Farmed Tilapia Production in the Philippines
Is Declining: What Has Happened and What Can Be Done

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Tilapia is the second most important farmed fish in the Philippines produced in ponds, cages, and pens. While from 2001 to 2011 there was an increase in the production of farmed tilapia by 240%, the production increase was only 7% from 2007 to 2016. An assessment of the farmed tilapia production for 2007–2016 was done using data of the Philippine Statistics Authority (PSA) for total annual production and annual production according to the culture system. Results showed that the average annual production rate (AAPR) was only 0.7% for the period, 4.8% for brackishwater ponds, 1.5% for freshwater pens, 1.3% for freshwater cages, and 1.1% for freshwater ponds. Brackishwater ponds throughout the country, freshwater ponds in Mindanao, and marine coastal water cages are seen to have a high potential for growth. From focus group discussions and key informant interviews with 55 tilapia farmers in Luzon and Mindanao, the major causes for the low production of farmed tilapia identified were “High Water Temperature” (68%), “Lack of Government Assistance” (58%), “Poor Breed of Tilapia” (48%), “High Cost of Production” (46%), and “Lack of Capital” (44%). Measures are recommended for addressing the major causes of low production.

Keywords: aquaculture, farmed tilapia, fish farming, fisheries, Nile tilapia

INTRODUCTION
The tilapia is the second most important farmed fish in the Philippines next to milkfish (*Chanos chanos*). While the milkfish is an indigenous fish, the Mozambique tilapia (*Oreochromis mossambicus*) was first introduced in the country in 1950 from Thailand followed by the Nile tilapia (*O. niloticus*) in 1972 and other species (*O. aureus, O. hornorum, Coptodon zillii, and Sarotherodon melanotheron*). The per capita availability of tilapia for Filipinos was 2.8 kg/y in 2016 compared to 2.5 kg/y for milkfish (PSA 2018).

In 2016, the total production of tilapia (mainly Nile tilapia) in the Philippines was 300,720 metric tons (MT) – valued at ₱24 billion – with 86% coming from farms and 14% from fishing in inland waters. Production of farmed tilapia in 2015 was 54% from freshwater ponds, 30% from freshwater cages, 8% from freshwater pens, and 7% from brackishwater ponds. Luzon (mainly freshwater) is the biggest producer of farmed tilapia in the country with 92% of the total production (261,210 MT), followed by...
Mindanao (freshwater and seawater) with 6%, and the Visayas (mainly brackishwater) with 2% (BFAR 2016).

From 2001 to 2011, there was a 240% increase in tilapia production in the country from 107,000 MT to 257,000 MT – attributed to formulated diets and improved strains of Nile tilapia (Romana-Eguia et al. 2013). From 2007 (241,183 MT) to 2016 (259,045 MT), however, the increase in production was only 7% according to the Bureau of Fisheries and Aquatic Resources (BFAR; www.bfar.da.gov.ph). In the Road Map for the Tilapia Industry (2014–2016) of the BFAR, a 3% increase in production per year was projected (Guerrero 2013). However, the PSA’s statistics (www.psa.gov.ph) showed that there was a 0% increase in the production for the same period.

This article shall discuss the causes of low farmed tilapia production in the Philippines for the period 2007–2016 and recommend measures for addressing them.

WHAT HAS HAPPENED

From the fisheries data of the PSA (www.psa.gov.ph) on annual farmed tilapia productions for 2007–2016 (Table 1), the AAPR of farmed tilapia was 0.7%. The AAPR was computed by measuring the increase or decrease in percentage production between successive years within the given period and dividing the resulting sum of the percentage production rates by the number of years covered. From the total annual productions of the various culture systems for 2007–2015 (Table 2), the AAPRs found were 4.8% for brackishwater ponds, 1.5% for freshwater pens, 1.3% for freshwater cages, and 1.1% for freshwater ponds (Table 2).

Data from focus group discussions and key informant interviews with 55 tilapia farmers (pond, cage, pen, and hatchery operators) from Luzon and Mindanao were gathered using a structured questionnaire. It was found that of the socioeconomic, technological, institutional, and climatic factors listed in the questionnaire, the top major factors (causes) for the low farmed tilapia production identified by the respondents were “High Water Temperature” (68%), “Lack of Government Assistance” (58%), “Poor Breed of Tilapia” (48%), “High Cost of Production” (46%), and “Lack of Capital” (44%).

