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Research Article

Value Chain Map of Bali Sardinella (Tamban) in Bulan, Sorsogon

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ABSTRACT

Fishery is an essential part of food security and livelihood among the Filipino people. This study described the value chain map of Tamban, the challenges encountered by the stakeholders that adversely affect its production, recommended measures to address those challenges, and proposed strategies towards its commercialization in Bulan, Sorsogon. The study employed both quantitative and qualitative data gathering procedures to produce an in-depth data for better analysis. Executed through using survey questionnaire and semi-structured interview, and official document analysis. Tamban is commonly sold to consumers and business in both fresh and processed forms such as dried, smoked, and canned. There are sixty-eight large-scale fish traders, and thirteen small-scale processors; nine for drying, three for smoking, and one for canning. The analysis demonstrates that the largest financial value-added net of cost was realized at the level of processors of fresh to be delivered to wet market for PHP 81.29 during the peak season and PHP 79.85 in lean season. Stakeholders face two major issues: the seasonality and fluctuating catch and the significant losses occurring in peak season. Negotiate fixed-rate/price range, annual contracts for essential supplies like ice, salt, fuel, and plastic bag. Create an emergency stockpile to cushion producers against sudden price shocks. A roadmap to meeting the set goals—minimize errors, idle time, hazards, cost, waste, and maximize opportunities, production, yield, sales, revenue, and efficiency is proposed.

Keywords: *Fish commercialization, Food security, Philippine fisheries, Sorsogon, Tamban, Value-added products, Value chain analysis*

Introduction

Fisheries play a significant role for humanity. Not only a source of food and livelihood globally, as well, it adds up to sustainability and sustenance. Fishes are delicate, hence, vulnerable to post-harvest losses when there is an absence of strategic measures. It is always a prerogative to protecting our food not to be

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contaminated, putting efforts to extend its shelf life, and by ensuring to maintain its quality would result to a reliable food supply. Post-harvest inefficiencies can increase the likelihood of higher scrap rates and will eventually lead to food insecurity, turning prices of food to rise, and ultimately the inefficient handling of the scarce resources to be used in their production and consumption (De Castro, 2023). Flaten et al. (2024) explains that the commercialization of fish becomes more challenging to handle because of the inconsistent and highly varying quality of inputs and outputs. It has also recognized the irregularity of prices of yields and outputs.

The small aquaculture in developing countries is falling short of its potential and endures in facing some challenges. These challenges include having low productivity, they are not producing enough fish, and they hit walls when trying to reach the market due to many obstacles in accessing markets. To fix this, there should be support and investment in small-scale aquaculture, and be given priority when setting policies. Moreover, this is key in boosting rural settlers' income and food security to all (Bjørndal et al., 2024) Fisheries in the Philippines challenges such as the low productivity, higher risks in transportation, inadequate infrastructures, and lack of government support persist. Fishing and obtaining other aquatic resources safely and bringing it to its consumers bears a huge risk and difficulty. These so called challenges arise because of underdeveloped road networks, little government help, and limited resources.

The significance of reducing wastes and spoilage from the fishing yield and mitigate food losses. Clean governance is emphasized to collectively contribute objective of ensuring a to the national responsive, people-centered, technology-enabled, and food-secure nation. In addition, these are relevant to the purpose of the current research, which is to become resilient by lessening food poverty, preventing to have higher food prices, and enabling an efficient food distribution and consumption. According to Agarwal (2017), the issue of wasted food and losses in crops production have received much attention and focus. As a result, the whole of government is actively bringing to attention the designing of policies aimed at mitigating these avoidable losses. The primary causes of these losses are either inadequate or poorly maintained storage and transport systems, a significant absence of reliable market information, and insufficient knowledge and training among the fishers. The perishable nature of produce means susceptible to losses, especially if driven by systematic flaws. The poor handling practices and inappropriate packaging are being amplified by critical infrastructure deficits. Furthermore, a lack of cold storage and robust transportation networks affects the capacity of the industry.

Additionally, the challenges are further compounded with inherently higher production and transportation risks associated with the aquatic environment and longer production cycles further complicate the commercialization of aquatic products (Asche et al., 2008). For developing countries like the Philippines, an archipelagic nation, depends well on aquatic products/resources for food, economic growth, source of income, and cultural practices as well (SEAFDEC, 2022; Avanza, et al., 2017). As it is understood that fisherfolk largely apply subsistence-oriented practices for consumption purposes, they still provide vast volume of fish catch for commercialization through fish brokers and fish dealers. In the Philippines, the production of sardines from 2013-2018 averaged 346,826 metric tons annually (PSA, 2020). Due to detrimental factors such as illegal, unreported, unregulated, harmful fishing practices, underregulated post-harvest, environmental challenges, and the destruction of ocean ecosystem caused by pollution, the population of sardines species are put at risk. According to the Bureau of Fisheries and Aquatic Resources (BFAR) (2020), out of nine species of sardines in the Philippines which are considered major species, there are six namely: Sardinella lemuru, Sardinella gibbosa, Sardinella albella, Amblygaster sirm, Escualosa thoracata and Sardinella fimbriata. Sardines belong to the family of Clupeidae and subfamily of Clupeinae and these species are locally known as *lawlaw* or *tamban*. Being cheap but high with protein, sardines present one of the most significant commercially important pelagic species, contributing substantially to the economy by 25

percent of the total commercial fisheries output in the year 2018. In the Philippines, Bali Sardines (Sardinella lemuru) is misidentified and wrongly labeled as Sardinella longiceps (Indian Sardines) by the Philippine Statistics Authority (PSA) and old references from the Bureau of Agricultural Statistics (BFAR, 2020).

