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## SUCCESS STORY

### Invertebrates are a boon to aquaculture in Tanzania

By Caleb Price, Morgan Chow, Kat Goetting, and Hillary Egna

October 2015

#### **AquaFish researchers test alternative protein sources to help bring down cost of fish feeds**



Testing different substrates on the yield and protein composition of earthworms for use in fish feed.

Aquaculture in Tanzania has mostly been relegated to rural areas, where fish are grown in small ponds as a secondary activity for farmers wanting to supplement their income and diet. This type of small-scale aquaculture is often not economically sustainable due to a number of factors, including high production costs. Perhaps the most significant barrier to growth of the aquaculture industry in Tanzania is the high cost and relative scarcity of quality fish feed. There is competition between agriculture sectors for protein sources, such as fishmeal, that are necessary to produce quality feed. Consequently, high-quality fish feed is often hard to find and expensive when available.

Recognizing the bottleneck created for the growth of Tanzanian aquaculture by this widespread lack of quality feed, AquaFish Innovation Lab researchers at Sokoine University of Agriculture (SUA) in Morogoro, Tanzania, investigated the potential of invertebrates as an affordable alternative protein source for fish feeds. Specifically, two common invertebrates were studied — housefly larvae and earthworms — both of which are good candidates because of their relatively short life-cycles and high fecundity.

Scientists first tested the effects of different substrates on the yield and protein composition of the earthworms and maggots. They found that the type of substrate used affected the quality of protein produced, depending on the invertebrate. For earthworms, the highest quality protein was achieved using cow manure as the culture media, while chicken manure yielded the highest quality protein in housefly larvae.

The second objective of this research was to evaluate the growth performance of juvenile tilapia (*Oreochromis niloticus*) fed diets containing protein meal made from earthworms and housefly larvae. Researchers designed an experiment to test five treatments of formulated fish feed in a controlled grow-out trial, where each treatment diet contained an incremental level of crude protein derived from the two invertebrate meals. Fish were grown in controlled conditions in the wet laboratory at SUA for eight weeks.

Results of the grow out trial indicate that the fish fed diets containing between 25% and 35% housefly meal gained more weight compared to those fed a control diet. Diets containing housefly meal out-performed those made with earthworm meal, and feed conversion ratios were the best for fish fed the 35% diets — which were also the most cost-effective treatment for producing a unit of fish.

This investigation highlights the potential for producing and using locally sourced ingredients as low-cost alternatives to traditional sources of protein meal in fish feed production. Formulating fish feed using high quality protein from invertebrates can reduce overhead costs, improve the sustainability of smallholder aquaculture systems, and increase food security at the household level.

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