

# Value Chain Analysis of Tilapia (*Oreochromis Niloticus*) in South Cotabato, Philippines

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Date Submitted:  
**April 8, 2026**

Date Accepted:  
**May 10, 2026**

Date Published:  
**May 21, 2026**

DOI:  
**10.5281/zenodo.20323104**

## ABSTRACT

The "Value Chain Analysis of Tilapia in South Cotabato" analyzes production processes to map functional links, assess profitability, and identify systemic bottlenecks to enhance industry competitiveness. Addressing the lack of integrated sectoral data, the study identifies key players, determines product and payment flows, and evaluates the policy environment. Using a descriptive research design, the researcher conducted surveys and Key Informant Interviews (KII) with 110 value chain actors across ten municipalities and one city. The value chain map identifies input suppliers, growers, processors, and traders as primary operators. Results indicate that while the industry is highly profitable yielding a 328% Return on Investment (ROI) through Sex-Reversed Tilapia

(SRT) technology, it is burdened by exorbitant feed costs (60% to 80% of expenses) and structural gaps, including a 95.44% proliferation of unregistered hatcheries. Product flow is primarily directed toward local and regional markets, as export operations have not yet commenced. The industry faces significant biological risks, specifically kamahong (mass fish kills), while market power remains concentrated among intermediaries. Finally, a decentralized government shares fisheries management between national (DA-BFAR) and municipal levels. These findings conclude that the industry remains vulnerable to environmental hazards and high input dependency despite its profitability. The study suggests that key players must initiate interventions such as R&D for cost-effective feeds, investments in cold chain logistics, and strengthened technical training and registration protocols to resolve industry challenges.

**Keywords:** *Value Chain Analysis, Tilapia, South Cotabato, Sex-Reversed Tilapia, Aquaculture, Market Channels, Post-Harvest Losses, Kamahong, Feed Costs, Fisherfolk Cooperatives.*

## INTRODUCTION

The fisheries and aquaculture sector serves as a critical pillar of the global food system, providing essential income and livelihoods for millions, particularly in developing nations where it acts as a primary engine for poverty alleviation and food security (FAO, 2014; Meded Awel, 2018). Within this landscape, tilapia has emerged as the world's most widely cultivated aquatic organism. Often dubbed the "aquatic chicken" due to its versatility across production environments ranging from subsistence household ponds to intensive commercial cages it remains a vital, high-acceptance protein source (Ahmed, 2009; BFAR, 2022). In the Philippines, the National Tilapia Industry Roadmap 2022–2025 identifies Nile tilapia (*Oreochromis niloticus*) as the dominant species, citing its physiological hardiness and salinity tolerance as key drivers for its widespread culture.

This study is theoretically anchored in Michael Porter's (1985) Value Chain Analysis (VCA), as cited by Zaman et al. (2025), a strategic framework that maps the full spectrum of activities from initial input supply to final consumption. This approach is instrumental in identifying systemic bottlenecks and elucidating the incremental addition of value and the distribution of rewards across each node of the chain (Kaplinsky & Morris, 2000). As highlighted by Ayubu (2017), VCA serves as a potent diagnostic tool that empowers smallholders by enhancing value-added activities and mitigating economic vulnerability through increased operational transparency.

Regionally, SOCCSKSARGEN (Region XII) stands as a vital aquaculture hub, consistently ranking as a top producer in Mindanao. In South Cotabato, production is heavily concentrated in the municipality of Lake Sebu, where approximately 90.30% of tilapia output is generated within freshwater fish cages (DA, 2023). However, while national tilapia production grew by 3.3% in early 2025, the local industry remains plagued by acute environmental risks. Foremost among these is the recurrent mass fish kill locally known as "kamahong". Triggered by thermal turnover and sudden dissolved oxygen depletion, these events cause devastating economic shocks that threaten the long-term sustainability of the regional value chain.

The necessity of this research is further underscored by persistent industry constraints. High feed costs, which typically account for 60% to 80% of total production expenses, remain the primary hurdle to profitability. Furthermore, small-scale producers are frequently marginalized by formal credit markets due to stringent collateral requirements, forcing a precarious reliance on informal loans with exorbitant interest rates (Nelligan, 2022; Magna et al., 2023). These financial burdens are compounded by logistical inefficiencies; inadequate cold storage and substandard road networks lead to significant post-harvest losses, while a lack of comprehensive data profiling hinders the implementation of standardized procedures and equitable profit-sharing (DA, 2023).

To address these multifaceted concerns, this study utilizes Value Chain Analysis to pinpoint critical nodes for improvement and provide a granular understanding of the actors and activities within each segment. By identifying specific strategies to bolster the industry's competitive position, this analysis prioritizes interventions needed to overcome systemic bottlenecks and enhance climate change resiliency. Ultimately, the findings will provide the analytical foundation for a strategic roadmap and an evidence-based framework, guiding future investments and policy development to transform the local tilapia industry into a robust engine for poverty alleviation.

### **Statement of the Problem:**

Generally, the study aims to analyze the value chain of tilapia in South Cotabato

Specifically, the study seeks to answer the following questions:

1. Who are the key players involved and their roles and contributions in the value chain?
2. What is the demographic profile of the key players involved in the value chain?
3. What does tilapia value chain map look like, which traced and identified two key questions, namely (a) what are the different marketing channels/product flow and payment of tilapia within the chain, and (b) what are the value addition of each actor in the chain?
4. What is the cost-structure and profitability of the chain?
5. What are the current challenges and opportunities in the value chain?
6. What are the possible government or institutional interventions and external factors affecting the value chain of tilapia?
7. What is the policy environment of the tilapia industry in South Cotabato?

### **Significance of the Study**

The Value Chain Analysis (VCA) of tilapia is crucial as it addresses the pressing industry requirement for a firm foundation of interventions, thereby the laying down the priority interventions for the tilapia industry development. This analysis is warranted because tilapia is deemed highly suitable in

South Cotabato with high market potential, and it is recognized as a specific product within the fisheries-based commodity systems included in the National Agriculture and Fisheries Modernization and Industrialization Plan (NAFMIP) for 2021-2030.

The study will provide a comprehensive look at the entire chain, spanning from input suppliers to the final consumer in the study area. The results of this study are considered helpful because it provides a holistic picture of the existing opportunities and constraints in tilapia production and marketing along the value chain. The findings are intended to be used as a source material for further fishery value chain studies and can contribute to the development of improved strategies for reorienting the marketing system for the benefit of small farmers and traders.

### **Scope and Delimitation of the Study**

The study will focus mainly on analyzing value chain of tilapia in the province of South Cotabato, which comprises ten (10) municipalities and one (1) city. The province includes the municipalities of Banga, Lake Sebu, Norala, Polomolok, Sto. Niño, Surallah, Tampakan, Tantangan, Tboli, Tupi, and City of Koronadal. The discussion includes fresh tilapia and different product forms from other areas, which can be used as benchmarks due to the developing nature of the industry in the province. The research will cover the production cycle of fresh tilapia from brooding to grow-out phase including the different practices involved and various materials and inputs required such as brood stock, fry, fingerlings, feeds, and fertilizers among others.

The study limited its scope to producers/fish operators, local collectors/ assemblers, wholesalers, retailers, and consumers who are currently or previously engaged in fish value chain in South Cotabato. Hence, the main limitation of this study will be lack of reliable data about fishery in this study area and the problem of getting ample literatures to review about analysis of fish value chain and market chain in the province and budget constraints.

The aforementioned circumstance posed challenges for the researcher in collecting relevant data. The researcher will rely on survey results, approximations from key informants as well as available research and publications online.

### **Definition of Terms**

For better understanding of the concepts and results in this study, the following terms are defined as follows:

**Aquaculture.** The intentional farming of tilapia and other aquatic species in inland waters like Lake Sebu. Unlike open-sea fishing, this involves human control over the environment and the life cycle of the fish to ensure a stable harvest.

**Bureau of Fisheries and Aquatic Resources (BFAR).** The primary government agency under the Department of Agriculture tasked with regulating, managing, and providing technical support to the tilapia industry in South Cotabato.

**Consolidator.** A strategic middleman responsible for "bulking" in which the process of gathering smaller harvests from various growers and sorting them by size and quality to meet the demands of large-scale buyers.

**Consumer.** The end-user in the chain who purchases tilapia based on household needs, taste preferences, or budget, effectively driving the demand for the entire industry.

**Enablers.** The supporting cast of the value chain, including banks, NGOs, and government units, that provide the "fuel" (loans, training, or infrastructure) necessary for direct players to operate.

**Fish Fingerlings.** The "seed" of the industry; young tilapia that have grown past the fry stage and are robust enough to be transferred into cages or ponds for final grow-out.

**Fish Cage.** Netting enclosures suspended in Lake Sebu's waters. These structures are the primary production units for the 90.30% of tilapia produced in the province.

**Fish Pond.** Earthen, man-made basins typically used by land-based growers as an alternative to lake-based cage farming.

**Fisherfolk.** The hardworking individuals in South Cotabato who depend on inland water resources for their livelihood, ranging from small-scale cage operators to workers in local rivers.

**Fisherfolk Cooperative.** A community-based organization where small farmers pool their money and labor to gain better bargaining power when buying feeds or selling their harvest.

**Grower.** The heart of the production phase; the person or entity responsible for the daily care, feeding, and management of tilapia until they reach a marketable size.

**Hatchery.** The starting point of the chain; a specialized facility that breeds broodstock to produce the high-quality fry and fingerlings required by growers.

**Input Provision.** The "entry node" of the chain, encompassing the supply of everything needed to start a fish farming, including fingerlings, feeds, fertilizers, and even the capital to buy them.

**Lake.** Refers to inland bodies like Lake Sebu, which act as the primary "farm fields" for South Cotabato's aquaculture economy.

**Manufacturer/Processor.** Actors who take raw, whole tilapia and transform them into value-added products like lamayo, chicharron, or dried fish to increase shelf life and profit.

**Market.** The commercial "meeting place", whether a physical wet market in Koronadal or a wholesale channel, and where prices are negotiated and tilapia changes hands.

**Market Chain.** The logistical "pathway" that tilapia follows as it moves physically and commercially from the waters of South Cotabato to the dinner tables of consumers.

**Marketing.** The active process of bridging the gap between the producer and the buyer, ensuring that a highly perishable product like tilapia arrives fresh and at the right time.

**Producer/Operator.** Any individual or business that manages the actual "means of production" (cages, ponds, and labor) with the intent of selling fish for profit.

**Retailers.** The final middlemen in the chain, often found in local wet markets or stalls, who break down bulk purchases into small quantities for individual families.

**Tilapia.** Referred to here as the "aquatic chicken" of South Cotabato which is known for its hardiness, fast-growing fish species (*Oreochromis niloticus*) that serves as the central commodity of this research.

**Traders.** The essential links who connect growers to the wider market by purchasing fish in bulk and transporting it to various geographical locations.

**Value Chain:** The full "story" of a tilapia product, from the moment a fingerling is bought to the final sale of a processed fish, focusing on how each step adds worth and cost.

**Value Addition.** Any action taken, such as cleaning, icing, or cooking that increases the price or desirability of the tilapia as it moves through the chain.

**Wholesaler.** Large-scale merchants who buy in massive volumes from producers and sell exclusively to other middlemen (like retailers) rather than directly to the public.

## Literature Review

Tilapia is the second-most consumed fish in the country (after milkfish), and accounts for 12 per cent of overall animal protein consumption in the Philippines, representing 2.71 kg per capita per year (Philippine Statistics Authority, 2022a). In various countries, tilapia is considered a pest species and are common food source in most of the developing countries. Tilapia thrive in warm-water, tropical condition and are known for their hardiness, rapid growth rate and efficient feed conversion ratio.

The Nile tilapia (*Oreochromis niloticus*) is a key aquaculture species in the Philippines, valued for its hardiness and fast growth rate, making its value chain essential for addressing national food security concerns (Nelligan, 2022).

### **Value Chain of Tilapia**

Kaplinsky et al., (2015), defined value chain as the entire range of activities required to bring a product or service from its conception, through various production and delivery phases, to its final consumption and disposal. As products move through these successive stages, transactions occur, money and information are exchanged, and value is progressively added (Kaplinsky et al., 2001). A.J. Kulmiyie (2010) stated in his study that, in the fisheries sector, the value chain is specifically defined as the movement of fish from the landing beach, through the supply chain, to the final consumer, encompassing all activities and the subsequent value addition undertaken by different stakeholders in pursuit of profit.

El-Sayed et al. (2015) reported that, the approach of Value Chain Analysis (VCA) has gained prominence in the fisheries and aquaculture sectors. It serves as a systematic tool for policymakers and managers to understand processes, identify constraints, evaluate performance, and analyze market relationships (Asiedu et al., 2015). VCA is fundamentally viewed as a key entry point for poverty alleviation. The design and characteristics of value chains for capture and culture fisheries differ significantly based on the species, country, and region involved.

In the context of the Philippines, the tilapia value chain is recognized as an important contributor to food security and is essential for meeting the demands of the growing population. The Department of Agriculture – Philippine Rural Development Project (DA-PRDP) South Luzon Cluster developed a Value Chain Analysis (VCA) for the aforementioned commodity in order to enhance the 5 competitiveness of the industry as a whole and uncover additional prospects (Department of Agriculture, 2021).

Additionally, the analysis of the fresh tilapia value chain in the SOCCSKSARGEN Region (Region XII) conducted by the Department of Agriculture – Philippine Rural Development Project (DA-PRDP), which includes South Cotabato, for the purpose to obtain a comprehensive understanding of the dynamics and competitiveness of the industry. South Cotabato is a key province in Region XII where tilapia cultivation takes place in both freshwater fishponds and freshwater fish cages. The value chain for fresh tilapia in Region XII generally involves key players such as input suppliers, growers, traders/wholesalers/consolidators, retailers, and restaurants. The predominant method of trade in Region XII is the sale of whole fish (live, fresh, or frozen) within both retail and wholesale markets (Department of Agriculture, 2023).

### **Activities in the Value Chain of Tilapia**

According to Aaron (2014), in its most basic form, a typical seafood value chain consists of harvesting (through fishing or aquaculture), primary processing, secondary processing, distribution, marketing, and consumption. The value chain for tilapia in the Philippines is considered relatively short compared to chains for highly processed foods, largely due to the high perishability of the fish and the prevailing consumer preference for unprocessed, whole, and sometimes live fish (The Tilapia Technical Committee, 2018).

In Region 12 (SOCCSKSARGEN), where South Cotabato is located, the value chain is delineated across six major functional areas: input provision, primary production, consolidation, processing, and distribution (culminating in retailing/final sale) according to Department of Agriculture (2023). These stages involve a sequence of related enterprises (actors) performing functions that convert inputs into outputs. The core processes, regarded as primary activities that directly contribute to value creation, encompasses sourcing the commodity, trading and processing activities, and the final sale of the fish to the end consumer (Jamer et al., 2025).

### **Major Tilapia Species**

Tilapias are cold-blooded aquatic vertebrates belonging to the family *Cichlidae*, encompassing the genera *Oreochromis*, *Tilapia*, and *Sarotherodon*. The Nile Tilapia (*Oreochromis niloticus*) is the species most commonly cultured globally and within the Philippines. The Nile Tilapia was introduced to the Philippines in 1972 by the Asian Development Bank (ADB), succeeding the earlier introduction of the

Mozambique tilapia (*Oreochromis mossambicus*) in 1950 (Department of Agriculture, 2023). However; according to Nelligan (2022), the broodstock currently used in the Philippines are often the result of cross-hybridizations derived from Nile Tilapia, Red Tilapia, and Mozambique Tilapia, aiming to achieve specific desirable characteristics like color and cold tolerance.

Moreover, the Nile tilapia has quickly become a favorite among local farmers and Filipino customers (ADB, 2004). Its rising popularity is due to their hardiness resistance to disease, ease of breeding, reasonable growth rate, good taste, and tolerance to a wide range of environmental conditions including temperature and salinity (Bureau of Fisheries and Aquatic Resources, 2022).

Lastly, almost all available strains of fry in the Philippines originate from the foundational Genetically Improved Farmed Tilapia (GIFT) strain, initially released in the 1990s by WorldFish and its partners (Romana-Eguia et al., 2020). Other enhanced strains available for culture in the Philippines include Genetically Enhanced Tilapia (GET) and Sex-Reversed Tilapia (SRT) as indicated in the report of Department of Agriculture (2023).

### **Fresh/Chilled Tilapia Production**

The Philippines' value chain for tilapia typically short due to the high perishability of the fish and the prevalent consumer preference for unprocessed, whole, live fish (The Tilapia Technical Committee, 2018). The predominant method of trade in Region XII involves the sale of whole fish, which may be live, fresh, or frozen, in both retail and wholesale marketplaces (Department of Agriculture, 2023). The same with the article of Jamandre et al., (2011), pointed out that Filipino householders generally demonstrate a preference for fresh tilapia with firm meat.

Likewise, logistical operations in the value chain are closely managed due to the high perishability of tilapia, necessitating the close proximity of facilities to reduce transport costs and minimize quality loss (Mamauag, 2022), so transport cost become increasingly important. In developing countries such as the Philippines, the issue of perishability is compounded by inadequate infrastructure, such as cold storage, which makes fish especially susceptible to wastage (Kruijssen et al., 2025).

In Region 12, the current estimate for post-harvest losses is 10%. When promoting fresh tilapia locally, retailers often use branding such as "Lake Sebu Tilapia" or "SACI Tilapia" to imply high quality (Department of Agriculture, 2023).

### **Value-Added Tilapia Production**

Value-added tilapia production involves a range of activities and processes that increase the value of a product as it moves through the supply chain often resulting in increased profits for participating actors. According to Meded et al., (2018), value added operations can generally include fundamental processing steps like gutting, filleting, sorting, grading, plastic packing, smoking, icing, salting, sun-drying, storing, and refrigeration. In various circumstances, commercial processing into diverse products can augment the economic value of tilapia, potentially yielding significant foreign currency revenue and employment benefits.

Meanwhile, products made from tilapia may be found in the Philippines in various forms. It is primarily categorized as the entire fish, the fillet, the pulp or minced sections, and the skin (PRDP, 2014; the Tilapia Technical Committee, 2018). Whole tilapia can be marketed as live, raw refrigerated (whole-gutted), preserved, or smoked versions. Fillets are widely accessible and can be purchased fresh or refrigerated. The pulp and minced tilapia flesh components are transformed into many value-added products such as surimi, morsels, tofu, siomai, longganisa (fish sausage), prospect, quekiam, tocino (marinated fillets), and tilapia bagoong (fish paste) according to BFAR, National Tilapia Industry Roadmap 2022-2025. Small-scale processors also produce smoked whole tilapia and tilanggit (salted, sun-dried whole tilapia), while factories may produce whole-gutted-frozen tilapia, fillets, and cubes (Nelligan, 2022). Furthermore, tilapia skin is used in the production of leather products and gelatin, and has potential in the pharmaceutical

industry. Tilapia exports are often frozen whole fish that has been gutted and filleted (Department of Agriculture, 2023).

Furthermore, the Philippines frequently restricted the production and marketing of highly processed tilapia products, which are typically carried-out by micro-enterprises and community groups with government support (Department of Agriculture, 2023). Actors who engage in value-adding activities, particularly processors, particularly attain the highest net returns or marketing margins since they change the form of the product. However; the fresh tilapia VCA developed by DA in 2023, indicates that the fresh tilapia chain in the SOCCSKSARBEN region, grow-out producers acquire a higher added value (51%) than traders/wholesalers (15%), primarily due to the high costs they absorb such as feeds, fingerlings, and labor).

### **Key Players that are involved in each Chain of Tilapia**

According to KIT et al., (2016), the fish value chain includes direct actors who involved in activities (producers, traders, consumers) and indirect actors or enablers, who provide financial and non-financial support services such as input suppliers, credit agencies, business service providers, government, non-governmental organizations (NGOs), researchers, and extension agents.

Moreover, based on the report of Department of Agriculture (2023); in region 12, the following are important direct players in the tilapia value chain are: a.) input suppliers: these actors provide essential inputs such as fingerlings/fry, feeds, fertilizers, and cage materials. Hatchery operators play a significant role, with various tilapia strains being made available through governmental and private hatcheries; b.) producers/grow-out farmers: these are the tilapia growers, who often rely on the industry for their livelihoods. In Region 12, Indigenous Peoples (IPs), specifically the T'boli and B'laan communities in Lake Sebu, South Cotabato, are identified as primary cultivators; c.) traders/wholesalers/consolidators: these intermediaries connect producers and consumers. They often operate as shippers or viajeros who purchase tilapia in bulk and distribute to various geographical markets or other bulk buyers; and d.) retailers and institutional buyers: Retailers are the smallest traders who sell directly to end-users in channels such as wet markets and supermarkets. Institutional purchasers include restaurants, hotels, and malls.

On the hand, supporting actors/enablers include the Bureau of Fisheries and Aquatic Resources (BFAR), local government units (LGUs), the Department of Agriculture (DA), the Department of Trade and Industry (DTI), and financial institutions. Government agencies remain crucial sources of extension and technical advice to small-scale farmers. Due to the complexity of tilapia value chain fish often pass-through multiple intermediaries, functioning as a relay race where the product title is transferred from one specialized actor to the next, with each stop adding value in the form of physical processing, time, utility, or place utility.

### **Current Challenges and Opportunities in the Value Chain of Tilapia**

#### ***Input and Production Constructions***

The primary constraint impeding the efficient functioning of the aquaculture system is the exorbitant cost of feed and other essential inputs, such as fertilizers. Feed expenses can account for 60% to 80% of the overall production cost in intensive tilapia cultivation. Also, the lack of registered tilapia hatcheries has resulted in the proliferation of poor-quality fingerlings. Farmers report difficulties in securing a sufficient supply of good quality broodstock (Department of Agriculture, 2023). High input costs and long grow-out periods contribute to low growth rates and prices that are unprofitable for farmers in areas like Tanzania (Ayubu, 2017).

Moreover, the impacts of climate change are a major constraint, particularly the expected increase in water temperatures in inland ponds, which sharply decreases tilapia growth rates as the fish expend energy to cool themselves (Nelligan, 2022). In Region 12, for instance, experiences frequent fish kill phenomena known as "k'mohung" or "kamahong," which results in mortality and significant production losses (Department of Agriculture, 2023).

Finally, grow-out producers, especially those in the marginalized sector, have limited access to financial and credit linkages due to the stringent criteria and exorbitant interest rates imposed by lending institutions. In addition, the low uptake and adoption of Good Aquaculture Practices (GAqP) undermine overall productivity in the Philippines (Department of Agriculture, 2023).

### ***Market and Logistical Constraints***

The tilapia value chain faces logistical limitations due to insufficient infrastructure such as cold storage. Inadequate cold storage infrastructure, poor road conditions leading to farms, and insufficient transportation facilities hinder the efficient movement of products and increase expenses, causing delays and product deterioration. In Region 12, the post-harvest losses are estimated to be 10%, and high spoilage is a concern due to the perishable nature of the fish. Correspondingly, logistical networks are often characterized by inefficient and fragmentation, which makes it challenging for dealers to consolidate the product (Department of Agriculture, 2023).

In terms of pricing, there is strong evidence of market power imposed upon fish producers/fishermen by the retailers. Farmers are frequently forced to sell at lower, unprofitable prices and often act as price takers. Jamandre et al., (2011), a significant constraint affecting the entire chain is consumer perception of tilapia as a cheap, low-quality fish, leading to a low willingness-to-pay among consumers.

One of the governance weaknesses is the lack of comprehensive profiling of tilapia producers, processors, and traders. The procedures governing the tracing of commodity outflow are insufficient (Department of Agriculture, 2023).

### ***Technology and Production Upgrading***

According to Nelligan (2022), the sector has a significant opportunity to develop “climate-smart” tilapia aquaculture to adapt to the adverse effects of climate change. This includes developing genetic strains of tilapia that are able to maintain growth rates in warmer water. Another key strategy is breeding genetic strains that can tolerate salt water to allow sea-based mariculture (Guerrero, 2019). The production of Sex-Reversed Tilapia (SRT) offers a higher productivity rate compared to ordinary fingerlings, presenting an opportunity for growers to increase income (Department of Agriculture, 2023).

More importantly, the availability of alternative ingredients for local feed preparation provides a chance to reduce dependency on expensive commercial feeds. Research and Development (R&D) initiatives are needed to devise cost-effective feed formulations using locally available resources (Department of Agriculture, 2023).

### ***Market Development and Value Addition***

The processing of tilapia into various forms is recognized as a key avenue for growth particularly as an emerging business in Region 12 (Department of Agriculture, 2023). Nelligan (2022) states that, there are opportunities to process tilapia into value-added products like frozen fillets, tilapia surimi, and tocino to improve taste and increase willingness of consumers to pay. Tilapia processing presents a favorable prospect for growers to engage in value-enhancing endeavors. It simply means that, there are opportunities in utilizing tilapia skin for the pharmaceutical industry (for example, for gelatin), which is an area of ongoing research (Department of Agriculture, 2023).

Moreover, Nelligan (2022) explains that, a consumer targeted marketing campaign to improve to perception of tilapia is highly recommended intervention that may lead to further demand and increased prices. For instance, the rebranding of tilapia as "Hainan bream" in China, accompanied by targeted marketing activities, offers a successful model for promotion (Godfrey, 2021).

Lastly, the global tilapia market is expected to reach US\$ 9.2 Billion by 2027, driven by the growing population of health-conscious consumers shifting towards protein-rich diets, providing a robust export and local market opportunity (Department of Agriculture, 2023).

### ***Policy and Infrastructure Interventions***

The National Tilapia Competitiveness Vision includes specific goals to reduce fishery post-harvest losses from 25% to 10% within five years. To achieve this, objectives include enhancing the quality and traceability of exported tilapia products and strengthening the marketing system (National Tilapia Industry Roadmap 2022-2025).

Upgrading key infrastructure is essential, including the construction/upgrading of fish landing facilities and cold chain facilities for consolidation. The construction/upgrading of farm-to-market roads is also necessary to improve market access (Department of Agriculture, 2023).

Government support can enhance the supply chain by implementing strategies to incentivize farmers to register their operations, which grants them access to financial and non-financial support services provided by government agencies. Strengthening fisheries cooperatives, organizations, and associations is also critical for improving bargaining power and accessing benefits (Department of Agriculture, 2023).

### **Policy Environment in Value Chain Analysis of Tilapia**

According to Meded et al., (2018), policymakers can assess the development status of fishery sector and identify opportunities and constraints for its future growth by using value chain analysis. The government of the Philippines has identified tilapia as a key commodity to address food security and poverty alleviation concerns (Nelligan, 2022). As articulated in the Philippine Tilapia Industry Roadmap 2022-2025), the National Tilapia Competitiveness Vision aims to establish a globally competitive and sustainable tilapia business, privately driven, and market-oriented, supported by robust government assistance.

The current regional objective in Region 12 is to enhance tilapia production, aiming to increase it from 19,246.68 MT in 2024 to 22,450.00 MT by 2026. Policy recommendations emphasize strengthening surveillance and monitoring of hatcheries and aquafarms, and implementing Good Aquaculture Practices (GAqP). Effective governance requires establishing and enforcing ethical rules to govern the actions of stakeholders, particularly producers and processors, to guarantee high-quality products throughout the supply chain. However, challenges persist due to weak governing regulations on tracing commodity outflow and the lack of comprehensive profiling of key players (Department of Agriculture, 2023).

Empirical studies on fisheries value chains highlight variations in efficiency and financial distribution across different species and regions. According to Ayubu (2017), value chain for farmed fish, like Nile Tilapia in Tanzania are often characterized as short and simple due to the relatively low quantities produced locally.

On the one hand, chain for high-value export commodities like tuna in General Santos City tend to be higher and more complex, involving consolidation, freezing, and specialized processing (Quido, 2023). On the other hand, according to Nelligan (2022), when compared to the global leader which is China; the Philippines lags significantly in production efficiency (China obtains 16t/ha compared to about 7t/ha in the Philippines), certification, and capacity for value-added processing.

Moreover, the distribution of added-value is frequently unequal, favoring downstream actors with significant value addition or market power. In the analysis of fresh tilapia in the SOCCSKSARGEN region, grow-out producers obtained the highest added value (51%) compared to traders/wholesalers (15%), although farmers shoulder the largest portion of the costs (Department of Agriculture, 2023). The largest net returns or marketing or marketing margins are typically obtained during the final selling phase, which often involves restaurants or retailers who chance the product's from (Mutia et al., 2025). For instance, in Bangladesh, the commission agent (Arathder) attained maximum value addition for tilapia, but retailers received the highest value-addition for Pangasius (Zaman et al., 2025). Small-scale fishers and farmers often receive the least economic benefit in comparison to other players due to their lower bargaining power against larger processors and retail market (Bangnot et al., 2021).