In the case of Tamban, the supply chain flows from the fishers (who act as suppliers), passes through various intermediaries (such as local fish broker, fish dealer, financier), and ultimately be delivered to reach the end-buyers (Future of Fish, 2021). Tamban's price is characterized as highly volatile in the local market. The price volatility is subject to noticeable seasonal fluctuations, having high prices observed during the lean season and substantial drops occurring in the peak season. Records in 2020 had showed these extremes resulted in a record price differential, with a maximum of 40 pesos per kilo against a minimum of two pesos per kilo, or worst 0, this is when fishermen opt to send it back to ocean than selling them lower than 2 pesos per kilo. While the overall price variation of *tamban* fish is fundamentally dictated by supply and demand, in Bulan trading/market exhibits significantly lower selling prices compared to the other regions. For instance, the price in Bulan contrasts hugely with those recorded in other major markets: it sells for approximately 40 pesos per kilo in Iloilo (Oceana Philippines, 2017), and in Cagayan de Oro, prices range widely from 20 to 120 per kilo (Salgados, 2020).

The PSA reported that, next to the Region 9 or the Zamboanga Peninsula that has the largest percentage of sardines production (46%), Region 5 or the Bicol Region has the fourteen percent average annual sardines production, 2002-2018—second in the country. "Sardines make up around 15 percent of total fish catch and is one of the most accessible protein sources for Filipinos", (BFAR, 2020). Sardine fish has its major ecological importance as it forms the basal part of the marine food web, providing an essential food source for larger predators like tuna, other marine mammals, and cetaceans.

A large proportion of the production comes from Ragay Gulf-Ticao Pass-San Bernardino Strait that shares 16,699 square kilometers Philippine fishing grounds—accessible from Bulan. Bali sardinella, or locally known as *tamban* or *lawlaw*, being cheap but high with protein. Commercially, within the country, sardines are highly significant pelagic species.

Bulan, one of the fourteen towns in the province of Sorsogon, has twenty coastal barangays out of sixty-three barangays, namely: R. Gerona, Danao, Namo, Nasuje, Inararan, J.P. Laurel, Zone 6, Zone 7, Zone 4, Zone 2, San Vicente, San Rafael, Otavi, J. Gerona, Marinab, Butag, Aguinaldo, Osmena, Quezon, and Sagrada. This town has 6,555 registered fisherfolk according to the Bureau of Fisheries and Aquatic Resources (BFAR)-Fisherfolk Registration System; and 457 largarete boat owner as of September 09, 2025 (Municipal Agriculture Office, 2025). The peak *tamban* fishing season occurs during April and May. Conversely, the lean season runs from July to October, primarily because of the southwest monsoon or the so called habagat. According to the Municipal Agriculture Office (MAO 2025), *tamban* fishing along with farming are the major sources of livelihood and income of the majority of the families in Bulan, Sorsogon and its neighboring municipalities. These residents of Bulan, Sorsogon which are categorized as fisherfolk, laborers, fish vendors, and traders, whose income depends on the *tamban* catch, processing, and trading. In 2024, Bulan was able to trade a total of 39,267,988 kg of *tamban* for domestic commerce. It comprises of 98.56 percent of total fresh fish unloaded, meaning, there is only one point forty-four percent different fish species after *tamban*.

There is one operational sardines factory established on 2019 and remains operational to date. The Guinbe Food Corp. is located at Barangay Beguin, Bulan, Sorsogon (Business Permit and Licensing Office, 2025) Moreover, majority of the *tamban* catch goes to the sardines factories situated in Navotas—Youngstown, Akian Food Processing Corp., St. Joseph, Slord. Second highest shipment goes to Century Pacific Food Inc. located in Cavite and Batangas.

The main purpose of conducting a value chain analysis is to identify means of gaining enhanced value for the suppliers, processors, producers, and traders. This must result to strategies, which involve improvements in the

quality and product design, enabling all the players to secure greater value, and allow them to diversify into new product lines. (Adan et al., 2020). For an effective small-scale fisheries management, with conducted value chain analysis, necessitates a multi-faceted approach. Key recommendations to improve sustainability, efficiency include imposing stricter harvest size limits and concurrent monitoring schemes, seasonal closures, supporting the economic well-being of stakeholders through implementation of social enterprises and better credit facilities, all while putting to place robust habitat protection (Rosales et al., 2017).

Fishing is an important economic sector that drives economic growth, providing a crucial source of livelihood and employment and widespread benefits for all key players in its own value chain. The value chain analysis enables to have detailed and comprehensive understanding of the entire fisheries production system, highlighting the roles and interactions of key actors involved (Moctezuma, 2025). Kaplinsky and Morris (2025) assert that value chain analysis methods must be tailored to the unique characteristics of the resource under assessment, and that there is no single, one-size-fits-all strategy and there is no universally applicable approach for analyzing value chain analysis. These fundamental elements encompass the constituent nodes and actors, the nature of their relationships and linkages, the generation of added value, and the governance mechanisms that regulate the system.

