

Assessment and Recommendations for Two Active and Potential Aquaculture Production in Rift Valley and Coast Provinces, Kenya

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Aquaculture Without Frontiers

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Kenya

- Long history of fish consumption
- Increase in demand due to
 - Increase in migration and commerce
- Increase in demand for high quality protein
- Annual fish production 180,000 metric tons (2003)
- Lake production on the decline
 - Degradation
 - Loss of habitat
 - Fishing pressure
- Prefer larger fish caught on the Uganda side
- Export larger ocean caught fish
 - Only small dried ocean fish available



Lake Victoria

- Largest lake in Africa
 - Chief reservoir of the Nile,
 - Mainly in Tanzania and Uganda
 - Bordering on Kenya
 - Among the freshwater lakes exceeded in size only by Lake Superior
 - 26,828 square miles
 - 200 species of fish
 - *Tilapia* is the most economically important

Kenyan Government

- Promotes aquaculture for consumption and profit
 - Health benefits
 - Poverty alleviation
 - Food security
 - Social well being



Development of Aquaculture... differs by region

- 1984- an experimental station was established
 - Eldoret University (formerly Moi University)
 - Funded to support the Aquaculture Collaborative Research Support Program
 - Several cooperatives developed to spread the aquaculture activities throughout the area.



Recent History

- In 2009- Kenyan Government provided funds to stimulate the country's economy.
- The Ministry of Fisheries Development (MFD) established the Fish Farming Enterprise Productivity Program (FFEPP).
 - To employ underemployed youths to construct fish ponds,
 - Construct hatcheries to provide participant farmers with seed stock



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- Government subsidize for new participants:
 - The labor for pond construction
 - Stocking of ponds,
 - Fish feed production,
 - Fish harvesting and marketing,
 - Provide training in fish farming.
- This program is popular and has had a positive impact.
- Several farmers show interest in starting or continuing with aquaculture
- There is demand for more fish production.

- The result of MFD 5.7 billion Ksh (\$490 million) investment in aquaculture is an additional 150,000 farmers throughout 160 constituencies have started culturing fish since 2009 [4].





Invitation to Assist

- Objective 1: To assess present activities and the potential for increasing aquaculture production in areas where protein deficiency will benefit from increased fish production.
- Activities: Visit two different sites to assess the areas for activities, potential and make recommendations.



Eldoret University

Funded in 1984 to develop fish station



University of Eldoret

- Several animal programs to support area agriculture
- Full support for Aquaculture program
- Operating fish station
 - Employ A Station Manager and Assistant Manager
 - Ample spring fed reservoir with gravity feed to ponds



Issues raised by staff

- Small size after 8-10 months of growth
 - Slow growth attributed to low night temperatures?

After conversations with staff and review of temp logs, it seemed unlikely to be the cause of such slow growth

We asked them to take us through a normal day....

Pond Management

- **Water quality:** Staff knew about plankton blooms and how important, but didn't know what to look for or how to establish. There was sporadic pH and O² testing done.



Pond Management

- **Fertilization:** Was done weekly with application of urea, ammonium phosphate, and chicken manure.
- This was costly and did not take into consideration need, water quality temperature or season.



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Pond Management

- **Stocking:** The staff knew the importance of stocking density, but lacked the importance of calculating the productivity of the pond and carrying capacity



Pond Management

- **Feeding:** The station makes their own feed of wheat bran, wheat flour and water which mixed prior to pelleting.
- We observed feeding. The staff fed a fixed amount of feed to each pond regardless of the pond size, fish size or density.
- The feed was very poor quality and crumbling consisting of around 70-80% fibrous powdery fines.

Pond Management

- **Harvesting:** The harvest method employed was seine fish out and put more in to make up for what you took out.
- Multiple partial harvests.



Pond Management

- **Breeding:** The fish station would supply “fingerlings” to local growers, however they were not strong in sexing fish and perhaps their ratio and management for adequate stocking was off.
- Hapas were used.



Fish Farmer Field Day

- There was a workshop planned while we were there attended by 47 existing and potential fish farmers.
- Several demonstrations were given
- Concerns:
 - Marketing
 - All male population
 - Better feed using local products
 - Better production



Out in the Field

- Met with Extension agents
- Viewed several ponds
- Talked to a few growers
- Visited feed co-op



Government assistance

- The Government through the FFEPP supplied “pelletized” feed at 26-37% protein to new growers, however...



Feed analysis...

- When feed was handled, it was very fine powder and when tasted was thought to have no fish meal or oil or any oil of any kind.
- On later testing in the US was found to have 13-16% protein.
- When we contacted the manufacturer, they would not talk to us or give us the formula for the feed.

- Observations:
- There is tremendous interest and opportunity to make fish available through pond production.
- The University of Eldoret has done an excellent job at making the station available for demonstration and practical applications.
- The staff and several farmers along with the area extension agent have a fairly good understanding of the principals of aquaculture.

However.....

- It appears technical aspects of site selection, good management practices, feed development and composition, pond management, water quality requirements, and species selection were insufficient.
- Lack of technical training is a major challenge to expansion of aquaculture in Kenya.

- Observations:
- There has been attempts in training Fisheries Officers (FO) as extension specialists at Moi University and Sagana CRSP from 1999-2000.
- Many FO were reassigned and replaced with those that did not have the same level of training. Farmers stated that some did not promote aquaculture due to lack of training
- There are eight important aquaculture demonstration training facilities
- The number of new producers are being inadequately served, especially in areas far from the training facilities that give varying information.
- What will happen when government subsidies are no longer available.