Lastly, according to Meded et al., (2018), access to extension services, market information, competitive marketing agents, and infrastructure are some of the factors that influence value chain

performance. The amount of fish produced, fishing experience, fish prices, and access to modern transport and credit significantly influence market supply and adoption of value addition activities.

### Value Chain Map for Tilapia

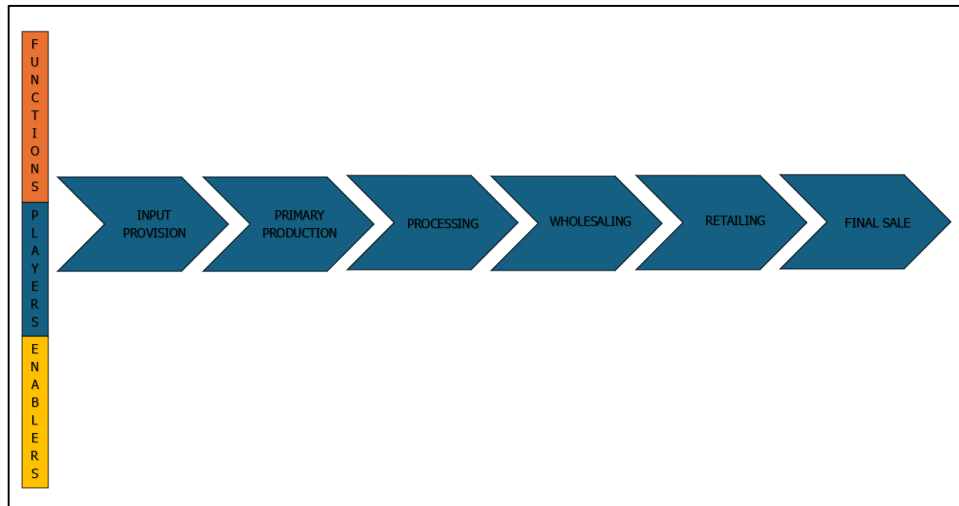


Figure 1. *Value Chain Map of the Tilapia in South Cotabato*

Figure 1 represent the value chain map for tilapia in South Cotabato, the Basic Functions or chain links from the input provision, primary production, processing, wholesaling, retailing to final sale. The figure showed the different activities within the chain of every player and their functions and the enablers involved. The input provision included the act of supplying or providing tilapia. The primary production involved the main processes resulting in raw food materials, and the trader broken down into assemblers, wholesalers, and retailers who move the product through the market. The processing is the procurement of products and the distribution is the retailing of the tilapia products. This framework will be used to map out the value chain and will determine the activities in each product produced by the tilapia industry.

### Analytical Framework of the Study

In the framework for the value chain analysis of tilapia in the province of South Cotabato, the stakeholders were identified as well as their profile through personal interviews. These interviews were designed to capture information regarding business profiles, operations, and marketing strategies. To determine financial outcomes, the framework analyzes production factors such as fry, fingerlings, and grow-outs alongside costs for fresh fish, salt, equipment, labor, transportation, and packaging. These data points are utilized to calculate disposal and selling prices, which further help in identifying value-added figures, profit levels, and industry challenges or opportunities.

Aside from the primary data that was taken from personal interview, secondary data were also collected through published and unpublished materials available. Statistical secondary data were also collected from the records of the different government agencies.

After the stakeholders together with the profiles were identified and also after the secondary data were gathered, different value chain analysis methods were used such as the following: value chain mapping, an examination of cost-structures and profitability.

Following the technical analysis, the framework focuses on the identification of government and institutional support, as well as other external factors affecting the sector. This leads to an assessment of the

overall policy environment of the tilapia industry. Finally, the entire analytical process concludes in the development of policy implications and recommendations intended to improve the industry. The analytical framework for the value chain analysis of tilapia in South Cotabato is shown on Figure.

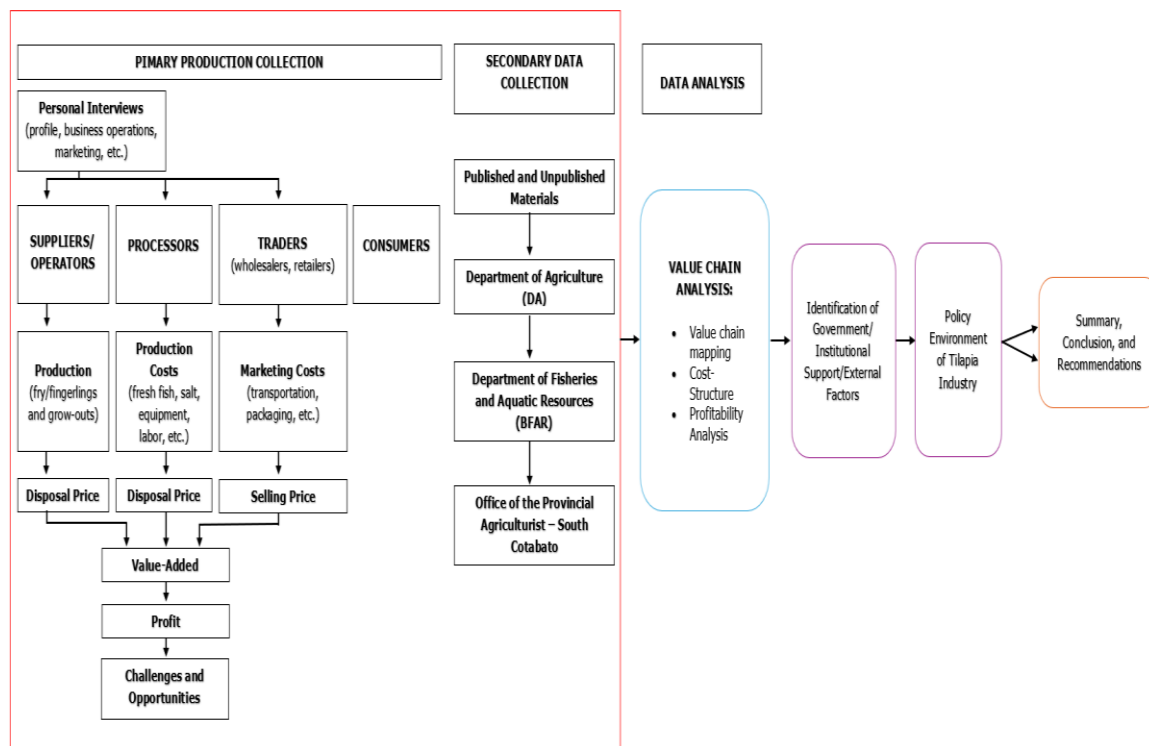


Figure 2. Analytical Framework for Value Chain Analysis of Tilapia in South Cotabato

## METHODS

### Research Design

The study employed a descriptive-analytical research design centered on Value Chain Analysis (VCA). This framework was systematically applied to map the flow of tilapia through four primary subsystems: input provision, production, processing, and marketing. The design was intended to move beyond simple description by identifying systemic bottlenecks, assessing the distribution of economic returns, and evaluating the impact of the enabling environment on industry performance.

### Location of the Study

The study was conducted across the province of South Cotabato, located in the SOCCSKSARGEN Region of Mindanao, Philippines. The geographic scope encompasses ten (10) municipalities including Banga, Lake Sebu, Norala, Polomolok, Sto. Niño, Surallah, Tampakan, Tantangan, Tboli, and Tupi, and the provincial capital, the City of Koronadal.

Specific sites within the province were strategically prioritized for data collection and personal interviews based on their specialized functional roles within the tilapia value chain:

*Lake Sebu:* This municipality served as a primary focus due to its extensive freshwater cage culture systems, which represent the backbone of the province's tilapia output.

*Banga, Surallah, and Tampakan:* These areas were identified as the primary regional sources for fingerling production and distribution.

*Koronadal City:* As the site of the Central Hatchery, the city serves as the critical supplier of broodstock and fingerlings to the rest of the province.

While municipalities such as Norala, Polomolok, Sto. Niño, and Tantangan were included in the scope, they exhibit a lower concentration of large-scale fish production, as their economies are primarily driven by large-scale agricultural plantations and agro-industries. These areas function largely as demand centers that rely on established supply chains originating from Lake Sebu and the neighboring trade hub of General Santos City.



Figure 3. Map of the Location of the Study

### Instrumentation

To establish methodological soundness and ensure the credibility of findings, the researcher-developed survey instruments underwent a rigorous validation protocol:

**Validity Check:** The instruments were evaluated by a panel of experts, including technical specialists from the Bureau of Fisheries and Aquatic Resources (BFAR) and academic advisors. This ensured the instrument accurately operationalized the functional links of the VCA framework (Kaplinsky & Morris, 2001).

Pilot Testing: A pre-test was conducted with ten (10) stakeholders excluded from the final sample. This identified and corrected ambiguous technical jargon, ensuring the tool was culturally and operationally appropriate for the local context.

### Sampling Procedure and Participants

The study employed a multi-stage sampling strategy, utilizing purposive sampling to target specific chain nodes and snowball sampling (adapted from Ting et al., 2025) to trace actual commercial relationships. This approach successfully recruited a total of 110 key players.

Table 1. *Distribution of Participants across Districts (n=110)*

Participant Node	District 1	District 2	District 3	Total
Tilapia Fingerling Suppliers	2	4	6	12
Tilapia Growers	17	7	14	38
Tilapia Processors	1	1	3	5
Tilapia Traders (Wholesale/Retail)	1	6	3	10
Tilapia Consumers	6	6	10	22
Tilapia Enablers	4	14	5	23
GRAND TOTAL	31	38	41	110

### Methods of Data Collection

**Primary Data:** Gathered through structured questionnaires and Key Informant Interviews (KII). Data include demographic profiles, production metrics, cost structures, and value-adding functions.

**Secondary Data:** Sourced from institutional records of the DA, BFAR, and the Provincial Agriculturist’s Office, ensuring primary findings were triangulated with official sector statistics and published literature.

After gathering the necessary data, the researcher then proceeded to the last phase which is the data analysis. The data gathered were being consolidated through statistical tools and descriptive analysis.

### Data Analysis

A descriptive tool was used to present the profile of the actors involved in the production and marketing of tilapia. This helps in the determination of who are the stakeholders and what are the activities that they perform in order to deliver the products to the consumers.

In determining the cost, margins, and profit of production and marketing of tilapia, cost and return analysis was used. This determines the net returns or net profit receive by each stakeholder.

In assessing the value addition, this was done by estimating the incremental monetary value added to inputs at each level of the value chain to generate output to the next level. The Absorption Costing Technique employed by Kuwornu et al. (2013) was used to estimate value added along the value chain. This costing technique assumes that the relevant cost to the fishing business is the total cost which is a sum of the total variable cost and fixed cost. Hence value (cost) is added by a current actor to the end product of the preceding actor to generate the current actor’s output which could be an intermediate product (for yet another actor) or a final product for consumption and disposal after use. Value added is computed as:

$$VA = TC - Vp$$

VA = Value Added

TC = Total Cost

Vp = Value of primary input (Tilapia) that is purchased from the preceding stage

### **Ethical Considerations**

To ensure participant protection, the researcher obtained ethical clearance from the Pangasinan State University (PSU) Research Ethics Board. Formal letters of request were personally handed to regional and provincial authorities to ensure adherence to institutional guidelines. Informed consent was established by providing respondents with a clear explanation of the study's purpose, emphasizing that their participation was voluntary. Data confidentiality was strictly maintained, with all gathered information treated as private and used exclusively for the research and analytical purposes of the thesis.

## **RESULTS AND DISCUSSION**

### **Key Players and Functions**

Comprehending the essential key players and their respective functions within the value chain was imperative in evaluating the comprehensive efficacy and efficiency of the rural development initiative. This section was devoted to furnishing details regarding the primary actors and their respective roles in the value chain from the descriptive answers of the respondents.

The study includes a large number of players who have been involved in various aspects of the tilapia value chains, as indicated by the respondents' responses. The respondents stated that every actor in the tilapia value chain has roles that are particular to the tasks they complete or the services they offer.

The key players of tilapia value chain in this study area were input supplier, individual fish producers', processors, traders and consumers. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor and some actors perform more than one role.

#### ***Input Suppliers as Providers***

The input supply segment in South Cotabato, comprising a specialized network of 12 fingerling suppliers, 11 registered feed distributors, 65 feed dealers, and 9 authorized fertilizer handlers (*see appendices D, E, and F for details*), serves as the foundational node of the tilapia value chain. This stage is fundamental because, as observed by Amoah et al. (2021), the quality and availability of these initial resources dictate the productivity and benefit distribution across all subsequent segments of the chain.

The study's findings align with the National Tilapia Industry Roadmap 2022-2025 (BFAR, 2022), which emphasizes that disseminating high-quality genetic strains, such as the GET EXCEL tilapia, is vital for maintaining environmental resilience and growth vigor. Beyond mere sales, local hatcheries fulfill the role identified by Nelligan (2022) as conduits for extension services, providing farmers with essential technical knowledge on best-practice management.

However, the empirical evidence highlights a significant financial burden caused by galloping costs, with commercial feed accounting for 40% to 89% of total expenditures, a reality that mirrors the findings of Lamo et al. (2023). This high dependency on manufactured inputs is exacerbated by a lack of formal credit access, forcing small-scale growers to rely on high-interest informal loans or personal savings, as noted by Magna et al. (2023), while rising costs for materials further compress profit margins (Jamandre et al., 2011).

To mitigate these economic pressures, the study observed that suppliers provide what the PRDP-IPLAN (2023) defines as "embedded services," using after-sales support to bridge the knowledge gap for farmers who lack formal aquaculture education (Ayubu, 2017). These interlinked activities between suppliers and producers create the competitive advantage championed by Porter (1998), ensuring the industry's self-sufficiency. Ultimately, this network is essential for aligning local operations with the National Agriculture and Fisheries Modernization and Industrialization Plan (BFAR, 2023), transforming tilapia aquaculture into a viable instrument for regional poverty alleviation and food security.

### ***Producers (Growers)***

Tilapia growers in South Cotabato serve as the primary actors responsible for transforming biological inputs into marketable products, representing the central operations node of the value chain. This segment, which includes approximately 3,765 fisherfolks, is a critical driver of regional food security. However, a significant institutional bottleneck exists: the majority of producers remain unregistered in the BFAR Fisherfolk Registration System (FishR). As cited by the Bureau of Fisheries and Aquatic Resources (2023), this lack of formalization prevents growers from accessing vital support services, including relief assistance, livelihood programs, and Philippine Crop Insurance Corporation (PCIC) coverage, thereby increasing their economic vulnerability to environmental shocks.

The industry's success is largely predicated on the selection of high-yielding species, specifically Nile Tilapia (*Oreochromis niloticus*) and genetically improved strains such as Sex-Reversed Tilapia (SRT) and GIFT. The adoption of these strains is instrumental in achieving growth vigor and environmental hardiness (BFAR, 2022). Specifically, SRT technology allows for all-male populations that achieve a marketable weight of 500 grams in just four months (BFAR-NFFTC, 2023). This technical alignment with established scholarship confirms that genetic enhancement is essential for maintaining steady production volumes despite the region's fluctuating environmental conditions (Romana-Eguia et al., 2020).

The production landscape in South Cotabato is geographically concentrated, with 90.30% of output originating from freshwater fish cages in Lake Sebu. Operations range from backyard subsistence units to commercial-scale enterprises utilizing advanced mechanization to target export markets. In alignment with the framework by Romana-Eguia et al. (2020), growers utilize three management systems such as extensive, semi-intensive, and intensive in which differentiated by stocking densities and input levels. While the semi-intensive system is most prevalent, the Department of Agriculture (2023) reports that the industry still grapples with a 10% post-harvest loss. These losses are exacerbated by the perishable nature of the commodity and inadequate cold storage infrastructure, a logistical gap highlighted by Kruijssen et al. (2023).

Labor management within this node is characterized by a profit-sharing model between proprietors and caretakers. In South Cotabato, caretakers typically receive a base salary and a 30% share of net profits, a model that Amoah et al. (2021) identifies as a critical determinant of sustainability because it aligns labor incentives with farm productivity. Ultimately, empirical evidence identifies the producer node as the primary site of value generation in South Cotabato.

### ***Processors***

The tilapia processing sector in South Cotabato is an emerging industry focused on the development of form utility, a key element for securing a competitive edge within contemporary value chains. By serving as the essential bridge between raw extraction and consumer delivery, processors facilitate the vital shift from primary farming to end-user consumption (Zaman, et.al, 2025). Despite this strategic potential, the sector is currently under-leveraged; the Bureau of Fisheries and Aquatic Resources (2023) highlights that adopting these value-added practices is a vital requirement for increasing farmer income and stabilizing the regional aquaculture economy.

A major institutional obstacle identified in this study is the high degree of informality and the deficiency in professional profiling within the industry. With only five active processors documented, a significant gap in official records is evident. As BFAR (2023) contends, the absence of a standardized database for processors and traders prevents the deployment of targeted interventions. This resulting information imbalance, a key factor in business success according to Martin et al. (2007) which distorts market awareness and prevents the establishment of a fair profit-sharing system for local participants.

Moving from home-based processing to professional-grade production is further hampered by inadequate infrastructure and strict regulatory demands. The PRDP-IPLAN (2023) identifies the scarcity of facilities meeting Good Manufacturing Practices (GMP) and FDA requirements as a decisive hurdle in

Region 12. Lacking the funds for advanced technology like blast chillers, local operators remain locked out of premium markets, including the airline and luxury hotel sectors (Jamandre et al., 2011). Additionally, the continued 10% post-harvest loss in South Cotabato confirms the concerns of Kruijssen et al. (2020) regarding the extreme fragility of fresh fish products in areas with poor cold-chain logistics.

Regardless of these issues, the economic outlook for processing remains strong. Methods such as producing lamayo, dried fish, and chicharon allow for the profitable use of smaller tilapia that would otherwise be undervalued in the fresh market (BFAR, 2022). These conversions often result in a value-added margin of more than 60%, greatly increasing profits relative to the sale of whole fish (Marisa et al., 2023). Furthermore, the move toward convenient, ready-to-consumer products aligns with changing consumer habits, which can increase market value and boost regional demand (Nelligan, 2022).

Beyond purely financial metrics, the processing node acts as a vital platform for gender-based social progress. In the Philippine context, women play a leading role in post-harvest activities, particularly in the drying and smoking of fish and the creation of value-added by-products (Quido, 2023). This specialized involvement serves as a powerful driver for female empowerment, enabling women to provide critical secondary income for their families (Jamer & Manzano, 2025). Conclusively, as synthesized by Ayubu (2017), the formalization and technological modernization of this sector offer the most effective route to turning South Cotabato's tilapia industry into a resilient pillar of regional food security.

#### ***Traders (Wholesaler and Retailers)***

In the South Cotabato tilapia value chain, wholesalers and retailers function as essential intermediaries that bridge the structural gap between rural producers and urban consumers. These actors specialize in outbound logistics, marketing, and sales, performing the primary activities necessary to establish a competitive advantage and generate value for the end-user. As observed by Nelligan (2022), the Philippine tilapia industry is characterized by relatively concise chains that rely heavily on the agility of these intermediaries to maintain the continuous flow of products from farm to market.

A defining feature of this node is the reliance on interfirm relationships, specifically the traditional "suki" system. These long-term, trust-based partnerships allow traders to secure consistent volumes while mitigating risks in an otherwise unorganized market (Zaman, et.al., 2025). While the use of mobile technology facilitates robust vertical links and real-time information sharing, a significant information asymmetry persists. As noted by Meded Awel (2018), traders often remain "information-rich" compared to their information-poor producer counterparts, granting them a distinct advantage in price negotiations.

The sustainability of the industry is tethered to the ability of these actors to create place utility in which the value added by transporting a perishable commodity to high-demand urban centers. Because tilapia is highly sensitive to spoilage, intermediaries must navigate logistical complexities rapidly to minimize the 10% post-harvest loss prevalent in the province (Kruijssen et al., 2020).

Economically, the segment is characterized by a significant imbalance of market power. According to the DA (2023), wholesalers and retailers often dictate farm-gate prices because producers, lacking cold storage, are forced into "emergency sales" of harvested stock. To stabilize their own supply chains, some wholesalers have adopted backward integration strategies—producing their own fish to bypass supply volatility and meet the strict commitments of institutional buyers like malls and restaurants (Jamandre et al., 2011).

The profiles of these actors further reveal distinct operational strategies based on scale:

**Wholesalers:** Act as bulk shippers serving regional markets like General Santos City. They often utilize informal financing to secure exclusive rights to a farmer's harvest, a practice that DA (2023) identifies as a non-official contract that limits producer autonomy.

**Retailers:** Represent the final link to the consumer, utilizing aerated tricycles to manage daily volumes of 100–150 kg. Despite their smaller scale, retailers often secure the highest net profit margins due to lower marketing overheads and direct access to end-users (Ayubu, 2017). Notably, this segment is a

primary site for gender-based economic participation, as women continue to dominate the marketing and distribution nodes of the Philippine fish chain.

### ***Marketing***

Within province's tilapia sector, wholesalers operate as high-impact intermediaries that resolve logistical disconnects by supplying fresh products to institutional outlets, such as malls and restaurants, alongside traditional wet market vendors. While wholesalers control bulk movements, local producers often opt for direct-to-consumer marketing in their own communities; this tactic, as noted by Surtida (2000), enables farmers to secure the total retail margin and circumvent intermediary markups that frequently fluctuate between 10% and 50%.

Retailers function as the final touchpoint for consumers, employing fixed stalls or aerated mobile units to preserve fish quality. The empirical observation that local retailers maintain a daily throughput of 100–150 kg (averaging 5–6 fish per kg) is consistent with the findings of Jamandre et al. (2011), which suggest this volume is ideal for ensuring quick inventory turnover in a saturated market. According to Nelligan (2022), this disciplined stock management is a necessity rather than a choice; without access to refrigeration, retailers must liquidate their supply daily to avoid the drastic price cuts or total product spoilage caused by miscalculating market demand.

Pricing dynamics in the province are highly responsive to fish size and local branding, specifically the "SACI" variety from Lake Sebu. The study's finding that live, larger tilapia fetch the highest market premiums aligns with research by Zaman et al. (2025), who emphasize that larger fish provide superior unit margins by satisfying the quality standards of high-end buyers. In South Cotabato, the "Lake Sebu" label acts as a vital market signal; according to the Department of Agriculture (2023), retailers capitalize on this regional reputation as a hallmark of quality, using it to justify higher price points and attract a loyal customer base.

However, a fundamental structural disparity exists regarding the concentration of market power among intermediaries. Leveraging their superior market intelligence, wholesalers and retailers often implement additional fees that substantially drive up the consumer price. According to the Department of Agriculture (2023), a notable power disparity exists because producers, restricted by a lack of storage infrastructure, are often forced into immediate and disadvantageous transactions. These challenges highlight the urgent necessity for a centralized market information system to facilitate a more equitable distribution of profits across the industry.

### ***Final Sale***

The final selling phase in South Cotabato represents the critical transition of tilapia into the market for local consumption, serving as the primary point of distribution to regional demand centers. In the provincial context, this distribution involves a network of wholesalers and merchants who supply fresh tilapia to public markets and high-end institutional buyers, such as restaurants and malls. As observed by Nelligan (2022), the efficiency of this phase is paramount due to the extreme perishability of tilapia, requiring a concise and agile supply chain.

Producers in South Cotabato utilize distinct marketing strategies, often choosing between direct-to-consumer sales and intermediary-based transactions. According to Surtida (2000), direct marketing to local talipapa (wet markets) typically yields higher profits for cultivators, as it allows them to capture the full retail value and bypass the markups imposed by middlemen. Furthermore, by selling in close proximity to production sites, farmers mitigate transportation expenditures and minimize post-harvest losses. This strategy aligns with the findings of Meded Awel (2018), who argue that reducing the distance between the farm and the market is a primary determinant of improved returns on labor and capital.

Retailers function as the final link to the consumer, utilizing aerated mobile units or fixed stalls to maintain fish quality. The study's finding that retailers manage daily volumes of 100–150 kg of live fish is empirically consistent with Jamandre et al. (2011), who suggest this volume is ideal for ensuring rapid

inventory turnover. This operational scale is a strategic necessity; as Nelligan (2022) notes, the lack of cold storage forces retailers to liquidate stock daily to avoid the steep discounts associated with unsold products. Despite these logistical pressures, Ayubu (2017) observes that retailers often achieve the highest net profit margins in the chain due to their direct access to end-consumers and lower overhead costs compared to wholesalers.

The emerging processing sector in Region 12 further enhances the chain by creating form utility through products like lamayo, dried tilapia, and chicharon. In alignment with the National Tilapia Industry Roadmap (BFAR, 2022), these value-adding activities extend shelf life and cater to the province's growing agro-tourism market. The processing segment typically secures a higher value-added ratio than the fresh fish trade, as the physical transformation of the product significantly elevates its market value.

Finally, the study identifies a prevalent "arm's-length" transaction model, particularly involving walk-in clients and institutional intermediaries. In these exchanges, merchants often exercise significant market power, dictating price structures based on target market preferences. As cited by the Department of Agriculture (2023), this power imbalance often allows intermediaries to impose additional charges that diminish the producer's share of total revenue. Ultimately, established scholarship suggests that the development of a coordinated marketing network and a centralized market information system is essential for ensuring an equitable distribution of profit across the South Cotabato tilapia value chain.

#### ***Enabler (Service Provider)***

In the South Cotabato tilapia industry, enablers consist of government institutions and specialized agencies that provide the critical support services and regulatory framework necessary to enhance productivity. According to Kaplinsky and Morris (2001), these organizations constitute the "enabling environment" that shapes the operating conditions for all commercial actors. These entities, which include government bodies, research centers, and NGOs, function as indirect actors that do not trade fish but instead formulate the policies and provide the infrastructure required to maintain industry competitiveness (Ratilla et al., 2016). Guided by the Fisheries Code of 1998, the regulatory management of this sector is a shared responsibility that ensures food safety and standardized inspection procedures (Llanto et al., 2017). However, a critical institutional bottleneck persists as many local growers remain unregistered in the Fisherfolk Registration System (FishR), a status that prevents them from accessing vital interventions such as relief assistance and Philippine Crop Insurance Corporation (PCIC) coverage.

To mitigate these challenges, enablers facilitate technology transfer and extension services, which Khan et al. (2021) identify as essential for empowering producers through the transmission of specialized skills. These efforts align with the National Tilapia Industry Roadmap 2022–2025, specifically through the provision of Sex-Reversed Tilapia (SRT) to drive growth vigor and the delivery of "embedded services" that provide farmers with technical guidance on best-practice management (Nelligan, 2022). This support network is further diversified by the DTI, which links fishers to high-value markets, and the DOST, which provides technological assistance to enhance the efficiency of local enterprises. Moreover, the DENR-EMB enforces environmental compliance, while agencies like the PFDA and PhilMech work to develop cold storage infrastructure to reduce the province's 10% post-harvest loss (DA, 2023).

Ultimately, the role of these enablers confirms the findings of Martin et al. (2007), which suggest that access to information, technology, and finance are the primary determinants of success for value chain actors. These institutions provide the necessary coordination to ensure the industry remains resilient against external pressures such as climate change. As emphasized by DA (2023), creating a comprehensive strategic framework that encompasses these support units is the essential foundation for transforming the local tilapia industry into a powerful tool for poverty alleviation and food security.

### Demographic Profile of the Key Players in the Value Chain of Tilapia

#### *Age*

Table 2 showed the age distribution of the key players in the value chain of tilapia. The age groups were divided into four categories: 18-28, 29-39, 39-49, and 50 & above. Mostly or 55% of the key players asked where 50 and above years old. Followed by 25% of 39-49, and 16% where 29-39 years old. Lastly, 4% in the population were 18-28 years old, indicating the youngest key players in the chain. More so, most of the key players were 39- 49 years old signifying that the key players were already in the middle age. suggesting that the industry relies on older generations.

Table 2. *Age distribution of the key players in the value chain of tilapia in South Cotabato, 2026*

<b>AGE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
18 – 28	4	4%
29 – 39	18	16%
39 – 49	28	25%
50 & Above	60	55%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

#### *Gender*

Based on the data presented in the table 3, a total of 61 respondents self-identified as male. This figure denoted a proportion of roughly 55% of the entire pool of participants. Conversely, a total of 49 respondents self-identified as female, represented approximately 45% of the overall sample. The row labeled "total" displays the combined number of male and female participants, which amounts to 110 and constitutes the entire sample size, equivalent to 100%. The data revealed that a significant proportion of the participants were male.