With the increasing concern of wastage of *tamban*, especially during the peak season, and the reality that fish commercialization forms a significant part in the economic development of a nation as a whole, particularly in the Philippines that is an archipelagic country. The Local Government Code (LGC) of 1991, also known as the Republic Act No. 7160, mandates all the Local Government Units (LGUs) to undertake several key functions and measures within the fishery sector, this includes providing assistance for agricultural and fishery activities, to promoting the development of local channels (even through cooperatives), and enforcing all relevant fishery laws within its municipal waters.

The LGUs were given powers to approve and enact necessary ordinances and resolutions essential for efficient and effective local governance in actively protecting the environment. In exercising this power, the LGU is further mandated to impose appropriate penalties for environmentally destructive acts. Theses destructive and prohibited acts include, but not limited to, destructive fishing (such as dynamite fishing), illegal logging and resource smuggling (including logs and endangered species of flora and fauna), slash-and-burn farming, and any other activities leading to pollution, accelerated eutrophication of water bodies, or ecological imbalance (Local Government Code, 1991).

The Philippine Fisheries Development Authority (PDFA) is also mandated to advance fishing industry by primarily providing critical post-harvest infrastructure and facilities, and essential support services designed to optimize the efficiency of fish and fishery products handling and distribution, thereby elevating product value and enhancing their overall quality (PFDA, 2025).

The Philippine Republic Act No. 8435, also known as the Agricultural and Fisheries Modernization Act (AFMA), comprehensively defines post-harvest activities. These specifically encompass threshing, drying, milling, grading storing, stripping, winnowing, chipping, and washing. Correspondingly, the Act mandates the provision of necessary infrastructure to support the operations such as drying and milling facilities, fish ports and landings, warehouses, buying stations, market infrastructures, and transportation systems (National Agriculture and Fishery Council, 2014).

Methods

Research Design

This study on the value chain map of Bali Sardinella (Tamban) in Bulan, Sorsogon, is descriptive research that has utilized mixed method; thus, it employed both qualitative and quantitative data gathering procedures to produce an in-depth data for better analysis.

A descriptive method of research has been used: survey questionnaire– quantitative approach. A document analysis to systematically

interpret official documents has been made in the conduct of this study– a qualitative approach. Furthermore, a survey questionnaire was the main instrument used by this study. The data gathered were respectively tallied and analyzed through weighted mean, frequency count, and ranking. The respondents were the incidental clients who were accredited Philippine Fisheries Development Authority-Bulan Fish Port Complex (PFDA-BFPC) clients— fish buyer/seller, fish brokers and staff, fish dealers/traders, fishermen, and laborers for the fiscal year 2024, and BPLO recognized Tamban processing business, registered for the fiscal year 2025.

Secondary data were formally requested from respective national and local government offices, namely: a) Philippine Fisheries Development Authority-Bulan Fish Port Complex (PFDA-BFPC), b) Sangguniang Bayan (SB), c) Municipal Agriculture Office (MAO), d) Municipal Treasury Office (MTO), e) Municipal Environment and Natural Resources Office (MENRO), f) Business Permit and Licensing Office (BPLO), and g) Sorsogon State University – Bulan Campus and Magallanes Campus. Moreover, past studies, government agency's official documents and issuances. Literatures gathered from the internet as online sourced materials, web page and websites of government offices, past researches published in professional journals, articles and other sources are part of the secondary data used in this study.

The Respondents

The respondents from the fisherman group were the 5 clients who were accredited and renewed Philippine Fisheries Development Authority-Bulan Fish Port Complex (PFDA-BFPC) clients since January 2024. This comprised the 25 percent of the total respondents. The respondents from the fish broker and staff group were the seven clients who were accredited and renewed PFDA-BFPC clients since January 2024. This comprised the 35 percent of the total respondents. The respondents from the fish buyer group were the five clients who were accredited and renewed PFDA-BFPC clients since January 2024. This comprised the 25 percent of the total respondents. The respondents from the fish processor group were the three clients who were given business permit and license by the BPLO since January 2024. This comprised the 15 percent of the total respondents. Key informant interviews (KII) were also conducted with the academe, and incumbent officers of the Sangguniang Bayan and the Municipal Agriculture Office.

Data Gathering Procedures

A survey questionnaire and semi-structured interview were utilized as tools for gathering primary data. Prior to the pre-testing of questionnaire, the researcher prepared letters addressed to the Officer-in-Charge of the Philippine Fisheries Development Authority-Bulan Fish Port Complex and the Local Government Unit of Bulan requesting permission to allow distribution of questionnaire to incidental clients. The letters were received on September 10, 2025 and the researcher was then permitted to administer the questionnaire individually to twenty incidental respondents where the five are from fishermen group. Seven from fish broker and staff group, five from fish buyer group, and three from fish processor group. Moreover, the researcher was able to have an interview with a representative from the Sangguniang Bayan ng Bulan.

The duration of data capture was more than two months, from September 11 – November 15, 2025. Attention was taken to ensure that all questionnaire distributed to respondents were retrieved, thereby achieving the desired response rate.

The respondents were given instructions on how to complete the questionnaire. Moreover, semi-structured interview was conducted to each respondent simultaneously. It took an average of about twenty-two minutes until the semi-structured interview was properly and completely done with each respondent.

