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COMPARATIVE ANALYSIS OF CURRENT FARMING PRACTICES OF MILKFISH AND TILAPIA

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Executive Summary

Milkfish (*Chanos chanos*) and tilapia (*Oreochromis* spp., *Sarotherodon* spp., *Tilapia* spp.) are the most farmed and among the top five priority species for aquaculture in the Philippines (Department of Agriculture - Bureau of Fisheries and Aquatic Resources [DA-BFAR], 2022). Both gained popularity in local and international markets because of their rapid growth, resistance to diseases, adaptability to a wide range of environments, and high nutritional value (Alal, 2018; Coniza, 2009). The Philippines ranked second in milkfish production globally and sixth in tilapia production in 2020 and 2019, respectively (DA-BFAR, 2022a; DA-BFAR, 2022b).

However, despite the impressive performance, significant contribution to the economy and food security, milkfish and tilapia industries face significant challenges that affects its competitiveness. According to the DA-BFAR (2022a), the milkfish industry encountered problems like the use of improper aquaculture practices leading to issues such as siltation, mass fish kills, and overfeeding. Similarly, the tilapia industry



fingerlings, and marketing challenges (DA-BFAR, 2022b). The implementation of Good Aquaculture Practices (GAqP) is one of the strategies identified by the DA-BFAR to increase milkfish and tilapia production, food sufficiency and ensure food security for Filipinos. In 2017, the Department of Agriculture-Bureau of Agriculture and Fisheries Standards (DA-BAFS) established a Philippine National Standard (PNS) on Code of Good Aquaculture Practices (GAqP) for Milkfish and Tilapia (PNS/BAFS 196:2017). In 2022, the DA-BAFS Standards Research Division (SRD) received the priority list from DA-BAFS Standards Development Division (SDD) for CY 2023-2026. In the priority list for CY 2025, the DA-BAFS SDD included the table review and possible amendment of PNS on Code of GAqP for Milkfish and Tilapia (PNS/BAFS 196:2017) in 2025, considering its age of five years. Hence, in the second semester of 2023, the DA-BAFS SRD conducted this study to obtain available information on the current grow-out farming practices of milkfish and tilapia in ponds to support the review and necessary amendments of PNS/BAFS 196:2017.

Secondary data gathering was conducted through a literature review of technical guide, manuals, fact sheets, and standards. A comparative analysis was undertaken to compare and analyzed the milkfish and tilapia farming practices in ponds in the Philippines and other countries.

The major findings of this study are as follows:

Milkfish Grow-out Farming Practices in Ponds

a. Site selection

Location: The DA-BFAR and DOST- PCAARRD recognized the importance of selecting a suitable site for milkfish with abundant source of water (tidal water), good soil retention (clay loam), and easy road access. DOST-PCAARRD also emphasized the importance of farm security against poaching.

Layout and design: DOST-PCAARRD recommended pond size for semi-intensive milkfish culture ranging from 1-5 ha. Regarding pond depth, BFAR and DOST-PCAARRD had differing views. BFAR suggested a deepest depth of 1 m. for semi-intensive culture, while DOST-PCAARRD considered this as the lowest recommended depth. Both offices advised to install sluice gates with fine mesh screens as water control structures, with DOST-PCAARRD emphasizing the importance of perimeter dikes and wave breakers to control water level.

b. Source of stock: DOST-PCAARRD recommended milkfish seedstock can be sourced from the wild, local hatcheries, and may be imported from Indonesia.

c. Farm management:

For culture system and stocking density, both DA-BFAR and DOST-PCAARRD specified semi-intensive culture as one of the farming systems that may be used when farming milkfish. However, DOST-PCAARRD (2016) presented additional culture systems such as straight run or extensive culture, progression or modular culture, intensive culture and polyculture with corresponding stocking densities.

For water management, both DA-BFAR and DOST-PCAARRD recommended a wide range of temperature and salinity. When it comes to dissolve oxygen, both recommended 5ppm as an optimum level in growing

milkfish. However, BFAR recommended up to 3 ppm. According to DOST-PCAARRD (2016), milkfish may still survive below the 5ppm but its growth will suffer. For pH, DA-BFAR said that 7.5-8.5 was the ideal pH level for milkfish.

For water exchange, both DA-BFAR and DOST-PCAARRD recommended regular water replacement as part of good aquaculture practices. Both considered the influence of tides when replacing water in ponds. The recommended water replacement percentages differed per culture system

For soil management, both DA-BFAR and DOST-PCAARRD recommended the use of lime for water quality management in aquaculture. The main difference was that BFAR specifies hydrated lime, while DOST-PCAARRD offered wider options of lime such as agricultural lime, slaked lime and quicklime.

For fertilizer, both DA-BFAR and DOST-PCAARRD recommended the use of natural and inorganic fertilizers in aquaculture. They differed on the recommended rates which were based on the culture system and soil fertility of the pond.