Table 3. *Gender distribution of the key players in the value chain of tilapia in South Cotabato, 2026*

<b>GENDER</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
Male	61	55%
Female	49	45%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

#### *Educational Attainment*

The presented tabular data below displayed the distribution of survey respondents according to their educational attainment, thereby emphasizing the diverse range of educational levels among the participants. The sample consisted of 78 individuals who had completed college education, representing 71% of the respondents. After this, a cumulative count of 23 participants had fulfilled the requirements for high school graduation, which accounted for 21% of the entire population under study. Further, 6 participants finished their elementary education which corresponded to 5%. Subsequently, a total of 3 participants had fulfilled their vocational education, which constituted 3% of the overall sample. The data indicated that the cohort with the highest number of individuals possessed a college degree, whereas the groups with the lowest numbers were comprised of individuals who lacked any formal education or had pursued post-graduate or vocational education.

Table 4. *Educational attainment distribution of the key players in the value chain of tilapia in South Cotabato, 2026*

<b>EDUCATIONAL ATTAINMENT</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
Elementary	6	5%
High School	23	21%
College	78	71%
Vocational	3	3%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

### ***Organizations/Affiliations***

According to the data presented in the table below, the organization and affiliation of key players in the tilapia value chain which reveals that non-members represent the largest segment of the group, totaling 52 respondents which accounts for 37% of the total participants. This group is characterized by a high concentration of consumers, as well as independent wholesalers, retailers, and a portion of the growers who operate without formal ties to an organization. Players who maintain membership in an association or cooperative constitute 32% of the chain, represented by 35 respondents. These members are predominantly growers, though the category also includes integrated roles such as Input Provider/Grower and Grower/Processor. Government institutions and entities make up the remaining 21% of the value chain, consisting of 23 respondents. These participants function almost exclusively as enablers, providing the necessary regulatory and resource support to the other players in the chain.

The distribution of affiliations indicates that organization is most prevalent among the production side of the value chain, as growers are the most likely to be members of associations or cooperatives to leverage collective resources and support. On the other hand, customers and retail actors on the downstream end of the chain function primarily as non-members on an individual basis. In order to ensure the overall functionality of the value chain, the government plays a distinct and specialized role as an enabler, or support structure, as opposed to a direct commercial participant.

A consistent trend is mirrored in the longevity of tilapia consumption among surveyed consumers. A significant 59.1% have been farming as well as consuming tilapia and tilapia products for 10 years and above. This is followed by 21.8% who have been part of the market for 6 to 9 years, and 18.2% with a history of 2 to 5 years of consumption. Similar to the industry players, the proportion of new consumers with less than one year of experience is extremely low at 0.9%. This figure illustrates strong consumer loyalty and the status of tilapia as a long-term dietary staple.

Table 5. *Organizations/affiliations distribution of the key players in the value chain tilapia, 2026*

<b>ORGANIZATIONS/ AFFILIATIONS</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
Member	35	32%
Non-Member	52	47%
Government Institution/Entity	23	21%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

### *Civil Status*

The tabulated data indicated that the category in question comprises 81 respondents, which represents 73% of the overall sample. The table shown that a majority of the participants had already entered into matrimony. Subsequently, a solitary classification is comprised of participants who are presently single. It can be observed that the category in question comprises 27 respondents, accounting for 25% of the overall sample. Nonetheless, there exists a solitary participant falling under this classification, constituting a mere 2% of the overall participants. This group comprises of individuals who have experienced spousal loss, commonly referred to as widowhood.

Table 6. *Civil status distribution of the key players in the value chain of tilapia in South Cotabato, 2026*

<b>CIVIL STATUS</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
Single	27	25%
Married	81	73%
Widowed	2	2%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

### *Years in Industry*

Table 7 illustrated that a significant proportion of the participants in the research, the majority of these stakeholders, specifically 59% have been active in the industry for 10 years and above. Meanwhile, 22% of the players have a tenure of 6 to 9 years, while 18% have been involved for 2 to 5 years. A negligible 1% of the participants are new entrants with less than one year of experience, suggesting that the supply side of the value chain is dominated by veteran practitioners.

A consistent trend is mirrored in the longevity of tilapia consumption among surveyed consumers. A significant 59.1% have been farming as well as consuming tilapia and tilapia products for 10 years and above. This is followed by 21.8% who have been part of the market for 6 to 9 years, and 18.2% with a history of 2 to 5 years of consumption. Similar to the industry players, the proportion of new consumers with less than one year of experience is extremely low at 0.9%. This figure illustrates strong consumer loyalty and the status of tilapia as a long-term dietary staple.

Table 7. *Years in service distribution of the key players in the value chain of tilapia in South Cotabato, 2026*

<b>YEARS IN INDUSTRY</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
Less than 1 year	1	1%
2 – 5 years	20	18%
6 – 9 years	24	22%
10 years and above	65	59%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

### **Value Chain Mapping**

Figure 4 represents the Value Chain Map for tilapia fish that is being sold in the local market. The figure illustrates the different activities per segment in the value chain from the provision of inputs up to its final sale for local consumption. Different key players like hatchery and nursery operators, fingerlings, feeds and fertilizers suppliers, cage manufacturers, tilapia growers, traders/consolidators, wholesalers and retailers are identified to perform these activities. The value chain also illustrates the flow of tilapia from

the growers to its final destination. The actors involved in tilapia processing are fishery-based associations and individuals from different localities. Some retailers directly buy tilapia from growers and sell it to the public market. Another channel identified is the involvement of traders/consolidators/wholesalers who sell to local destinations such as restaurants, supermarkets, malls, bagsakan centers and even outside the region. While some sell to retailers as intermediaries prior to reaching the final market.

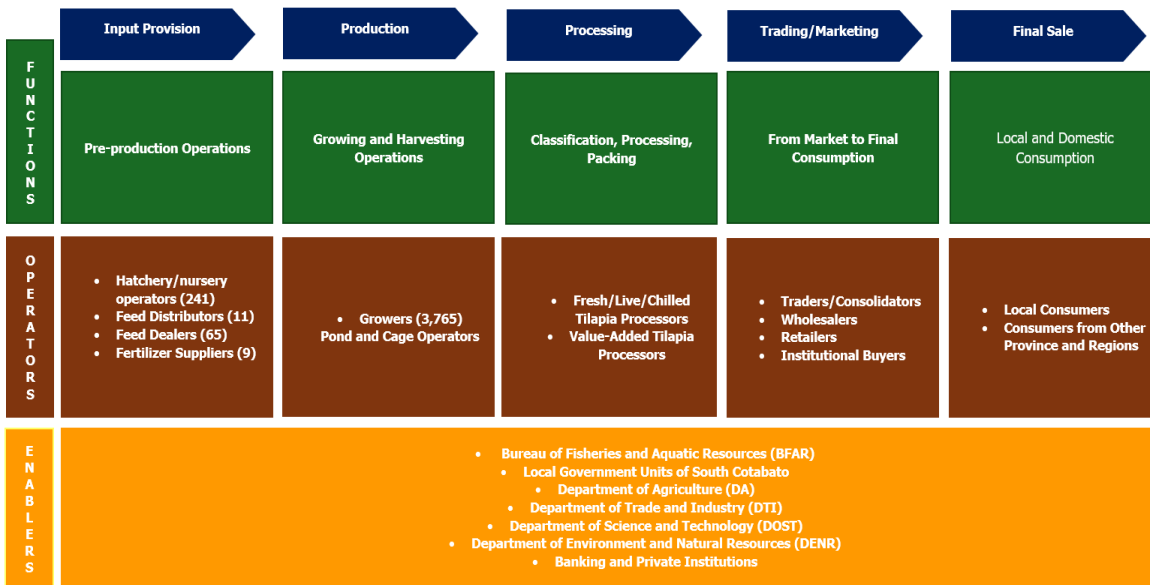


Figure 4. Value Chain Map for Tilapia in South Cotabato Province

### Market Channels

The predominant method of trade in South Cotabato involves the sale of whole fish, either in the form of fresh chilled or live, or processed, within both retail and wholesale marketplaces. Tilapia production in the eleven (11) localities involved several methodologies: backyard, extensive, and intensive farming techniques. Fingerlings originate from Banga, Surallah, Lake Sebu, Tampakan, Polomolok, and BFAR Offices. Within the realm of fisheries practices, it is standard practice for those engaged in fishing activities to cultivate tilapia, often for around 3 to 4 months, mainly when intensive farming methods are employed. On the other hand, the cultivation season for prolonged farming typically spans around 7 to 8 months. The tilapia is then distributed to various intermediaries, including dealers, distributors, and retailers, while several individuals choose to sell it directly from their own residences.

The province's total output in 2025 was 4,468.89 metric tonnes, equal to 604.57 million pesos (2025 (OPAg – South Cotabato and Bureau of Fisheries and Aquatic Resources Region 12, 2025). Further, traders/wholesalers, and retailers who distribute the product to public markets, institutional purchasers, restaurants, and malls, ultimately reaching the end consumers, facilitate the domestic market for tilapia. There are several dealers engage in the distribution of tilapia to various provinces and cities beyond the province, such as General Santos City, Sultan Kudarat, Sarangani, Cotabato. The tilapia produce is also distributed or reaches other regions such as Bukidnon, Cagayan, Tagum City, Panabo City, Marawi City, and Davao City, among other locations. However, it should be noted that the province has not yet started exporting tilapia to other nations. And in order to further strengthen the tilapia sector, this needs to be taken into consideration.

The market channel for tilapia in the province of South Cotabato is relatively concise and straightforward, consisting of seven (7) distinct chains, as seen in Figure 6. In South Cotabato, farmers and producers engage

in direct transactions with households and supply their produce to vendors in wet markets, restaurants, and roadside kiosks.

The tilapia fingerlings usually acquired by the growers for grow-out purpose. The initial transaction involves the acquisition of tilapia by the wholesaler. The entity may be a municipal organization or an individual merchant. Then, the product undergoes a transactional process wherein it is transferred to the merchant and then acquired by the consumer or institutional buyer, such as restaurants or local markets. In the second link of the supply chain, the wholesaler receives tilapia from producers and then sells it straight to consumers or walk-in buyers. Conversely, the third link in the supply chain involves the transfer of tilapia from producers to retailers, often at wet markets or “talipapa”, before reaching the end customers. The fourth link in the chain pertains to the common practice of small-scale producers predominantly engaging in direct sales to customers, particularly those close to their farms and individuals who make in-person purchases. The fifth link of the chain, the processor receives the tilapia from the producer and sell it directly to consumer. The sixth link involves a sequential flow where specialized input supplier provides quality fingerlings to growers who raise them to marketable weights, followed by processors who transform the raw fish into value-added forms for distribution through retailers to final household and institutional consumers. Finally, in the case of the seventh link of the chain, the input supplier sells tilapia straight to buyers/consumers (growers) in several locations, including nearby cities, other provinces, and outside the region. This chain eliminates the role of the wholesaler. Specific individuals utilize tilapia for personal consumption. Furthermore, others engage in agricultural tourism activities where local tourists are allowed to catch their fish and compensate according to their harvest's weight.

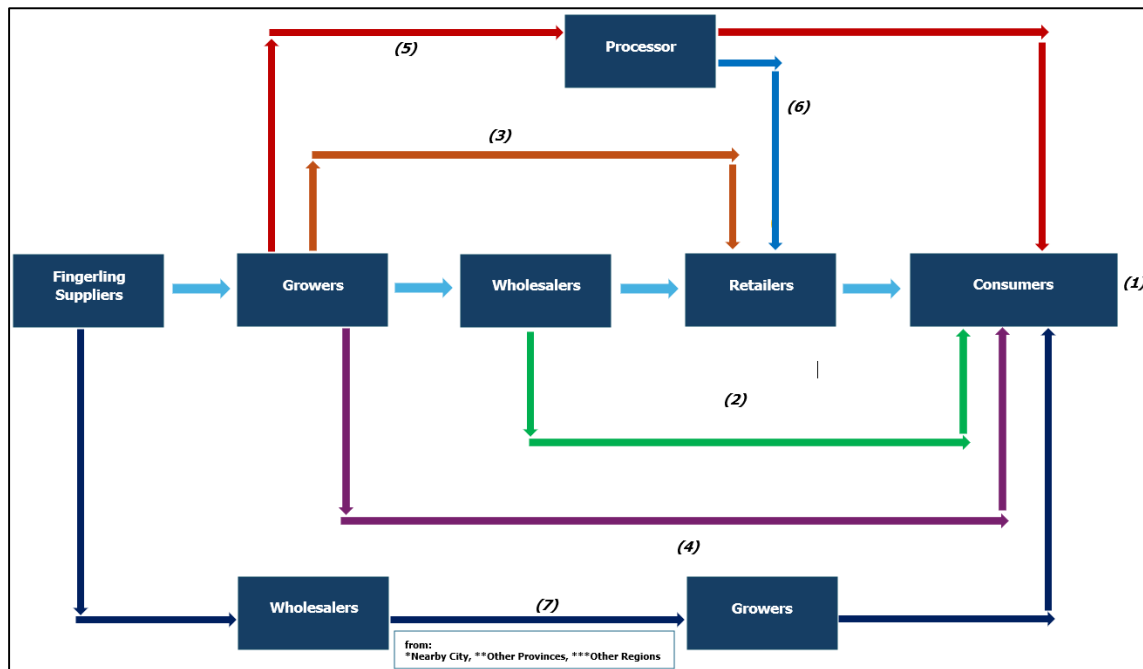


Figure 5. *Tilapia Key Market Channels*  
 Source: KII

**Grow-out and Processed Tilapia**

\*Nearby City/Municipalities

General Santos City

\*\*Outside the Province

Alabel, Lutayan, Buluan, Tacurong, Isulan, Lebak

### **Tilapia Fingerlings**

\*Nearby City

General Santos City

\*\*Outside the Province

Sultan Kudarat, Sarangani, North Cotabato

\*\*\* Outside the Region

Davao City, Cagayan, Bukidnon, Panabo City, Tagum City, Lanao, and Marawi City

However, the absence of comprehensive monitoring and tracking systems for tilapia delivery can be attributed to the inadequate enforcement of controls by the government on the tilapia industry. Hence, the percentage distribution per player per market channel is limited and currently unavailable.

### **Channel I: Input Suppliers - Growers - Wholesalers - Retailers - Consumers**

The tilapia supply chain in South Cotabato functions as a structured Value Chain Analysis (VCA) model where value is incrementally added at each node to create a competitive advantage (Porter, 1985; Zaman et al., 2025). At the foundational stage, fingerling suppliers manage "inbound logistics" by disseminating improved genetic strains, while simultaneously providing essential technical extension services to producers (BFAR, 2022; Nelligan, 2022). Growers then act as the central "operations" node, where biological inputs are transformed into marketable products over a 3-to-8-month cycle; this stage contributes the highest value addition as fish biomass can increase 300-fold during the culture period (Bestari & Morales, 2003; Nelligan, 2022).

Market distribution is facilitated by wholesalers, who leverage trust-based "suki" relationships to manage outbound logistics, though they often exercise "market power" to influence retail prices (Zaman et al., 2025). Retailers serve as the final link, typically handling daily volumes of 100–150 kg of live fish to minimize spoilage risks in the absence of cold storage, often achieving high net profit margins by selling directly to end-users (Jamandre et al., 2011; Ayubu, 2017). The chain concludes with consumers, who predominantly prefer live whole fish weighing 200–250g, reflecting tilapia's status as the "fish of the masses" (BFAR, 2022; Jamandre et al., 2011). Ultimately, this system serves as a primary engine for poverty alleviation, provided that information and profits are equitably distributed along the chain (Ayubu, 2017).

### **Product Flow**

The Product Flow follows a physical path from upstream production to downstream consumption centers. It begins when hatcheries deliver 18-day-old fries to nurseries, which then condition them for approximately 45 days into fingerlings. These fingerlings are transferred to growers, who raise the fish for a period ranging from 3 to 8 months depending on the desired marketable size and farming intensity. Once the fish reach the preferred size, such as 250–300 grams for household use, wholesalers typically pick up the harvest directly at the farm site using specialized transport vehicles equipped with aerators. The product is then transported to fish markets where it is sold to retailers who move the fish to public markets. Then, the fish reaches the consumers, who generally prefer purchasing whole live fish for immediate consumption.

### **Financial Flow**

The Financial Flow generally moves in the opposite direction of the product, flowing from the consumer back up to the initial suppliers. Transactions between consumers and retailers in wet markets are predominantly conducted in spot cash. After each transaction day, retailers remit their net sales proceeds to wholesalers or traders. Wholesalers typically pay growers via after the final weighing of the harvested fish.

In some specialized arrangements, wholesalers may provide "feed loans" to growers, where the cost of inputs is later deducted from the net sales value of the harvested fish. At the start of the chain, growers often pay fingerling suppliers in a cash-to-cash basis.

**Information Flow**

The Information Flow is a bidirectional process used to coordinate production schedules, quality standards, and market pricing. Actors communicate primarily through face-to-face contact or via mobile phones to share real-time data. Fingerling suppliers provide growers with technical guidance or "techno-guides" concerning the management and health of the fish. Growers and wholesalers exchange information regarding the availability, size, and quantity of stocks to coordinate harvesting dates. Market-driven information, such as current farm-gate, wholesale, and retail prices, is constantly monitored by all actors to ensure competitiveness. Additionally, retailers and consumers provide feedback on product quality, such as meat firmness or preferences for specific skin colors, which growers use to adjust their production techniques.



Figure 6. *Input Suppliers - Growers - Wholesalers - Retailers – Consumers*

**Channel II: Input Suppliers - Growers - Wholesalers - Consumers**

The tilapia supply chain in South Cotabato aligns with Michael Porter’s (1985) Value Chain Analysis, functioning as a structured sequence where value is incrementally added at each node to establish a competitive advantage. This specific pathway illustrates a high-level model of how aquaculture businesses transform biological inputs into finished products through a series of interlinked activities.

At the initial stage, fingerling suppliers manage "inbound logistics" by overseeing the production of high-quality fingerlings. Consistent with research by Jamandre et al. (2011) and Nasr-Allah et al. (2014), this sequence follows a continuous 18-day fry cycle at the hatchery level, followed by a 30-to-45-day nursery conditioning period until fish reach marketable fingerling sizes. The selection of specific genetic strains, is a critical determinant of growth vigor and survival rates for the entire chain.

Subsequently, growers act as the pivotal "operations" node, transforming fingerlings into harvestable tilapia through freshwater cage or pond systems. As documented by Bestari and Morales (2003) and Nelligan (2022), these production cycles vary from three-month intensive rotations to eight-month extensive methods. Literature suggests that this stage generates the most significant value addition, as the biomass of the fish can multiply up to 300 times during the grow-out phase.

The harvest is then moved by wholesalers, who manage "outbound logistics" by coordinating bulk purchases directly at the farm-gate. These actors provide essential place utility, navigating the logistical hurdles of transporting highly perishable stock to terminal markets or regional hubs. To stabilize their market position, Zaman, et.al. (2025) observe that these traders often utilize deep market intelligence and may employ backward integration to secure their supply lines against external risks.

The process terminates with the consumer, typically local households who demonstrate a strong preference for live fish in the 250–300g range. This trend, highlighted by The Tilapia Technical Committee (2018) and Jamandre et al. (2011), confirms tilapia’s widespread popularity as an accessible "aquatic chicken" that balances meat quality with affordability. Conclusively, as summarized by Ayubu (2017), this linear progression from hatchery to household acts as a vital driver for economic upliftment, provided that profit margins and market data are shared fairly across all nodes of the chain.

**Product Flow**

The Product Flow describes the physical movement of fish from upstream production sites to downstream demand centers. It begins when hatcheries deliver young fries to nurseries for a conditioning and growth period of approximately 45 days, after which they are delivered as fingerlings to the growers. Once the tilapia reaches marketable size, wholesalers typically pick up the harvest directly at the farm site using specialized vehicles equipped with tanks and aerators, as many growers lack their own transport. The product then moves to central fish markets, where it is distributed and eventually sold to consumers in a fresh or live state.

**Financial Flow**

The Financial Flow involves the movement of payments, credit terms, and payment schedules, generally moving in the opposite direction of the product from the consumer back to the initial suppliers. Transactions initiated by consumers at the local market level are predominantly conducted in spot cash. Wholesalers typically pay growers using cash-basis method. At the start of the chain, growers often pay suppliers in cash basis upon receiving the fingerlings.

**Information Flow**

The Information Flow is a bidirectional process used to coordinate production schedules, quality standards, and market pricing across all actors. Suppliers of fingerlings provide the growers all the instructions they need to cultivate the fish. Growers and wholesalers communicate via mobile phones or in-person interactions about the number, size, and availability of stocks in order to plan particular harvesting dates. To keep the supply chain responsive to consumer demand, everyone involved continuously monitor market-driven information, such as current farm-gate, wholesale, and retail pricing. Moreover, wholesalers and consumers provide feedback to growers regarding preferred product quality, such as meat firmness and specific skin colors.

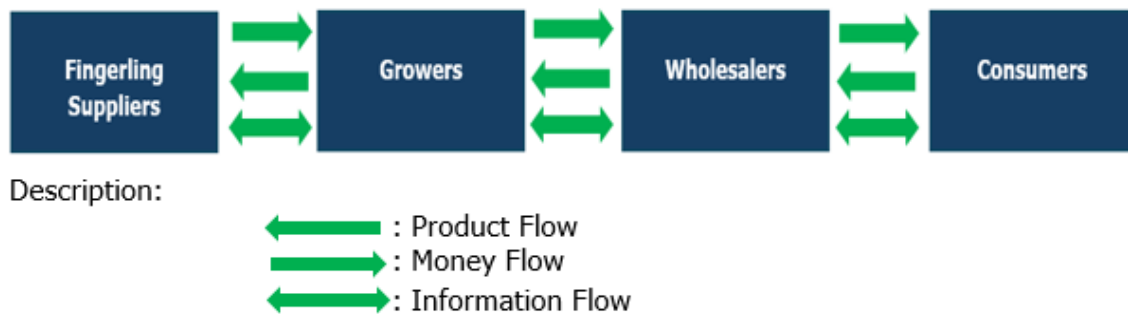


Figure 7. *Input Suppliers - Growers - Wholesalers – Consumers*

**Channel III: Input Suppliers - Growers - Retailers - Consumers**

The tilapia industry in South Cotabato mirrors Michael Porter’s (1985) Value Chain Analysis (VCA), operating as a series of interconnected activities where economic worth is generated through the systematic conversion of raw inputs into consumer-ready products. This specific channel illustrates the

"short" value chain model typical of domestic aquaculture, designed to facilitate the rapid movement of the commodity from the hatchery to the dinner table to preserve freshness and meet the localized demand for live fish.

At the onset of the chain, fingerling suppliers oversee "inbound logistics" by managing the selection of high-performance broodstock and the distribution of quality seeds to both commercial and subsistence farms (Jamandre et al., 2011). As Nelligan (2022) observes, these suppliers act as more than just vendors; they provide critical "embedded services," such as technical extension and best-practice management advice, which are vital for the overall productivity of the chain. Subsequently, growers function as the pivotal "operations" node, rearing fingerlings into harvestable tilapia via freshwater cages or ponds. In South Cotabato, these production cycles vary from three-month intensive rotations to eight-month extensive methods. According to the Department of Agriculture (2023), this stage represents the primary site of value generation in Region 12, with producers capturing a dominant 51% profit margin.

Retailers serve as the terminal commercial link, bridging the gap between the farm-gate and the consumer through wet markets and local kiosks. To counteract the threat of spoilage in a region lacking cold-chain infrastructure, these actors typically move 100–150 kg of livestock daily to ensure total inventory liquidation (Jamandre et al., 2011). Despite the small scale of their operations, Ayubu (2017) notes that retailers often secure substantial net margins by maintaining direct relationships with the public and avoiding the logistical costs associated with large-scale wholesaling.

The process terminates with household consumers, who exhibit a powerful preference for live, whole tilapia in the 250–300g range. This preference for minimally processed fish is the fundamental reason the value chain remains compact and efficient. In alignment with research by Hossain (2009), this widespread consumer demand has established tilapia as the "aquatic chicken," prized for its resilience and accessibility. Ultimately, this streamlined progression serves as a vital pillar for regional food security, though its future success is contingent upon the equitable distribution of technical expertise and economic rewards across the entire network.

### **Product Flow**

The Product Flow follows a physical progression from early-stage biological development to final consumption centers. It begins with hatcheries producing young fries which are transferred to nurseries for a 30- to 45-day conditioning period until they become marketable fingerlings. These fingerlings are then delivered to growers, who raise the tilapia over a period ranging from 3 to 8 months depending on the intensity of the farming methodology used. Once the fish reach a preferred household size, typically between 250 and 300 grams, they are moved to retailers who prepare them for sale in public markets. The flow concludes when the consumers purchase the fresh or live fish for immediate food preparation.

### **Financial Flow**

The Financial Flow involves the upstream movement of payments and credit arrangements from the point of sale back to the initial producers. Growers often compensate fingerling suppliers through spot cash. Transactions between consumers and retailers at local markets are almost exclusively conducted using spot cash. Retailers then remit net sales proceeds to the growers to pay for the volume of fish purchased for that transaction day. In some instances, financial support is provided through credit associations or informal arrangements to help farmers manage high input costs.

### **Information Flow**

Fingerling suppliers provide technical guidance growers regarding fish production and management practices. Growers and retailers use face-to-face contact or mobile phones to coordinate harvesting dates and share real-time data on current farm-gate and retail prices. Retailers communicate specific consumer preferences back to growers, such as requirements for meat firmness, preferences for

darker skin color, or specific weight classes. All actors in the chain monitor these information trends to ensure their operations remain profitable and responsive to fluctuations in demand.



Figure 8. *Input Suppliers - Growers - Retailers - Consumers*

#### **Channel IV: Input Suppliers - Growers - Consumers**

The direct-to-consumer route functions as a "zero-level channel" that streamlines the value chain by prioritizing rapid physical flow from upstream production to immediate local consumption. According to Porter (1985), this configuration optimizes the primary activities of inbound logistics and operations by effectively bypassing the outbound logistics costs and price escalations typically associated with multiple intermediaries.

At the beginning of this channel, input suppliers serve as the foundational node for inbound logistics, managing the selection of improved broodstock to ensure optimal growth performance. As noted by Jamandre et al. (2011), these actors are responsible for introducing high-performance genetic strains which are instrumental in maintaining growth vigor and reducing mortality rates.

By rearing 18-day-old fry into healthy fingerlings over a 30-to-45-day nursery cycle, these suppliers provide the essential biological foundation required for high-productivity farming.

Growers function as the central "operations" node, where these biological inputs are transformed into marketable tilapia. According to Nelligan (2022), this stage represents the most significant point of value generation, as the fish can increase in weight by approximately 300 times during a typical intensive culture period. Empirical evidence from the region indicates that when producers manage the entire grow-out phase until the fish reach the consumer-preferred weights of 250–300 grams, they retain the highest added value, often securing profit margins as high as 51%.

The inclusion of local residents and walk-in buyers at the farm gate facilitates a transaction model based on "order and pick-up" or "first come, first served" mechanics. According to the Department of Agriculture (2023), this strategy allows small-scale cultivators to bypass wholesalers, thereby eliminating middleman markups that typically range from 5% to 20%. Furthermore, as argued by Meded Awel (2018), direct farm-site sales strategically reduce transportation overhead, minimize spoilage-related losses, and significantly improve the overall return on labor and capital.

Ultimately, situating these results within established scholarship confirms that this streamlined configuration is an efficient instrument for poverty alleviation and regional food security. By establishing a direct link between the farm and the consumer, producers gain greater control over pricing and distribution. This empirical alignment with the findings of Marisa (2019) and Ayubu (2017) highlights that while this channel may be localized in scale, its ability to provide fresh, affordable protein directly to neighborhoods makes it a vital pillar of the South Cotabato tilapia industry.

### Product Flow

The Product Flow outlines the sequential progression of tilapia from biological inception to domestic consumption. It starts with hatcheries providing 18-day-old fry to nursery units, which typically spend 30 to 45 days conditioning them into hardy fingerlings. These young fish are then stocked by growers, who manage the rearing process for a duration of 3 to 8 months, depending on how intensely the farm is managed. The product is delivered straight to the customer at the production location after the tilapia reaches the typical consumer preference of 250–300 grams. This channel is unique because it often facilitates agricultural tourism in province, where local visitors can harvest their own fish and pay based on the weight of their catch.

