (industry structure and product qualities) elements must be considered [33]. These variables are connected to the supply chain's two pillars: supply chain activity design and management and supply chain relationship formation and maintenance.

Data Connectivity in catfish supply chain management

The accuracy of the meeting point of traceability between upstream to downstream traceability is played by traders, namely: small collectors, large collectors (suppliers) and warehouses; at the time of transaction of fish (raw materials) to factories or other processing units. The potential for malpractice in the form of data and information fraud that may occur in the capture fisheries and aquaculture sub-sectors is very small; however, the existence of honesty regarding the origin and treatment that has been carried out previously during cultivation activities and fishing activities can be known (traced) by these traders, shown in figure 1.

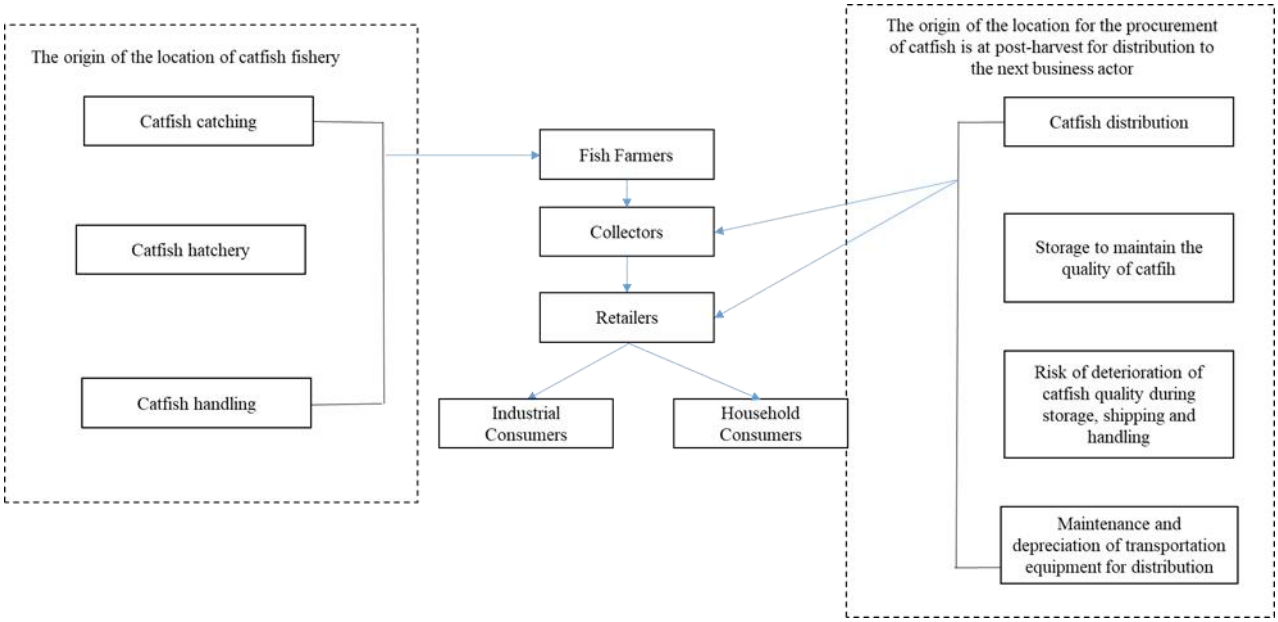

Fig 1. Traceability data design in catfish supply chain

Large collectors generally receive fish from small collectors. Small collectors are often diligent in traveling around (meeting farmers in ponds or boat owners and fishermen on the beach). They are very much in control of the 'field.' Small collectors are seen as knowledgeable about the productive behavior carried out by business actors in the aquaculture sub-sector and capture fisheries sub-sector. Small collectors generally do not have direct contact with the factory but still have to deposit through the warehouse or large collectors. Thus, large collectors are parties who have direct

contact and trust fish and shrimp processing factories; they must document the traceability data as well as possible.

The term warehouse refers to collectors with large capital who have the ability in simple pro-cess facilities and trained human resources to carry out postharvest and pre-processing before the fish is delivered to the factory. The warehouse became an extension of the factory to cut production costs. They were buying agreement fish and shrimp between the factory and the warehouse, able to provide certainty of supply of fish and shrimp raw materials on a large scale for factories to fulfill contracts his business. Based on these facts, traders should have monitored the data travel scheme at the upstream traceability level. Thus, all potential forms of malpractice at the upstream level, which aim to obtain profits unreasonably, can be avoided.

Warehouse, collector, and micro collector; acting as a trader; have a definite source of benefits from the application of good postharvest technology. Besides that, they have a very strong emotional affinity, including fishers or cultivators. Price competition between traders is not a factor key to business strategy. Good service, the emotional closeness that can form loyalty, and the application of postharvest technology are the keys to the success merchant's business.

Small collectors can also provide accurate traceability data to large collectors and warehouses to be forwarded to the processing plant unit [35]. This has been exemplified in the processing of milkfish (Chanos chanos Forskall) cultivated from traditional ponds to be processed to be used as tuna bait and for export scale human consumption. Small collectors can also access sales of fish and shrimp up to the factory through cooperation with wholesalers; even in many cases often become the spearhead of processing factories to obtain raw fish and shrimp with certain criteria in limited quantities.