WHAT CAN BE DONE

Culture Systems and Tilapia Production

There is a high potential for further increase in tilapia production in brackishwater ponds. The country has more than 200,000 ha of brackishwater ponds that are mainly used for the culture of milkfish and shrimps (Penaeus spp.). With the development of tilapia strains

### Table 1. Total annual farmed tilapia productions (MT) for 2007–2016 and AAPR (%).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>241,163</td>
</tr>
<tr>
<td>2008</td>
<td>257,132</td>
</tr>
<tr>
<td>2009</td>
<td>260,911</td>
</tr>
<tr>
<td>2010</td>
<td>258,839</td>
</tr>
<tr>
<td>2011</td>
<td>257,385</td>
</tr>
<tr>
<td>2012</td>
<td>260,536</td>
</tr>
<tr>
<td>2013</td>
<td>268,819</td>
</tr>
<tr>
<td>2014</td>
<td>259,198</td>
</tr>
<tr>
<td>2015</td>
<td>261,210</td>
</tr>
<tr>
<td>2016</td>
<td>259,045</td>
</tr>
</tbody>
</table>

| AAPR | 0.7 |

### Table 2. Tilapia productions (MT) by culture system and AAPRs (%) for 2007–2015.

<table>
<thead>
<tr>
<th>Year</th>
<th>Brackishwater Pond</th>
<th>Freshwater Pen</th>
<th>Freshwater Cage</th>
<th>Freshwater Pond</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>12,155</td>
<td>19,215</td>
<td>79,001</td>
<td>130,456</td>
</tr>
<tr>
<td>2008</td>
<td>14,957</td>
<td>21,120</td>
<td>81,748</td>
<td>138,862</td>
</tr>
<tr>
<td>2009</td>
<td>14,921</td>
<td>21,512</td>
<td>83,749</td>
<td>140,422</td>
</tr>
<tr>
<td>2010</td>
<td>13,999</td>
<td>21,533</td>
<td>102,622</td>
<td>142,913</td>
</tr>
<tr>
<td>2011</td>
<td>14,194</td>
<td>22,268</td>
<td>98,452</td>
<td>142,645</td>
</tr>
<tr>
<td>2012</td>
<td>14,380</td>
<td>21,379</td>
<td>100,682</td>
<td>144,261</td>
</tr>
<tr>
<td>2013</td>
<td>15,213</td>
<td>21,905</td>
<td>105,329</td>
<td>142,852</td>
</tr>
<tr>
<td>2014</td>
<td>18,449</td>
<td>21,358</td>
<td>87,742</td>
<td>143,336</td>
</tr>
<tr>
<td>2015</td>
<td>18,378</td>
<td>21,460</td>
<td>94,723</td>
<td>142,339</td>
</tr>
</tbody>
</table>

| ARR | 4.8   | 1.5 | 1.3 | 1.1 |

and hybrids (e.g., Molobicus and BEST) of the BFAR that are saline-tolerant, the culture of tilapia in brackishwater ponds has been promoted (Guerrero 2018a). The culture of the euryhaline black-chin tilapia (Sarotherodon melanotheron), which thrives in Laguna de Bay and Manila Bay (Bigalbal et al. 2018), can also be considered. The species, which had been introduced in Taal Lake, is now one of the top five most abundantly caught fishes with good acceptance by consumers (Mutia pers. comm.).

Tilapia productions in the freshwater pens of Laguna de Bay (Laguna and Rizal) and Lake Buluan (Maguindanao), and floating cages in Taal Lake (Batangas), Lake Buhi (Camarines Sur), and Lake Sebu (South Cotabato) appear to be holding up with relatively low AAPRs despite the fish kills that have occurred in them due to cage congestion and water pollution (Luistro 2008, Escandor 2015, MindaNews 2017). The number of fish pens in Laguna de Bay has been reduced due to negative ecological and social impacts (Palma 2016). Likewise, the number of cages in Taal Lake has been lessened from 14,000 to 7,000 to minimize fish mortalities during the occurrence of lake overturns (Balazon pers. comm.). There is a need for regulating the number of tilapia pens and cages in water bodies within their carrying capacities for sustainability. However, further increase in tilapia production for such culture systems is limited.

The low AAPR for freshwater ponds indicates that further growth of such culture system, particularly in Luzon, is unlikely because of the limited areas for expansion and increasing competition for water resources by domestic, industrial, and agricultural users. There has been little or no increase in the area (14,531 ha) of freshwater ponds in the country, of which 68% of the productive area (6,522 ha) is in Central Luzon (BFAR 1997). There is, however, high potential for growth of the culture system in the inland and upland areas of Mindanao where the supply of fish is lacking and freshwater resources are abundant (Guerrero 2017a).

