



LESSONS LEARNED | 1706

Africa's Age of Aquarium: farming ornamental fish in the rainforests of West Africa to improve livelihoods of the poor

KEY LESSONS LEARNED

- Commercially sound and environmentally sustainable trade in non-timber forest products is a viable means of conserving rainforest ecosystems and sustaining traditional livelihoods.
- Ornamental aquaculture systems that make minimal modifications to streams and depend on natural nutrient cycles provide incentives for forest dwellers to conserve rivers and streams.
- Refining green aquaculture technologies goes hand in hand with grass roots organization to hone marketing skills and advocate conservation and the fair valuation of ornamental fish.
- Reduced mortality in shipments of ornamental fish to Western markets conserves fish in their ecosystems while multiplying the economic returns to local communities.

We are in the Lower Guinean rainforest of Cameroon; a dark canopy of green leaves shades a moist carpet of mosses and ferns below. We steam from the tropical heat; beating rain from towering white thunder clouds trickles down our necks before it disappears into streams. The water flows slowly, bubbling over long stretches of shallow riffles interrupted by deeper pools that merge to form wider, muddy rivers that meander to the Atlantic Ocean. Insects buzz continuously.

But in these streams hide attractive, marketable, freshwater fish! Due to the complex ecology of the river systems and the numerous different microhabitats, the fish species diversity here is high though fish abundance is low. Most of the rivers currently fished are overexploited and the foreign aquarium trade of these desirable little fish is dominated

by a few middlemen who reap 95% of the profit and have little stake, and less interest, in sustainable management. Capture techniques are crude; husbandry practices are weak; consequential mortality from capture to delivery is high; delivery times are unreliable; and species are often inaccurately identified. To be blunt, the trade has a poor reputation, stocks run the risk of collapse and, in particular, the local populations living around the rivers reap little profit from their enterprise.

A project has been carried out since mid 2002 by The WorldFish Center in partnership with a community service organization "Organisation pour l'Environnement et le Développement Durable" (OPED) to enable the fishers to take control of their business and to build a firm financial



More than 200 species of valuable ornamental fish live in the rivers of the Lower Guinean rainforest. Yet wasteful exploitation and callous shipping of ornamental fish — almost entirely for the profit of foreign middlemen — has seen 85% of the fish perish before reaching overseas markets. Such squandering of natural resources is clearly unsustainable. This project developed sustainable approaches for farming ornamental fish to improve livelihoods of poor communities.

footing. The project set several goals and objectives: improve techniques for capture and holding of fish to increase their survival; assist the local fishers to organize themselves into a cooperative whereby they could negotiate better prices from buyers; develop local management plans for rainforest rivers and sensitize local authorities regarding the monetary value of rainforest ecosystems to lobby for their protection.

The low natural abundance of fish and the status of infrastructure suggested that relying exclusively on exploitation of wild fish would never produce revenues sufficient to sustain rural livelihoods or justify responsible management. However, aquaculture of these ornamental fishes could be both a sustainable and profitable strategy. As culture outside of the rainforest environment would prove difficult, there would be an added incentive to protect the local brood stock in the rivers by implementing appropriate river management plans. The trade would also offer alternative employment to young men and women who might otherwise be tempted to live by slash-and-burn agriculture, illegal logging or to migrate from rural areas to the cities in search of work.

The project contributes in its own small way to improving the financial position of disadvantaged rural populations and towards Millennium Development Goal 7 - ensuring environmental sustainability by integrating the principles of sustainable development into policies and reversing the loss of environmental resources.

The goal is to take a disparate, inefficient, resource exploitative business and convert it into a profitable, local enterprise where the return on the investment of time and money goes back to the village population. As the financial value of the natural resource - the genetic diversity of natural fish brood stock - becomes clear, an incentive is created for appropriate management of the riverine ecosystems, to maintain the unique environmental characteristics that permit these species to survive, to reduce pollution from

pesticides and insecticides, and to reduce siltation caused by poor land management. The project applies a model that is based on a clear understanding of the relevant biological parameters through a progressive succession of sociological and economic interventions.

The project is on-going. However, the Lessons Learned at this stage are important and should be used to guide the development of similar projects that follow this model.