### Financial Flow

The Financial Flow represents the upstream movement of currency from the point of final sale back to the resource providers. In this direct marketing system, end-users usually pay the cultivators in spot cash the moment they receive the fish. Growers then use these proceeds to pay their fingerling suppliers to cover initial stocking expenses. These upstream payments are generally settled cash. Because this route excludes intermediaries, the producer captures the entire retail price, although they must bear nearly all production risks and significant operational costs, which account for about 86% of the added unit cost.

### Information Flow

The Information Flow acts as a bidirectional communication loop used to align production output with consumer requirements. Input providers distribute "techno-guides" and technical advisory services to growers to ensure proper fish nutrition, health, and pond management. Between the farmer and the consumer, data is shared primarily through mobile phones or face-to-face interactions concerning price points, fish availability, and current quality. Purchasers communicate their specific volume and size needs, while growers advise on optimal harvesting schedules to ensure the tilapia is in peak condition upon purchase. This close contact enables farmers to adjust their culture methods to produce the specific traits, such as meat firmness or skin color, that their local customers value.



Description:

- : Product Flow
- : Money Flow
- : Information Flow

Figure 9. *Input Suppliers - Growers – Consumers*

### Channel V: Input Supplier - Growers – Processors – Consumers

This operates as a chronological series of activities where value is generated by converting biological resources into specialized consumer goods. In this system, each participant executes a distinct task, from managing inbound logistics to sophisticated manufacturing, to secure a market edge and fulfill targeted consumer demands.

The fingerling suppliers oversee "inbound logistics" by introducing high-performance broodstock and quality fingerlings. In accordance with research by Jamandre et al. (2011) and Nelligan (2022), these actors manage a disciplined 18-day fry cycle and a subsequent nursery phase, ensuring the genetic integrity

necessary for the chain's overall productivity. Following this, growers act as the central "operations" node, rearing these fingerlings through freshwater cage or pond systems for up to eight months. As Ross Nelligan (2022) observes, this stage remains a primary site for value generation, as the massive 300-fold biomass increase transforms basic inputs into high-value food commodities.

The processing node serves as a vital bridge that creates "form utility" by transforming raw tilapia into specialized items like lamayo, chicharon, and dried fish. Marisa et al. (2023) highlights that this segment often yields a value-added margin exceeding 60%, as physical processing enables the product to be sold at a much higher price point than whole fresh fish. This segment is indispensable for managing the extreme perishability of the species and for satisfying the requirements of the province's growing agrotourism and hospitality sectors.

The process culminates with consumers, ranging from domestic households to institutional clients like hotels. While traditional buyers prefer live fish, Awel (2018) and Kakerissa et al. (2024) note that urban and tourist markets increasingly value convenience and variety, creating lucrative niches for processed goods. Finally, as synthesized by Ayubu (2017) and Zaman et al. (2025), this value-added pathway functions as a significant driver of local economic development. Ensuring that producers and processors are linked through GMP-compliant infrastructure is critical for unlocking the industry's full potential and facilitating a more balanced distribution of economic rewards.

### Product Flow

The Product Flow describes the physical movement of the commodity from biological development to the final consumer in a processed state. It commences when hatcheries provide fingerling to the growers. Grow-out operators rear the fish typically targeting larger sizes required for appropriate size for the market or processing and then deliver the harvest to processors like Katipuneros Fisherfolk Association and Resorts in Lake Sebu. At the processing, the raw tilapia is transformed into value-added products such as lamayo, chicharon, and dried tilapia. The flow concludes when these processed items are distributed to consumers through tourist spots or direct to end-users.

### Financial Flow

The Financial Flow involves the upstream movement of payments and credit arrangements from the point of sale back to the initial producers. Consumers typically pay spot cash to retail which then remit the funds to the processors. Processors generally pay growers using cash payments after the transaction is completed. At the start of the chain, growers compensate fingerling suppliers through direct payments.

### Information Flow

Input providers distribute essential technical advisory services to farmers regarding the tilapia farming and especially the management of the stock. To maintain their high-end inventory, processors communicate strict criteria to growers regarding required fish size, volume consistency, and meat quality.



Description:

- : Product Flow
- : Money Flow
- : Information Flow

Figure 10. *Input Suppliers - Growers - Processors – Consumers*

All participants rely heavily on mobile phones and face-to-face interactions to coordinate real-time farm-gate prices, delivery schedules, and current stock availability. Furthermore, consumer feedback regarding meat firmness and product form preference is relayed back through the chain, allowing producers to adjust their feeding regimes and production techniques to meet specific market demands.

#### **Channel VI: Input Suppliers - Growers - Processors - Retailers - Consumers**

This sixth supply chain configuration represents an integrated value-added pathway, wherein a chronological sequence of activities converts biological inputs into specialized finished goods to secure a market edge. As argued by Zaman, et.al. (2025), this framework encapsulates the entire lifecycle of the product, ensuring that every participant at each node contributes to the total economic output of the industry.

The chain begins with fingerling suppliers, who manage the "inbound logistics" by introducing high-performance broodstock to guarantee environmental resilience and vigorous growth. In accordance with findings by Jamandre et al. (2011), the distribution of quality fingerlings particularly Sex-Reversed Tilapia (SRT) is a decisive factor, as it dictates the survival rates and productivity of all following segments. Subsequently, growers serve as the pivotal "operations" hub, rearing fingerlings in freshwater systems. Nelligan (2022) observes that this stage generates the most substantial value addition, as the 300-fold increase in biomass during a short intensive cycle allows efficient producers to secure profit margins as high as 51% (Department of Agriculture, 2023). The processing segment introduces vital "form utility" by converting raw harvests into specialized items like lamayo, chicharon, and dried fish. Retailers then facilitate the terminal commercial link, moving 100–150 kg of stock daily to avoid the spoilage risks inherent in regions with poor cold-chain infrastructure (Jamandre et al., 2011). Despite their modest scale, Ayubu (2017) points out that retailers often achieve the best marketing margins by bypassing large-scale logistics costs and selling directly to the public.

The process ends with consumers, including local households and institutional clients like malls and hotels. While a strong preference for live fish in the 250–300g range remains a hallmark of the Philippine market (Hossain, 2009), the growing urban and agro-tourism sectors are driving demand for processed variety and convenience. Conclusively, this six-node structure is the most intricate yet potentially most lucrative route for regional development. Promoting synergy between producers and processors specifically through the establishment of GMP-compliant facilities is a vital requirement for ensuring that South Cotabato retains the maximum possible value from its tilapia industry.

#### **Product Flow**

The Product Flow describes the physical movement of the tilapia from biological development to the final consumer in a processed state. It begins with hatchery operators who condition marketable fingerlings over a 30- to 45-day cycle. These fingerlings are transferred to growers, who raise the fish for several months typically ranging from 3 to 8 months until they reach the sizes required by the next actor. For this specific channel, growers typically produce fish which are delivered to processors to meet product requirements. The processors then transformed raw fish into value-added items such lamayo, chicharon, and dried tilapia. These processed goods are then directly moved to consumers. The flow concludes when the consumers purchase these processed items for home consumption.

#### **Financial Flow**

The Financial Flow involves the upstream movement of payments, credit terms, and payment schedules, generally moving in the opposite direction of the product. Consumers at the retail level initiated the flow by paying processors in spot cash for their purchases. Processors generally compensate growers using cash as specified in their procurement. To cover the initial investment expenditures at the beginning of the chain, producers pay input providers for fingerlings in cash.

### Information Flow

The Information Flow is a bidirectional exchange used to coordinate technical management, quality standards, and market pricing across all chain actors. Similar to the other chains, the fingerling suppliers provide technical guidance to growers regarding the management practices to ensure high-quality output. Processors communicate specific requirements back to growers regarding raw material size, volume, and meat quality to ensure the harvested fish are suitable for processing. Retailers share market intelligence regarding consumer preferences for meat firmness and specific product forms, allowing growers and processors to adjust their production techniques. All participants in the chain use mobile phones and face-to-face contact to exchange real-time information on farm-gate, wholesale, and retail prices, as well as delivery schedules and the availability of stocks.

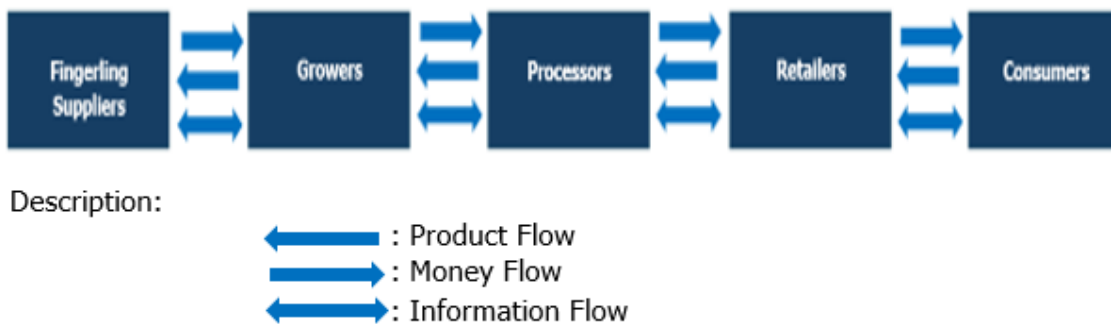


Figure 11. *Input Suppliers - Growers - Processors - Retailers – Consumers*

### Channel VII: Fingerling Suppliers – Wholesaler – Growers – Consumers

The tilapia value chain in South Cotabato is defined by a complex structural landscape where adaptive supply channels, ranging from zero-level direct marketing to multi-tiered networks, strive to create "place" and "time" utility for a highly perishable commodity (Porter, 1985). While the path from fingerling suppliers in Banga and Surallah to regional growers satisfies broad demand, these multi-tiered systems often escalate marketing costs, leading to a lower revenue share for producers compared to more streamlined routes (Zaman et al., 2025). This logistical complexity is compounded by severe institutional bottlenecks; although the province hosts over 200 hatcheries, only six are formally registered with the Bureau of Fisheries and Aquatic Resources (BFAR). As cited by Llanto et al. (2017), this lack of formalization precludes the majority of actors from accessing essential state support—including PCIC insurance and relief assistance—while hindering the implementation of Good Aquaculture Practices (GAqP).

Socio-cultural dynamics further introduce management risks that deviate from scientific best practices. The local tendency to purchase broodstock directly from growers to minimize costs leads to inbreeding and genetic deterioration, while the prevalence of a fatalistic "Bahala na" mindset undermines proactive risk mitigation. According to Nelligan (2022), these behavioral traits, coupled with an aging workforce where 55% of actors are over 50 years old, present significant barriers to the adoption of modern, efficient technologies.

These internal vulnerabilities are intensified by climate-induced shocks, particularly in Lake Sebu, where rising temperatures and seasonal fluctuations force producers to incur restoration costs of up to 60% of their total asset value (Ramirez et al., 2019). Such production losses, equivalent to months of gross income, highlight an urgent need for heat-tolerant strains and improved water quality management. Ultimately, the industry suffers from a market power imbalance where large-scale wholesalers dictate prices to producers acting as "price takers." As emphasized by Ayubu (2017) and Zaman et al. (2025), while processors and retailers capture the highest value-added ratios, the sustainability of the chain depends on

establishing a centralized market information system to ensure a more equitable distribution of profit among the smaller, more vulnerable production nodes.

**Product Flow**

The physical journey of the commodity begins with hatcheries who produce the fingerlings. These juvenile fish are consolidated by wholesalers and distributed to grow-out operators in Nearby Cities like General Santos City and outside the province in Sultan Kudarat, Sarangani, and North Cotabato and even outside the region such Davao City, Cagayan, Bukidnon, Panabo City, Tagum City, Lanao, and Marawi City. Growers raise the tilapia until they reach standard marketable sizes, typically 250–300 grams for households or larger weights for institutional needs. The flow of marketable fish then extends Outside the province to high-demand buyers including Alabel, Lutayan, Buluan, Tacurong, Isulan, Lebak, where they are delivered in live and fresh-chilled.

**Financial Flow**

The movement of capital starts at the retail level, where consumers typically provide spot cash payments to retailers or directly to growers at the farm gate. These proceeds flow upstream to the Growers, who then compensate their Wholesalers for the delivered stocks. Payments between growers and their upstream suppliers, including hatcheries and feed dealers, are frequently settled through cash or bank instruments such as 7-day post-dated checks.

**Information Flow**

Communication within this channel functions as a bidirectional loop that synchronizes production techniques with evolving market preferences. Fingerling Suppliers provide necessary technical guides to ensure that growers in areas like Alabel or Lutayan produce high-quality yields. Wholesalers and traders use mobile phones and face-to-face contact to share real-time data on farm-gate prices, stock availability, and delivery schedules to minimize the bottleneck of assembling required volumes. Growers further adapt their management to meet specific provincial demands relayed by buyers.



Description:

- : Product Flow
- : Money Flow
- : Information Flow

Figure 12. *Input Suppliers – Wholesalers - Growers – Consumers*

**Assessment of Value Addition**

**Fixed Cost Structure**

The following is an explanation of the fixed cost structures for the different players in the tilapia value chain based on the table 8.

*Fingerling Suppliers (Ordinary and Sex-Reversed)*

From the table 8, we see that for both ordinary and sex-reversed fingerling suppliers, the highest fixed cost is incurred on the purchase of fishnets (100 meters, 28 mm-thick), costing Php 17,000.00. This mirrors the findings in the sources where nets represent the primary fixed investment for producers.

*Cage Growers (Ordinary)*

For cage growers, the primary fixed cost is for specialized netting, specifically B-Net, CC-Net, and GG-Net, totaling Php 8,500.00. This reflects the intensive use of cage culture systems mentioned in the sources, which require significant netting infrastructure to contain the fish.

***Pond Growers (Ordinary and Sex-Reversed)***

Based on the table 8, pond growers do not show specific fixed costs. Pond growers often utilize natural earthen ponds on land they already own, which avoids the need for the expensive specialized equipment required for cage farming, which is why there is no fixed cost. Because they rely on traditional manual methods and basic tools, they may have no significant new capital expenses to report for that specific production season

***Processors (Lamayo and Chicharon)***

Processors of Tilapia Lamayo and Tilapia Chicharon spend the most money on digital weighing scales, with a fixed cost of Php 540.00. The weighing scales are the most critical fixed asset for processors to ensure accurate commercial transactions.

***Wholesalers and Retailers (Fresh Tilapia)***

For wholesalers and retailers of fresh tilapia, the highest fixed expenditure is on weighing scales, costing Php 1,560.00. This is a higher investment compared to the processors' scales, likely due to the larger volumes handled or the need for scales suited for high-traffic retail environments.

Table 8. *Fixed Cost components for the different players in the tilapia value chain*

<b>Fixed Cost Items</b>	<b>Cost (P '000)</b>
<b>Fingerling Supplier (Ordinary)</b>	
Fishnet (100 meters, 28 mm-thick 7 mm; Inner)	17.00
	<b>17.00</b>
<b>Fingerling Supplier (Sex-Reversed Tilapia)</b>	
Fishnet (100 meters, 28 mm-thick 7 mm; Inner)	17.00
	<b>17.00</b>
<b>Pond Grower (Ordinary)</b>	
-	-
<b>Cage Grower (Ordinary)</b>	
B-Net, CC-Net, GG-Net	8.50
	<b>8.50</b>
<b>Pond Grower (Sex-Reversed Tilapia)</b>	
-	-
<b>Processor (Tilapia Lamayo)</b>	
Digital Weighing Scale	0.54
<b>Processor (Tilapia Chicharon)</b>	
Digital Weighing Scale	0.54
<b>Processor (Dried Tilapia)</b>	
-	-
<b>Wholesaler (Fresh Tilapia)</b>	
Weighing Scale	1.56
	<b>1.56</b>
<b>Wholesaler (Tilapia Fingerlings)</b>	
-	-
<b>Retailer (Fresh Tilapia)</b>	
Weighing Scale	1.56
	<b>1.56</b>
<b>Retailer (Dried Tilapia)</b>	
-	-
<b>Processor (Tilapia Lamayo)</b>	
Digital Weighing Scale	0.54
	<b>0.54</b>

These fixed investments are essential for establishing the infrastructure needed for production, value-added processing, and the eventual sale of tilapia products to consumers. The summary of fixed cost actors is shown in table 9.

Table 9. *Summary of Fixed Cost Actors*

<b>ACTOR</b>	<b>PRIMARY FIXED COST ITEM</b>	<b>COST (P '000)</b>
Fingerling Supplier	Fishnet (100m, 28mm)	17.00
Cage Grower	B-Net, CC-Net, GG-Net	8.50
Processors	Digital Weighing Scale	0.54
Wholesalers/Retailers	Weighing Scale	1.56

In order to map the capital and financial requirements necessary for taking part in various phases of the tilapia value chain. Ultimately, it confirms that producers contribute more significant capital to establish husbandry infrastructure compared to the commercial tools needed by downstream processors and retailers.

### ***Variable Cost Structure***

Based on table 10a to table 10c, the variable cost structures for the various tilapia value chain participants are explained as follows:

#### ***Fingerling Suppliers***

**Fingerling Supplier (Ordinary):** An average of ₱ Pph 4,600.00 was spent on labor, covering both pond preparation (Pph 12,600.00) and harvesting (Pph 12,000.00). Other inputs included fertilizers and lime (Pph 12,000.00) and the initial breeders (Pph 3,000.00). Over the production cycle, the highest variable cost was spent on a specialized nutrition regimen consisting of fry booster, fry mash, and grower feed amounting to Pph 101,480.00. The total variable cost for this supplier was Pph 142,580.00.

**Fingerling Supplier (Sex-Reversed):** This actor spent Pph 12,600.00 on pond preparation labor. A distinctive variable expense of Pph 20,800.00 was incurred for sex-reversal treatments, including methyl testosterone and alcohol. Similar to the ordinary supplier, the highest variable cost was feed, specifically grower feed at ₱146,950.00, contributing to a total variable cost of Pph 235,380.00.

#### ***Tilapia Growers (Producers)***

**Pond Grower (Ordinary):** A significant total of Pph 81,000.00 was spent on labor across pre-stocking, seeding, and the four stages of the culture period. The average cost of size 17 fingerlings was Pph 50,000.00. Over the production season, about Pph 615,270.00 was spent on an intensive feeding program including fry mash, starter, grower, and finisher feeds which is the highest variable cost. The total variable cost reached Pph 817,170.00.

**Pond Grower (Sex-Reversed):** The structure of this actor is similar to that of a typical pond grower but with a higher investment in fingerlings amounting to Pph 75,000.00. Further, the most substantial expenditure was on feed, totaling Pph 628,620.00, leading to a total variable cost of Pph 855,520.00.

**Cage Grower (Ordinary):** For this actor, variable costs are significantly lower, totaling Pph 26,850.00., in which Pph 2,000.00 was spent on labor and Pph 1,200.00 on fingerlings. The highest variable cost item was feed, specifically grower feed at Pph 12,750.00, followed by finisher feed at Pph 8,400.00.

#### ***Wholesalers and Retailers***

**Wholesaler (Fresh Tilapia):** The highest variable cost item was the tilapia, costing an average of Pph 300,000.00. Additional costs included truck rentals (Pph 3,000.00), labor (Pph 1,500.00), and packaging materials like styrofoam and ice (Pph 4,580.00). The sum variable cost is to Pph 309,080.00.

Wholesaler (Fingerlings): The dominant cost component was the fingerlings themselves, costing an average of Php 428,000.00. Minimal costs included truck rentals (Php 3,000.00) and labor (Php 960.00), and the total variable cost is Php 431,960.00.

Retailers (Fresh Tilapia): The highest variable cost was the tilapia (Php 12,800.00), with the least expensive expenses being ice (Php 3,000.00) and haulage (Php 30.00). The overall variable cost is Php 13,220.00.

For dried tilapia retailers, the primary cost was the dried fish (Php 1,000.00), with additional expenses for rental (Php 50.00), cellophane (Php 75.00), and transportation (Php 250.00), resulting in a Php 13,220.00 variable cost.

*Processors*

Processor (Tilapia Lamayo): The highest variable cost item was the fresh tilapia, costing an average of Php 12,100.00. This actor spent an additional Php 6,590.00 on value-adding ingredients (vinegar, sugar, garlic, etc.) and Php 600.00 on hired labor, resulting in a Php 19,290.00 total variable cost.

Processor (Tilapia Chicharon): Similarly, the highest cost was the fresh tilapia at Php 11,250.00. Other significant variable costs included cooking oil (Php 2,790.00) and breadng materials (Php 2,200.00), totaling Php 17,410.00.

Processor (Dried): The highest variable cost was the fresh tilapia (Php 2,100.00), whereas labor (Php 150.00) and salt (Php 300.00) had smaller expenses.

Table 10a. *Variable Cost components for the fingerling suppliers (ordinary & sex-reversed) in the tilapia value chain*

<b>Variable Cost Items</b>	<b>Cost (P '000)</b>
<b>Fingerling Supplier (Ordinary)</b>	
Breeder	3.00
Labor (Pond Preparation)	12.60
Lime	3.00
Fertilizer (Urea and Organic)	9.00
Nylon (Nylon twine # 16)	1.50
Labor (Harvest)	12.00
Fry Booster	24.66
Fry Mash	15.59
Grower	61.23
	<b>142.58</b>
<b>Fingerling Supplier (Sex-Reversed Tilapia)</b>	
Breeder	3.00
Labor (Pond Preparation)	12.60
Lime	1.21
Nylon (Nylon twine # 16)	1.50
Methyl testosterone (to treat 32,400 fry)	16.00
Alcohol (80-95% ethyl/isopropyl alcohol)	4.80
Fry Booster	49.32
Grower	146.95
	<b>235.38</b>
<b>Pond Grower (Ordinary)</b>	
<i>A. Pre – Stocking/Pond Preparation</i>	
Labor	36.00
Fertilizer (16-20-0)	22.50
Chicken Manure	18.00
Lime	30.00
<i>B. Stocking/Seeding</i>	
Labor	1.80
Fingerlings size 17	50.00
<i>C. Culture Period</i>	
<i>Fry Mash</i>	
1.a Labor	10.80
1.b Feeds	21.65
<i>Starter</i>	
2.a Labor	10.80
2.b Feeds Pre-starter	43.20
2.c Feeds Starter	63.38
<i>Grower</i>	
3.a Labor	10.80
3.b Feeds	244.92
<i>Finisher</i>	
4.a Labor	10.80
4.b Feeds	242.52
	<b>817.17</b>

Table 10b. *Variable Cost components for the cage grower (ordinary), pond grower (sex-reversed), and wholesalers (fresh & fingerlings) in the tilapia value chain*

<b>Variable Cost Items</b>	<b>Cost (₱ '000)</b>
<b>Cage Grower (Ordinary)</b>	
Fingerlings	1.20
Bamboo Pole	1.20
Nylon (Nylon twine # 16)	0.76
Mono rope Black (6mm)	0.10
Agoha needle	0.04
P.E. Rope	0.20
Labor for construction (3days)	1.00
Others (Miscellaneous)	0.20
Labor/Salary	1.00
Grower	12.75
Finisher	8.40
	<b>26.85</b>
<b>Pond Grower (Sex-Reversed Tilapia)</b>	
<i>A. Pre – Stocking/Pond Preparation</i>	
Labor	36.00
Fertilizer (16-20-0)	22.50
Chicken Manure	18.00
Lime	30.00
<i>B. Stocking/Seeding</i>	
Labor	1.80
Fingerlings size 17	75.00
<i>C. Culture Period</i>	
Fry Mash	
1.a Labor	10.80
1.b Feeds	35.00
Starter	
2.a Labor	10.80
2.b Feeds Pre-starter	43.20
2.c Feeds Starter	63.38
Grower	
3.a Labor	10.80
3.b Feeds	244.92
Finisher	
4.a Labor	10.80
4.b Feeds	242.52
	<b>855.52</b>
<b>Wholesaler (Fresh Tilapia)</b>	
Tilapia	300.00
Ice	0.80
Styrofoam/crates	3.14
Big PE Colored Plastic	0.64
Labor (packing and hauling for 2 hours)	1.50
Truck rental	3.00
	<b>309.08</b>
<b>Wholesaler (Tilapia Fingerlings)</b>	
Tilapia Fingerlings, Size #20	168.00
Tilapia Fingerlings, Size #22	260.00
Labor	0.96
Truck rental	3.00
	<b>431.96</b>

Table 10c. *Variable Cost components for the retailers (fresh & dried), and processors (lamayo, chicharron, & dried) in the tilapia value chain*

<b>Variable Cost Items</b>	<b>Cost (₱ '000)</b>
<b>Retailer (Fresh Tilapia)</b>	
Rental	0.05
Electricity	0.02
Hauling (from the entrance of the public market to the pwesto)	0.03
Hauling (from the farm to public market)	0.03
Ice	0.20
Cellophane	0.07
Salt	0.02
Tilapia	12.80
	<b>13.22</b>
<b>Retailer (Dried Tilapia)</b>	
Dried Tilapia	1.00
Rental	0.050
Cellophane	0.075
Transportation	0.25
	<b>1.36</b>
<b>Processor (Tilapia Lamayo)</b>	
Fresh Tilapia	12.10
Salt	0.20
Vinegar	3.27
Sugar	0.88
Water	0.55
Garlic	0.52
Pepper	0.55
Laurel Leaves	0.44
Container/Packaging	0.18
Hired Labor	0.60
	<b>19.29</b>
<b>Processor (Tilapia Chicharon)</b>	
Fresh Tilapia	11.25
Breading (Cornstarch or all-purpose flour)	2.204
Pepper	0.03
Garlic Powder	0.2325
Cooking Oil	2.79
Hired Labor	0.9
	<b>17.41</b>
<b>Processor (Dried)</b>	
Fresh Tilapia	2.1
Salt	0.300
Hired Labor	.15
	<b>2.55</b>

As demonstrated across all actors, feed remains the primary variable cost for those in the production/growing stage, while the purchase of the fish itself is the dominant variable cost for processors and distributors. The summary of fixed cost actors is shown in table 11.

Table 11. *Summary of Variable Cost Actors*

<b>ACTOR</b>	<b>HIGHEST VARIABLE COST ITEM</b>	<b>COST (P '000)</b>	<b>TOTAL VARIABLE COST (P '000)</b>
Fingerling Supplier (Ordinary)	Grower Feed	61.23	142.58
Fingerling Supplies (Sex-Reversed)	Grower Feed	146.95	235.38
Pond Grower (Ordinary)	Grower Feed	244.92	817.17
Pond Grower (Sex-Reversed)	Grower Feed	244.92	855.52
Cage Grower (Ordinary)	Grower Feed	12.75	26.85
Wholesaler (Fresh Tilapia)	Tilapia	300.00	309.08
Wholesaler (Tilapia Fingerlings)	Tilapia Size #22	260.00	431.96
Processor (Lamayo)	Fresh Tilapia	12.10	19.29
Processor (Chicharon)	Fresh Tilapia	11.25	17.41
Processor (Dried)	Fresh Tilapia	2.10	2.55
Retailer (Fresh Tilapia)	Tilapia	12.80	13.22
Retailer (Dried)	Tilapia	1.00	1.36

So as to determine short-term economic decisions and overcome industry constraints, it is necessary to identify important financial pressures, such as high feed costs for producers and fish purchase prices for processors, as table 27 illustrates. Before an actor may generate a net farm income, all operational expenses must be "covered" and value addition must be calculated using this data. With the objective to successfully satisfy market demand, these analyses ultimately direct strategic policy interventions and enable actors to transition toward active, cost-efficient management to effectively meet market demand.

### **Value Addition of Tilapia**

Based on the table 12, the results of the analyses reveal that of the main actors such as producers (pond growers and fingerling suppliers) added the most value to tilapia in the chain, with pond growers (sex-reversed) adding Php 780,520.00 and pond growers (ordinary) adding Php 767,170.00. This was followed by the wholesalers (distributors) adding between Php 3,960.00 and Php 10,640.00, processors adding between Php 450.00 and Php 7,730.00, and finally the retailers adding between Php 360.00 and Php 1,980.00.

The following explains the significant value addition by the different actors:

**Pond Growers (Ordinary and Sex-Reversed):** These actors add the highest value (Php 767,170.00 – Php 780,520.00) because they go through a complex series of husbandry practices, including intensive pond preparation with lime and fertilizers, and a multi-stage feeding regimen (fry mash, starter, grower,

and finisher) required to transform Php 50,000.00 – Php 75,000.00 worth of fingerlings into a marketable harvest.

**Fingerling Suppliers (Ordinary and Sex-Reversed):** These actors add substantial value (Php 156,580.00 – Php 249,380.00) to the chain by initiating the production process. This involves managing breeder stock and, in the case of sex-reversed suppliers, employing technical treatments like Methyl testosterone and alcohol to ensure high-quality, non-prolific stock for growers.

