Adapting Best Management Practices for Enhancing the Profitability of Small-Scale Aquaculture in Ghana, Tanzania, and Kenya

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Project: Enhancing the Profitability of Small Aquaculture Farm Operations in Ghana, Kenya, and Tanzania

The growing aquaculture industry in sub-Saharan Africa has the potential to contribute to **development and food security** by providing jobs and a nutritious source of animal protein. However, further developing the aquaculture industry must be done responsibly. The adoption of best management practices (BMPs) can **help mitigate the need for prohibitive environmental regulations** on smallholder fish farms while also **maximizing profits.**

With USAID support, AquaFish used **three outreach and diffusion techniques** *to* promote **adoption of two target technologies** to increase effectiveness in small-scale aquaculture operations in Ghana, Tanzania, and Kenya from 2010-2014. The adoption of these technologies helps manage pond inputs and effluents, and results in increased **economic, environmental, and agronomic efficiencies** in fish production.

Partnering Institutions:

- Oregon State University (US) -- Lead Institution
- Purdue University (US)
- Virginia Tech (US)
- Kwame Nkrumah University of Science and Technology (Ghana)
- Ministry of Fisheries Development (Kenya)
- Ministry of Natural Resources and Tourism (Tanzania)
- Sokoine University of Agriculture (Tanzania)



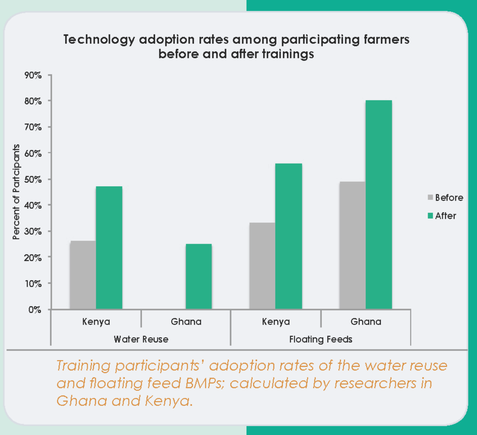



Target Technology

Effluent Management: Water Reuse

Improved effluent management practices include guidelines on pond operation, management of settling ponds and vegetation ditches, draining into wetlands, top-releases for partial drainage, and water reuse. Water reuse -- **holding or recirculation** -- provides <u>environmental benefits</u> including:

- Mitigated water scarcity issues
- Enhanced production efficiency via nutrient retention
- Increased profitability



Training participants' adoption rates of the water reuse and floating feed BMPs; calculated by researchers in Ghana and Kenya.

Water reuse in aquaculture also results in **improved water quality** in surrounding areas, as less nutrient-rich effluent is released into adjacent water bodies.

Nutrient Management: Floating Feeds

Using floating feeds instead of sinking feeds reduces the likelihood of over feeding, which saves on input costs and **increases farm profitability**. Researchers in Ghana and Kenya conducted profitability analyses, and found that if the floating feed technology is adopted, the average increase in household income would be:

Ghana = $767.00/year
Kenya = $728.49/year

<u>Benefits also include:</u>

- Reduced need for aeration
- Improved survival rates
- Reduced use of chemicals
- Better feed conversion ratio **(FCR = weight of feed fed/fish weight gain)**
- Better water quality

Predicted water pollution reduction if floating feed BMP is adopted in Ghana:

Water Quality Parameter	Predicted Reduction Under BMP
$PO4^{-3}$ Total Phosphates	0.73
Suspended Solids	78.48
Total Settleable Solids	496.45
Dissolved Inorganic Nitrogen (DIN)	-0.92
Total Dissolved Nitrogen (TDN)	2.75

Reduction in water pollution levels according to major water quality parameters in kg/ha/year, if the floating feed BMP is adopted in Ghana by 38% of farmers.

Outreach and Diffusion

More than **17,000** people reached

Central Media

Regional and national workshops targeting as many farmers as possible to expand first exposure to BMPs.

14 workshops were held in **three** countries with a total of **842** participants. These workshops taught **all aspects of pond management**, including pond construction and maintenance, business management, fish marketing and product development, economic benefits of BMPs, feeding strategies, and record keeping.

- **Five** workshops in Ghana (**545** trainees)
- **Five** workshops in Kenya (**172** trainees)
- **Four** workshops in Tanzania (**125** trainees)

BMP Demonstrations

On-farm demonstrations of BMPs.

Data from demonstration ponds was compared to data from ponds with 'regular' management techniques to provide with-versus-without comparison of the benefits and costs of BMP implementation.

- **Eight** demonstration farms in Ghana
- **Seven** demonstration farms in Kenya

Outreach materials such as **posters, leaflets, and radio broadcasts** in local languages, were used to educate the public and to promote BMPs

Lateral Diffusion

Development of networks through participation at workshops and on-farm demonstrations.

Farmers exposed and trained at workshops and demonstration sites constitute **nodes in a social network**. These farmers then spread information to other farmers, who also become nodes, propagating their own networks and laterally transmitting knowledge.

This method **increases the exposure to BMPs** and decreases the reliance on extension agents that may be under temporal or geographical limitations.





All photos are courtesy of the AquaFish Innovation Lab

The Feed the Future Innovation Lab for Collaborative Research on Aquaculture & Fisheries

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