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## Introduction

Tilapia are produced in developing countries by some of the world's poorest farmers. This fish is a key contributor to global food security as an international trade product, and as a local crop. AquaFish sponsors research that helps optimize tilapia production techniques for small- and semi-intensive farms. The major objectives of this research are to make tilapia culture more efficient and accessible to local communities, and to mitigate negative environmental impacts. AquaFish investigations have focused on topics that include reduced feeding strategies, alternative feeds, supply chain assessments, and methyl testosterone elimination techniques.



## Smallholder Impacts

The outcomes of these investigations have been disseminated to stakeholders using a variety of outreach methods including workshops, symposia, and internet-based podcasts focused on improving local capacity for farming tilapia. Efforts to utilize accessible, low-cost innovative technologies in outreach have been received positively by end users. Combining these technological advances with a proven capacity building strategy, AquaFish has provided a means for farmers to more effectively grow tilapia, ultimately improving nutrition for consumers and generating income for a pathway out of poverty.

## Feeding Strategies

One way to reduce total feed costs for tilapia is by decreasing the amount of feed used for grow-out of marketable fish.

AquaFish researchers in the Philippines tested the growout performance of tilapia fed at varying fractions of a normal daily ration (100% daily): 67% daily feeding, 50% daily feeding and 100% alternate day feeding.

Six separate farms found that feeding at 50% sub-satiation was as effective at producing tilapia of similar gross yield as fish grown on full ration (100% daily) feedings.

Furthermore, a combined feed reduction strategy that incorporates elements of two or more of the different rations proved to be less effective than the 67% feeding rate used alone. Despite similar growth rates, the survivorship of fish and final yield was reduced when using combined feed reduction strategies.



AquaFish researchers from Central Luzon State University in the Philippines partnered with researchers from North Carolina State University to profile the supply chain for tilapia markets and address concerns of members in the supply chain. They provided the following recommendations:

1. Establish nurseries with high quality broodstock and increase technology transfer to farmers for better health management of tilapia;
2. Conduct market promotion activities highlighting the various niche opportunities for tilapia growers;
3. Motivate small farmers to participate in supply chains by setting up an incentive scheme;
4. Create an accreditation program for feed manufacturers, hatcheries and processors to improve quality assurance; and
5. Provide capital to improve facilities and reduce logistics/transaction costs