**Cage Growers:** They contribute Php 34,150.00 in value by constructing specialized lake-based infrastructure using bamboo poles and various nets to manage the fish during the culture period.

**Wholesalers (Fresh Tilapia and Fingerlings):** These actors add between Php 3,960.00 and Php 10,640.00 in value through logistical and handling activities. Their role is to bridge the gap between production sites and markets by providing truck rentals, labor for hauling, and icing to maintain product quality.

**Processors (Lamayo, Chicharon, and Dried):** These actors add value (up to Php 7,730.00) by undertaking significant value-adding activities such as cleaning, gutting, and seasoning with ingredients like vinegar, garlic, and pepper, or applying breeding and oils to transform fresh fish into specialized, consumer-ready products.

**Retailers (Fresh and Dried Tilapia):** As the final link in the chain, they add value (up to Php 1,980.00) by providing essential market services, including sorting, ice preservation, and final packaging in cellophane for individual consumers.

As seen in the table 28, while producers incur the highest operational risks and farming costs, all actors must cover their fixed and variable costs before realizing a Net Income, which ranges from a high of Php 827,620.00 for sex-reversed fingerling suppliers to Php 230.00 for processors of dried tilapia.

Table 12. *Value Added by Actors*

ACTOR	TOTAL FIXED COST (TFC)	TOTAL VARIABLE COST (TVC)	TOTAL COST (TC)	TOTAL REVENUE (TR)	PRIMARY INPUT VALUE (Vp)	NET INCOME	VALUE ADDED (VA)
Fingerling Supplier (Ordinary)	17.00	142.58	159.38	192.00	3.00	32.62	<b>156.58</b>
Fingerling Supplies (Sex-Reversed)	17.00	235.38	252.38	1,080.00	3.00	827.62	<b>249.38</b>
Pond Grower (Ordinary)	0.00	817.17	817.17	1,120.00	50.00	302.83	<b>767.17</b>
Pond Grower (Sex-Reversed)	0.00	855.52	855.52	1,120.00	75.00	264.48	<b>780.52</b>
Cage Grower (Ordinary)	8.50	26.85	35.35	42.00	1.20	6.65	<b>34.15</b>
Wholesaler (Fresh Tilapia)	1.56	309.08	310.64	320.00	300.00	9.36	<b>10.64</b>
Wholesaler (Tilapia Fingerlings)	0.00	431.96	431.96	472.00	428.00	40.04	<b>3.96</b>
Processor (Lamayo)	0.54	19.29	19.83	27.00	12.10	7.17	<b>7.73</b>
Processor (Chicharon)	0.54	17.41	17.95	27.75	11.25	9.80	<b>6.70</b>
Processor (Dried)	0.00	2.55	2.55	2.78	2.10	0.23	<b>0.45</b>
Retailer (Fresh Tilapia)	1.56	13.22	14.78	16.00	12.80	1.22	<b>1.98</b>
Retailer (Dried)	0.00	1.36	1.36	1.68	1.00	0.32	<b>0.36</b>

### Price And Cost Structure

Cost and returns of each player in tilapia fingerlings, grow-out production, and processed tilapia is presented in tables below. The prices in the operation cost are based on the current prices and costs in the market. The selling price, on the other hand, is based on interviews during KII and validated during the stakeholder’s consultation. Net quantities sold are based on actual recounts of players. In the tilapia industry in the South Cotabato, various participants have encountered varying levels of return on investment.

### Income and Profits per Player

#### *Fingerlings/Hatchery Operator (Ordinary and Sex-Reversed Tilapia)*

Fingerlings produced in the province are classified into ordinary and sex-reversed tilapia (SRT). Pond preparation and production practices are relatively similar except for the addition of methyl testosterone hormones in SRT production. This hormone is added to the feeds for 21 days. The quicker growth rate of males compared to females and the ability to regulate reproduction have led to a substantial increase in yield and revenue for SRT. Many hatcheries are seeing the advantages of producing SRT compared to ordinary fingerlings. SRT has shown a significant increase in yield and income because of the faster-growing males compared to females and the control of reproduction. Despite the advantages of producing SRT, hatchery operators in the region still produce ordinary fingerlings because some tilapia growers, specifically the pen operator, still prefer to buy ordinary fingerlings. Most of the hatchery operators depend on the preference of the buyer. The activity cycle of fingerlings is assumed to occur every two months, resulting in a harvest each year.

#### *Ordinary Fingerlings*

Table 13 shows the cost and benefit analysis of the ordinary fingerlings production. The biggest percentage of its operational cost is feed (63.59%) amounting to Php101,244.00. Production cost, which included the purchase of breeder stock, accounts to 20.99% while pond preparation expenses have 15.42% share of the total operational cost. Harvested fingerlings are sold per kilogram and classified according to sizes. As reflected in below, hatchery operators have a net income of Php32,422.00. Return on investment is computed at 20.32%.

Table 13. *Cost and Return Analysis for Hatchery Operator producing Ordinary Fingerlings*  
 Source: KII/Stakeholder’s Consultation

<b>Product Type/Form</b>	Fingerlings					
<b>Player</b>	Hatchery Operator					
<b>Activity Details</b>	Production of fingerlings for grow-out					
<b>Activity Cycle per Year</b>	Every 2 months harvest					
<b>Other relevant assumption</b>	The lifespan of breeder can last up to 2 years. Equivalent to 12 harvest period Pond size: 5x30 square meter Production cost once only in the entire cycle @ 60% productivity rate Unit:					
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity per harvest</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>2 years</b>	<b>Total</b>	<b>Percentage</b>
<b>REVENUE</b>	<b>50</b>	<b>kilos</b>	<b>325.00</b>	<b>600</b>		
CC	30	kilos	300.00	12	108,000.00	
DD	20	kilos	350.00	12	84,000.00	
<b>TOTAL REVENUE</b>					<b>192,000.00</b>	
<b>OPERATING COST</b>						
<i><b>Pond Preparation</b></i>						<b>15.42%</b>
Labor	3	pax	350.00	12	12,600.00	
Lime	25	kilos	10.00	12	3,000.00	
Fertilizer (Urea and Organic)	10	kilos	75.00	12	9,000.00	

<b>Production Cost</b>						<b>20.99%</b>
Breeder	600	pcs	5.00		3,000.00	
Fishnet (100 meters, 28 mm-thick 7 mm; Inner)	1	roll	8,500.00	2	17,000.00	
Nylon (Nylon twine # 16)	1	roll	1,500.00		1,500.00	
Labor (Harvest)	1	pond	1,000.00	12	12,000.00	
Feeds						<b>63.59%</b>
Fry Booster	3	sacks	685.00	12	24,660.00	
Fry Mash	3	sacks	433.00	12	15,588.00	
Grower	5	sacks	1,020.50	12	61,230.00	
<b>TOTAL COST</b>					<b>159,578.00</b>	<b>100.00%</b>
<b>NET INCOME OR VALUE ADDED</b>					<b>32,422.00</b>	
<b>VALUE ADDED PER UNIT</b>					<b>54.04</b>	
<b>RETURN ON INVESTMENT</b>					<b>0.20</b>	
<b>PAYBACK PERIOD</b>					<b>4.92</b>	
<b>UNIT COST</b>					<b>265.96</b>	

### Sex Reversed Fingerlings

Production of SRT fingerlings yields a higher income compared to ordinary fingerlings. Total revenue reached Php 1,080,000.00 while the total operating cost was only at Php 252,382.80. This results in a net income of Php 827,617.30 with an attractive ROI of 328%. Attractive return on investment refers to the monetary benefits or earnings produced by effectively drawing in investments. It represents the favorable result or profit an investment opportunity or project has attained regarding financial returns. Based on the conducted KII, 30% of the total income goes to the laborers or the “bantay”, while the remaining 70% share is for the hatchery owner. Similar to ordinary fingerlings, feed expenses have the biggest share in the operational cost equivalent to 77.77%. Due to its relatively bigger sizes, harvested fingerlings are sold per piece in the actual market transactions. However, for the purpose of comparison, harvested quantity is converted into kilograms.

Table 14. *Cost and Return Analysis for Hatchery Operator producing Sex-Reversed Tilapia (SRT)*  
 Source: KII/Stakeholder’s Consultation

<b>Product Type/Form</b>	Fingerlings					
<b>Player</b>	Hatchery Operator					
<b>Activity Details</b>	Production of fingerlings for grow-out					
<b>Activity Cycle per Year</b>	Every 2 months harvest					
<b>Other relevant assumption</b>	The lifespan of breeder can last up to 1 year. Equivalent to 6 harvest period Pond size: 5x30 square meter Production establishment and production cost once only in the cycle @ 60% productivity rate					
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity per harvest</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>2 years</b>	<b>Total</b>	<b>Percentage</b>
<b>REVENUE</b>	90,000 divided by 1,000		(90,000 x P1.00) divided by 90	<b>1,080</b>		
Fingerlings	90	kilos	1,000.00	12	1,080,000.00	
<b>TOTAL REVENUE</b>					<b>1,080,000.00</b>	
<b>OPERATING COST</b>						
<b>Pond Preparation</b>						<b>5.47%</b>
Labor	3	pax	350.00	12	12,600.00	
Lime	5	kilos	20.18	12	1,210.80	
<b>Production Cost</b>						<b>16.76%</b>
Breeder	600	pcs	5.00		3,000.00	
Fishnet (100 meters, 28 mm-thick 7 mm; Inner)	1	roll	8,500.00	2	17,000.00	
Nylon (Nylon twine # 16)	1	roll	1,500.00		1,500.00	

Methyl testosterone (to treat 32,400 fry)	1	bottle	4,000.00	4	16,000.00	
Alcohol (80-95% ethyl/isopropyl alcohol)	2	liters	200.00	12	4,800.00	
<b>Feeds</b>						<b>77.77%</b>
Fry Booster	6	sacks	685.00	12	49,320.00	
Grower	12	sacks	1,020.50	12	146,952.00	
<b>TOTAL COST</b>					<b>252,382.80</b>	<b>100.00%</b>
<b>NET INCOME OR VALUE ADDED</b>					<b>827,617.20</b>	
<b>VALUE ADDED PER UNIT</b>					<b>807.98</b>	
<b>RETURN ON INVESTMENT</b>					<b>3.28</b>	
<b>PAYBACK PERIOD</b>					<b>0.34</b>	
<b>UNIT COST (TC/VPC)</b>					<b>233.68</b>	

### *Tilapia Grower by Culture System (Cage/Pond)*

Tilapia grow-out in the region may be categorized into three different culture systems: cages, ponds, and pens. The succeeding tables illustrate the incomes and revenue of the different culture systems.

#### *Cage Culture System*

Using a cage culture system is widely used in Lake Sebu and Lake Seloton that accounts to 779 growers. Considering an area of 357 cubic meters with a survival rate of 80%, Feed Conversion Ratio (FCR) of 1.5, an Average Body Weight (ABW) of 225 grams after harvest. Cage Growers in Lake Sebu and Lake Seloton uses a semi-intensive culture system that uses a stocking density of 4 pieces per square meter with a Days of Culture (DOC) approximately 4 months or 120 days. As shown in table 20, the total revenue for the cage culture system reached Php 42,000.00 while total operating cost was only Php 35,350.00. This results in a net income of Php 6,650.00 while ROI is projected at 19%. According to the informants, 3.39% of the total income goes to the fingerlings procurement, 36.78% goes to cage materials needed, while the remaining 59.83% share is for the feeds during culture period. The payback period will be within 5.32 years.

Table 15. *Cost and Return Analysis of Tilapia Grower using Cage*

Source: *KII/Stakeholder's Consultation*

<b>Product Type/Form</b>	Fresh Tilapia – ordinary fingerlings				
<b>Player</b>	Cage Grower				
<b>Activity Details</b>	Production of fresh tilapia				
<b>Activity Cycle per Year</b>	1 cropping				
<b>Other relevant assumption</b>	Area: 357 cu.m Number of Unit (5m X 5m X 3m): 1 unit Survival Rate: 80% FCR: 1.5 ABW after Harvest: 225 grams DOC: 180 days SD: 4 pcs/cu.m.				
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity per harvest</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>	<b>Percentage</b>
<b>REVENUE</b>					
Volume of the Product Sold	300	kilos	140.00	42,000.00	
<b>TOTAL REVENUE</b>				<b>42,000.00</b>	
<b>COST</b>					
<b>1. Fingerlings</b>	5	kgs	240.00	<b>1,200.00</b>	<b>3.39%</b>
<b>2. Cage Materials</b>				<b>13,000.00</b>	<b>36.78%</b>
a. Bamboo Pole	6	pole	200.00	1,200.00	
b. B-Net, CC-Net, <b>GG-Net</b>	1	bundle	8,500.00	8,500.00	
c. Nylon (Nylon twine # 16)	2	kgs	380.00	760.00	

d. Mono rope Black (6mm)	1/2	kgs	200.00	100.00	
e. Agoha needle	2	pcs	20.00	40.00	
f. P.E. Rope	1	kgs	200.00	200.00	
g. Labor for construction (3days)	1	pax	1,000.00	1,000.00	
h. Others (Miscellaneous)	1	Php.	200.00	200.00	
i. Labor/Salary	2	Month	500.00	1,000.00	
<b>3. Feeds</b>				<b>21,150.00</b>	<b>59.83%</b>
a. Grower	300	kgs	42.50	12,750.00	
b. Finisher	200	kgs	42.50	8,400.00	
<b>TOTAL COST</b>				<b>35,350.00</b>	<b>100.00%</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>6,650.00</b>	
<b>VALUE ADDED PER UNIT</b>				<b>22.17</b>	
<b>RETURN ON INVESTMENT</b>				<b>0.19</b>	
<b>PAYBACK PERIOD</b>				<b>5.32</b>	
<b>UNIT COST</b>				<b>117.83</b>	

### Pond Culture System

Table 16 presented the cost and return analysis for tilapia production in ponds using ordinary fingerlings. The annual activity cycle consists of two agricultural cycles. Using standard fingerlings in a semi-intensive culture method with a stocking density of five (5) pieces per square meter, fresh tilapia's pond production generates more revenue than cage production. Tilapia production requires high capital investment in production inputs. Feeds including labor account to 80.63% of the total expenses while other inputs such as fingerlings account to 6.34%. The tilapia production cost was spent mostly on supplemental commercial feeds. The high cost of commercial feeds contribute to the constraints and have a direct impact on the total volume of harvest. However, tilapia growers in the region have limited awareness on the preparation of low-cost tilapia feed and alternative feed ingredients. Only few growers are producing farm-made feeds, most of the tilapia growers' have high dependency on using commercially available feed.

Table 16. *Cost and Return Analysis of Tilapia Pond Grower for Ordinary Fingerlings using Freshwater Pond*  
 Source: KII/Stakeholder's Consultation

Product Type/Form		Fresh Tilapia - Ordinary			
Player		Pond Grower			
Activity Details		Production of fresh tilapia			
Activity Cycle per Year		2 croppings			
Other relevant assumption		Water Area: 10,000 square meter, Water Depth: 1 – 1.5 meters Survival Rate: 80% FCR: 1.5 ABW after Harvest: 200 grams, Initial weight: 0.3 grams DOC: 120 Days, SD: 5 pieces per square meter, Initial size #: 17			
Cost and Returns Per Activity Cycle	Quantity per harvest	Unit	Price per Unit	Total	Percentage
<b>REVENUE</b>					
Volume of the Product Sold	8,000	kiloqrams	140.00	1,120,000.00	
<b>TOTAL REVENUE</b>				<b>1,120,000.00</b>	
<b>COST</b>					
<b>A. Pre – Stocking/Pond Preparation</b>				<b>106,500.00</b>	<b>13.03%</b>
1. Labor	100	man-days	360.00	36,000.00	
2. Fertilizer (16-20-0)	10	baqs	2,250.00	22,500.00	
Chicken Manure	120	baqs	150.00	18,000.00	
3. Lime	100	baqs	300.00	30,000.00	
<b>B. Stocking/Seeding</b>				<b>51,800.00</b>	<b>6.34%</b>
1. Labor	5	man-days	360.00	1,800.00	
2. Fingerlings size 17	50,000	baqs	1.00	50,000.00	

<b>C. Culture Period</b>				<b>658,865.00</b>	<b>80.63%</b>
<b>1. Fry Mash</b>					
1.a Labor	30	man-days	360.00	10,800.00	
1.b Feeds	50	bags	433.00	21,650.00	
<b>2. Starter</b>					
2.a Labor	30	man-days	360.00	10,800.00	
2.b Feeds Pre-starter	40	bags	1,080.00	43,200.00	
2.c Feeds Starter	60	man-days	1,056.25	63,375.00	
<b>3. Grower</b>					
3.a Labor	30	man-days	360.00	10,800.00	
3.b Feeds	240	bags	1,020.50	244,920.00	
<b>4. Finisher</b>					
4.a Labor	30	man-days	360.00	10,800.00	
4.b Feeds	240	bags	1,010.50	242,520.00	
<b>TOTAL COST</b>				<b>817,165.00</b>	<b>100.00%</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>302,835.00</b>	
<b>VALUE ADDED PER UNIT</b>				<b>37.85</b>	
<b>RETURN ON INVESTMENT</b>				<b>0.37</b>	
<b>PAYBACK PERIOD</b>				<b>2.70</b>	
<b>UNIT COST</b>				<b>102.15</b>	

Pond production of fresh tilapia in a semi-intensive culture system using ordinary fingerling with a stocking density of five (5) pieces per square meter yields higher income compared to cage production. As to the economic aspect, the pond grower's total revenue reached Php 1,120,000.00 while total operating cost was only Php 817,165.00. As shown in the table 21, this results in a net income of Php 302,835.00 while ROI is computed at 37%. The payback period will be within 2.70 years.

The table below shows the cost and return analysis for fresh tilapia production in ponds using SRT fingerlings. Similarly, the activity cycle remains at two croppings when it comes to using SRT fingerlings. Based on the computation, the cost for the pond preparation accounts to 12.45% of the total production cost while stocking/seeding only accounts to 8.98%. The culture period, which includes the commercial feeds and labor for maintenance and harvest, still bears the highest production cost at 78.57%. The total revenue of pond growers using SRT fingerlings had to reach Php 1,120,000.00 while the total operating cost was only Php 855,515.00. The use of SRT Fingerling for grow-out yields a net revenue of Php 264,485.00, resulting in an excellent return on investment (ROI) of 31%. The revenue generated by pond cultivation surpasses cage production, and the investment will be recouped within 3.66 years.

Table 17. *Cost and Return Analysis of Tilapia Pond Grower for SRT Fingerlings using Freshwater Pond*  
 Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>		Fresh Tilapia - SRT			
<b>Player</b>		Pond Grower			
<b>Activity Details</b>		Production of fresh tilapia			
<b>Activity Cycle per Year</b>		2 croppings			
<b>Other relevant assumption</b>		Water Area: 10,000 square meter, Water Depth: 1 – 1.5 meters Survival Rate: 80% FCR: 1.5. ABW after Harvest: 250 grams Initial weight: 0.3 grams DOC: 120 Days, SD: 5 pieces per square meter, Initial size #: 17			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity per harvest</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>	<b>Percentage</b>
<b>REVENUE</b>					
Volume of the Product Sold	8,000	kilograms	140.00	1,120,000.00	
<b>TOTAL REVENUE</b>				<b>1,120,000.00</b>	
<b>COST</b>					
<b>A. Pre – Stocking/Pond Preparation</b>				<b>106,500.00</b>	<b>12.45%</b>
1. Labor	100	man-days	360.00	36,000.00	
2. Fertilizer (16-20-0)	10	bags	2,250.00	22,500.00	
Chicken Manure	120	bags	150.00	18,000.00	
3. Lime	100	bags	300.00	30,000.00	

Many of the underlying causes of low productivity among marginalized sectors is caused by the low financial capacity of growers to provide production inputs. Some government agencies and private institutions also provide credit and financial support services; however, growers still have limited access to financial and credit linkages due to strict requirements and high interest rates of lending institutions.

**Tilapia Processors (Lamayo, Chicharon, and Dried)**

The processing of tilapia within the region is primarily divided into three distinct product forms: lamayo, chicharon, and dried. The detailed summaries that follow outline the financial performance and revenue generated by these specific processing ventures.

***Processed Tilapia (Lamayo)***

Table below described the weekly processing of fresh tilapia into Lamayo, which uses small-sized fish (8-10 pieces per kilo). In a single activity cycle, a processor generates a total revenue of Php 27,000.00 against a total operating cost of Php 19,829.00. This results in a rewarding net income of Php 7,171.00 per week, with a Return on Investment (ROI) of 36%. The unit cost is calculated at Php 99.15, allowing the processor to gain Php 35.86 in value-added profit for every unit sold, with an immediate payback period of only 2.77.

<b>B. Stocking/Seeding</b>				<b>76,800.00</b>	<b>8.98%</b>
1. Labor	5	man-days	360.00	1,800.00	
2. Fingerlings size 17	50,000	pieces	1.50	75,000.00	
<b>C. Culture Period</b>				<b>672,215.00</b>	<b>78.57%</b>
<b>1. Fry Mash</b>					
1.a Labor	30	man-days	360.00	10,800.00	
1.b Feeds	50	baqs	433.00	35,000.00	
<b>2. Starter</b>					
2.a Labor	30	man-days	360.00	10,800.00	
2.b Feeds Pre-starter	40	bags	1,080.00	43,200.00	
2.c Feeds Starter	60	man-days	1,056.25	63,375.00	
<b>3. Grower</b>					
3.a Labor	30	man-days	360.00	10,800.00	
3.b Feeds	240	bags	1,020.50	244,920.00	
<b>4. Finisher</b>					
4.a Labor	30	man-days	360.00	10,800.00	
4.b Feeds	240	bags	1,010.50	242,520.00	
<b>TOTAL COST</b>				<b>855,515.00</b>	<b>100.00%</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>264,485.00</b>	
<b>VALUE ADDED PER UNIT</b>				<b>33.06</b>	
<b>RETURN ON INVESTMENT</b>				<b>0.31</b>	
<b>PAYBACK PERIOD</b>				<b>3.23</b>	
<b>UNIT COST (TC/VPC)</b>				<b>106.94</b>	

Table 18. *Cost and Return Analysis of Tilapia Processor (Lamayo)*

Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>	Processed Tilapia (Lamayo)			
<b>Player</b>	Tilapia Processor			
<b>Activity Details</b>	Processing of fresh tilapia			
<b>Activity Cycle per Year</b>	Weekly			
<b>Other relevant assumption</b>	Small size tilapia (8-10 pieces per kilo)			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>				
Volume of the Product Sold	200	packs	135.00	27,000.00
<b>TOTAL REVENUE</b>				<b>27,000.00</b>
<b>COST</b>				
Fresh Tilapia	110	kilos	110.00	12,100.00
Salt	10	kilos	20.00	200.00
Vinegar	38.5	kilos	85.00	3,272.50
Sugar	11	kilos	88.00	880.00
Water	22	liters	25.00	550.00
Garlic	5.5	kilos	95.00	522.50
Pepper	27.5	kilos	20.00	550.00
Laurel Leaves	440	packs	1.00	440.00
Digital Weighing Scale	1	unit	538.00	538.00
Container/Packaging	4	packs	44.00	176.00
Hired Labor	3	man/day	200.00	600.00
<b>TOTAL COST</b>				<b>19,829.00</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>7,171.00</b>
<b>VALUE ADDED PER UNIT</b>				<b>35.86</b>
<b>RETURN ON INVESTMENT</b>				<b>0.36</b>
<b>PAYBACK PERIOD</b>				<b>2.77</b>
<b>UNIT COST</b>				<b>99.15</b>

***Processed Tilapia (Chicharon)***

The production of tilapia chicharon serves as an exceptionally profitable value-adding venture that uses good-sized tilapia to create a value-added dish. This operation achieves a total revenue of Php 27,750.00 while maintaining a total cost of Php 17,994.50. As a result, the processor earns a substantial net income of Php 9,755.50 per cycle, boasting a robust ROI of 54%. With a unit cost of Php 239.93 per kilo, the processor gains a remarkable Php 130.07 in profit per unit, leading to an immediate payback period of just 1.84 as seen in table 19.

Table 19. *Cost and Return Analysis of Tilapia Processor (Chicharon)*  
 Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>	Processed Tilapia (Chicharron)			
<b>Player</b>	Tilapia Processor			
<b>Activity Details</b>	Processing of fresh tilapia			
<b>Activity Cycle per Year</b>	Weekly			
<b>Other relevant assumption</b>	Good size tilapia (2-4 pieces per kilo)			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>				
Volume of the Product Sold	75	kilos	370.00	27,750.00
<b>TOTAL REVENUE</b>				<b>27,750.00</b>
<b>COST</b>				
Fresh Tilapia	75	kilos	150.00	11,250.00
Breeding (Cornstarch or all-purpose flour)	19	kilos	116.00	2,204.00
Pepper	1.5	kilos	20.00	30.00
Garlic Powder	1.5	kilos	155.00	232.50
Cooking Oil	15	liters	186.00	2,790.00
Digital Weighing Scale	1	unit	538.00	538.00
Hired Labor	3	man/day	300.00	900.00
<b>TOTAL COST</b>				<b>17,994.50</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>9,755.50</b>
<b>VALUE ADDED PER UNIT</b>				<b>130.07</b>
<b>RETURN ON INVESTMENT</b>				<b>0.54</b>
<b>PAYBACK PERIOD</b>				<b>1.84</b>
<b>UNIT COST</b>				<b>239.93</b>

**Processed Tilapia (Dried Tilapia)**

Presented in table 20 is the cost and return analysis or processing of dried tilapia that serve as an important outlet for small-sized fish that may otherwise have low market value. This artisanal operation reaches a total revenue of Php 2,775.00 against a total operating cost of Php 2,550.00. This results in a net income of Php 225.00 per week and an ROI of 9%. The unit cost is set at Php 22.9, yielding a value-added profit of Php 2.03, with the initial investment being recovered within 11.33.

Table 20. *Cost and Return Analysis of Tilapia Processor (Dried Tilapia)*  
 Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>	Processed Tilapia (Dried Tilapia)			
<b>Player</b>	Tilapia Processor			
<b>Activity Details</b>	Processing of fresh tilapia			
<b>Activity Cycle per Year</b>	Weekly			
<b>Other relevant assumption</b>	Small size tilapia			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>				
Volume of the Product Sold	111	bundles	25.00	2,775.00
<b>TOTAL REVENUE</b>				<b>2,775.00</b>
<b>COST</b>				
Fresh Tilapia	30	kilos	70.00	2,100.00
Salt	15	kilos	20.00	300.00
Hired Labor	1	man/day	150.00	150.00
<b>TOTAL COST</b>				<b>2,550.00</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>225.00</b>
<b>VALUE ADDED PER UNIT</b>				<b>2.03</b>
<b>RETURN ON INVESTMENT</b>				<b>0.9</b>
<b>PAYBACK PERIOD</b>				<b>11.33</b>
<b>UNIT COST</b>				<b>22.97</b>

Tilapia processing in the province of South Cotabato remains an emerging industry that offers favorable prospects for growers to increase their earnings through value-enhancing activities, though it currently faces limitations due to a lack of specialized facilities that meet GMP and FDA compliance.

### Tilapia Wholesaler (Fresh/Fingerlings)

Tilapia wholesaling in the province may be categorized into two primary market activities: the consolidation of fresh marketable tilapia for terminal markets and the distribution of tilapia fingerlings to grow-out farmers. The succeeding details illustrate the incomes and revenue of these different wholesaling operations.

#### *Wholesaler (Fresh Tilapia)*

The consolidation and selling of tilapia in bulk to the retailers and institutional buyers is on a weekly transaction. Traders usually shoulder the transportation cost. In the province, traders transported the fresh tilapia in the market either through rented vehicles or owned trucks. If the selling price of the trader is at Php 160.00 per kilogram and unit cost is Php 155.32. The trader gains Php 4.68 in every 1 kilo of tilapia sold in the market. On a weekly basis, total revenue of traders reached up to Php 320,000.00 while total operating cost was Php 310,636.00. As shown in table 21, this results in a net income of Php 9,364.00 with an ROI at 3%.