Secondary data, on the other hand, were gathered from records of relevant national and local government agencies' offices, namely: a) Philippine Fisheries Development Authority-Bulan Fish Port Complex (PFDA-BFPC), b) Sangguniang Bayan (SB), c) Municipal Agriculture Office (MAO), d) Municipal Treasury Office (MTO), e) Municipal Environment and Natural Resources Office (MENRO), f) Business Permit and Licensing Office (BPLO), and g) Sorsogon

State University – Bulan Campus and Sorsogon City Campus. Other secondary data such as articles and studies were taken from online sources through the internet.

Data Analysis

For describing the value map of tamban in Bulan, Sorsogon, the researcher made a tally of the responses of the respondents to make a detailed flow of primary and secondary activities being performed to create optimum value for tamban products. With the use of quantitative data, the study also determined the costs (in PHP) incurred on each activity towards the delivery of finished product. It also analyzed the profit margins and value-added by determining the price, cost, and profit margin associated with each actor in every link of the chain. Moreover highlighting where the most financial value is being created and distributed, and the volume per destinations identified with its vertical linkages.

After retrieving the questionnaire, the researcher made a tally of the responses and presented it in a tabular form for better visual presentation and followed by numerical interpretation and discussion. Frequency count and ranking were used in identifying the challenges that were perceived by the stakeholders of tamban. After the interview, field notes and summary or transcript were accomplished. Rigorous thematic analysis was made. Open-ended responses were collated and transcribed. The data was read repeatedly to have data familiarization. Responses were coded to identifying recurring ideas. Similar codes were grouped into themes to back the objective of recommending measures to address the challenges in operations, and proposing of strategies towards tamban commercialization. Visual mapping such as diagrams and tables to plot the relationship between codes, potential themes, and sub-themes. Analytic narrative to systematically provide interpretation to validate claims. And discuss overall findings regarding the objectives and existing literature and suggest implications for future research and actions.

Research Instruments

Two sets of questionnaires were designed (see appendix C and Appendix D); the first is written in English, while the other is written in Tagalog, without altering the essence of each item in the questionnaire, for those who may want to better understand its content and to easily answer the questions being asked. The questionnaire contained personal information about the respondent, such as name (optional), and work. And the checklist regarding the challenges they met along the value chain of tamban categorically presented as a) environmental challenges, b) economic and financial challenges c) logistical challenges, d) quality control challenges, e) information deficiency, and f) capacity constraints.

Part of the semi-structured interview are guide questions pertaining to the capitalization (in Philippine Peso), quantity/volume (in kilograms), and delivery destinations. Another portion pertains to the challenges and challenges they perceive along the value chain or processing of tamban. A similar to above-mentioned checklist were utilized.

Ethical Considerations

The respondents were asked for their consent before making them participating on their part of the study. They were provided with instructions on how to complete the questionnaire and have been provided transparency about the objectives of the study and the use of findings. They were given assurance of the confidentiality of personal-sensitive and business-sensitive data. As well, the researcher prepared a letter addressed to the Officer-in-Charge of the Philippine Fisheries Development Authority-Bulan Fish Port Complex requesting permission to allow distribution of questionnaire to their clients. Pilot testing or dry run of the filling of the instrument has been made; several adjustments were attuned referencing the comments and suggestions about the contents of the questionnaire received.

In summary, participants and key informants were informed of the study's objectives and have participated voluntarily. More importantly, anonymity and confidentiality are strictly observed.

Results and Discussions

The Value Chain Map of Tamban

Recent data showed that there is an extreme volatility in tamban catch over the six-year period (2019-2023), with no stable trend. The most significant growth, the largest relative jump was in 2020, with a +341.35% increase in 2019. On the other hand, the most significant decline occurred in 2022, where the tamban catch dropped by -68.59% from the 2021 peak. Moreover, the data shows a strong recovery happened in 2023 with a nearly 140% growth rate after the major fall in 2022 (Municipal Agriculture Office, 2025).

The quality and size of tamban are the most essential and critical product requirement towards good prices. Generally, prices vary depending in the volume of catch, season, quality, and size. Smaller tamban size and poor-quality command low price. The lean season consistently drives the prices upwards, that usually fall on the months of July to October due to the southwest monsoon or habagat (Municipal Agriculture Office, 2025).

The value addition in preserving tamban before it is being sold to the consumers to increase its worth or market value: as far as the sardines factory is the end-buyer, the value-added in tamban per kg is estimated to be PHP 16.82 during the peak season and a possible loss per kg of PHP 13.18 during the lean season due to the combination of lower or few volume of catch and higher total cost against the product sales. This is too risky and not wise to trade tamban for sardines factories. It should be in the reactive strategy of the business to have contingency plans and be able to connect with the local wet markets. On the other hand, the value-added net cost in processing tamban for wet market distribution is estimated at PHP 81.29 per kg during peak season while PHP 79.85 per kg lean season during the lean season. Market fees, unloading fees, packaging costs, labor, materials and ingredients, and capital are among the key components across various levels of the value chain to add to the value of the final product.

For processors of (dried), the value-added net of cost, which represents payments for labor, materials and ingredients, packaging costs, and capital, is estimated to be PHP 20.78 per kg during the peak season, while PHP 41.94 on lean seasons. While for commercial processors (smoked), it is estimated to be PHP 05.13 per kg during the peak season, while PHP 48.40 during the lean season. Lastly, for commercial processor (canning), which represents payments for labor, materials and ingredients, packaging costs, and capital, is estimated to be negative PHP 3.55 per kg during the peak and lean seasons. This is the reason why the 2 business that were operational last until 2022 and 2024 ceased their operations because it is not profitable due to higher cost than of the buying price in Pangasinan.