The data for tilapia production in pens and cages in marine coastal waters have only been reported by the PSA for the years 2007–2009, with volumes of 0.32 MT for pens and 12.67 MT for cages. In our 2018 visit to the BFAR’s National Mariculture Center in Panabo City (Davao del Norte), we learned about the culture of the “Kingfish” (a red tilapia hybrid) in marine cages by a private sector operator. Production of 1,200 MT and gross sales of ₱306,200 / production cycle were reported in 2017 for the “high-value fish” (Guerrero 2018b). With the available 50,150 ha of marine coastal waters in the country planned for mariculture development by the BFAR (Salayo et al. 2012), there is a high potential for the application of such culture system for tilapia production.

Measures for Addressing the Major Causes of Low Tilapia Production

“High Water Temperature.” Measures to mitigate the “high water temperature” (32 °C+), particularly of freshwater and brackishwater ponds, include the use of shading and deepening of ponds. The use of net shade (Aquashade) on top of earthen ponds reduced water temperature by 4 °C during noon time and significantly increased spawning rate and seed production of Nile tilapia compared to unshaded ponds (The Tilapia Technical Committee 2017). There was better growth of the black-chin tilapia in a freshwater earthen pond that had 24% with the floating aquatic weed, Pistia stratiotes,
with lowering of water temperature by 3 °C than without the plant during the hot season month of April (Guerrero 2017b). Reputola (2018) recommended the deepening of shallow brackishwater ponds for grow-out of tilapia to a minimum of 1.5–2.0 m to make them “more stable in temperature, salinity, and dissolved oxygen;” and an average depth of 1.2 m for freshwater breeding ponds.

“Lack of Government Assistance.” Government assistance in the form of extension and technical services for improving the efficiency and productivity of tilapia farmers appears to be inadequate. Since the devolution of fisheries extension from the BFAR to the local government units (LGUs) in 1991 with the Local Government Code (RA 7160), there has been a slow down in the effective delivery of fisheries extension services to fish farmers because of budgetary constraints and lack of trained personnel of LGUs (DOST-NAST 2012). To address this issue, the capability of LGUs to extend technical information and assistance to tilapia farmers should be strengthened through dedicated, well-trained, and adequately supported aquaculture extension workers. Training of such workers can be done in collaboration with the Agricultural Training Institute of the Department of Agriculture and/or with the aquaculture research and development units of the BFAR, state colleges and universities (SCUs), and the Aquaculture Department of the Southeast Asian Fisheries Development Center (AQD-SEAFDEC).

“Poor Breed of Tilapia.” The improved strain of Nile tilapia for freshwater culture (i.e., GET-EXCEL) and salt-tolerant hybrids (i.e., Molobicus and BEST) for brackishwater culture developed by the BFAR may not be readily accessible to tilapia farmers throughout the country. While the BFAR has accredited private sector tilapia hatcheries in Central Luzon for producing “quality fry/fingerlings,” such accreditation has not been widely extended to other parts of the country. Most of the cage operators in Taal Lake, for instance, still depend on private hatcheries using Nile tilapia breeders of dubious origin for their fry/fingerling supply. A private Nile tilapia pond hatchery in Calauan, Laguna (St. Mary’s Aquafarm) has developed its own improved strain using between and within family selection methods with the Chitralada (imported from Thailand), IDRC (AQD-SEAFDEC), and GET-EXCEL strains. More accredited private tilapia hatcheries should be established with government support. Private hatchery/nursery operators should also be encouraged to follow the example of the St. Mary’s Aquafarm in Laguna with government assistance.

“High Cost of Production.” Intensive culture of tilapia in ponds and cages requires the use of commercial feeds that can constitute 60–70% of the total operating costs. The high cost of feeds is due to the high cost of imported feed ingredients such as fish meal and soybean meal (Rana and Hasan 2013). Lessening the cost of feeding can be done by substituting imported feedstuffs with locally available alternatives such as copra meal and by improving the efficiency of feeding. Argana (2017) reported that protein-enriched copra meal can replace 50% of the soybean meal in the diet of the Nile tilapia with no negative effects on growth, production, and feed efficiency. The use of floating extruded feeds was found to be more efficient than slow-sinking feeds for the Nile tilapia in the floating cage in Taal Lake in terms of growth, biomass harvest, and feed conversion. The floating feeds reduced feed use by 20–30% and lessened feed cost by 18–29% (Muyot et al. 2018).

“Lack of Capital.” Funding of most tilapia farms in the country is from informal sources like self-financing, friends, and relatives rather than from formal sources such as banks. Availing of loans from banks is often not resorted to because of the paperwork, the need for collaterals and high interest rates (DOST-NAST 2012). Soft or interest-free loans should be extended by the government to tilapia farmers for their expansion in priority areas.

ACKNOWLEDGMENT

The author is grateful for the Research Fellowship Grant of the National Academy of Science and Technology, Philippines and the assistance of Mesdames Luzviminda Guerrero and Marichu Fabro in the interviews with the tilapia farmers.

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