Table 21. *Cost and Return Analysis of Fresh Tilapia Wholesaler*  
 Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>	Fresh Tilapia			
<b>Player</b>	Wholesaler			
<b>Activity Details</b>	Selling of tilapia in bulk to retailers and institutional buyers			
<b>Activity Cycle per Year</b>	Weekly transaction			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>				
Volume of the Product Sold	2,000	kilos	160.00	320,000.00
<b>TOTAL REVENUE</b>				<b>320,000.00</b>
<b>TOTAL COST</b>				
<b>Operating Cost</b>				
Tilapia	2,000	kilograms	150.00	300,000.00
Ice	4	blocks	200.00	800.00
Styrofoam/crates	32	pieces	98.00	3,136.00
Big PE Colored Plastic	32	pieces	20.00	640.00
Weighing Scale	1	unit	1,560.00	1,560.00
Labor (packing and hauling for 2 hours)	10	pax	150.00	1,500.00
Truck rental	1	week	3,000.00	3,000.00
<b>TOTAL COST</b>				<b>310,636.00</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>9,364.00</b>
<b>VALUE ADDED PER UNIT</b>				<b>4.68</b>
<b>RETURN ON INVESTMENT</b>				<b>0.03</b>
<b>PAYBACK PERIOD</b>				<b>33.17</b>
<b>UNIT COST</b>				<b>155.32</b>

#### *Wholesaler (Tilapia Fingerling)*

The wholesaling of tilapia fingerlings acts as a vital bridge between hatcheries and nurseries and the grow-out farmers who require high-quality fingerlings for stocking. This business model typically follows a bi-weekly transaction cycle, managing the high-volume distribution of juvenile fish. Based on

financial data, a wholesaler can achieve a total revenue of Php 472,000.00 by selling 1,800 kilograms of fingerlings (categorized as Size #20 and Size #22). With a total operating cost of Php 431,960.00, the wholesaler earns a net income of Php 40,040.00, resulting in a 9% Return on Investment. This operation is highly specialized, requiring careful management to minimize in-transit mortality of the live fish seeds while moving them from central supply points to diverse production sites.

Table 22. *Cost and Return Analysis of Tilapia Fingerlings Wholesaler*  
 Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>	Tilapia Fingerlings			
<b>Player</b>	Wholesaler			
<b>Activity Details</b>	Selling of fingerlings in bulk to grow-out			
<b>Activity Cycle per Year</b>	Bi-weekly transaction			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>	<b>1,800</b>			
Volume of the Product Sold, Size #20	800	kilos	240.00	192,000.00
Volume of the Product Sold, Size #22	1,000	kilos	280.00	280,000.00
<b>TOTAL REVENUE</b>				<b>472,000.00</b>
<b>TOTAL COST</b>				
<b>Operating Cost</b>				
Tilapia Fingerlings, Size #20	800	kilos	210.00	168,000.00
Tilapia Fingerlings, Size #22	1,000	kilos	260.00	260,000.00
Labor	3	pax	350.00	960.00
Truck rental	1	bi-week	3,000.00	3,000.00
<b>TOTAL COST</b>				<b>431,960.00</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>40,040.00</b>
<b>VALUE ADDED PER UNIT</b>				<b>22.24</b>
<b>RETURN ON INVESTMENT</b>				<b>0.09</b>
<b>PAYBACK PERIOD</b>				<b>10.79</b>
<b>UNIT COST</b>				<b>239.98</b>

### Tilapia Retailer (Fresh/Dried)

Tilapia retailing in the region may be categorized into two primary product forms: fresh and dried tilapia. The following information show the incomes and revenue of these different retail operations.

#### *Retailer (Fresh Tilapia)*

The operation of the retailers of fresh tilapia in the region is on a daily basis. The total revenue reached is Php 16,000.00 while total operating cost is only Php 14,780.00. As shown in table 23, this results in a net income of Php 1,370.00 while ROI is at an attractive 22% only. The unit cost is at Php 184.75 per kilogram while the selling price is at Php 190.00 per kilogram. This implies that the retailer gains Php 15.25 in every one kilo of tilapia sold in the public market. The payback period will be within 12.11 years.

Table 23. *Cost and Return Analysis of Fresh Tilapia Retailers*  
 Source: KII/Stakeholder's Consultation

<b>Product Type/Form</b>	Fresh Tilapia			
<b>Player</b>	Retailer			
<b>Activity Details</b>	Retail of fresh tilapia in public market			
<b>Activity Cycle per Year</b>	Daily Operation			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>				
Volume of the Product Sold	80	kilos	200.00	16,000.00

<b>TOTAL REVENUE</b>				<b>16,000.00</b>
<b>TOTAL COST</b>				
<i>Operating Cost</i>				
Rental	1	day	50.00	50.00
Electricity	1	day	20.00	20.00
Hauling (from the entrance of the public market to the pwesto)	3	tray	30.00	30.00
Hauling (from the farm to public market)	3	tray	30.00	30.00
Weighing Scale	1	unit	1,560.00	1,560.00
Ice	1	block	200.00	200.00
Cellophane	1	pack	70.00	70.00
Salt	1	pack	20.00	20.00
Tilapia	80	kilos	160.00	12,800.00
<b>TOTAL COST</b>				<b>14,780.00</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>1,220.00</b>
<b>VALUE ADDED PER UNIT</b>				<b>15.25</b>
<b>RETURN ON INVESTMENT</b>				<b>0.08</b>
<b>PAYBACK PERIOD</b>				<b>12.11</b>
<b>UNIT COST</b>				<b>184.75</b>

#### *Retailer (Dried Tilapia)*

The retail of dried tilapia in public markets also functions on a daily basis. Table 24 illustrates that, for this activity cycle, the total revenue generated is Php 1,675.00, compared to a total operating cost of Php 1,370.00. This results in a daily net income or value added of Php 305.00, yielding an attractive ROI of 22%. The unit cost is calculated at Php 18.27 per bundle, meaning the retailer gains a rewarding profit of Php 4.07 for every bundle sold. Due to the high liquidity and efficiency of this emerging market niche, the payback period is reached within only 4.49 days.

Table 24. *Cost and Return Analysis of Dried Tilapia Retailers*

<b>Product Type/Form</b>	Dried Tilapia			
<b>Player</b>	Retailer			
<b>Activity Details</b>	Retail of dried tilapia in public market			
<b>Activity Cycle per Year</b>	Daily Operation			
<b>Cost and Returns Per Activity Cycle</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price per Unit</b>	<b>Total</b>
<b>REVENUE</b>				
Small	20	bundle	15.00	300.00
Medium	25	bundle	20.00	500.00
Large	25	bundle	35.00	875.00
<b>TOTAL REVENUE</b>				<b>1,675.00</b>
<b>TOTAL COST</b>				
<i>Operating Cost</i>				
Dried Tilapia	2	sack	500.00	1,000.00
Rental	1	day	50.00	50.00
Cellophane	1	pack	70.00	70.00
Transportation	2	trip	250.00	250.00
<b>TOTAL COST</b>				<b>1,370.00</b>
<b>NET INCOME OR VALUE ADDED</b>				<b>305.00</b>
<b>VALUE ADDED PER UNIT</b>				<b>4.07</b>
<b>RETURN ON INVESTMENT</b>				<b>0.22</b>
<b>PAYBACK PERIOD</b>				<b>4.49</b>
<b>UNIT COST</b>				<b>18.27</b>

### Profitability Analysis of the Chain

This part includes per cycle cost and return of tilapia culture which were determined for the one-year production period and assess the effects of some important variables of production on gross return for this fish culture in a specific area. This section presents the spirit of the survey results on economic analysis including profitability of Tilapia fish culture in the province of South Cotabato. Profitability is one of the major criteria for the determination of the acceptance of any farming business. The specific objectives of this part are the determination of costs, returns and profitability analysis of tilapia in the study area.

#### *Profitability Analysis of Hatchery Operator producing Ordinary Tilapia Fingerlings*

Table 25 shows the financial profile of hatchery operators producing ordinary tilapia fingerlings in South Cotabato, as indicated by a Benefit-Cost Ratio (BCR) of 1.20, demonstrates a robust agribusiness model where returns consistently surpass expenditures. This ₱0.20 return per peso invested is congruent with the study of Alam (2005) and Magna et al. (2023), who emphasize that a BCR exceeding unity is a fundamental prerequisite for sustainable rural poverty alleviation. The operation is characterized by a cost-sensitive structure, with variable expenditures of ₱142.58 thousand comprising 89.5% of the total budget. Notably, commercial feeds account for 63.54% of these costs, an observation that mirrors the 73% expenditure benchmark identified by Jamandre et al. (2011). Conversely, the ₱17.00 thousand allocated to fixed costs ensures the maintenance of the critical infrastructure and breeding ponds necessary for a continuous production cycle.

Furthermore, the 16.99% net profit margin recorded at the hatchery level represents a significantly more resilient financial buffer than those of wholesalers (2.93%) or retailers (7.62%). Despite the superior 253% Return on Investment (ROI) associated with Sex-Reversed Tilapia (SRT) technology, ordinary fingerlings remain a vital node as traditional producers prioritize their lower initial procurement costs. Ultimately, as articulated in the study Department of Agriculture (2023), long-term sustainability is predicated on the integration of Best Management Practices (BMPs) and the acquisition of high-quality broodstock to buffer against input price volatility and environmental shifts.

Table 25. *Profitability Analysis of Hatchery Operator producing Ordinary Tilapia Fingerlings*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱159.38
Variable Cost	₱142.58
Fixed Cost	₱17.00
Production	
Harvest from Tilapia Fingerling (CC)	0.36 kg
Harvest from Tilapia Fingerling (DD)	0.34 kg
Total Production	0.6 kg
Return	
Return from Tilapia Fingerling (CC)	₱108
Return from Tilapia Fingerling (DD)	₱84.00
Total Return (TR)/Gross Return (GR)	₱192.00
Gross Margin (GM)	₱49.42
Net Return (NR)	₱32.62
Benefit-Cost Ration (BCR)	1.20
Gross Profit Margin (GPM)	25.74%
Net Profit Margin (NPM)	16.99%

***Profitability Analysis of Hatchery Operator producing Sex-Reversed Tilapia Fingerlings***

Presented in Table 26 is the financial performance of hatchery operators producing Sex-Reversed Tilapia (SRT) in South Cotabato that reveals an exceptionally lucrative and efficient agribusiness model, as evidenced by a Benefit-Cost Ratio (BCR) of 4.28 which indicates that every Php 1.00 invested generates Php 4.28 in revenue. This level of profitability is empirically aligned with research by Magna et al. (2023) and Alam (2005), who argue that BCR indicators significantly greater than unity characterize aquaculture as a robust tool for rural poverty alleviation and household income augmentation. The operation achieves an outstanding net profit margin of 76.63%, substantially outpacing international benchmarks like the 44% net profit reported in Egyptian hatcheries by Nasr-Allah et al. (2014). According to the Bureau of Fisheries and Aquatic Resources (2021), this superior performance is driven by monosex technology, which creates all-male populations that grow 10% to 120% faster than mixed-sex stocks and provides management utility by preventing unwanted reproduction that competes for space and dissolved oxygen.

The cost structure is dominated by variable expenses of ₱235.38 thousand, accounting for 93.26% of total production costs, a concentration consistent with the Department of Agriculture (2023) which identifies supplemental commercial feeds as the dominant expenditure at 77.97% of SRT operational outlays. This high dependency on external inputs, which typically consumes 60% to 80% of total operating capital, makes local operators vulnerable to the fluctuating prices of raw materials like protein supplements. Despite these costs, the 78.21% gross profit margin confirms that the technical transformation of the seed through sex reversal adds substantial form utility, granting operators significant market leverage over traditional producers. These findings confirm the SRT hatchery node as the most lucrative segment of the regional value chain with a Return on Investment (ROI) of 253%, directly advancing the goals of the National Tilapia Industry Roadmap 2022-2025. Ultimately, sustaining this high-growth trajectory requires a commitment to Best Management Practices (BMPs) and Good Aquaculture Practices (GAqP) to mitigate biological risks and ensure a stable supply of superior broodstock amidst climate-induced environmental volatility.

Table 26. *Profitability Analysis of Hatchery Operator producing Sex-Reversed Tilapia*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year)(₱ '000)
Cost	
Total Cost	₱252.38
Variable Cost	₱235.38
Fixed Cost	₱17.00
Production	
Harvest from Tilapia Fingerling (SRT)	1.08 kg
Total Production	1.08 kg
Return	
Return from Tilapia Fingerling (SRT)	₱1,080
Total Return (TR)/Gross Return (GR)	₱1,080

Gross Margin (GM)	₱844.62
Net Return (NR)	₱827.62
Benefit-Cost Ration (BCR)	4.28
Gross Profit Margin (GPM)	78.21%
Net Profit Margin (NPM)	76.63%

***Profitability Analysis of Tilapia Pond Grower using Ordinary Fingerlings***

The financial performance of tilapia pond growers in South Cotabato utilizing ordinary fingerlings, as quantified by a Benefit-Cost Ratio (BCR) of 1.37, establishes the enterprise as a highly viable and sustainable agribusiness model as seen in table 27. This BCR exceeding unity signifies that the total benefits of production significantly surpass operating expenditures, a result that aligns with the research of Magna et al. (2023) and Alam (2005), who identify such indicators as hallmarks of a robust tool for rural poverty alleviation and household income augmentation. A unique characteristic of this operation is its cost structure, where the total production cost of ₱817.17 thousand consists entirely of variable expenses, resulting in zero fixed costs and indicating a highly flexible business model that likely leverages rented facilities or communal water resources to minimize barriers to entry. However, this 100% dependency on variable inputs specifically fingerlings and supplemental commercial feeds, makes the enterprise's net return highly sensitive to market fluctuations, a concentration of costs empirically consistent with findings in the Department of Agriculture (2023) and study by Mutia et al. (2020), which establish that feed costs alone typically consume 60% to 80% of total operating capital.

The grower's ability to generate a consistent Profit Margin of 27.04% for both gross and net indicators demonstrate high operational efficiency in converting sales into realized profit. While this model proves to be stable, it operates with thinner margins and lower technological complexity compared to Sex-Reversed Tilapia (SRT) systems, which can achieve a significantly higher Return on Investment (ROI) of up to 253% due to the faster growth rates and higher survival percentages of all-male populations. Finally, situating these results within the scholarship of Ahmed and Toufique (2015) and the National Tilapia Industry Roadmap 2022-2025 highlights the sector's vital role in ensuring regional food security and providing affordable animal protein while maintaining economic resilience in the face of supply chain volatility.

Table 27. *Profitability Analysis of Tilapia Pond Grower using Ordinary Fingerlings*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱817.17
Variable Cost	₱817.17
Fixed Cost	0
Production	
Harvest from Tilapia	8.0 kg
Total Production	8.0 kg
Return	

Return from Tilapia	₱1,120.00
Total Return (TR)/Gross Return (GR)	₱1,120.00
Gross Margin (GM)	₱302.83
Net Return (NR)	₱ 302.83
Benefit-Cost Ration (BCR)	1.37
Gross Profit Margin (GPM)	27.04%
Net Profit Margin (NPM)	27.04%

***Profitability Analysis of Tilapia Grower using Cage***

Table 28 presents the financial performance of tilapia cage growers in South Cotabato, evidenced by a Benefit-Cost Ratio (BCR) of 1.19, confirms that the enterprise is an economically viable agribusiness model where total benefits exceed operating expenditures. This finding aligns with the scholarship of Magna et al. (2023) and Alam (2005), who identify positive BCR indicators as essential hallmarks of a sustainable agribusiness capable of supporting rural livelihoods and household income augmentation. Unlike pond-based models, cage culture involves a more complex cost structure where fixed costs of ₱8.5 thousand represent a significant 24% of total production expenses. Moreover, Magna et al. (2023) observe that the depreciated cost of equipment typically represents the largest component of fixed assets in small-scale cage aquaculture, a structural burden that must be recovered through consistent harvest yields.

While the enterprise achieves a gross profit margin of 36.07%, its operational efficiency is heavily influenced by high variable costs, primarily supplemental commercial floating feeds, which study by Jamandre et al. (2011) and the Amoah, et.al. (2021) indicates consistently represents the largest share of production expenses. This high dependency on expensive external inputs makes the grower’s net profit margin of 15.83% highly sensitive to market price fluctuations and potential handling losses during harvest. However, the relatively slim net margin of 15.83% suggests that the operation is less efficient at spreading out structural costs compared to high-volume pond systems, as small-scale producers often miss out on economies of scale due to limited cash flow.

The operation’s Net Return of ₱6.65 thousand from a 300 kg harvest validates cage culture as a durable segment of the regional value chain that supports food security. To ensure long-term sustainability, research by Amoah et al. (2021) and the National Tilapia Industry Roadmap suggest that growers must increase harvest density and adopt Best Management Practices (BMPs) to mitigate environmental risks, such as the seasonal fish kills known as kamohung. Lastly, improving access to high-yielding Sex-Reversed Tilapia (SRT) technology could further enhance the profitability of this node by providing faster growth rates and higher survival percentages compared to ordinary stocks.

Table 28. *Profitability Analysis of Tilapia Grower using Cage*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱35.35
Variable Cost	₱26.85
Fixed Cost	₱8.5
Production	
Harvest from Tilapia	0.3 kg
Total Production	0.3 kg

Return	
Return from Tilapia	₱42.00
Total Return (TR)/Gross Return (GR)	₱42.00
Gross Margin (GM)	₱15.15
Net Return (NR)	₱6.65
Benefit-Cost Ration (BCR)	1.19
Gross Profit Margin (GPM)	36.07%
Net Profit Margin (NPM)	15.83%

***Profitability Analysis of Tilapia Pond Grower using Sex-Reversed Tilapia Fingerlings***

The financial standing of tilapia pond operators in South Cotabato who utilize Sex-Reversed Tilapia (SRT) fingerlings illustrates a viable and consistent agribusiness framework, supported by a Benefit-Cost Ratio (BCR) of 1.31 as indicated in table 29. This economic performance resonates with the research of Magna et al. (2023) and Alam (2005), which suggests that BCR values above 1.0 establish aquaculture as an effective tool for increasing household earnings and reducing rural poverty. A unique feature of this sector is its cost structure, in which the total ₱855.52 thousand production budget is entirely variable. This lack of fixed costs implies a flexible operational strategy, potentially involving communal or leased assets that allow farmers to avoid heavy capital investments.

Financial data indicates a high reliance on variable inputs, particularly labor and commercial feeds, which represent 79.16% of total expenditures. This trend is consistent with the Department of Agriculture (2023) and Mutia et al. (2020), which state that feed expenses generally account for 60% to 80% of operating capital in intensive farming. Although the higher price of SRT fingerlings ranging from Php 0.40 to Php 0.50 per piece results in a 23.61% profit margin that is slightly lower than the 27.04% seen in traditional stocks, the use of monosex technology provides superior biological value. As highlighted by Hossain (2009) and the Bureau of Fisheries and Aquatic Resources (2021), SRT fish grow up to 120% faster than mixed-sex populations and prevent uncontrolled breeding, which preserves water quality and pond space.

These growers act as the essential operations stage, converting biological inputs into an 8.0-ton harvest with a net return of ₱264.48 thousand per cycle. This productivity supports the National Tilapia Industry Roadmap 2022-2025 by encouraging the use of high-yield, genetically improved fish to strengthen regional food security. Finally, as argued by Ayubu (2017) and the Department of Agriculture (2023), the future of this industry depends on adopting Best Management Practices (BMPs) and improving access to formal credit to protect against market price swings and climate-related production threats.

Table 29. *Profitability Analysis of Tilapia Pond Grower using Sex-Reversed Tilapia Fingerlings*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱855.52
Variable Cost	₱855.52
Fixed Cost	0
Production	

Harvest from Tilapia	₱8.00
Total Production	₱8.00
Return	
Return from Tilapia	₱1,120.00
Total Return (TR)/Gross Return (GR)	₱1,120.00
Gross Margin (GM)	₱264.48
Net Return (NR)	₱264.48
Benefit-Cost Ration (BCR)	1.31
Gross Profit Margin (GPM)	23.61%
Net Profit Margin (NPM)	23.61%

***Profitability Analysis of Tilapia Lamayo Processor***

Data in table 30 establishes that the financial viability of Tilapia Lamayo processing in South Cotabato is evidenced by an undiscounted Benefit-Cost Ratio (BCR) of 1.36, which confirms its status as a sustainable agribusiness model. This performance supports the research of Magna et al. (2023) and Alam (2005), who argue that a BCR above 1.0 indicates a venture’s potential to increase household income and alleviate rural poverty. By achieving a 26.56% net profit margin, these processors demonstrate high operational efficiency in creating "form" and "time utility" through marinating and drying activities that Porter (1985) defines as essential for establishing competitive advantage within a value chain.

The cost structure of this sector is highly sensitive to variable expenses, which account for 97.3% of total outlays. This finding aligns with the research of Mutia et al. (2020) and Amoah et al. (2021), who found that raw material procurement typically represents the largest expenditure for fish processors, often between 88% and 94% of production costs. According to Department of Agriculture (2023), this reliance on variable inputs characterizes the regional processing sector as a micro-enterprise that maintains low fixed costs by utilizing household tools and community-based systems. This shift toward processed goods like Lamayo also matches consumer trends toward convenience and longer shelf life, as noted by Jamandre et al. (2011).

Beyond profit, this sector plays a vital role in food security and waste reduction. Nelligan (2022) and the National Tilapia Industry Roadmap highlight that value-addition can reduce the perishability of fish and cut post-harvest losses from 25% to 10%. Furthermore, Amoah et al. (2021) point out that processing provides critical livelihood opportunities for women, who often lead this workforce and improve profitability through family labor. However, the Department of Agriculture (2023) warns that the long-term growth of these small-scale processors depends on overcoming barriers such as a lack of formal food safety certifications and the need for facilities that comply with Good Manufacturing Practices (GMP).

Table 30. *Profitability Analysis of Tilapia Lamayo Processor*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	

Total Cost	₱19.83
Variable Cost	₱19.29
Fixed Cost	₱0.54
Production	
Volume of the Product Sold	0.2 pack
Total Product Sold	0.2 pack
Return	
Return from Tilapia Fingerling (SRT)	₱27.00
Total Return (TR)/Gross Return (GR)	₱27.00
Gross Margin (GM)	₱7.71
Net Return (NR)	₱7.17
Benefit-Cost Ration (BCR)	1.36
Gross Profit Margin (GPM)	28.56%
Net Profit Margin (NPM)	26.56%

***Profitability Analysis of Tilapia Chicharon Processor***

The financial assessment of Tilapia Chicharon processing in South Cotabato establishes it as an optimal agribusiness configuration, empirically supported by a Benefit-Cost Ratio (BCR) of 1.55 as observed in Table 31. This coefficient of investment efficiency suggests that each unit of deployed capital yields a 1.55 return, characterizing the enterprise as a resilient mechanism for rural poverty alleviation and decentralized economic development (Magna et al., 2023; Alam, 2005). Notably, this segment emerges as the most capital-efficient echelon within the provincial value chain, exhibiting a profitability index that surpasses both upstream production and conventional post-harvest methodologies. The underlying cost architecture demonstrates an acute elasticity relative to variable inputs, which represent 97% of total operational outlays (₱17.41 thousand); this fiscal concentration validates the observations of Mutia et al. (2020) and Kakerissa et al. (2024) concerning the significant budgetary weight of raw material acquisition in niche aquaculture processing. Furthermore, the marginal fixed cost of ₱0.54 thousand signifies a lean, micro-enterprise operational framework that utilizes communal assets to preserve the operational flexibility necessary for maintaining competitive advantage within fragmented market landscapes.

From a value chain perspective, this node achieves maximum form utility through the synthesis of highly perishable aquaculture byproducts into high-value, shelf-stable consumer commodities. The sector's 35.32% net profit margin exemplifies an exceptional capacity for value capture, corroborating the theoretical frameworks of Amoah et al. (2021) and Zaman et al. (2025), which suggest that processing nodes often secure disproportionate profit shares via product differentiation and penetration of specialized market niches. Moreover, the integration of fish skins and trimmings into crackling production directly facilitates the circular economy and resource optimization mandates outlined in the National Tilapia

Industry Roadmap 2022-2025. Although Carolino et al. (2021) underscore the sector's pivotal role in the socio-economic empowerment of female and marginalized cohorts, the study on Fresh Tilapia VCA by Department of Agriculture (2023) identifies critical institutional impediments specifically the lack of infrastructure compliant with Good Manufacturing Practices (GMP) as a bottleneck to scalability. Consequently, the industrial maturation of this high-return node remains contingent upon targeted policy interventions in post-harvest logistics and the formalization of food safety certifications to achieve alignment with international quality standards.

Table 31. *Profitability Analysis of Tilapia Chicharon Processor*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱17.95
Variable Cost	₱17.41
Fixed Cost	₱0.54
Production	
Volume of the Product Sold	0.075 kg
Total Product Sold	0.075 kg
Return	
Return from Tilapia Fingerling (SRT)	₱27.75
Total Return (TR)/Gross Return (GR)	₱27.75
Gross Margin (GM)	₱10.34
Net Return (NR)	₱9.80
Benefit-Cost Ration (BCR)	1.55
Gross Profit Margin (GPM)	37.26%
Net Profit Margin (NPM)	35.32%

***Profitability Analysis of Dried Tilapia Processor***

The economic assessment of dried tilapia processing in South Cotabato, supported by a Benefit-Cost Ratio (BCR) of 1.09, classifies the enterprise as a marginally viable agribusiness framework. Although a BCR above 1.0 validates that production gains outweigh operating costs, this figure represents the narrowest investment efficiency among all local value-adding status. This outcome aligns with the findings of Magna et al. (2023) and Alam (2005), who observe that while such ventures are economically sustainable, their minimal returns typically define them as subsistence-level household activities rather than scalable commercial operations. The study reveals a lean cost architecture where 100% of the ₱2.55 thousand budget is dedicated to variable inputs, specifically raw fish and salt. This expenditure pattern is corroborated by Mutia et al. (2020), which identify raw material procurement as the primary financial burden for processors. Furthermore, the lack of fixed overhead suggests an informal micro-enterprise model that prioritizes traditional sun-drying over capital-intensive infrastructure.

This segment offers essential time utility by extending the shelf life of perishable aquaculture products. However, the modest 8.27% net profit margin indicates a restricted capacity for value capture when compared to more advanced processed goods. In contrast to Tilapia Lamayo (BCR 1.36) or Chicharon (BCR 1.55), which achieve significant form utility through seasoning and frying conventional sun-drying fails to attract the market premium necessary for higher profitability, reinforcing the need for product differentiation noted by Jamandre et al. (2011). Despite these thin margins, the sector remains a vital entry point for marginalized groups, including women and indigenous populations in Lake Sebu, who utilize family labor to maintain viability. While Amoah et al. (2021) acknowledge these roles as crucial for poverty reduction, the minimal ₱0.23 thousand net return per cycle leaves operators highly susceptible to market volatility. As argued by Nelligan (2022) and Zaman et al. (2025), systemic risks such as fluctuating farm-gate prices and inadequate post-harvest storage continue to threaten the resilience of micro-processors who lack the fiscal buffer to absorb economic shocks.

Table 32. *Profitability Analysis of Dried Tilapia Processor*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱2.55
Variable Cost	₱2.55
Fixed Cost	0
Production	
Volume of the Product Sold	0.111 bundle
Total Product Sold	0.111 bundle
Return	
Return from Dried Tilapia	₱2.78
Total Return (TR)/Gross Return (GR)	₱2.78
Gross Margin (GM)	₱0.23
Net Return (NR)	₱0.23
Benefit-Cost Ration (BCR)	1.09
Gross Profit Margin (GPM)	8.27%
Net Profit Margin (NPM)	8.27%

***Profitability Analysis of Fresh Tilapia Wholesaler***

The financial architecture of fresh tilapia wholesaling in South Cotabato is defined by a high-volume, low-margin framework, as evidenced by a Benefit-Cost Ratio (BCR) of 1.03 as illustrated in Table

33. This marginal return of ₱0.03 per peso invested underscores the economic vulnerability of this node, a condition Nelligan (2022) and Ayubu (2017) attribute to heightened market competition and intermediary density. Dominating the cost structure are variable expenditures (₱309,080), which account for 99.5% of total outlays; this heavy reliance on procurement and logistics aligns with the assertions of Mutia et al. (2020) and Zaman et al. (2025) regarding the primary financial burdens of fish intermediaries. Given the negligible fixed costs (₱1,560), institutional solvency is predicated on accelerated capital turnover and substantial throughput (2,000 kg/cycle).

Furthermore, the 2.93% Net Profit Margin (₱9,360) provides an insufficient buffer against exogenous shocks, such as fuel price volatility or product spoilage, a sensitivity highlighted by Phiri et al. (2013) that frequently relegates wholesalers to price takers. Within the context of Porter's (1985) value chain theory, while these actors provide critical place utility, they capture significantly less value than processing segments such as tilapia chicharon (BCR 1.55 which generate form utility. Even with an average market price of ₱160/kg, wholesalers retain a disproportionately small fraction of consumer expenditure. Thus, the long-term resilience of this high-risk logistical engine necessitates targeted investments in cold-chain infrastructure and enhanced market-matching mechanisms.