The analysis clearly demonstrates that the largest net financial value-added net of cost was realized at the level of processors of fresh tamban to be delivered to the wet market for PHP 81.29 during the peak season and PHP 79.85 even in lean season. This stems from the economic value created by transporting the product to the right place, transforming those to the right form, and delivering those at the right time. Simultaneously, the canning has the lowest value-added net of cost negative PHP 3.55 during the lean season.

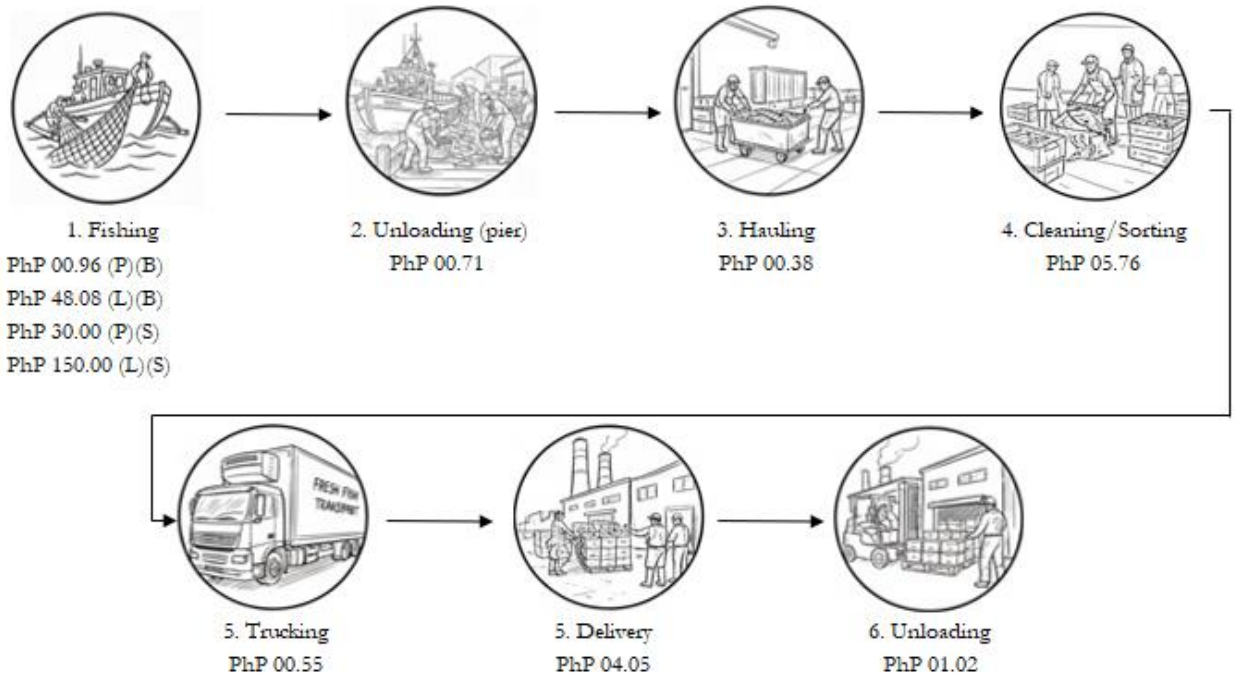

Figure 1. Value chain map of Tamban, traded as Fresh Goods

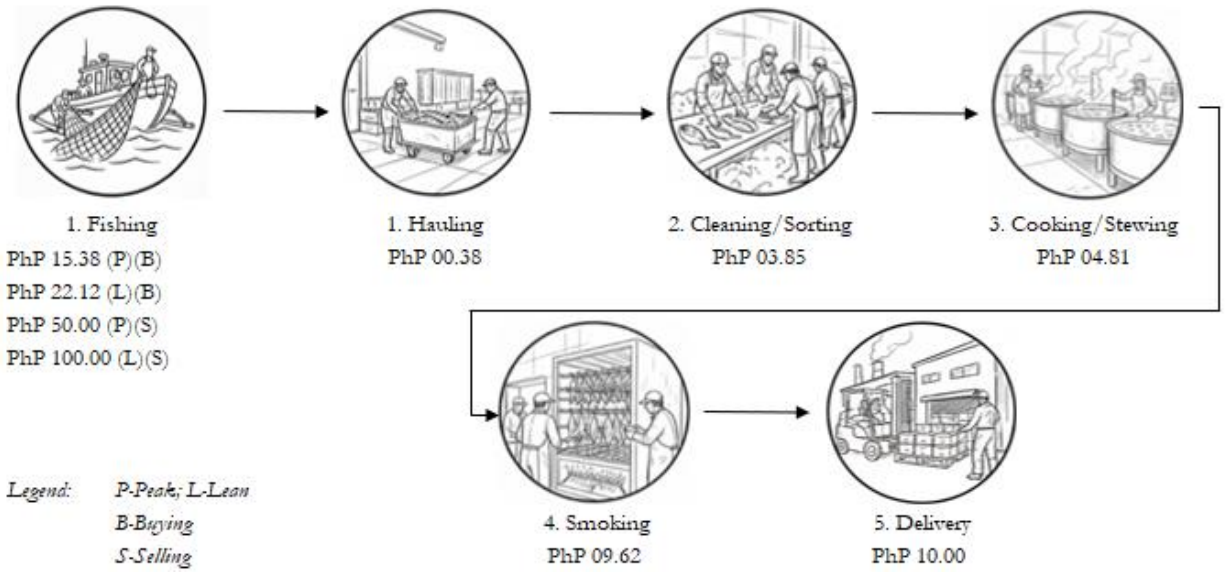

Figure 2. Value chain map of Tamban, traded as Dried Fish

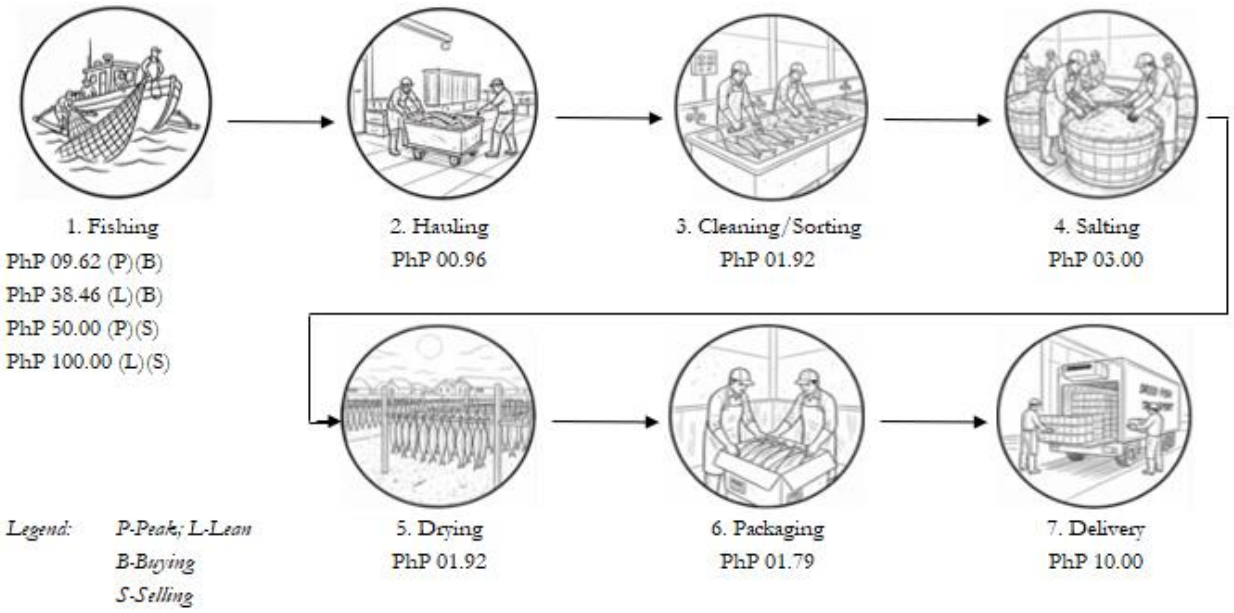

Figure 3. Value chain map of Tamban, traded as Smoked Fish

As shown in Figures 1, 2, 3, the value chain of tamban transported as commodity starts from fishing and ends with the unloading of goods on the customer's place. The value chain encompasses the whole sequence of activities requires to transform a product idea into a final product offering (involving a combination of physical transformation and the input from various service providers), delivery to final customer, and the final disposal after use (Mehrotra et al., 2007). On each stage of the chain, a specific cost is added that will later on determine the market value of the fresh tamban. During the peak season, the price of tamban falls down to less than a peso. It is the time where the oversupply is experienced. When all the demand has been already met, it results to diminished value of tamban. In scenarios like this, several reasons are cited, lack of cold storage, shortage of ice, and even trucks. The highest variability and financial impact occur at the initial fishing due to seasonality and or scarcity. The greatest operational cost in handling is in sorting/packaging, which adds significant value through preparation and preservation. Finally, the high cost of delivery suggests that the final mile logistics and intermediary margins are a significant factor in the fish's final price before it enters the factory or market for further processing. The theory of economy of scale can be appreciated even in the delivery segment. The chain is a clear path of increasing accumulated cost, transforming a raw catch into a market-ready commodity.

