

# CRSP Helps Fish Farmers Lower Feed Costs In Tanzania

## Local Solutions Improve Profitability

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*"Availability of this locally sourced, low-cost feed will be a major step towards improving profitability of smallholder aquaculture enterprises*

*in Tanzania."*

— Dr. Kwamena Quagrainie, AquaFish  
CRSP researcher



Farmers learn to make pelleted fish feed at a 2011 CRSP hands-on training session using simple meat grinder production technology. The feed mix contains maize bran and *Moringa oleifera* leaf meal as the protein components, both affordable, locally available ingredients that farmers can easily obtain.

The government of Tanzania looks to aquaculture as a viable enterprise for poor smallholder farmers, who can provide their families with much needed protein and also earn income from the fish they sell locally. Since 2006, AquaFish CRSP and its predecessor - Aquaculture CRSP - have collaborated with the Tanzanian Fisheries and Aquaculture Development Division and researchers at Sokoine University of Agriculture to help strengthen the aquaculture sector. An obstacle blocking growth of aquaculture is the high cost of fish feeds, particularly the feeds with high protein. Fortunately, local forage trees offer a promising low-cost solution. CRSP researchers are currently developing an affordable feed formulation using the leaves of *Leucaena leucocephala* and *Moringa oleifera*.

Tanzanian farmers raise Nile tilapia in earthen ponds. They fertilize their ponds with manure and compostable leaves to stimulate growth of the plankton that supply tilapia with much of their food. But to improve production potential of the tilapia crop, farmers supplement this natural food with fish feed. For most small farmers, this feed consists of rice and maize bran, kitchen leftovers, and garden remains. Low in protein and other essential nutrients, these plant-based feeds are insufficient for promoting rapid growth of marketable fish.

Higher quality commercial feed formulated with fishmeal or soybean meal is in short supply in sub-Saharan Africa and is too expensive for the average Tanzanian farmer. Also, producing fishmeal from wild-caught and other fish raises significant environmental and food security issues.

Kajitanus Osewe, Deputy Director of Fisheries & Aquaculture in the Ministry and emeritus Aquaculture CRSP investigator, finds the affordability of nutritious feeds to be a major hindrance to the development of the Tanzanian aquaculture industry. As Osewe sums up the current situation, "There is limited formulated feed available to fish farmers, and they are also expensive, which is a disincentive to aquaculture growth."

*Leucaena* and *Moringa* were originally introduced as forage for cattle, sheep, and goats that graze on their edible parts as they roam freely in and around Tanzanian villages and towns. Now they are now well established as inexpensive, local sources for quality livestock forage in Tanzania's subsistence farming system. According to Sokoine University investigator Dr. Sebastian Chenyambuga, these shrubby trees are ideal for the country's dry, tropical climate. "*Leucaena leucocephala* and *Moringa oleifera* are deep rooted and can access soil water and nutrients that are out of reach of most crops and forage species, and this enables them to produce and retain high-quality green forage throughout the year," says Chenyambuga.

The CRSP team at Sokoine University has partnered with researchers at the University of Arkansas at Pine Bluff to develop an affordable tilapia feed formulation using the readily available forage leaves. The goal is a nutritious, protein-balanced diet that farmers can prepare themselves. Ongoing CRSP studies are focusing on dietary elements such as digestibility the leaf meal as well as growth performance and survival of fish fed on experimental feed formulations. Preliminary studies show that these leaf meals can lower feed costs when substituted for up to 50% of the soybean feed component. Of the two species, Moringa appears to have the best nutritional potential. In recent experimental feed trials, CRSP researchers at Sokoine University found that tilapia fed with a formulation of Moringa and sunflower leaf meals have a higher growth rate than with standard fish feed formulated with soybean meal.



*While a CRSP-supported MSc student at Sokoine University, Margareth Kibodya Mbwana helped with the laboratory analysis of Leucaena and Moringa leaf meals. In this particular test, she is determining their crude fiber content.*

Building capacity through training is also an integral part of the AquaFish CRSP and Aquaculture CRSP program in Tanzania. Since 2003, CRSP workshops in aquaculture basics have helped fish farmers improve their production and business management skills as well as profitability. The training focus is comprehensive covering an array of topics dealing with pond construction and management, fish reproductive control, fish feed and health management, record-keeping, and enterprise management. CRSP stresses a hands-on approach in its workshops and on-farm trials to ensure that farmers get practical experiences that they can directly apply to their operations.



*Tilapia farmers Ramadhanim, Abdallah, and Chamirunda stand in a newly constructed earthen pond with a composting crib in the background for holding the dry manure used as pond fertilizer. As CRSP cooperators in a 2009 on-farm trial, they helped CRSP researchers test the tilapia-catfish predation culture technique in their small-scale farm conditions to verify its success in improving yield while controlling tilapia overpopulation.*

To ensure that there is a network of aquaculture experts who can advise farmers, CRSP also supports graduate training. One of the CRSP student success stories is Margareth Kibodya Mbwana, who completed her MSc in Management of Natural Resources for Sustainable Agriculture at Sokoine University in 2011. Margareth is well on her way to realizing her professional goal to help build fish farming in Tanzania. In July 2011, she was selected as one of the two Tanzanian candidates to participate in CRSP's CAP (Certification of Aquaculture Professionals) intensive course held at Auburn University. As a trained technical advisor and role model for gender integration, Margareth will be an instrumental player in guiding both men and women producers in farm management and technology adoption.

Two CRSP-trained farmers, Amina Ramadhani and Abdallah Abdallah, embody the promise of a successful aquaculture sector. Fish farming is improving their livelihoods and the

nutritional status of their families. They now raise their own fish for food and generate a small income from fish sales. For 2010, Amina reported earnings of approximately 450,000/= Tanzanian Shillings ( $\approx$  280 USD). CRSP plans to enlist the help of farmer cooperators such as Amina and Abdallah to mentor fellow tilapia farmers in adopting the leaf meal feed innovation as well as other CRSP technologies.

The next phase of the sustainable feed project will see production of a formulated leaf meal feed by a pilot commercial operation to produce feed with locally grown leaf meals. As Dr. Kwamena Quagrainie of Purdue University, the US Lead investigator on the CRSP project, notes “Availability of this locally sourced, low-cost feed will be a major step towards improving profitability of smallholder aquaculture enterprises in Tanzania.”

*Standing on the bank of a CRSP-designed fish pond, Dr. Sebastian Chenyambuga (left) of Sokoine University discusses the benefits of CRSP training with fish farmers Abdallah Abdallah and Mrs Amina Ramadhani. Both farmers have improved their tilapia production by adopting CRSP pond construction techniques and production practices.*



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