Table 33. *Profitability Analysis of Fresh Tilapia Wholesaler*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱310.64
Variable Cost	₱309.08
Fixed Cost	₱1.56
Production	
Volume of the Product Sold	2.00 kg
Total Product Sold	2.00 kg
Return	
Return from Dried Tilapia	₱320.00
Total Return (TR)/Gross Return (GR)	₱320.00
Gross Margin (GM)	₱10.92
Net Return (NR)	₱9.36
Benefit-Cost Ration (BCR)	1.03
Gross Profit Margin (GPM)	3.41%
Net Profit Margin (NPM)	2.93%

***Profitability Analysis of Tilapia Fingerlings Wholesaler***

The financial evaluation of tilapia fingerling wholesalers in South Cotabato, as shown in Table 34, highlights a resilient agribusiness model with a Benefit-Cost Ratio (BCR) of 1.09. This return of ₱0.09 for every peso invested indicates economic viability, supporting the theories of Magna et al. (2023) and Alam (2005). The operation is distinguished by a purely variable cost structure (₱431,960), pointing to a flexible viajero approach that operates without fixed overhead. This profile aligns with Mutia et al. (2020) and Nasr-Allah et al. (2014), who observe that seed procurement and logistics typically account for over 90% of trade costs.

Revenue generation is centered on Size #22 fingerlings (₱280,000), which outperform Size #20 (₱192,000), confirming a market demand for larger, standardized seeds to achieve consistent growth (Jamandre et al., 2011). With a net profit margin of 8.48%, this segment maintains a more robust financial cushion than fresh tilapia wholesalers (2.93%–5%). Although Nelligan (2022) and Ayubu (2017) describe wholesalers as price takers, the superior BCR here reflects a market premium for the technical complexities of transporting live stock.

These wholesalers deliver essential place utility to isolated areas like Lake Sebu and time utility by aligning with peak demand in March and April (Nasr-Allah et al., 2014). According to the National Tilapia Industry Roadmap 2022-2025, these intermediaries are crucial to food security. By facilitating the distribution of high-yield strains like Sex-Reversed Tilapia (SRT), they enhance regional productivity and the overall resilience of the value chain.

Table 34. *Profitability Analysis of Tilapia Fingerlings Wholesaler*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱431.96
Variable Cost	₱431.96
Fixed Cost	0.00
Production	
Volume of the Product Sold, Size #20	0.80 kg
Volume of the Product Sold, Size #22	1.00 kg
Total Production	1.80 kg
Return	
Volume of the Product Sold, Size #20	₱192.00
Volume of the Product Sold, Size #22	₱280.00
Total Return (TR)/Gross Return (GR)	₱472.00
Gross Margin (GM)	₱40.04
Net Return (NR)	₱40.04

Benefit-Cost Ration (BCR)	1.09
Gross Profit Margin (GPM)	8.48%
Net Profit Margin (NPM)	8.48%

***Profitability Analysis of Fresh Tilapia Retailers***

Presented in table 35, the financial performance of fresh tilapia retailers in South Cotabato, characterized by a Benefit-Cost Ratio (BCR) of 1.08, validates the economic viability of a model where enterprise benefits consistently surpass total expenditures. This empirical evidence supports the theoretical frameworks of Magna et al. (2023) and Alam (2005), who identify a BCR exceeding unity as a fundamental indicator of sustainable poverty alleviation. By generating a net return of ₱1,220 per cycle, this node functions as a resilient and indispensable terminal link within the regional value chain.

The cost structure is heavily weighted toward variable inputs (₱13,220), which constitute 89% of aggregate spending primarily driven by procurement logistics. This concentration aligns with findings by Mutia et al. (2020), while the 11% allocation for fixed costs (₱1,560) reflects the low overhead requirements, such as market fees and refrigeration, noted by Nelligan (2022). Furthermore, retailers leverage form utility by offering processed or dried tilapia at an implied price of ₱200 per unit. Following the logic of Porter (1998) and Zaman et al. (2025), this strategic transformation enhances value and shelf life, enabling retailers in Region XII to achieve price premiums for branded products such as "Lake Sebu" or "SACI" tilapia.

With a net profit margin of 7.62%, the retail segment maintains a significantly more robust financial cushion than the wholesale node (2.93%). As observed by Ayubu (2017) and Nelligan (2022), while wholesalers operate as price takers with thin margins, retailers achieve stability by managing smaller volumes to mitigate losses from unsold stock or temperature abuse. In conclusion, within the context of the National Tilapia Industry Roadmap 2022–2025, these actors are essential to regional food security. Despite a gross margin of 17.38%, Amoah et al. (2021) posit that long-term sustainability remains dependent on the adoption of Good Manufacturing Practices (GMP) and the strengthening of producer-retailer linkages to buffer against seasonal supply volatility.

Table 35. *Profitability Analysis of Fresh Tilapia Retailers*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱14.78
Variable Cost	₱13.22
Fixed Cost	₱1.56
Production	
Volume of the Product Sold	0.08 kg
Total Product Sold	0.08 kg
Return	

Return from Dried Tilapia	₱16.00
Total Return (TR)/Gross Return (GR)	₱16.00
Gross Margin (GM)	₱2.78
Net Return (NR)	₱1.22
Benefit-Cost Ration (BCR)	1.08
Gross Profit Margin (GPM)	17.38%
Net Profit Margin (NPM)	7.62%

***Profitability Analysis of Dried Tilapia Retailers***

The financial performance of dried tilapia retailers in South Cotabato, evidenced by a Benefit-Cost Ratio (BCR) of 1.24, underscores a robust agribusiness model where every Php 1.00 invested generates a Php 1.24 return as shown in table 36. This viability aligns with Magna et al. (2023) and Alam (2005), who identify a BCR exceeding unity as a critical indicator for rural poverty alleviation. With a 19.05% net profit margin, this node is the most capital-efficient segment in the local tilapia value chain.

A salient feature is the 100% variable cost structure (₱1,360.00), which facilitates optimal operational flexibility. Consistent with Jamandre et al. (2011) and Nelligan (2022), the absence of fixed overhead characterizes micro-entrepreneurs using mobile or temporary infrastructures to mitigate capital risk. Through strategic inventory diversification into varying bundle sizes, these actors provide essential form and time utility. As supported by Jamer et al. (2025) and Zaman et al. (2025), such price-sensitive differentiation captures broader market segments, specifically low-income households needing accessible, shelf-stable protein.

Despite lower volumes, dried tilapia retailers maintain a superior financial cushion compared to the 2.93% margins of wholesalers. This advantage is attributed by Ayubu (2017) and Phiri et al. (2015) to direct consumer engagement and dynamic pricing strategies. From the perspective of Porter’s (1985) value chain framework, these retailers fulfill a primary marketing function central to the National Tilapia Industry Roadmap 2022–2025. Essentially, the robust BCR and margin profile validate this segment as a sustainable livelihood strategy that enhances regional food security and empowers marginalized stakeholders.

Table 36. *Profitability Analysis of Dried Tilapia Retailers*

Cost, Production, and Return	Quantification of Indicators (unit/activity cycle per year) (₱ '000)
Cost	
Total Cost	₱1.36
Variable Cost	₱1.36
Fixed Cost	0
Production	
Volume of the Product Sold (Small)	0.200 bundle

Volume of the Product Sold (Medium)	0.025 bundle
Volume of the Product Sold (Large)	0.025 bundle
Total Product Sold	0.075 bundle
Return	
Return from Dried Tilapia	₱1.68
Total Return (TR)/Gross Return (GR)	₱1.68
Gross Margin (GM)	₱0.32
Net Return (NR)	₱0.32
Benefit-Cost Ration (BCR)	1.24
Gross Profit Margin (GPM)	19.05%
Net Profit Margin (NPM)	19.05%

### Challenges and Opportunities

The table below identified challenges or constraints faced by the tilapia industry in different segments and suggests opportunities or solutions to address those challenges. The tilapia industry is hindered by high feed costs, limited access to credit, and poor infrastructure that leads to significant post-harvest losses. Environmental threats, such as rising water temperatures and devastating mass fish kills known as "kemohung," further reduce productivity and stock survival. However, the sector has strong growth potential through high-yielding Sex-Reversed Tilapia technology and the processing of value-added products like lamayo and chicharon. Strengthening farmer cooperatives and adopting locally sourced alternative feeds are key strategies for increasing profits and ensuring long-term industry sustainability.

Table 37. *Challenges and Opportunities in the Value Chain*

OPPORTUNITIES	CONSTRAINTS	PRIORITY AREA
<b>INPUT PROVISION</b>		
Availability of alternative ingredients for local feeds preparation	<ul style="list-style-type: none"> <li>- High cost of inputs (feeds and fertilizers)</li> <li>- Lack of awareness on the low-cost tilapia feed and alternative feed ingredients</li> </ul>	South Cotabato Province (All municipalities and city)
Availability of credit and financial support services from government and private institutions	<ul style="list-style-type: none"> <li>- Limited access to financial and credit linkages due to strict requirements and high interest rates of lending institutions</li> </ul>	
BFAR provides technical support in hatchery	<ul style="list-style-type: none"> <li>- Too many unregistered hatcheries resulted to</li> </ul>	

establishment and management  Presence of LGU-owned hatcheries for benchmarking	proliferation of poor-quality fingerlings - Insufficient supply of good quality broodstock - Lack of traceability schemes on the genetic characteristics of tilapia species	
Sex-Reversed Tilapia (SRT) has a higher productivity rate compared to ordinary fingerlings.	- Weak promotion and awareness activities on the Sex-Reversed Tilapia (SRT).	
Issuance of FOO 338 “Guidelines on the Dispersal/Distribution of Fish Fingerlings and Broodstock	- Non-uniformity in size of ordinary and SRT fingerlings in the market.	
<p>Tilapia farmers claim that the biggest slice in input and production cost is spent mostly on supplemental commercial feeds. This feeding strategy used for intensified tilapia production has resulted in the growers’ dependency to commercial feeds. The rising cost of commercial tilapia feed, however, is inducing some farmers to opt for alternative locally-produced feeds. With this situation at hand in the fishery sector in the region, the locale has strategized to adopt a feeding strategy backed by the experts in fishery production. The formulation of locally-produced farm-made tilapia feed pellets is one of the feeding techniques to reduce the input and operational costs while maintaining the quantity and quality production of tilapia, thereby increasing profit margin. Having a localized fish feeding approach will improve farm incomes to alleviate poverty and provide an entry for economic participation in the future. However, the financial capacity of growers to provide inputs is still a challenge as some of the tilapia growers belong to the marginalized sector.</p> <p>Additionally, the lack of registered tilapia hatcheries in the region resulted in proliferation of poor-quality fingerlings. This calls for BFAR’s extensive effort for regulation and monitoring in close coordination with the LGUs. Also, the office should strengthen their promotion and awareness activities related to Sex-Reversed Tilapia (SRT) for better productivity and increased income of growers.</p>		
<b>PRODUCTION</b>		
Availability of Good Aquaculture Practices  GAqP can help growers in reducing incidences of pest and diseases and in improving farm productivity	- Low uptake and adoption of good aquaculture practices (GAqP)	South Cotabato Province (All municipalities and city)
	- Lack of R&D for tilapia diseases	
Cash indemnification of DRRM to damage losses and fish kills	- Decreased productivity due to unfavorable	

Availability of climate and weather advisories	weather conditions and climate change	
Majority of grow-out farms are not registered.	- BFAR and other NGAs provide various technical and analytical services to registered grow-out farms	
Available technical personnel /farm experts from BFAR as resource persons for trainings and capacity building activities	- Lack of trainings on aquaculture technologies, entrepreneurship, and farm management	
	- Poor drainage system of some fishponds.	
DA/BFAR facilitates accreditation of organized groups	- Lack of organized/clustered groups/associations to meet the market demand	
	- Lack of proper recording/accounting of production expenses among growers.	
<p>Fish kill incidences particularly in Lake Sebu cages resulted in considerable economic and social losses. The losses in every incident of fish kill in the region are often blamed on mismanagement of fish feeding activities and extreme weather situations due to climate change. Natural causes may be infectious diseases, algal blooms, toxins from run-off water, or part of their natural life cycle.</p> <p>Productivity levels of the majority of the growers in the province of South Cotabato, both freshwater culture systems, reduced due to pest and disease infestations and poor aquaculture practices. Although BFAR and other relevant agencies are providing training on GAqP, acceptance and adoption is still a challenge as many growers need behavioral change from their traditional way of growing tilapia and adopt latest technologies introduced to them.</p> <p>Moreover, the effects of climate change in the grow-out farms have been manifested in various ways depending on the locations of the farms. Environmental management systems of tilapia farming need to be strengthened to lessen the impact of climate change and its effect on the productivity of the tilapia.</p> <p>Same with hatcheries, it is notable that the region is dominated with non-registered grow out farms. While BFAR has already exhausted their efforts in encouraging grow-out farmers to register in the Fishery Registration (FishR) system, the need for registration was not appreciated by the growers since they are not exporting their products to the international market.</p>		
<b>PROCESSING</b>		
Processed-tilapia by-products is an emerging business.	- Lack of post-harvest facilities (fish landing facilities for	South Cotabato Province (All municipalities and city)

<p>Opportunities in the use of tilapia in the pharmaceutical industry.</p> <p>Fast development of agro tourism in some provinces.</p>	<p>consolidation and processing facilities for tilapia processed products).</p> <ul style="list-style-type: none"> <li>- Poor transport facilities.</li> <li>- Poor road conditions leading to tilapia farms.</li> </ul>	
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In South Cotabato, processing of tilapia into various product forms is still an emerging business. Small-scale processors are very limited due to lack of processing facilities that are GMP and BFAD compliant. Processing tilapia is an opportunity for tilapia growers as they venture into value-adding activities. Post-harvest facilities and logistics support are also limited that need support from public-private partnership.

**TRADING**

<p>Availability of regulations and policies on the determination of prevailing prices and traceability on the commodity flow</p> <p>Marketing opportunities within and outside the region</p>	<ul style="list-style-type: none"> <li>- Limited market matching activities</li> <li>- Monopoly on the market price</li> </ul>	<p>South Cotabato Province (All municipalities and city)</p>
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One of the marketing mechanisms employed by the tilapia producers is through inclusion of the role of an intermediary in a distribution or transaction chain. This intermediary or so-called traders serve as a link between producers/farmers and consumers. Traders hold a vital role and specialize in strategic marketing activities. They do not produce anything but possess extensive knowledge of the market, thereby charging additional costs that could relatively affect the pricing of the commodity.

Moreover, tilapia producers and traders have encountered many limitations within tilapia production's logistical and aspects. Market access is restricted. Several farmers are situated in remote and elevated areas, specifically cultivating freshwater fishponds. There needs to be more access to farm-to-market roads. Tilapia growers need help accessing markets due to insufficient transportation infrastructure, substandard road conditions, or restricted entry to ports or distribution centers. Consequently, this might lead to delays and a subsequent rise in transportation expenses.

**MARKETING**

<p>Availability of regulations and policies on the determination of prevailing prices and traceability on the commodity flow</p> <p>Marketing opportunities within and outside the region</p>	<ul style="list-style-type: none"> <li>- Limited market matching activities</li> <li>- Monopoly on the market price</li> </ul>	<p>South Cotabato Province (All municipalities and city)</p>
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In order to fully understand the existing tilapia industry scenario, there is a need to review existing government policies which may have influenced current tilapia industry status. Moreover, this policy environment is known to have resulted in continuous increase in retail prices of tilapia, yet declining share of fishermen's income to prices paid for by fish consumers and that also subjected fisherfolks under

the influence of market power. The price of tilapia is increasing while the share of fishermen to prices paid for by consumers is decreasing. There is strong evidence of market power imposed upon fish producers/fishermen by the retailers.

In addition, one of the gaps in this segment is the need for more production capabilities, but possess considerable market expertise resulting to more market opportunities.

**ENABLING ENVIRONMENT**

	- Weak governing regulations on tracing the commodity outflow	South Cotabato Province (All municipalities and city)
	- Lack of profiling of tilapia producers, processors and traders/retailers	South Cotabato Province (All municipalities and city)

In order to maintain a sustainable tilapia industry in the province, it is necessary to have a better knowledge and understanding of the different players involved in the tilapia value chain. Its relationship and function that might have an impact on the industry must be given attention. However, the region lacks the appropriate database and profiling of the key players in the tilapia value chain. Also, updating of the governing regulations and policies on the tracing the commodity flow is deemed necessary to maintain the competitiveness advantage of South Cotabato tilapia in the market.

*Source: KII, Stakeholders Consultation*

**Government and Institutional Support Services**

Supporting actors are those who provide supportive services for tilapia producers in the study area including supplying tilapia seeds/fingerlings and other inputs, training and extension, different information, financial and credit services and legality concern services. According to Martin et al. (2007), access to information or knowledge, technology and finance determines the state of success of value chain actors. Department of Agriculture (DA), Bureau of Fisheries and Aquatic Resources (BFAR), Local Government Units (LGUs), and rural micro finances are the main supporting actors who play a central role in the provision services in tilapia value chain of this study area. Different NGO’s who are performing their work on natural resource conservation henceforth for the sustainability of the area provides economic support to fisherfolk.

**Financial Services**

Small-scale operators usually rely on their limited household savings to finance tilapia operations. However, the long growing period before harvest and sales can strain household finance. Access to financial capital is generally a major constraint. Farmers usually avoid formal credit from commercial banks and private lending institutions because of high interest rates, paper work, and requirements for collateral. In addition, the risks of tilapia farming have often deterred small-scale farmers from attempting to obtain formal credit, fearing loss of property or collateral in the event of harvest failure. Many farmers resort to informal credit, which incurs high interest but is usually collateral free, readily available, and has flexible repayment terms. Informal loans may carry interest rates of 2.5 – 20.0% per month.

The dominance of informal credit over formal credit in tilapia farming is further emphasized by the emergence of informal credit schemes and other financial arrangements to overcome financial barriers facing tilapia production. For instance, the financier-caretaker arrangements, trader-operator agreements (usually forward sales), contract farming, and various suppliers' credit schemes. The nonbank financial arrangements have benefited and enabled small-scale farmers to take advantage of the economic opportunities of tilapia farming.

For credit support, agencies involved including Landbank of the Philippines, Agricultural Credit Policy Council (ACPC), LGUs, rural banks and fisheries cooperatives. They will work on the specific guidelines to make credit accessible and available to all. The Philippine Crop Insurance Corporation (PCIC) on the other hand shall handle the insurance program. The following are some of the financial services programs available for fisheries and aquaculture farming:

**1. Agricultural Credit Policy Council's Programs: Production Loan Easy Access (PLEA)** – aims to provide easy and convenient credit access, low interest rate, expanded credit delivery channels, instills credit discipline and is focused on the marginal farmers/fisher folks.

The Eligible Borrowers for this program are the Marginal/Small Farmer/Fisher folk, registered with the Registry System for Basic Sectors in Agriculture (RSBSA), (Enrolled in the Juan Magsasaka't Mangingisda National Database System (Intervention Cards), must be of good character/Member of Cooperative (if new, must pass the CI/BI of the conduit or if existing borrower, must have good credit standing), and only one member of the household can avail of a loan at a time.

*Agricultural Credit Support Project* - Contributing to the National Government's goal of poverty reduction, the Agricultural Credit Support Project (ACPC) offers loan funds toward increasing investments, creating new job opportunities, and improving agricultural productivity in the rural areas. The ACSP provides credit support to agriculture and agri-related projects within a value chain.

**2. Land Bank of the Philippines Credit Programs:** Agricultural Competitiveness Enhancement Fund- Lending Program which aims to increase productivity of farmers and fisherfolk by providing the necessary credit to farmers and fisherfolk and their cooperatives and associations, and micro and small-scale enterprises, for the acquisition and establishment of production, postharvest, and processing machineries, equipment and facilities, farm inputs and improvement. A maximum of Php 5.0 Million can be availed by farmer and fisherfolk cooperatives, associations, and Micro and Small Enterprises (MSEs) and Php 1.0 Million by individual farmers/fishers.

Target Borrowers

1. Individual farmer and fisherfolk
2. Farmers' and Fisherfolk Cooperatives and Associations
3. Registered Micro and Small Enterprises (MSEs)

**3. PenBank** – An affiliate of the RD Corporation. The bank partner in growing rice, corn, sugarcane, and other crops, including growing fruits such as papaya, pineapple, bananas, and so on. We are also active in financing animal husbandry such as goats, chickens, cattle and others, as well as in the cultivation of fisheries such as tilapia, bangus, and other types of marine resources. Loan Amount - It depends on the funds the farm needs starting

**4. DBP Sustainable Agribusiness Financing Program** – provides credit for agribusiness projects engaged in the production, harvest, processing, and marketing of crops, poultry, livestock and fishery.

**5. Philippine Crop Insurance Coop.** – *Fisheries Insurance Program* - The Philippine Crop Insurance Corporation (PCIC) provides insurance protection to fish farmers/fisherfolk/ growers against losses in unharvested crops or stock in fisheries farms due to natural calamities and fortuitous events.

**Object of Insurance** - Unharvested crop/ stock in fisheries farms specified in the application for fisheries insurance on the farmland specified on the insurance application

**Area Coverage** - Nationwide

**Amount of Cover** - Cost of production inputs, the value of the fish farmer/ fisherfolk/grower's own labor and those of the members of his own household, including the value of labor of hired workers per Fisheries Farm Plan and Budget.

**Premium rate %** - Shall be determined by PCIC, Subject to the established provisions. This ranges from 2% to 12% depending on the result of the pre-coverage evaluation of the risk proposed, and other factors such as agro-climatic conditions and terrain, project management factors and production and loss records.

**Covered risks** - Limited Cover of crop/stock due to natural disasters Extended Cover against loss of crop/ stock and other eligible properties due to fortuitous events and force majeure.

### ***Non-Financial Services***

Substantial and continuous programs of freshwater aquaculture research and extension have been undertaken in the Philippines since 1972. Tilapia farming in fishponds and small-scale reservoirs developed mainly on irrigated and rainfed rice lands. Cage farming has been practiced since the 1970s in large and small lakes. Other fishponds (mostly for tilapia) have long been part of small-scale, mixed enterprise farms in the uplands and other remote areas. However, most freshwater aquaculture in the Philippines has developed as a specialized enterprise: with fish as a cash crop and not as a component of the kinds of integrated agriculture-aquaculture farming systems that have typified its history in much of Asia. Similarly, rice-fish integrated farming has not prospered in the Philippines and its future prospects seem limited. Tilapia farming in the Philippines has been and remains a specialized enterprise, regardless of scale, while it retains an artisanal character. Advisory services are critical to the success of tilapia operations, particularly for small-scale tilapia farmers who lack the necessary training and education.

There is also the need to stimulate the acquisition and use of non-financial service delivery models to address issues on accessibility and weak demand. Business development and logistic services in tilapia value chain is provided in the following ways:

#### **1. Informal**

Technologies, knowledge, skills on good farming practices and as well as in marketing of tilapia are available to farmers and other VCA players through informal gatherings and of industry players. This information includes sharing of best practices and technologies, buying prices, cost of inputs and available markets. Other successful growers, who at the same time are contractors, are doing research through the internet regarding technologies and good agricultural practices.

#### **2. Embedded**

Entrenched services for the industry included support services provided by processors and input providers to producers on good agricultural practices and recent technologies, new pest and diseases including anti-pest remedies.

#### **3. Fee-based services**

There are specific services available for a designated charge, including the acquisition of Bureau of Fisheries and Aquatic Resources (BFAR) Local Transport Permit (LTP) for the transportation of fingerlings. This service is provided to farmers who wish to purchase fingerlings from the BFAR-Technology Outreach Station (BFAR-TOS).

#### **4. Stand-alone free services**

The BFAR Regional Offices, HEIs offering fisheries courses, TESDA, ATI, DOLE, CDA and LGUs can be tapped for training programs.

The Philippine Fisheries Development Authority (PFDA) and Philippine Center for Postharvest Development and Mechanization (PHilMech) in coordination with BFAR shall handle all government infrastructure programs such as the construction/improvement of processing plants. PHilMech will specifically work on all post-harvest equipment such as cold storage, reefer vans, among others. The private sector on their part can invest in post-harvest facilities to support tilapia export. Moreover, the National Irrigation Administration (NIA) will be tapped for the irrigation needs of tilapia farmers. Existing Irrigators' Association shall also be included in the structure.

These services include trainings, technology transfer and other extension services provided by national government agencies and LGUs such as the following:

**Department of Social Welfare and Development (DSWD) Livelihood Assistance Grants (LAG)** - an effort to ease the socio-economic effects, the Department of Social Welfare and Development (DSWD)

continues to strengthen its initiatives to support the most vulnerable and the marginalized, including fisherfolk and farmers.

**Department of Agriculture-BAR Research Policy and Advocacy Program** - monitors and evaluates the latest trends and events in relation to agriculture and fisheries research and development. From the latest and relevant empirical data and statistics from the sector, BAR provides inputs and policy recommendations and pertinent documents that address emerging issues and concerns in agriculture and fisheries R&D.

#### **Department of Trade and Industry**

**The Fish Right Program** - it is in collaboration with the United States Agency for International Development (USAID). The program aims to link organized fishers' groups and incentivize the adoption of responsible fishing practices in coastal communities. It involves Mapping Partnership Opportunities and Seafood Value Chains, Developing Partnerships that Support Fisheries Management Measures, Collaboration Across the fisheries supply chain, Harnessing Technology for Enforcement and Management, Deploying Innovative Financing and Business Models, and Strategy Development.

Furthermore, the Department of Trade and Industry (DTI) in South Cotabato collaborates with the Bureau of Fisheries and Aquatic Resources (BFAR) to jointly enhance the fishing sector in the province. Furthermore, the Trade Department is actively promoting its food development program and implementing investment promotion and marketing strategies. These efforts include organizing regional trade fairs and providing export-related assistance. Additionally, the department conducts various training and offers technical assistance, specifically focusing on enhancing skills in processing and value-adding fresh tilapia. These initiatives aim to contribute to the growth and development of the fishery industry sector in the region.

#### **Kadiwa ni Ani at Kita - Department of Agriculture (DA)**

The "Kadiwa ni Ani at Kita" initiative is a joint endeavor by the Department of Agriculture, Bureau of Fisheries and Aquatic Resources (BFAR), Department of Interior and Local Government, and Food Terminal Inc. (FTI), a Government-Owned and Controlled Corporation (GOCC). The Kadiwa market system aims to provide affordable access to essential agricultural commodities for economically disadvantaged households in the Philippines. The term "Kadiwa" can be interpreted as "one idea, one thought," aligning with the Secretary's paradigm of "New Thinking" for Agriculture. This project aims to develop a direct connection between farmers/fisherfolk and the consuming population. The Kadiwa program, currently known as 'Ani at Kita,' seeks to ensure farmers receive fair prices for their produce while offering customers inexpensive, safe, and healthy food options.

#### **Department of Science and Technology- SET-UP Program**

The Small Enterprise Technology Upgrading Program (SETUP) is being implemented by the Department of Science and Technology (DOST) as a critical initiative to engage with entrepreneurs in the Philippines. The acronym SETUP represents the Small Enterprise Technology Upgrading Program. This program is designed to be implemented across the entire nation. It aims to promote and support small and medium-sized enterprises (SMEs) in adopting technological advancements. The ultimate goal of this program is to enhance the efficiency and effectiveness of SMEs' operations, increasing their productivity and competitiveness in the market. The Department's primary objective is to support Micro, Small, and Medium Enterprises (MSMEs) through offering technological assistance. These are as follows:

- (a) Provision of technology;
- (b) Testing of products for compliance to international standards;
- (c) Assistance in packaging and labeling of products;
- (d) Creation and management of databases and information systems; and
- (e) Links with national and international organizations to provide raw material source, market, training, financing, and equipment design and fabrication.

**Department of Environment and Natural Resources - Environmental Management Bureau**

The Department of Environment and Natural Resources (DENR) plays a crucial role in the formulation and implementation of environmental management policies, guidelines, and regulations, as well as the conservation and safeguarding of natural resources in the Philippines. The acquisition of the Department of Environment and Natural Resources' Environmental Compliance Certificate (ECC) is a requirement for any planned projects that are classified as Environmentally Critical Projects (ECPs) or are located in Environmentally Critical Areas (ECAs) and are believed to have significant environmental impacts.

