

provided with a notebook to keep records of inputs and outputs. Out of 21 farmers, 12 farmers chose Nile tilapia for culture while nine chose carps. Farmers were allowed to harvest fish whenever they wanted but were asked to keep all the records of consumption and sales. It was recommended that farmers raise their fish on low cost production methods in green water system using locally available on-farm supplementary feeds and kitchen wastes. Final harvest of the remaining fish was done after about eight months.

Results

Results of the pilot project are shown in Table 1. Although small in volume, carp culture is well established in Nepal but Nile tilapia is a new species for farmers. However, more people chose to culture Nile tilapia, but they constructed smaller ponds probably because they wanted to test it first in smaller ponds. Due to this, total production, consumption and income from tilapia are lower as compared to carps. Nevertheless, extrapolated yield or the productivity (t/ha/yr) was higher from tilapia. Fig. 1 shows that fish production, consumption and sales peaked at about the 350 m² pond size and the relationship shows that these might decrease if the size of the ponds is bigger. It indicates that as the pond gets bigger, farmers lack inputs/resources to support it. It suggests that pond size should not exceed 350 m² for the resource poor farmers. By looking at the relationship, it can be suggested that a pond of 175-300 m² should be recommended which would produce about 50-90 kg of fish out of which 20-35 kg would be for family consumption and 30-50 kg for sale which would generate 30-60 US\$ income in a year that could contribute 10-20% of the income required to rise above the widely accepted 1US\$ per day threshold.

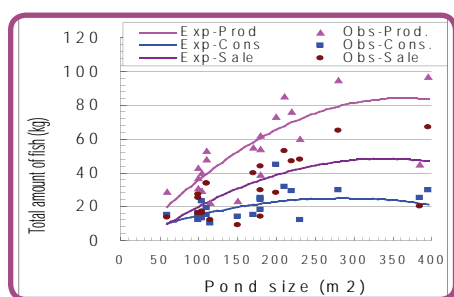


Fig. 1: Relationship of pond size with fish production, consumption and sale.

Table 1: Outcomes of the pilot project Phase I.

Descriptions	Carps	Nile tilapia
No. of farmers	9	12
Size of the ponds (sq.m.)	234	131
Fish production (kg/family/crop)	66	42
Fish production (kg/family/year)	99	63
Productivity (t/ha/yr)	4.2	4.8
Fish consumption (kg/family)	25	17
Total value of fish produced (US\$)	75	37
Income from fish sold (US\$)	47	22
Contribution to poverty reduction (%) ^a	20	10

Table 1: Outcomes of the pilot project Phase I. Note: ^a Per cent contribution to the income required to be above the poverty benchmark of 1US\$ a day assuming that the fish pond was managed by one female member of the family.

Impacts and Implications

The pilot project proved that direct aquaculture intervention is possible. Women can manage small ponds (small-scale aquaculture) that seem to be suited to them. In contrast to the previous notion that prevailed in the country, it has provided evidence for Nepalese policy makers and others that fish can be cultured economically in small ponds. However, it has been perceived that selection of target family/group and the site is critical.

Although the project was small, it has large impacts. Thirteen neighbouring farmers constructed ponds next to the project farmers before the end of the first phase of the project. After evaluating the outcomes and impacts of the first phase, the WDP-German committee extended another two-year phase to expand the activities in the same district as well as an adjacent district i.e. Nawalparasi, adding another 53 women farmers. In this phase, fish culture was integrated with vegetable gardening.

In continuation, the Canadian Cooperation Office (CCO) provided funds for another 60 farmers to add to these groups and establish cooperatives so that they could continue or expand their activities including establishment of small businesses even after the project period ends.

The project has been considered one of the most successful projects in Nepal. The project site has been a popular place to visit by farmers and officials of many government and non-government organizations. More importantly, the outcome of the project has impacts on policy formulation by the government. The Directorate of Fisheries Development Division, under Ministry of Agriculture, Government of Nepal and the Fisheries Division of Nepal Agriculture Research Council (NARC) have accepted the model and have promoted the idea throughout the country.

At the same time, this has also impacted on the activities of the local and international NGOs. For example, using the same idea, World Bank through Winrock international has supported about 650 families to construct ponds in western Terai and another 600 ponds are going to be added in the same region. Plan international, which is one of the largest NGOs in Nepal, is also planning to support about 1,000 families using the same model in central Terai. It has been felt that due to the political change, all the stakeholders are under pressure to work together to demonstrate the impacts/results. If everything goes well, aquaculture development in Nepal is likely to take off and hopefully the sector will be more visible in terms of contribution to food security, employment creation and the country's economic development.

Aquaculture without Frontiers (AwF): voluntary services for the poor in developing countries

Michael New, OBE - Chairman, Aquaculture without Frontiers, www.aquaculturewithoutfrontiers.org

AwF operates by supplying voluntary technical advice and other resources that support responsible and sustainable aquaculture practices that have the potential to alleviate poverty and improve health through the provision of 'home-grown' food and income generation. AwF recognizes the role that women play in aquaculture and related activities and targets 'grass root' farmers. It is committed to being culturally sensitive and non-discriminatory and non-aligned in religion and politics. AwF, where appropriate, cooperates with other organisations with complementary aims.