Each of the stages incur cost that would, in the end, be accumulated and will directly affect the value of commercialized tamban. It can be observed that the costs differ depending on the quality requirement of a finished product. The fresh tamban required the highest level of quality unlike to the other processing type for it would later on be placed in advanced processes such as canning, homemade dishes, and many more. In hauling, the smoking has the lowest cost because the fish is directly being unloaded near the processing plant and do not actually undergo checkpoint from the fish port.

The five most significant destinations for commercial fish transshipment, along with their respective percentages of the total volume, are: Navotas – 64.23%, Batangas – 11.58%, Cavite – 10.63%, Lucena – 3.19%, Sorsogon – 2.43%, the remaining percentage, which is 7.94, represents the portion of the commercial fish transshipment that went to other destinations not included in the "five most" list. This data highlights the critical role of Navotas as the central hub for fish trading and distribution. With 64.23% of the transship-

ments, it acts as the single most important market where fish from various sources are consolidated, processed, and redistributed. The next two destinations, Batangas (11.58%) and Cavite (10.63%), receive a substantial, though significantly smaller, share, indicating their importance as secondary regional markets/distribution points. Together, the top three destinations—Navotas, Batangas, and Cavite—account for the vast majority of the transshipment volume, totaling over 86% (64.23% + 11.58% + 10.63% = 86.44%). Meanwhile, Lucena (3.19%) and Sorsogon (2.43%) represent tertiary destinations, serving smaller regional markets, and the remaining 7.94 percent went to other destinations not included in the top five destinations. The sharp drop in percentage after the top three emphasizes the highly centralized nature of commercial fish trade distribution. Navotas, Batangas, Cavite, Lucena, and Sorsogon.