UNDERPIN THE BUSINESS WITH SOUND SCIENCE

The initial research into the ecology of the riverine ecosystems has been vital in determining the optimum strategies for fish capture, culture and husbandry. The river water is weakly acidic, pH between 5 and 6, conductivity 20–30 $\mu\text{S}/\text{cm}$, temperature 20–30°C; it is low in nutrients but high in tannin. This knowledge has proven essential in the design of the aquaculture enterprises.

ESTABLISH PARTNERSHIPS

Never underestimate the power of a partnership or the rewards that come from a committed, long term involvement with a local community. These are key steps for achieving successful outcomes.

LAUNCH TECHNOLOGICAL INNOVATIONS

- Training courses led by the fishers with guidance from OPED and scientists were successful in teaching fish handling, transport and holding techniques.
- Small-scale revolving loan schemes were successful in facilitating construction of 'pond' aquaculture stations within the river as fish holding stations.
- Working with nature to modify the local environment rather than to build new facilities was both cost-effective and improved fish survival.

- Fish that were fed a maintenance diet manufactured from locally available agricultural by-products showed improved quality and survival.
- Additional nutrient input from feeding led to increased fish biomass in the adjacent river waters outside the holding areas.
- Discipline in recording fish catch, numbers held, and mortality was hugely beneficial in determining cause of mortality within the chain from fisher to exporter and provided sufficiently robust catch per unit effort (CPUE) data to ensure that the fishery is presently sustainable. Hence, a monitoring system was developed without the need for extra financing or government intervention.
- The establishment of a center with aquaria and aeration to serve as a staging point for holding and packaging fish prior to shipment caused a quantum leap in efficiency and fish quality. Rather than travelling twice, once to place an order and then returning when the fish had been caught, the buyer could select his product and depart within the day, saving time and money. Fish survival rates rose from 20% to 90%.

ESTABLISH COOPERATIVES

Although the fishers of the region were initially suspicious of their competitors, patience and external assistance was rewarded with the formation of a community group that could act as an intermediary between individual fishers and external buyers, and negotiate higher fish supply prices. In addition to organizing sales, the group established a community development fund to channel a percentage of profits into village projects.

UNDERSTAND THE LOCAL ECONOMIC PSYCHOLOGY

While the profits from new orders rose dramatically, the upwardly revised prices caused many buyers to seek supplies from other fishers although the higher quality products, improved fish survival and reduced time requirements more than justified the higher asking prices.

INTEGRATE TECHNOLOGY WITH SOUND BUSINESS PLANNING

The establishment of alternative business practices requires an understanding of both market economics and local psychology. The running of the aquaria and holding facility is only economically feasible if the volume of trade is sufficient to cover all the operating costs. Initially the export market proved difficult to penetrate due to the poor reputation of exporters and insufficient knowledge of international importers. It is, therefore, necessary to develop local markets and facilitate access to the international market as integral parts of this development paradigm.

ONE SUCCESS LEADS TO ANOTHER

As the number of people advocating clean, clear rivers for their ornamental fish increases, so do the benefits that flow downstream to all the 8 million people living in the Lower Guinean rainforest that depend upon river ecosystems for their livelihoods.

DESIGN FOR SCALE AND REPLICATION

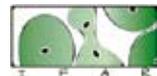
The substantial market for unusual, decorative fish species generates opportunities for the increase in volume, number of species and number of people involved. The Central African rainforest covers 1.9 million square kilometres with a resident population of 20 million people who face the same constraints and opportunities found in Cameroon. All would benefit from sustainable river management and some could benefit from opportunities in aquaculture and the trade in aquarium fish.

FUTURE RESEARCH

Rainforest resources are put to a wide range of uses, some of which are more sustainable than others, and many represent competing interests. Building upon the lessons learnt so far, WorldFish is currently working on identifying threats to the integrity of rainforest river ecosystems and developing alternative management strategies to ensure that the resource will be available for future generations of Central Africans.

WorldFish Lessons Learned briefs are executive summaries of research projects with particular focus on lessons learned. These briefs play a role in knowledge management and sharing.

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