Many people from the aquaculture sector have proved willing to offer their time, free, for field work or to provide technical advice by email, to serve the aims of AwF. The volunteer database already includes over 130 experts, with a wide range of technical expertise and language proficiency. In addition a number of students have volunteered for field work. Originally, a large proportion of the funds for the work of AwF came from individuals and organisations within the aquaculture sector, including the Fish Culture Section of the American Fisheries Society, the Aquacultural Engineering Society and three chapters of the World Aquaculture Society (WAS). We have been particularly pleased by the fund-raising activities of aquaculture students in the USA and Europe. Several supporters from the aquaculture industry are also gratefully acknowledged.

In addition, there is an encouraging tendency for the general public to support our work. For example, substantial funds have been raised through such diverse activities as sponsored dragon boat racing and an art exhibition.

AwF operates on a shoe-string with no paid staff and no home office; it is managed by directors from Australia, the USA and the UK. While such administrative frugality may be commendable for a new organization, moving to a higher level of activity will be

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impossible without enhanced fund-raising and a staffed home office. Project proposals that are submitted to AwF are examined by a Technical Advisory Group that includes Dr. David Little of the Institute of Aquaculture. India became the first country to have an AwF field project, which is being coordinated by AwF volunteer M.C. Nandeesh as a cooperative activity with St. Xavier's Bishramganj, near Agartala in Tripura. In the first phase thirty farmers and their wives were trained in fish culture. Utilizing the knowledge gained they renovated existing ponds, previously used mainly for water storage and the capture of wild fish, using proper aquaculture practices. Popular carp species along with some of the self recruiting species were introduced to ensure the sustainability of the activity. Farmers were encouraged to use locally available feed resources and the integration of fish ponds with other agricultural activities was encouraged. These activities have been extended to 50 families in the second phase of the project (2006).



Trainees being instructed by Tamanna Khatun on simple cage construction. (Photo courtesy Tamanna Khatun)

AwF has two on-going projects in Bangladesh. The first, in conjunction with Caritas-Bangladesh, involves the empowerment of women in integrated aquaculture (carp culture in ponds); fourteen women and their ponds are involved. The second project is a joint activity with another local NGO, the Voluntary Organization for Social Development. Again, the focus is women in aquaculture: our overall goal is the introduction of low-cost cage culture technology, using monosex Nile tilapia to thirty-five poor women to improve their nutritional status and livelihoods.



The men catch the fish and mother scales it for the family meal (Photo courtesy M.C. Nandeesh)

Although disaster relief is not our primary activity, AwF was asked to become involved by WAS in administering its YSI-funded relief funds for Aceh. Several projects implemented

by the Directorate of Aquaculture have been supported, including pilot tambak rehabilitation work, the restoration of two small shrimp hatcheries, and the introduction of seaweed culture. In addition, AwF has also been providing technical assistance to two other NGOs working in Aceh - Professionals International and MercyCorps. On-site advice has been provided by AwF volunteer (and now AwF Director) Kevin Fitzsimmons, while email advice has been provided by another AwF volunteer, Dallas Alston. Using funds provided by the LACC Chapter of WAS, AwF has also been able to provide some relief to a group of Indian shrimp farmers who suffered in the tsunami.

The European Aquaculture Society has provided funds to support student volunteers from European universities. The first grant was made to a Kenyan postgraduate student at the University of Wageningen; AwF co-funded (with Nutreco) a study to explore the potential for creating a hatchery to supply fish fry for aquaculture and restocking purposes in the Lake Naivasha area.

AwF Director Geoff Allan is currently working with World Vision Thailand (WVT) and the Department of Fisheries to provide AwF support to an expansion of WVT's earlier aquaculture training programme in the impoverished NE of Thailand. AwF volunteers have also provided email advice to a number of individuals and organisations in various countries, including Colombia and Peru.

Since AwF was formed in 2004, steady progress has been made and project activities have been commenced in several countries. It is clear that the concept behind the formation of AwF was sound; that there is a real need for the assistance that we can provide; that scientists and others in the aquaculture sector are keen to provide their experience on a voluntary basis, both in the field and through communications; and that the aquaculture sector is supportive, both morally and financially.

Individual, aquaculture society, and corporate donations have been received and it has been shown that the general public will support AwF, if individual supporters are willing to devote time and energy to organize fund-raising activities; such work needs expansion worldwide.

AwF Directors are currently considering the medium- and long-term future of AwF. In theory, activities could continue at the present level indefinitely if the work-load can be shared amongst the Directors and Foundation Members. However, scaling AwF up to address the needs that have been identified, and enabling full utilization of the voluntary services that are being offered to its cause, would demand a different management structure. Among the possibilities being considered are synergetic linkages with other international organisations dedicated to advancing responsible aquaculture.

A review of the sea lice bath treatment dispersion in Scotland

Dr Trevor Telfer and Dr Richard Corner, Environment Group



Enclosure for sea lice treatment

Therapeutants are key to combatting disease and its spread in aquaculture. This is of no less importance in reducing transmission and damage done by sea lice in salmon cages. In Scotland only two therapeutants against marine ectoparasite infestation are commonly used with salmon farms, one is an "infeed" (SLICE) and the other a bath treatment (EXCIS). SLICE is an "infeed" treatment which is preferentially used by the salmon farming industry because it is convenient and highly effective. EXCIS (active ingredient cypermethrin) is a bath treatment often used as an alternative or an accompaniment to SLICE to prevent overdependency.