INNOVATIVE FISH FEEDS AND NUTRIENT INPUT SYSTEMS FOR SMALL-SCALE AQUACULTURE IN AFRICA AND ASIA


INTRODUCTION

The high cost and variable quality of fish feed remains a barrier to profitability of small-scale aquaculture operations, and is exacerbated by the common practice of overfeeding. While high-quality fish feeds are critical to optimal fish growth and production, feed ingredients such as fishmeal, soy, corn, and wheat are globally traded commodities vulnerable to price fluctuations that can negatively impact farmers. Feed costs account for the greatest production cost for farmers, comprising about 80% of total costs in growing systems. The AquaNut Innovations Lab has been researching feed formulations, ingredients, and feed strategies on semi-intensive fish farms in Africa and Asia in order to reduce production costs and maximize profit for small-scale farmers. Strategies under development include:

- Improved low-cost, alternative feeds that incorporate the use of locally produced, high quality protein sources.
- Polyculture techniques such as multiple-species cultivation with cage culture.
- Alternative input practices, such as reduced feeding regimes. These techniques increase access to quality feed ingredients, improve feed efficiency, increase profits for farmers, and increase the sustainability of small-scale aquaculture.

TANZANIA

Problem: Fish farmers in Tanzania are unable to obtain affordable high quality protein sources due to competition for feed sources from other agriculture sectors and from human consumption.

Research/Solution: Evaluate maggot and earworm meal as alternative protein sources in Nile tilapia (Oreochromis niloticus) diets.

The chemical composition of maggots (Musca domestica), earworms (Lambotrichas terrestris), and fish meal were determined for crude protein, fat, crude fiber, and ash. Based on results, nine feed formulations were developed using mixtures of fish meal, maggot meal, earworm meal, and corn seed cake. All formulations contained approximately 30% crude protein. A feeding experiment was conducted to evaluate the growth performance, feed utilization, and cost-efficiencies of the nine feeds on Nile tilapia. Data collection has been completed and analyses are underway.

GREENWATER TECHNOLOGY

- When carefully managed, an aquaculture pond will naturally produce food items for fish, directly reducing the need for supplemental feeding. This approach to optimizing pond production is referred to as “greenwater technology” because of the color of phytoplankton blooms in fishponds - an indication of the high level of productivity.
- AquaNut researchers found that farmers using greenwater technology in suitable locations can produce up to 1000 kilograms of fish per hectare per year. fish/ha/yr, with optimal feeding inputs. A culture operation that uses supplemental feeds in addition to greenwater technology can surpass farms that spend much more using only feed inputs above.

ALTERNATE FEEDING STRATEGIES

- AquaNut research on alternate-day feeding with Nile tilapia (Oreochromis niloticus) in the Philippines achieved FCRR’s class 1 and reduced feed costs by 40% while still producing similar fish.
- Building off of this early success, AquaNut researchers turned their attention to tillapia (Oreochromis niloticus), a very popular local fish species throughout Asia. Alternative feeding trials produced similar-size fish while achieving an FCRR of 2.25 and saving 33% on feed, compared to the daily-fed regime.
- This simple technology is easy to implement and requires very little training, making it an ideal option for small-scale farmers.

BANGLADISH

Problems: High costs and negative environmental impacts of common aquaculture practices.

Solution/Research: Use integrated aquaculture technologies to reduce costs and minimize environmental impacts.

- Shrimp/carp polyculture improve species freedom and farmers’ profitability, with minimal environmental impact.

NEPAL

Problem: Expensive feeds limit economic returns of fish farmers.

Solution/Research: The use of polyculture with small indigenous species (SIS), while also increasing periphyton growth.

Experiments are underway to test the success of polyculture with small indigenous species (SIS). Periphyton provides an additional source of food for carp and improves water quality. Comparisons of growth outcomes from carp culture, carp/SIS polyculture, and other polyculture systems with and without periphyton enhancement will help determine best practices for optimal growth, yield, and profitability for farmers.

Trials conducted in 12 earthen ponds at the Aquaculture and Fisheries Department Farm were completed in April of 2013. The two most successful treatments (Carp/SIS polyculture with 30% feeding and Carp/SIS polyculture with feeding) are being tested at 16 fish farms in the Chitwan district, and at 22 fish farms in the Nawalpur district.

The results of these on-farm trials will provide valuable data on the feasibility of this polyculture technology for application and transfer to fish farmers across the region to improve the economic performance of their aquaculture operations.