The Challenges from Stakeholders' Perspectives and the Recommended Measures to Address Them

The key actors face two major issues, the seasonality and fluctuating catch of tamban and significant losses occurring in peak season. For the past six years, it is observed an extreme volatility in tamban catch (2019-2023), with no stable trend. The most significant growth, the largest relative jump was in 2020, with a +341.35% increase in 2019. On the other hand, the most significant decline occurred in 2022, where the tamban catch dropped by -68.59% from the 2021 peak. And the volume of tamban depends on the season. Peak season is from March to June, while the lean season is from July to October. There are times that fishermen have influx of catch, even resorting to throwing it back in the ocean because no one can buy it any more. On the contrary, there are times that fishermen have minimal volume of catch or having no catch at all. Tamban fishermen cannot catch other species because their assets (both largarete, and net type and other gears) and skill set are specific only in catching tamban. Even if they plan to, they cannot afford the necessary capital to purchase the assets and equipment needed to catch different fish species.

The identified challenges that adversely affect the production of tamban in Bulan, were categorized into six with top three specifics. Furthermore, the recommended measures move beyond generalized policy suggestions to offer specific, tiered interventions targeting the critical points of failure within the value chain—from the fishing grounds to the market. The lack of reliable data and information presents a major obstacle to effective decision- and policy-making ability. Optimal conditions for small-scale fishermen can be achieved by basing appropriate policies and management strategies on access to good and relevant up-to-date information.

First category is the xenvironmental challenges: seasonal and weather related disruptions, overestimates of demand resulting to excess inventory, overfishing. Fair and consistent implementation of the Bulan Municipal Fisheries Code of 2017, implement "reduce juvenile catch campaign". Establish and actively enforce community-managed Marine Protected Areas (MPAs). Designate and strictly protect key spawning grounds (coral patches) in Ragay Gulf-Ticao Pass-San Bernardino Strait (especially the Bulan fishing grounds), involving local fishers in the monitoring and enforcement (Bantay Dagat). Implement a Waste-to-Resource Management Program. Focus on regulating wastewater discharge from processing plants, and initiate a community-wide coastal clean-up and proper waste disposal system, particularly targeting plastic waste that affects water quality. Stipulate/strengthen/enforce fines and penalties to personalities and entities who throw waste. Through this way, others will hesitate doing so.

Second is the economic and financial challenges: access to capital, fluctuating tamban price, high operating costs, intense competition. Form a Tamban Fisher and Processor Cooperative (TFPC). The TFPC should negotiate bulk sales contracts with major institutional buyers (e.g., large processors/sardines factories, distributors) to establish a guaranteed floor price and ceiling price (price cap), shielding members from daily market volatility. Ignite new private-public partnership/government interventions, and reinforce existing ones. Let the Municipal/TFPC bulk- create a

buying and stockpiling program. Negotiate fixed-rate, annual contracts for essential supplies (ice, salt, fuel, plastic bag) and create a small emergency stockpile to cushion producers against sudden price shocks.

Third, the logistical challenges: port congestion, long lead time of unloading, traffic at the entrance and exit gates. Enhance joint patrols (bantay-dagat, coast guards, Bureau of Fisheries and Aquatic Resources (BFAR), Philippine Fisheries Development Authority-Bulan Fish Port Complex (FPDA-BFPC) and establish a Community Reporting System. Increase coordination between the Philippine Coast Guard, local police, the local government unit, and the Tamban Fisher and Processor Cooperative (TFPC). Equip legitimate vessels with clear registration markings and implement a confidential, protected reward system for citizens reporting illegal fishing and port traffic regulations.

Fourth, the quality control challenges: inherent perishability of tamban, quality and safety standards, inconsistent product quality, and sanitation rules and regulations. Decisively, consistently, and fairly implement and monitor the Hazzard Analysis Critical Control Point (HACCP) principles along the supply chain and value chain. The Philippine Fisheries Development Authority-Bulan Fish Port Complex should work hand in hand with the Bureau of Fisheries and Aquatic Resources in this matter of inspections. Moreover, the Good Manufacturing Practices (GMP) and Standard Operating Procedures for Sanitation (SSOP), as well as the issuance of the Non-Compliance Notice to violators are indeed useful.

Fifth category is the information deficiency: inaccuracy/inability to forecast both the supply and the demand, lack of coordination with suppliers, insufficient/inconsistent information dissemination. Develop a unified/integrated data monitoring/management of PFDA-BFPC and Bulan Local Government Unit (LGU) accessible to the public, ignite/sustain marketing initiatives of tambam processing. Develop a simple, cloud-based data dashboard. Create a secure, single online platform accessible to authorized stakeholders (fishermen, middlemen, local and national governments, (and the Tamban Fisher and Processor Cooperative or TFPC) to view aggregated data on average pricing, inventory levels, and stock forecasts. Bulan SB and LGU, PFDA-BFPC, must drive initiatives to attract new buyers, processors of tamban by laying out opportunities crafted through a science-based, data-driven and evidence-based studies and results. Launch a "Bulan Tamban" branding and digital marketing campaign. The TFPC should lead this by creating a quality seal, establishing an online presence, and facilitating direct communication (e.g., SMS alerts) between suppliers and bulk buyers.

