

RESEARCH INVESTMENT IN AQUACULTURE FEED TECHNOLOGY DEVELOPMENT AND TRANSFER FOR GLOBAL FOOD SECURITY

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Abstract

Investment in science and innovation is fundamental to developing effective solutions to many of the social, economic, and ecological challenges associated with global food security. Transferring new and improved technologies to farmers and industry is essential for scaling up farming technologies and best practices for broad adoption. The AquaFish Innovation Lab partners with international research institutions, fish farmers, industry, government agencies, and others to develop sustainable aquaculture technologies and systems that are relevant to local conditions and on-the-ground needs.

With feeds comprising the greatest production cost for fish farmers (about 60-90% of total cost of grow-out systems), the development and transfer of sustainable and affordable feeds and feed strategies for small- and medium-scale aquaculture in Asia and Africa is a major focus of AquaFish research. AquaFish has successfully developed solutions on alternative feeding strategies and feed sources that decrease production costs, reduce reliance on expensive feeds, increase overall fish yield, and decrease environmental impacts associated with aquaculture effluents.

Feed Reduction Strategies

The high cost and variability of commercial fish feeds remains a barrier to the profitability of aquaculture operations and is exacerbated by the common practice of overfeeding. Through groundbreaking research on alternative feeding strategies, AquaFish has enabled fish producers to significantly reduce feeds without compromising production.

Alternative Feed Ingredients

Quality fish feeds are critical for optimal fish growth and production; however, commercial fish feeds are often expensive, lack reliable ingredients, and often are not environmentally sustainable as they commonly contain fishmeal as the main protein source. AquaFish research on alternative protein sources in feeds is resulting in low-cost, alternative feeds.

Alternate-day Feeding in Bangladesh and the Philippines

AquaFish research by Central Luzon State University in the Philippines found that feeding tilapia on alternate days was effective at producing tilapia at similar yields as if fed at a full daily ration. Trials conducted on six farms found that fish on this reduced feeding strategy consumed almost 60% less feed, showed a 100% improvement in feed efficiency, and had no appreciable loss in specific growth rate or gross yield relative to fish fed a full ration level.



Technology Transfer

- In the Philippines, over 100 tilapia growers, feed manufacturers, academics, and government officials were trained.
- Studies in Bangladesh replicated the Philippines alternate day feeding experiments and built on this work by incorporating a polyculture system with tilapia and major Indian carps.
- Research on alternative day feeding is now underway in Tanzania, which can help transfer this technology to partners in Africa.



Periphyton Enhancement in Nepal

AquaFish research by the Agriculture and Forestry University in Nepal on enhancing periphyton growth in ponds with carp and small-indigenous species polyculture has shown increases in naturally-occurring food sources for fish that allows for a 50% reduction in feed use and an increased gross margin. Initial research findings are now being built upon to identify the best substrates on which to grow periphyton.