- Recommendations:
- There is a tremendous need for development and implementation of an in-depth, hands-on training program for farmers, and more importantly for extension personnel consisting of modules that include:
 - site selection
 - pond construction
 - water quality and management and
 - compost building
 - stocking
 - sexing



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- hatchery development and management
 - feed stuffs and supplemental feeds and feeding rate
 - pond management
 - harvesting
 - record keeping
 - marketing and sales
 - pond repair and restocking.
- There exists a need for further research into diversification into other fish species for pond culture.

- It is recommended that extensive culture using tilapia and catfish be stressed.
- Subsistence farmers use local fertilizers such as manure, local plant matter and kitchen waste to fertilize the ponds for plankton production.
- Ponds should be stocked with tilapia at a rate of 3 fingerlings per m² and utilization of supplemental feeds consisting of local plant material and insect larvae, where available.
- Natural spawning within the pond management scheme should be emphasized.
- 6 month production cycles should be emphasized with a full harvest every 6-7 months, a farmer with 6 ponds could harvest every month.

- Ponds could be constructed such that they empty from one into another to conserve inputs (fertilizer, plankton, and other nutrients) and water would be reused, water conservation being more important in arid and semi-arid regions.
- Natural spawning and fry management would allow re-stocking of fingerlings without the need for purchasing seedstock.
- A training program is essential for this area. It is believed that the interest is there for significant development.
- Regular in-service training and refresher courses for both fish station and extension personnel be offered.
- Train farmer Co-operative members, how to identify and source quality feed ingredients, procurement of ingredients, and appropriate methods for mixing, pelleting, drying, and storage of feed

Part Two: Coastal region of Kenya

- The Institute for Self Reliant Agriculture (SRA) a visit was made to the Koinjira for Kenya Center, Mnyenzi, Kenya
 - Koinjira for Kenya, a non-profit 501(c)3 community development organization activities include
 - school construction and classroom renovation,
 - education,
 - providing safe drinking water,
 - establishing scholarships,
 - training in micro-businesses,
 - providing health and nutrition education,
 - women's health services, and
 - assistance and training in agriculture and animal sciences

Koins for Kenya

- The community that covers 150 sq. mi. SRA provides funding and support in three principal areas;
- Animal husbandry of goats and chickens,
- Nutritional studies evaluating the link between increased protein intake (goat's milk) and health and school performance,
- Use of rotational gardens that are designed to minimize water evaporation.

Invitation to Assist

- **Objective 2:** To assess the potential for water retention systems that would serve to increased water availability, fish production and irrigation capacity in an area where water is very limited and protein deficiency is very prevalent.

Activities: SRA requested assistance to look at water issues for crop irrigation, and vegetable and protein production, and access to safe and sufficient drinking water.

- **It was decided to focus on irrigation and protein production implementing aquaculture.**







GONA WATER STORAGE TANK (50m³)



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Out in the Field...

Two farmers were visited in Gona B village, a small village near Mnyenzeni

- One of the strategic objectives of Phase II of the FFEPP is to harness rainwater at the household level to further enhance sustainable aquaculture.
- Both farmers had constructed small ponds next to their homes to catch rainwater from their rooftops to fill and maintain water levels in their ponds.

Mr. Chambuli

- Constructed two ponds next to each other, both approximately 25 m².
- Both ponds were lined with plastic liners and covered with water cabbage (*Pistia* sp.).
- The expense of the liners limits pond size, and therefore production.

Cultivated to slow evaporation?



- The water cabbage is cultured to minimize evaporation; however, light penetration was minimized prohibiting phytoplankton development, serving to reduce oxygen production.
- The fish raised in these ponds were very small and stunted.



Mr. Shabani

“Fish are too clever!”

- Mr. Shabani had built a small pond next to his home, also approximately 25 m².
- This pond was also covered with water cabbage, in addition to being shaded.
- There was little evidence of plankton.
- Following removal of the water cabbage, we harvested this pond.



Harvest of fish???

- Several passes were made through the pond with a mosquito net.
- The net neither reached the bottom, nor stretched from side to side.
- Approximately five fish were captured, averaging 1.0-1.5 g each.
- There was no evidence of larger fish.
- Mr. Shabani claimed to have harvested fish on a number of occasions for personal consumption.



Area for water retention...

- Several ponds where the clay soil was removed and the ponds were dug into the rocky shale-laden soil layer.
- This led to several wash-outs and inefficient use of dam height without the ability to capture or retain water level.
- Siting was adequate and suitable for capture of rainwater. The construction and construction materials were inadequate, leading to the failure.
- There were several examples of how NOT to build a pond

Other area potential



Observations and Recommendations

- The area has significant potential to capture rainwater and run-off in several of the valleys through pond/reservoir development.
- These reservoirs could then be linked in series to supply fish ponds with water and provide crop irrigation during the dry season when needed.

Recommendations...

- A presentation was given to the SRA group and Koins for Kenya personnel. After a few days of discussion and questions, the SRA group had gained a better understanding of the benefits of, and potential for aquaculture development in the area.







- It was recommended to SRA and Koins for Kenya to do a thorough life cycle-type assessment of proposed projects. Such an assessment can be used as a tool for getting community buy-in prior to initiating any large project.



- Large dam development was discouraged because of the environmental and community impacts such development brings.
- There is a need for an in-depth training program including all aspects of aquaculture and a well trained extension person to start aquaculture development in that area
- Need to identify a local champion to achieve sustainable extensive aquaculture programs in the area utilizing the natural strengths and resources of the people and land.

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Self Reliant Agriculture
Koins for Kenya