The issuance of the Environmental Compliance Certificate (ECC) was established through Administrative Order #42. This order stipulates that the Environmental Management Bureau (EMB), operating under the jurisdiction of the Department of the Environment and Natural Resources (DENR), is responsible for receiving, evaluating, and granting ECC applications that meet the necessary criteria. In the Philippines, any project that has the potential to impact the environment is required to obtain an Environmental Compliance Certificate (ECC) from the Department of the Environment and Natural Resources (DENR). In an alternative scenario, the project has the potential to receive a Certificate of Non-Coverage (CNC) if the team from the Department of Environment and Natural Resources - Environmental Management Bureau (DENR-EMB) determines that the project does not fall under the purview of the Environmental Impact Statement (EIS).

**Bureau of Fisheries and Aquatic Resources (BFAR)**

The Bureau of Fisheries and Aquatic Resources (BFAR), operating under the jurisdiction of the Department of Agriculture, assumes the governmental role of overseeing the advancement, enhancement, administration, and preservation of the Philippines' fisheries and aquatic resources. The Expanded SUREAid and Recovery Project, administered by the Department of Agriculture-Agricultural Credit Policy Council (DAACPC) in collaboration with BFAR-12, disbursed a sum of 3.730 Million Pesos in loans. In addition to providing financial services, the Bureau of Fisheries and Aquatic Resources (BFAR) also offers non-financial services to fisherfolk within the region. The services provided encompass several aspects such as extension, support, education and training, dispersal and distribution of fingerlings and broodstock, technical assistance, techno demonstration to livelihood, regional fisheries laboratory services, market development services, legal advisory services, and registration. The subsequent figures represent the non-financial services provided by the Bureau of Fisheries and Aquatic Resources (BFAR).

**(1) Balik Sigla sa Ilog at Lawa (BASIL)**

The BFAR- National Inland Fisheries Technology Centre is responsible for implementing a national program called "Balik Sigla sa Ilog at Lawa" (BASIL) that focuses on enhancing the fisheries in inland waters. Through the use of appropriate interventions and the application of a scientific approach to fish stocking, specifically utilizing the vacant niche or food-based approach, the program aims to optimize the production of these resources. The ultimate goal is to achieve increased production for the benefit of the rural population.

**(2) Broodstock and Fingerlings Distribution**

The distribution of broodstock and fingerlings in the SOCCSKSARGEN Region is a strategic institutional intervention coordinated through the BFAR-MFFTC in Kabacan and the Central Hatchery in Koronadal City to ensure a continuous and reliable regional production chain. This program primarily serves as a tool for poverty alleviation, enabling resource-poor households to establish small-scale tilapia farms for sustainable income and food security. Central to these efforts is genetic improvement, achieved by disseminating high-quality strains like GET-EXCEL, GIFT, and GST to replace less productive breeds and maintain growth vigor.

Beyond farm productivity, the initiative supports environmental restoration through the BASIL program, which regularly stocks fingerlings in inland waterways like South Cotabato that are dependent on rivers and small water impoundment projects (SWIP) for fish supply. The program also actively promotes

Sex-Reversed Tilapia (SRT) technology, which allows farmers to achieve faster growth cycles and a significantly higher Return on Investment (253%) compared to ordinary tilapia. Finally, these dispersal activities are integrated with technical support and laboratory services, providing essential training, water quality analysis, and rigorous monitoring for pathogens like the Tilapia Lake Virus (TiLV) to safeguard farmer investments.

The Bureau of Fisheries and Aquatic Resources in Region XII has assured that the public hatchery will persist in its provision of high-quality broodstock and fingerlings to fish farmers.

### **(3) Techno Demo Farm Projects**

Fish farmers in South Cotabato have been provided with techno-demo projects by the Bureau of Fisheries and Aquatic Resources (BFAR-12). The entity is responsible the implementation of the techno-demo projects in the province of South Cotabato. A total of thousands of tilapia fingerlings was sent to each recipient by their respective geographical requirements. The tilapia farmers were provided with enough feed to sustain the entire duration of the culture period. The Techno-demo programs implemented by the Bureau of Fisheries and Aquatic Resources (BFAR) aim to introduce recently developed technologies to fish farmers, to facilitate their implementation within their fish farms. This initiative aims to enhance the productivity of fish farmers, facilitate the growth of fishery production, and create opportunities for increased revenue among fish farmers, as envisioned by the Bureau.

### **(4) Trainings/Seminars**

The bureau took part in conducting trainings/seminars focused on aquaculture technology for the cultivation of hito and tilapia species which was participated by consisting of farm operators and municipal aquaculture technicians in the province.

The objective of the training program was to enhance the knowledge and skills of farm operators and technicians in the cultivation of tilapia and hito. The participants who undergo training will eventually establish partnerships with BFAR to enhance aquaculture productivity within the region.

The abovementioned non-financial services such as training and extension services are usually proposal based. Value chain players shall provide project/activity/training proposals on the intervention they need to the government agency provider. There are also instances that the government agencies/private sector ask the Provincial Local Government Units (PLGUs) on the list of possible beneficiaries of the intervention that they can provide.

### **(5) Laboratory Services**

A comprehensive set of examinations were conducted every month to assess the prevalence and impact of the Tilapia Lake Virus. The virus in question is a rapidly spreading pathogen that has been identified as the cause of widespread mortality events in both farmed and wild populations of tilapia. The Laboratory Services are provided at no cost to the Local Government Unit (LGU) run Hatcheries, registered hatcheries, and individuals who are enrolled in the Fisherfolk Registration System (FishR). Nonetheless, unregistered Hatcheries farms are subject to fines amounting to approximately Php 600.00 for each TiLV test sample and Php 100.00 for each water analysis sample

### **(6) BFAR- SAAD**

The primary objective of Phase 2 of the Department of Agriculture - Bureau of Fisheries and Aquatic Resources-Special Area for Agricultural Development (DA-BFAR SAAD) Programme is to make a meaningful contribution towards poverty alleviation and enhance the quality of life for marginalized fisherfolk and their communities. This will be achieved through the provision of sustainable livelihood opportunities and comprehensive assistance to economically disadvantaged fishing sectors. The successful implementation of a complete program under the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) XII Special Area for Agricultural Development (SAAD) Programme Phase II took place on August 22, 2023, in South Cotabato. The program's scope encompassed the communities of Tampakan, T'boli, and Lake Sebu. The comprehensive program consisted of several components, namely social readiness, the allocation of tilapia fingerlings, and the dispersal of supplemental feeds for the

T'boli community, supplementary feeds for Lake Sebu, and supplementary feeds for Tampakan. Farmers in South Cotabato predominantly utilized non-financial services offered by various government organisations, as opposed to financial services. The policy lacked stringency and did not enforce interest rates. The government in South Cotabato provided fisherfolks with training, capability development training and seminars, as well as interventions related to fingerlings and feeds. Nevertheless, priority is given to farmers and hatcheries that have completed the registration process. Non-registered farmers face limited opportunities.

In order to enhance productivity and attain regional and national objectives, it is imperative for the government to bolster capacity building programmes, incentivize farmers to engage in registration processes, reinforce the establishment of techno demo farms, and facilitate market connectivity and the establishment of market linkages for farmers.

### **External Factors Affecting the Value Chain**

The tilapia industry in South Cotabato is currently hindered by several environmental, economic, and logistical challenges:

- (1) ***Climate Change and Environmental Hazards.*** The province faces increased temperatures, erratic precipitation, droughts, and floods. These factors lead to decreased productivity and physical damage; for instance, in Lake Sebu, farmers have experienced production losses of up to 60% and significant revenue declines due to climate impacts.
- (2) ***Biological Threats.*** Mass fish kills, known locally as 'kamahong', are a recurring issue in Lake Sebu. Furthermore, the Tilapia Lake Virus (TiLV) poses a severe threat to both farmed and wild populations.
- (3) ***Economic Pressures.*** High costs for commercial feeds, which account for 60% to 80% of total production expenses, are a major barrier for growers. This has led to a dependency on commercial products, though some farmers are now exploring alternative, locally produced feed pellets.
- (4) ***Logistical and Structural Constraints.*** Many farms are located in remote areas with poor road conditions and limited access to farm-to-market roads, resulting in increased transportation costs and product spoilage. Additionally, the region suffers from a lack of post-harvest facilities, including fish landing centers and GMP-compliant processing plants.
- (5) ***Regulatory Issues.*** A significant challenge is the proliferation of unregistered hatcheries (approximately 95.44% of private hatcheries in the province are unregistered), which leads to the distribution of poor-quality fingerlings. Strict criteria and high interest rates from private lending institutions also limit growers' access to necessary credit.
- (6) ***Market Dynamics.*** Producers in Lake Sebu face stiff competition from unfed, low-cost tilapia supplied from other province for instance the Lake Buluan. Furthermore, there is evidence of market power dominance by retailers, which can lead to a declining share of income for the actual fish.

### **Policy Environment of the Tilapia Industry**

To enhance the efficiency of the value chain, the government has implemented various rules, regulations, laws, and policies to safeguard and manage the tuna industry at both regional and national levels. These formal regulations encompass essential legislations and fishery administrative orders specifically issued by the Department of Agriculture - Bureau of Fisheries and Aquatic Resources (DA-BFAR) for tilapia. In the decentralized system of government, the responsibility for regulatory management in the fisheries sector is shared between the national and local governments. The Fisheries Code of 1998 and the Local Government Code of 1991 serve as the guiding frameworks through which these regulatory powers are divided between the two levels of government. Consequently, local governments also play a role by enacting relevant city or municipal ordinances to support the tuna industry. The implementation of

domestic laws, policies, and regulations encompasses a broad range of management measures aimed at governing the tuna industry.

As a national agency, the DA-BFAR assumes the responsibility for fulfilling the Philippines' obligations and commitments under international and regional fisheries agreements in which the country is a participant. Therefore, the provisions and management measures outlined in these laws, policies, and regulations primarily aim to conserve tuna resources and foster sustainable development within the Philippine tuna industry. Table 53 exhibits a list of domestic laws, policies, and regulations that govern the tilapia industry in both the country and the region.

Table 38. *Key Legislations governing the Philippine Tilapia Industry*

<b>Republic Act No.</b>	<b>Title</b>	<b>General Description</b>
RA No. 10654	An Act to Prevent, Deter, Eliminate Illegal, Unreported and Unregulated Fishing, Amending Republic Act No. 8550, otherwise known as “The Philippines Fisheries Code of 1998”.	An act providing for the development, management and conservation of the fisheries and aquatic resources, integrating all laws pertinent thereto, and for other purposes
RA No. 7160	The Local Government Code of 1991	It represents the mode of implementation of the constitutional-enshrined principles of government decentralization and democratization and creates a system of governance far more complex but much more decentralized than any other prior system used in the Philippines (PCMGS: 2, 2001).
RA No. 7586	National Integrated Protected Areas System (NIPAS) Act of 1992	An act providing for the establishment and management of national integrated protected areas system, define its scope and coverage, and for other purposes
RA No. 8435	The Agriculture and Fisheries Modernization Act of 1997	An act prescribing urgent related measures to modernize the agriculture and fisheries sectors of the country in order to enhance their profitability, and prepare said sectors for the challenges of globalization through an adequate, focused and rational delivery of necessary support services, appropriating funds therefor and for other purposes
RA No. 10611	The Food Safety Law	An act strengthening the food safety regulatory system in the country to protect consumer health and facilitate market access of local foods and food products, and for other purposes
PNS/BAFS 135:2014	Philippine Standard Code of Good Aquaculture Practices (GAqP)	The Code of Good Aquaculture Practice (GAqP) is designed to prevent

		or minimize the risk associated with aquaculture production (mariculture, coastal aquaculture/brackish water culture, and freshwater culture). It applies to aquaculture farms/projects, such as, but not limited to, hatcheries, nurseries, fish cages, fish pens, fishponds, seaweed, and mollusks farm which may be owned by individuals, corporations, and/or producer associations
PNS/BAFS 196:2017	Good Aquaculture Practices for Milkfish and Tilapia	This Code aims to prevent or minimize the risk associated with aquaculture production specifically applicable to aquaculture farms or projects, such as, but not limited to hatcheries, nurseries and grow-out intended for tilapia and milkfish culture

The primary national policy that oversees the tilapia industry in the country is the Comprehensive National Fisheries Industry Development Plan (CNFIDP). This plan provides a comprehensive framework for promoting the optimal development and long-term sustainability of benefits derived by the nations from its fisheries. It aimed to provide strategic directions for the Philippine fisheries over the said years, as well as, identify priority projects for implementation over the first medium-term period. The Department of Agriculture - Bureau of Fisheries and Aquatic Resources (DA-BFAR) is the lead agency responsible for implementing this policy, which was initially developed for the years 2006 to 2025.

Since then, the CNFIDP has undergone various revisions in response to changes in the industry as well as in the policy environment, the Comprehensive National Fisheries Post-Harvest, Marketing and Ancillary Industries Plan (CPHMIAP) was crafted in 2018. The said CPHMAIP is intended to reduce fisheries post-harvest losses and increase the competitiveness of Philippine fish and fishery products in terms of domestic and foreign trade and marketing. These policies contribute to the overall governance and planning of the tilapia industry in the country.

Furthermore, there are relevant fisheries administrative orders that serve as regulatory measures for the tilapia industry in the Philippines. These administrative orders are designed to ensure compliance and address specific aspects of tilapia resource management.

Table 39. *List of Relevant Fisheries Administrative Orders for Tilapia and its Products*

<b>Fisheries Administrative Order (FAO)/Circular/Office Order Numbers</b>	<b>Title</b>	<b>Impact on Tilapia Industry</b>
FAO 117, Series of 1975	Rules And Regulations Governing the Operation of Processing Plants for Fish and Fishery/	Pursuant to the provisions of section 7, 16, and 18 of Presidential Decree No. 704, otherwise known as

	Aquatic Products, and Prescribing/Requiring Standards, Quality Control and Inspection of Processed Fish and Fishery/Aquatic	the "Fisheries Decree of 1975", the following rules and regulations governing the operation of processing plants for fish and fishery/aquatic products and prescribing/requiring standards, quality control and inspection of fish and fishery/aquatic products
FAO 135, Series of 1981	Rules and Regulations Governing Importation of Fish and Fishery/ Aquatic Products	Pursuant to the provisions of Sections 4 and 7 of Presidential Decree No. 704, as amended, otherwise known as 'The Fisheries Decree of 1975,' in the implementation of Section 18. If upon inspection the fish or fishery/aquatic product imported does not meet the quality requirements prescribed by the Bureau or prohibited fish are included in the importation, the same shall be removed immediately and in case of the latter, confiscated, and the importer shall, in addition, be penalized in accordance with the provisions of applicable laws, rules and regulations
FAO 195, Series of 1999	Rules and Regulations Governing Importation of Fresh/Chilled/Frozen and Fishery Aquatic Products	The order emphasizes the issuance of international health certificate on the imported fresh, chilled, frozen and fishery aquatic products supported by microbiological and chemical lab results, storage requirements and visual inspections
FAO 196, Series of 2000	Guidelines on the Creation and Implementation of Fisheries and Aquatic Resources Management Councils (FARMCs)	Through this provision will facilitate the creation of FARMC that will formulate relevant ordinances and regulations governing tilapia resources
FAO 205, Series of 2000	Price List of Tilapia Fingerlings and Breeders and Carp Fingerlings for Sale by the Bureau of Fisheries and Aquatic Resources	Accordance with Memorandum Circular No. 121 of the Office of the President entitled "Directing All Departments, Bureaus, National Government Including Government-Owned or Controlled Corporations to Revise Their Fees and Charges at Just and Reasonable Rates Sufficient to Cover Administrative Costs", and Department Order No. 66-90 of the Department of Finance dated 29 November 1990, the price of tilapia

		fingerlings, tilapia breeders and carp fingerlings are hereby revised pursuant to Section 65 (s) of RA 8550
FAO 210, Series of 2001	Rules and Regulation on the Exportation of Fresh, Chilled, and Frozen Fish and Fishery/Aquatic Products	Only fish products which have been processed in fish processing establishments certified by BFAR that are compliant with SSOP and HACCP system shall be allowed to be exported, provided that biological, microbiological and chemical characteristics are met
FAO 2012, Series of 2001	Guidelines on the Implementation of HACCP System	Implements HACCP system with appropriate guidelines to address food safety concerns and quality management for fish and fishery products
FAO 213, Series of 2001	Establishment and Maintenance of BFAR's Quality Control Laboratories and Collection of Fees and Charges for Examination Services	The order provides quality control laboratories that will serve as support services for the industry as part of their quality management
FAO 214, Series of 2001	Code of Practice for Aquaculture	Pursuant to Section 47 of R. A. No. 8550, this code of practice for aquaculture outlining the general principles and guidelines for environmentally-sound design and operation for the sustainable development of the industry is hereby promulgated for the information and guidance of all concerned.
BFAR Administrative Circular No. 251, Series of 2014	Traceability System for Fish and Fishery Products	Traceability is recognized internationally as an essential risk management tool enabling individual members of the supply chain to quickly identify problems and to promptly disseminate this information to affected parties. This circular aims to establish a traceability system for fish and fishery products for information, guidance and compliance of all fishy and aquatic business operators (FABO).
FAO 215, Series of 2001	Insurance for Aquaculture Crops/Stocks	Pursuant to Section 54 of R.A. No. 8550, and Rules 54.1 and 54.2 of the Department of Agriculture (DA) Administrative Order No. 3, Series of 1998, the following guideline on the insurance of crops/stocks in fishponds,

		fish cages, fish pens and other aquaculture projects is hereby promulgated for the information and guidance of all concerned.
FAO 220, Series of 2001	Operation of the Fish Health Laboratories and Collection of Fees and Charges Therefor	Pursuant to Section 67 of R.A. No. 8550, this guideline on the operation of fish health laboratories and collection of fees and charges for their administrative services is hereby promulgated for guidance of all concerned
FAO 223, Series of 2003	Further regulating the importation of live fish and fishery/aquatic products under FAO No. 135 s. 1981 to include microorganisms and biomolecules	Pursuant to Sections 10, 61(d), 65, 67, 100 and 107 of Republic Act No. 8550 and Section 7 of Presidential Decree No. 704 and further regulating the importation of live fish and fishery/aquatic products to include aquatic microorganisms under FAO No. 135 s. 1981, this order regulating the importation of live fish and fishery products, aquatic microorganisms and biomolecules conformably with the international agreements for aquatic environmental protection
FAO 227, Series of 2008	Rules and Regulations Governing the Export of Fish and Aquatic Products to European Union Member Countries	The World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary (SPS) Measures requires members to base their national SPS measures on international standards, guidelines and other recommendations adopted by the Codex Alimentarius Commission where these exist
FAO 228, Series of 2008	Rules Governing the Organization and Implementation of Official Controls on Fishery and Aquatic Products Intended for Export to the EU Market for Human Consumption	The WTO SPS Agreement recognizes the right of member countries to implement SPS measures necessary to protect human, animal or plant life or health having general hygiene rules are appropriate for business operators producing and handling all foods
FAO 233, Series of 2010	Aquatic Wildlife Conservation	Conserve wildlife species and its habitat, collection and wildlife trade regulation, promote the international conventions, initiate and support scientific studies for the conservation of biodiversity

Fisheries Office Order 241, Series of 2017	Mandatory screening for TiLV and Issuance of Health Certificate for Transboundary Movement of Tilapia for Aquaculture Purposes	In order to control and prevent the spread of TiLV, tilapia (egg, fry, fingerling, juvenile, and breeder) for transboundary movement intended for aquaculture purposes shall be screened and negative for TiLV by BFAR Fish Health laboratory and other BFAR recognized laboratory. It is noteworthy to highlight that as of the moment, there is no occurrence of Tilapia Lake Virus detected in Region 12.
Fisheries Office Order 338, Series of 2019	Guidelines on the Dispersal/Distribution of Fish Fingerlings and Broodstock	An order providing guidance on the establishment of government standard and low-price quality tilapia fingerlings and broodstock.
FAO 197-2, Series of 2024	Amended Rules and Regulations Governing the Lease of Public Lands for Fishpond and Mangrove-Friendly Aquaculture	Promote sustainable aquaculture practices, enhance ecological protection, and regulate the use of public lands for fish production, including the management of abandoned or underutilized areas
FAO 273, Series of 2025	Rules and Regulations Governing the Exportation of Fish and Fishery/Aquatic (FFA) Products Intended for Human Consumption	It mandates strict hygiene rules for primary and post-harvest stages, applying to all fishery and aquaculture business operators (FABO) to ensure compliance with national and international food safety standards.
FAO 275, Series of 2025	Rules and Regulations Governing Food Safety and Traceability on Importation of Fish and Fishery/Aquatic (FFA) Products Intended for Human Consumption	It provides that fishery products may imported only when the importation has been certified as necessary by the Department, in consultation with the NFARMC, and all the requirements of the Fisheries Code, as amended, as well as all existing rules and regulations have been complied with: provided, that fish imports for canning/processing purposes only may be allowed without the necessary certification

## SUMMARY

The following are the summary of findings of the study.

### 1. Key Players and their roles and contributions

The tilapia value chain in South Cotabato involves direct actors and indirect actors or enablers. Direct actors include input suppliers (hatcheries and nurseries providing fingerlings and feeds), producers/growers (managing freshwater ponds and cages), processors (transforming raw fish into value-added products like lamayo, chicharon, and dried tilapia), traders (wholesalers and

retailers managing logistics), and consumers. Supporting these are enablers such as the Bureau of Fisheries and Aquatic Resources (BFAR), local government units (LGUs), and financial institutions that provide technical guidance, regulatory frameworks, and credit services.

## 2. Demographic profile of the key players

The industry is dominated by a veteran workforce, with 59% of key players having over 10 years of experience. The demographic profile reveals that 55% are male and 55% are aged 50 and above, suggesting a reliance on older generations. Educational attainment is high, with 71% having completed college education. In terms of affiliation, 47% operate as independent non-members, while 32% belong to associations or cooperatives, primarily on the production side

## 3. Map of the Value Chain

The value chain map delineates six major functional areas: input provision, primary production, processing, wholesaling, retailing, and final sale. The study identified seven distinct marketing channels, ranging from direct farm-gate sales to complex multi-tiered networks involving wholesalers and processors. Payment flows generally move from consumers back to suppliers, characterized by spot cash transactions at the retail level and "feed loans" or cash payments between wholesalers and growers. Value addition occurs progressively at each node, with the highest value added at the primary production stage, where pond growers transform fingerlings into marketable harvests.

## 4. Cost-structure and profitability

The cost structure is heavily dominated by commercial feeds, which account for 60% to 80% of total production expenses in intensive cultivation. Fixed costs include specialized netting for growers and digital weighing scales for traders and processors. Despite high input costs, all segments of the chain remain profitable. Notably, Sex-Reversed Tilapia (SRT) fingerling production yields an exceptional Return on Investment (ROI) of 328%, while pond growers using semi-intensive systems report higher net incomes compared to cage growers.

## 5. Current Challenges and Opportunities

The industry faces critical challenges, including exorbitant feed prices, a proliferation of unregistered hatcheries leading to poor-quality seeds, and inadequate cold storage infrastructure. Environmental threats include climate change and rising water temperatures, which trigger mass fish kills known as *kamahong*, particularly in Lake Sebu. Conversely, significant opportunities exist in the adoption of SRT technology for higher productivity, the development of "climate-smart" aquaculture, and the expansion of value-added processing to improve market margins and consumer perception.

## 6. Government or institutional interventions and external factors

The tilapia value chain in South Cotabato is sustained by targeted government initiatives like the BASIL program, which uses a scientific food-based approach to enhance inland fisheries production for rural populations. Additionally, SAAD Phase II supports marginalized fisherfolk specifically across the communities of Tampakan, T'boli, and Lake Sebu. While enablers provide essential non-financial services like technical training and laboratory testing, these services typically prioritize registered farmers.

Despite this support, the industry faces significant external challenges, including biological threats like the Tilapia Lake Virus (TiLV), which mandates strict screening and health certificates for transboundary movement, and recurrent mass fish kills locally known as *kamahong*. Logistical hurdles, including substandard road conditions in remote farming areas and a lack of cold storage infrastructure, further exacerbate post-harvest losses, which are currently estimated at 10% due to rapid spoilage and high transportation costs.

Furthermore, institutional buyers such as malls, restaurants, and hotels have become vital destinations for the province's production, with specialized wholesalers acting as critical intermediaries to meet their specific volume requirements.

#### **7. Policy Environment of the Tilapia Industry**

The industry operates within a decentralized system where regulatory responsibility is shared between the national government (DA-BFAR) and local governments. Key guiding frameworks include the Fisheries Code of 1998 (RA 8550/10654) and the Local Government Code of 1991 (RA 7160). National strategic goals are set by the Comprehensive National Fisheries Industry Development Plan (CNFIDP) and the National Tilapia Industry Roadmap 2022-2025, which aim for a globally competitive and sustainable industry. However, governance is hampered by weak regulations on tracing commodity outflow and a lack of comprehensive profiling for all value chain participants.

## **CONCLUSIONS**

The following are the conclusion drawn based on the findings of the study:

#### **1. Key Players and their Roles and Contributions**

The value chain is composed of direct actors such as input suppliers, growers, processors, traders, and consumers as well as indirect actors or enablers like BFAR and LGUs. These players function interdependently to move products through six stages: input provision, primary production, processing, wholesaling, retailing, and final sale. The enablers are essential for creating a supportive environment through policy formulation, infrastructure, and technical guidance.

#### **2. Demographic Profile of Key Players**

The industry is characterized by a veteran and educated workforce, with 59% of players having over a decade of experience and 71% holding college degrees. The workforce is predominantly male (55%) and leans toward older generations, with 55% aged 50 and above. Furthermore, a large portion of actors (47%) operate independently without formal ties to cooperatives or associations.

#### **3. Tilapia Value Chain Map, Marketing Channels, and Value Addition**

The chain consists of seven distinct marketing channels that facilitate a primarily domestic product flow. Value addition is progressive at every node, but the highest value addition occurs at the primary production stage, particularly among pond growers who transform fingerlings into marketable fish through intensive husbandry. Payment flows are typically cash-based, though "feed loan" arrangements exist between wholesalers and growers.

#### **4. Cost-Structure and Profitability**

The industry is highly profitable across all segments, though it is burdened by high variable costs. Commercial feeds represent the most significant expenditure, accounting for 60% to 80% of total production costs. Notably, Sex-Reversed Tilapia (SRT) fingerling production stands out as the most lucrative niche, yielding an exceptional 328% return on investment.

#### **5. Current Challenges and Opportunities**

The chain faces inevitable challenges including exorbitant input costs, inadequate cold storage, and environmental threats like "kamahong" (mass fish kills). However, significant growth opportunities exist in the adoption of SRT technology for higher productivity, the formulation of localized alternative feeds, and the expansion of value-added processing for products like lamayo and chicharon.

## 6. Government Interventions and External Factors

Institutional support is provided through specialized programs like BASIL and SAAD Phase II, which offer fingerlings and technical training to marginalized sectors. Crucial external factors affecting the chain include biological threats such as the Tilapia Lake Virus (TiLV), climate change, and the growing role of institutional buyers like malls and restaurants in the domestic market.

## 7. Policy Environment of the Tilapia Industry

The industry operates under a decentralized governance system where regulatory power is shared between national agencies (DA-BFAR) and LGUs under the Fisheries Code of 1998 and the Local Government Code of 1991. National strategic frameworks, such as the National Tilapia Industry Roadmap 2022-2025, aim to reduce post-harvest losses and establish a globally competitive, sustainable business environment.

## RECOMMENDATIONS

1. To address production costs that currently account for 60% to 80% of total expenses, Research and Development (R&D) initiatives should prioritize the formulation of cost-effective, farm-made feed pellets using locally available alternative ingredients to enhance grower profit margins.
2. BFAR and Local Government Units should strengthen promotion and technical training for Sex-Reversed Tilapia (SRT) technology, as it offers a significantly higher 328% Return on Investment and allows growers to achieve marketable weights in just four months.
3. Urgent investment is needed in cold chain infrastructure and the construction of farm-to-market roads to minimize the 10% post-harvest loss rate currently caused by the high perishability of fish and logistical delays in remote areas.
4. BFAR and LGUs must formalize the 95.44% of unregistered private hatcheries by strengthening regulatory monitoring and incentivizing registration through access to free laboratory services, such as Tilapia Lake Virus testing, to ensure the quality of fingerlings.
5. The government should facilitate the establishment of GMP and FDA-compliant facilities for value-added products like lamayo and chicharon to allow growers to capture higher net returns and provide critical employment opportunities, particularly for women.
6. To overcome the market power dominance of retailers where individual farmers often act as price takers, the state must encourage the formation and accreditation of fisherfolk cooperatives to improve collective bargaining power and access to formal credit.
7. The industry should adopt climate-smart aquaculture practices, including the development of temperature-tolerant genetic strains and the provision of real-time weather advisories, to mitigate production losses from environmental hazards such as "kamahong" mass fish kills.

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