## Supply Chain Assessment

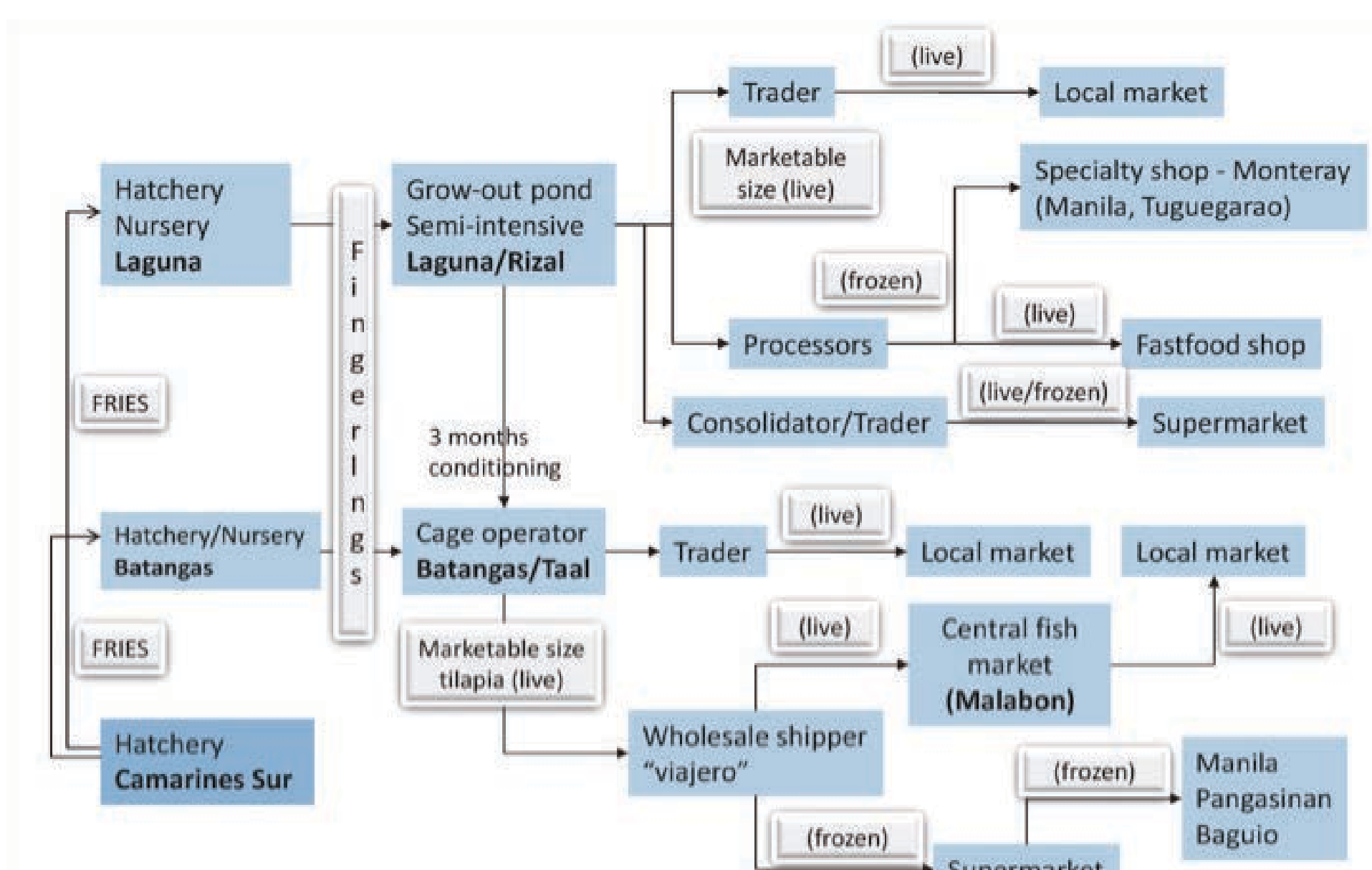


Figure from Ismandiro, W.E., L.U. Hatch, R. B. Bolivar, and R.J. Borski. 2011. Improving the Supply Chain of Tilapia Industry in the Philippines. In: The Proceedings of the 9th International Symposium on Tilapia in Aquaculture, Shanghai, China, April 2011. Liu Liping and Kevin Fitzsimmons, Eds.

## Alternative Feeds

In a pond trial in the Philippines, AquaFish researchers demonstrated that eliminating fishmeal from a standard 31% crude protein diet can produce a significant cost savings in feeds with no appreciable effect on growth performance and yield of tilapia raised in ponds.



A cost-return analysis shows that incorporation of a fishmeal-free diet resulted in an 8% feed-cost savings (almost US\$100) per hectare, above the > 50% savings seen with an alternate day feeding protocol.

The ability to produce pelleted fishmeal-free aquafeeds that are of comparable performance as extruded feeds can not only promote an additional cost savings in feed of 3-7%, but would allow manufacturers who lack costly extruders to expand to production of aquafeeds.

## Eliminating Residual MT

The aquaculture industry commonly uses synthetic steroids, especially methyltestosterone (MT), for tilapia masculinization treatments. This practice is beneficial in producing male monosex populations of tilapia for commercial aquaculture and growout operations. However, surplus MT can have detrimental effects for animals and humans, including reproductive dysfunction and neurotoxicity.

AquaFish researchers at the Universidad Juarez Autonoma de Tabasco in Mexico studied the potential of microbiological degradation processes for breaking down MT and removing it from the water supply. Results indicate that application of these bacteria to decompose residual MT in industry facilities is effective and promising.

Researchers are developing ways to transfer this technology to large hatchery facilities and to disseminate written materials and protocols on using bacterial bio-flocs as MT-degrading entities and probiotics in tilapia aquaculture.



## Outreach

Podcasting is an internet-based communication method that is increasing in popularity. Podcasts can be distributed at practically no cost to end users worldwide, and applications of this technology as a means of communication are growing.

In 2009, the AquaFish CRSP produced and uploaded the first Tilapia Podcast at North Carolina State University (NCSU). Interest in the podcasts has been excellent with 285 downloads and 444 hits on the NCSU iTunes server over a 2-month period, indicating they are an effective tool for disseminating tilapia culture technologies worldwide.

The first podcast was also played to 120 participants representing tilapia farming, aquafeeds, government, and academic communities through two workshops on tilapia feeding strategies and feed manufacturing held in two regions of Central Luzon, Philippines. Participants were highly receptive to this mode of disseminating information, which included podcasts translated into the local language.

*AquaFish researchers have generated a range of practical improvements in the culture methods of tilapia, many of which have increased the potential profitability for farmers. New feeding and pond fertilization strategies have already been widely recognized as having practical utility for Luzon area fish farmers and have been demonstrated to reduce costs for growout of Nile tilapia. These techniques have been shown to improve incomes of farmers and decrease effluents, with little impact on fish yield.*



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