Lastly, the capacity constraints category: not having the right tools and equipment, lack of technology integration, manpower shortages. Establish a micro-lending or equipment lease program. Partner with government offices (DOLE, DOST, TESDA), local banks or nonprofits to offer subsidized loans or a leasing scheme for modern, fuel-efficient engines, insulated containers, and better nets, conditional on adhering to sustainable fishing practices. Benchmark/adapt best practices from large and known fish ports governed by the PFDA, government intervention in procuring high-technology equipment. Conduct basic digital literacy workshops. Offer free, mandatory training sessions for fishers and processors on how to use basic digital tools, mobile apps for data entry, and communication platforms to increase adoption rates for new systems. Scheme for enabling fishermen and processors to acquire high-technology equipment, and machinery for standardization, lesser lead time, and quality control. Create and offer incentives (scholarships, better pay) to retain skilled local labor. Identify and inventory actual number or manpower to create a data-driven analysis of manpower shortage.

Proposed Strategies towards the Commercialization of Bali Sardinella (Tamban) in Bulan, Sorsogon

Any organization or business entity, regardless of how small or huge its capital, won't succeed unless it does not neglect strategizing. It is being able to pivot whatever may come their way to the top, or simply be able not just initially having competitive advantage but to sustain it. The company must be able to lever-

age or take advantage its strengths and opportunities, and while doing so, be efficient in eliminating every weakness they have and soaring above any threats.

Table 1. Stakeholder Matrix and their respective roles

Sector/Entity	Key roles towards *tamban* commercialization
Bureau of Fisheries and Aquatic Resources (DA-BFAR)	Technical assistance, data collection, research and development, fisherfolk registration and training, and strict and fair implementation of Comprehensive National Fisheries Industry Development Plan, and Approved National Sardines Management Plan
Department of Agriculture- Philippine Fisheries Development Authority (DA-PFDA)	Management and modernization of Bulan Fish Port Complex and add strategic post-harvest facilities such as cold storage, and ice plant (the newly built ice plant inside the fish port must have been working by now). Strict adherence to the sanitation standards and quality control measures. Accurate statistical data collection and storage.
Department of Trade and Industry (DTI)	Market access, promotion of *tamban* products locally and internationally, product labelling and packaging standards, micro, small, medium enterprises creation and development. Proce monitoring and control. Recommending and implementing price cap (automatic price freeze), price ceiling, or suggested retail price (if deemed applicable).
Local Government Unit of Bulan (LGU-Bulan), and other LGUs	Management of municipal waters, implementation of local ordinances (partnership with *bantay-dagat,* coast guard, municipal police), local infrastructures (fish landing, col storage)—review the MOA with Philippine Fisheries Development Authority-Bulan Fish Port Complex to reconcile conflicts in provisions, should there be.
Sangguniang Bayan and Sangguniang Panlalawigan	Revisit and update the Municipal Fishery Code of 2017. Intensify provisions pertaining to monitoring, safeguarding the ecosystem, moreover penalizing violators of illegal fishing. Establishing marine protected areas/fish sanctuaries, budget allocation for fisheries and livelihood programs.
Community fishermen, Cooperative leaders	Data collection and validation, adoption of high-technology for catching and post-harvest, and co-management of marine resources through Fisheries and Aquatic Resources Management Councils (FARMCs)
Academe (SorSU) and TESDA	Product innovation and development. Transfer of cost-effective processes, market research, and socio-economic studies. Agri-Entrepreneurship Training. Cooperative Management. Food Processing NC II. Proper icing, cold storage, fish handling protocols. Diploma in Fishery Technology.
Cooperative Development Authority (CDA)	Activate/reactivate fishermen cooperative. Cooperative mentoring and guidance until the concerned cooperative can truly stand on their own. Cooperative Management.
Land Bank of the Philippines, Development Bank of the Philippines Department of Agriculture	They should educate fisherfolk cooperative/associations, MSME involved in fishing, processing, trading, aquaculture, and other post-harvest activities their lending/loan program: Landbank: Aquatic Resource Acceleration, and AGRISENSO Plus Lending Program. DBP: DA-ACPC-BDP AgriNegosyo Loan Program, and Aquaculture Value Chain Financing Program (AVCFP) DA: Agri-Negosyo Loan Program (ANYO)

Conclusion

Everyone understands the need for more cohesive programs among key players for enhanced management of tamban as obvious source of food, livelihood, economic growth and the need to eliminating environmental risks and promote sustainability while we cultivate tamban. This study warrants more data-driven, fact-based researches, studies as itself. While there are already existing plans, policies, fishery code, Philippine Fisheries Development Authority's mandates, we should review and mobilize them, for purpose of integration and uniform/consistent implementation. In line with the study's significant findings and conclusions, the researcher presents the following recommendations to the PFDA, Sorsogon Provincial Government, Local Government Unit, and to the general public. Promote in the Sorsogon State University to prioritize research, theses, feasibility studies, product developments, and business plans diversified/differentiated tamban value-addition. The government should support all key players in the commercialization of tamban in aspects of finance, logistics, marketing, dedicated research, knowledge sharing, information dissemination, effective communication, technology adoption/integration, and the establishment of sound regulations.

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