- d. Feeds and feeding:** The DA-BFAR and DOST-PCAARRD recommended different types of feeds depending on the culture system employed. Generally, farmers may use natural food, supplemental, and commercial feeds. For feed storage, Myanmar recommended to consider good room ventilation, raise feed bags on wooden platforms, and follow the first-in first-out procedure.
- e. Fish health management:** The DA-BFAR and DOST-PCAARRD identified diseases of milkfish caused by pathogens like bacteria and parasites. To control the occurrence, DOST-PCAARRD (2016) emphasized the need to maintain good water circulation, follow appropriate stocking density and biomass within the

rearing system, and implement good aquaculture practices to prevent infection. For pest management, DA-BFAR and DOST-PCAARRD recommended manual picking, applying tobacco dust and combined use of ammonium sulfate (21-0-0) and lime. DOST-PCAARRD (2016) distinctly recommended the use of teased to eradicate pests.

- f. Biodiversity:** The DA-BFAR and DOST-PCAARRD recommended installing a fine mesh screen, applying tobacco dust, and using a combination of ammonium sulfate and lime in ponds to eradicate predatory fishes. DOST-PCAARRD suggested the use of scarelines, baited traps, and other indigenous traps to control predators outside the ponds (e.g., water snakes, birds, frogs, lizards, frogs, and etc.).
- g. Harvesting and post-harvest handling:** DA-BFAR and DOST-PCAARRD recommended total harvesting and selective harvesting, and the use of “*pasulang method*” when harvesting milkfish. DOST-PCAARRD recommended harvesting early in the morning when it is cooler to reduce stress and mortality. For post-harvest handling, DA-BFAR and DOST-PCAARRD recommended to pre-chill and sort the milkfish by size after harvest. DOST-PCAARRD provided additional guidelines to consider in handling milkfish after harvest.
- h. Traceability and record keeping:** The DOST-PCAARRD mentioned to keep records of weight and fish measurement during sampling as a basis for computing the feeding ration. Other activities that needs to be recorded were not mentioned.

Tilapia Grow-out Farming Practices in Ponds

a. Site selection

Location: The Philippines and Myan Mar emphasized the importance of abundant and clean water supply, easy road access, and security against poaching. However, they differed in soil preferences, where the Philippines favored clay loam while Myan Mar preferred clay soil. The Philippines placed distinct importance on site topography which should be gently sloping and safe from flooding, soil erosion, waves, and storms.

Layout and design: The Philippines and Myan Mar both recommended to consider size of pond compartments (200 m² -10, 000 m²), ideal depth of ponds (1.5m.) and installing water control structures (stand pipe or sluice gate) in water inlet and outlet. Myan Mar distinctly mentioned the suitability of a rectangular pond and construction of a dike, feeding platform, and fence around the farm and along embankments.

b. Source of stock: The Philippines and Myan Mar emphasized the importance of sourcing high-quality tilapia fingerlings from reputable hatcheries.

c. Farm management:

For culture system and stocking density, the Philippines detailed different types of tilapia culture system such as extensive (1-2 fingerlings/ m²), semi-intensive (3-4 fingerlings/m²), and intensive (5-10 fingerlings/m²). However, Myan Mar only mentioned semi-intensive (3-4 fingerlings/m²) as the primary culture system used by smallholder farmers in their country.

For water management, the Philippines and Myan Mar shared some similarities on recommended water quality parameters, such as minimum

dissolved oxygen (5ppm) and pH level (6.5-9.0). However, they differed in their guidance on temperature and salinity which vary depending on tilapia species. For turbidity, the Philippines suggested that water visibility should fall within 23-35 cm., while Myan Mar suggested 30-40cm. The Philippines specified safe total ammonia (0.02-0.05 mg/l) levels.

For water exchange, the Philippines and Myan Mar stressed the importance of water exchange but differed in their approaches. The Philippines established water exchange guidelines based on stocking density, with higher density requiring more frequent exchanges. Myan Mar's recommendations were event-driven, responding to unusual behavior of fish in the pond.

For soil management, the Philippines and Myan Mar recommended the use of lime to address soil quality. Myan Mar specified the use of agricultural lime, quicklime, and hydrated lime. For fertilizer, both the Philippines and Myan Mar recommended the use of natural fertilizers (livestock and agricultural waste or compost). Differences emerged in commercial inorganic fertilizers, where the Philippines favored ammonium phosphate while Myan Mar suggested triple superphosphate, urea, and a mixture of phosphate, nitrogen, and potassium.

d. Feeds and feeding: The Philippines and Myan Mar recommended different types of feeds depending on the culture system employed. Generally, farmers may use natural food, supplemental, and commercial feeds. For feed storage, Myan Mar recommended good room ventilation, rise feed bags on wooden platforms, and follow the first-in first-out procedure.

e. Fish health management: The Southeast Asian Fisheries Development Center (SEAFDEC) and Food and Agriculture Organization (FAO) identified diseases of

tilapia caused by pathogens like bacteria, parasites, fungi, and viruses. To control the occurrence of disease-causing organisms, SEAFDEC recommended observing good health management, good water management, and following proper stocking density. For pest management, SEAFDEC recommended the use of tea seed cake, rotenone, saponin, tobacco dust, lime, ammonia fertilizer, and installation of screens at water inlet and outlet.