The transformation of tracer data from upstream to downstream is played by traders, which consist of: (1) small collectors, (2) collectors, and (3) warehouses. Anyone in the business chain can do the potential for malpractice on fishery products. Traders must be able to play a role in tracing the journey of the fish they buy from each producer. Traders must be more careful when sorting and distributing fish (executing sales contracts) to processing units. In this phase of transformation from scheme 1 to scheme 2, the key point of traceability is in the hands of traders. The design of search data transformation accuracy can be built by strengthening traders' commitment, consistency, and performance. The potential for malpractice at the upstream and downstream levels must be recorded and stored neatly by traders for some time to ensure that consumers have consumed the final product and have passed the expiration date. There is absolutely no risk to food safety. Things that happen in the aquaculture sub-sector and capture fisheries sub-sector affect food safety assurance, which is played by the processed sub-sector and marketing of fishery products.

The form of responsible and credible search data transformation behavior is generally indicat-ed by strong business relationships between business actors in the fisheries sub-sector. The emo-tional closeness factor that had previously been built for a long time in the capture fisheries sub-sector between business actors was realized by knowledge of the type of ship, fishing gear, how fishers work, the type of fish that is the main target for fishing, how to handle fish on the ship, storage on the ship, the length of the fishing trip, to the fishing ground where the fish are caught. The same emotional closeness factor is also built in the aquaculture sub-sector to pond or pond conditions, water conditions, cultivation behavior, cultivators' commitment to the environment, land and environment cleanliness, seed selection, and selection of cultivation techniques and natural and arti-

ficial feed, to harvest and postharvest procedures. This commitment and consistency are based on several things, including:

1. Efforts to increase cross-trust among the business actors themselves
2. Efforts to obtain rewards in the form of higher price incentives
3. Efforts to minimize the risk of polluting the 'good name' of each actor

the business if there is a food safety risk in the future

Thus, the accuracy of traceability data transformation is closely related to the four main things above, which are considered in the application of traceability, namely: (1) knowledge, (2) education, (3) social, and (4) psychology; business actors and consumers in the chain of compiling traceability data. (Hosch & Blaha, 2017) states that the compilation of traceable data can be made if business actors in the chain of procurement, processing, and marketing of fish have a good commitment to be 'open' to the product.

Processed fishery business actors' behavior, commitment, and consistency are difficult to detect openly in transforming traceable data. Code showing the origin of the fish in the fish baskets being traded is only known to the fish factory/processor when ownership has changed hands in the fish auction process. The fish factory or processor will then select fish based on quality and size to be processed. Critical points that are very risky for errors in the transformation of traceable data are very likely to occur at this stage. Some possible causes of data transformation errors are:

1. Damage to the search code, which is generally made of simple label paper when moving fish between baskets or from basket to sorting table or vice versa, so that the trace code is lost;
2. Lack of consistency in applying the time limit for the transfer of the sorting process between tracer codes in the processing chain due to the large quantity of fish processed or negligence in writing the coding;
3. Contamination due to mixing between raw material codes caused by one of the lines of business actors being careless, hasty, and not careful what is done by the

processing employees; and

4. Some cheating behavior between fish owners and processors to get

additional profits in an unreasonable way.

Traceability application must be based on the consequences of an honest attitude between producers and distributors to convey “how” and “where” fish are processed. No statement has been found in the process of meeting points between business actors fisheries at the upstream level with downstream traceability in the form of:

1. Traceability is an obligation in processing fishery products;
2. Traceability is needed to implement quality assurance of fishery products; which

benefit consumers in local and international markets;

3. Efforts to implement traceability are an important instrument in the security system

food so that the production of processed fish gets international recognition

The meeting point is based on the thoughts of capture fisheries entrepreneurs solely so that their fish products sell; there is no risk of getting 'claims' and getting price incentives that are affordable higher. The accuracy of the data in the form of transformed information has been guaranteed by the honesty of each fishery business actor; because fishing and processing activities are already open. The incentives, such as additional costs proportional to additional income, are a stimu-

lus for business actors to implement traceability [36]. One concrete example of traceability was reported, applied to Jakarta's leading fish processing unit [37].

CONCLUSION

Sustainability and collaboration are significant concepts in catfish supply chain management because they support a complex system. Sustainability is one of the triple bottom line approaches that can maintain competitive economic, environmental, and social strategies. Several studies examine all of these elements, but economic factors remain the most important variables to consider when examining a sustainable supply chain. Minimizing uncertainty and spreading risk and costs among stakeholders is crucial to developing a stronger sustainability system for all stakeholders without harming other stakeholders such as local fishermen and SMEs.

Furthermore, few studies consider both vertical and horizontal collaboration as a network to achieve favorable competitive advantages. Collaboration as a network will facilitate long-term collaboration and disseminate advantages across the supply chain, from strategic to operational levels. Both principles have a huge impact on the catfish business in terms of attaining socio-economic development and reducing global environmental problems. Based on the findings of this literature study, it is critical to building a model that can support both sustainability and integrated collaboration. Methods used to establish sustainable supply chains and collaboration in supply chain management must be thoroughly examined for the next phase of the literature study. In addition, a review of assessment methods to determine the robustness of stakeholder participation should be addressed.

Compiling the accuracy of the meeting point of upstream traceability data with downstream traceability can be realized through the alignment of data transformation in sales notes from each party in the business chain. Implementation of accurate traceability through data transformation on notes is the simplest and most applicable way all business lines need to be adhered to until fishery products reach consumers. The weak implementation of traceability in Indonesia is caused by the lack of consumer understanding of the importance of traceability data; which has a strong impact on suppliers to 'ignore' the application of traceability for local products; even though the majority of fishery business actors has well-controlled the ability to using information technology devices in the form of android. Current accurate, traceable and detailed search data can only be applied to export-oriented fishery products due to the demands of business actors and regulations in export destination countries.

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