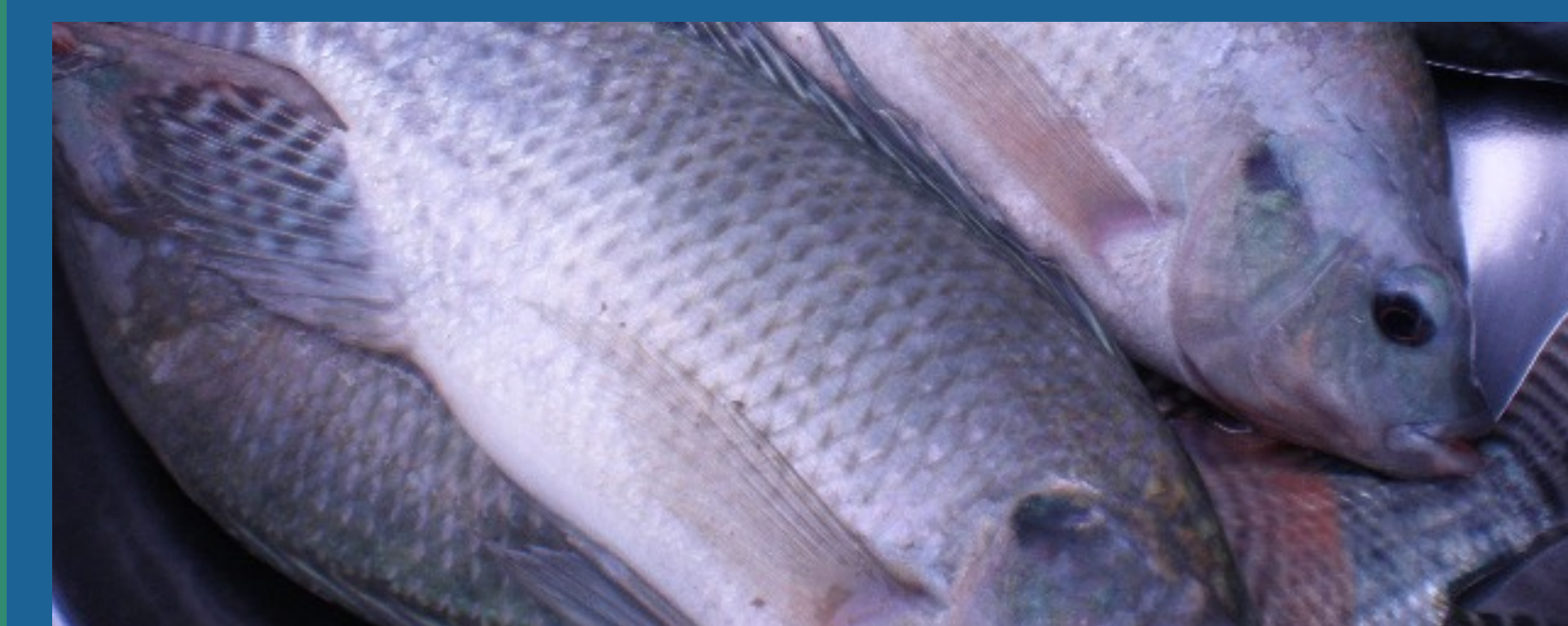
Technology Transfer

- Women's fish farmer groups in Chitwan and Nawalparasi have helped inform, while learning about best practices for reducing feeds through periphyton enhancement.
- Over 70 fish farmers have been engaged in this periphyton polyculture work, and their involvement is continuing into the next phase of research.



Invertebrates to Replace Fishmeal in Tanzania

At Sokoine University of Agriculture in Tanzania, AquaFish researchers explored housefly larvae (*Musca domestica*) and earthworms (*Lumbricus terrestris*) as replacement for fishmeal in feeds. The chemical composition of larvae, earthworms, and fishmeal were determined to develop alternative feed formulations. Researchers evaluated the growth performance, feed utilization, and cost effectiveness of nine feeds on Nile tilapia. Results produced a cost-effective feed composition for tilapia production, and further experiments are underway.



Technology Transfer

- An important goal of this research is to have the most cost effective, yet environmentally sustainable diets promoted and adopted by fish farmers and feed manufacturers.
- Researchers plan to train over 40 fish farmers on feed formulations using invertebrates.
- Four Masters students are earning aquaculture degrees and learning about alternative feeds through involvement in feeds experiments.



Soy Products in Snakehead Diet in Vietnam and Cambodia

At Can Tho University (CTU) in Vietnam, AquaFish researchers were able to reduce the amount of fishmeal in snakehead diets by including soy protein concentrate (SPC). Through feed experiments, they determined that fish feed can contain up to 40% SPC while retaining production levels and fish health. These findings have significant implications as creating a formulated feed with the inclusion of SPC reduces cost and decreases environmental impacts on local fisheries.



Technology Transfer

- In An Giang, Vietnam, 60 women snakehead farmers were trained on using formulated feeds and participated in on-farm trials.
- South-South collaboration between CTU in Vietnam and Inland Fisheries Research and Development Institute in Cambodia have resulted in transfer of knowledge and technologies on snakehead feeds.
- Results helped lift the ban on snakehead farming in Cambodia in 2016.



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