- f. Biodiversity:** The Philippines and Myanmar recognized predatory fishes as a potential threat in tilapia farming and recommended the use of rotenone to eradicate predators. However, both have distinct additional control measures, with the Philippines suggesting installation of a screen to water inlet and outlet while Myanmar recommended fishing with live bait to control predators.
- g. Harvesting and post-harvest handling:** The Philippines and Myanmar recommended total and selective harvest methods. Myanmar recommended to stop feeding 1–2 days before harvest to allow them to empty their stomach to improve water quality, survival, and condition of the tilapia during handling. After harvest, both the Philippines and Myanmar mentioned using clean water and quality ice to maintain the freshness and quality of harvested tilapia. The Philippines provided more detailed procedures for handling fresh and live tilapia including washing, sorting, counting, weighing, and packing, and the use of aerated tanks by pick-up trucks when transporting tilapia in live form.
- h. Traceability and record keeping:** The Philippines and Myanmar recommended keeping and maintaining records of all farm activities such as general pond information, pond and stock management, total production, and operating costs.

The major recommendations of the study are as follows:

1. *Milkfish Grow-out Farming Practices in Ponds*

- a. Site selection:** The site selection provision of the standard should include location, and layout and design. In terms of location, these specific requirements of milkfish should be considered: sources of clean and abundant water (preferably tidal water), easy road access, suitable type of soil (clay loam), and security against poaching. Layout and design should take into account the following: size of pond compartment (semi intensive: 1-5 ha.), ideal pond depth (1m.), water control structures (sluice gate), and installation of perimeter dike and wave breakers.
- b. Source of stock:** Farmers may source milkfish stocks from the wild, local hatcheries and may be imported only when necessary.
- c. Farm management:** Farmers should follow recommended stocking density depending on the preferred culture system to avoid overstocking and fishkills. Farmers should regularly test and monitor the water and soil quality parameters to ensure that it is within optimal range.
- d. Feeds and feeding:** Farmers should follow the type of feeds according to the culture system used and conduct periodic sampling of the milkfish for proper feed management. Farmers should also follow feed storage protocol.
- e. Fish health management:** Farmers should follow recommended control measures to maintain healthy stocks in case diseases and pest infestation arise.

- f. Biodiversity:** Farmers should be equipped with appropriate control measures to eliminate potential competitors on food and achieve good milkfish yield during harvest.
- g. Harvesting and post-harvest handling:** Farmers should practice “*pasulang method*” as common technique of harvesting milkfish and ensure that harvesting (total or selective) is done early in the morning to avoid stress and mortality. Follow recommended procedures for handling milkfish like washing, pre-chilling using quality ice, and sorting.
- h. Traceability and record keeping:** Farmers should regularly have accurate, detailed, and complete records of all of the farm activities for traceability purposes. It should be accessible during culture and for at least 24 months after production.

2. Tilapia Grow-out Farming Practices in Ponds

- a. Site selection:** The site selection provision of the standard should include location, and layout and design. In terms of location, these specific requirements of tilapia should be considered: sources of clean and abundant water, easy road access, suitable type of soil (clay loam or clay soil), security against poaching, and site topography (gently sloping and safe from flooding, soil erosion, waves, and storms). Layout and design should take into account the following: size of pond compartment (200 m² -10, 000 m²), ideal ponds depth (1.5m.), water control structures (stand pipe or sluice gate), shape of pond (rectangular), installation of dike, feeding platform, and fence.

- b. Source of stock:** Farmers should source tilapia stocks from reputable hatcheries.
- c. Farm management:** Farmers should follow recommended stocking density depending on the preferred culture system to avoid overstocking and fishkills. Farmers should regularly test and monitor the water and soil quality parameters to ensure that it is within optimal range.
- d. Feeds and feeding:** Farmers should follow the type of feeds according to the culture system used, follow feeding rate, and conduct periodic sampling of the tilapia for proper feed management.
- e. Fish health management:** Farmers should follow recommended control measures to maintain healthy stocks in case diseases and pest infestation arise.
- f. Biodiversity:** Farmers should be equipped with appropriate control measures to eliminate potential competitors on food and achieve good tilapia yield during harvest.
- g. Harvesting and post-harvest handling:** Farmers should ensure that harvesting (total or selective) is done early in the morning to avoid stress and mortality. Follow recommended procedures for handling fresh tilapia like washing, sorting, counting, weighing, packing, and use of quality ice. For live tilapia, farmers should use aerated tanks to transport live tilapia.
- h. Traceability and record keeping:** Farmers should regularly have accurate, detailed, and complete records of all of the farm activities for traceability purposes. It should be accessible during culture and for at least 24 months after production.

