

Aquaculture and resilience: Women in aquaculture in Nepal

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Abstract

Farming-based rural livelihoods are becoming increasingly vulnerable to the effects of global climate change and sudden and profound changes in social and economic systems. Diversification of livelihood options is believed to be vital to maintaining ecosystem resilience and building social systems resilience. Integrated agriculture-aquaculture (IAA) farming systems, considered among the promising options for small-scale farming households in China and Vietnam, are likely to be relevant in the context of mixed crop-livestock farming systems elsewhere as well. An adaptive research project carried out involving women members of ethnic *Tharu*, *Darai*, *Bote* and *Gurung* communities in Chitwan and Nawalparasi districts in Nepal between 2000 and 2007 evaluated the role of farm pond in diversifying livelihoods and reducing vulnerability. A newly introduced aquaculture sub-system complemented well with the existing mixed crop-livestock systems by virtue of increased synergistic relationships among the three sub-systems. Food and nutrition security of the participating households increased due primarily to a notable rise in quantity and frequency of fish consumption. In addition, household incomes were augmented through the sale of surplus fish. Development of Community Fish Production and Marketing Cooperatives exclusively owned and managed by the women themselves helped in women's empowerment through their improved access to and control over resources and increased roles in decision-making at both household and community levels. The study strongly suggests that IAA farming households are likely to be more resilient in coping with ecological, social and economic perturbations than their counterparts practicing traditional mixed crop-livestock farming.

Keywords: Fish; Integrated agriculture-aquaculture (IAA); Livelihoods; Resilience; Nepal

1. Introduction

Rural livelihoods in Asia are becoming increasingly vulnerable to the effects of global climate change and changes in social and economic systems. This is attributed to growing incidences of one or more types of "shocks", namely physical, biological, economic, social and policy-related (Resilience Alliance, 2007; 2010). In Nepal, common effects of global climate change - melting of glaciers at a rapid rate, uneven distribution of monsoonal rainfall, and increasing incidences of floods and droughts - have become phenomenal in recent decades. Consequently, adaptive capacity of semi-subsistence crop-livestock-based rural livelihoods in the country is believed to be declining. The landless, socially marginalized, ethnic minorities and those living in disaster-prone areas are among the most vulnerable sections of communities (Beveridge and Phillips, 2010) due to limited livelihood opportunities available to them.

Diversification of livelihood options is vital to maintaining ecosystem resilience and building social systems resilience. Integrated agriculture-aquaculture (IAA) farming systems, which is considered among the promising options for small-scale farming households in China and Vietnam for ages, is likely to be relevant in the context of mixed crop-livestock farming systems elsewhere as well (Pant et al., 2005). The role of IAA systems in household food and nutrition security, income generation and empowerment of women and marginalized communities has been increasingly appreciated in recent decades in a number of countries of Asia and Africa. Adaptive capacity of traditional small-scale mixed crop-livestock farming communities in a relatively poor resource-base context in Nepal can also be improved through the introduction of an aquaculture sub-system. It is believed to be effective in increasing local fish supply and diversifying livelihood options of small-holder farmers in Terai (southern plains) and mid-hill valleys, thereby also increasing resilience of rural livelihoods.

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An adaptive research, namely “Women in Aquaculture in Nepal” involving women members of ethnic *Tharu*, *Darai* and *Bote* - traditional fishing communities - was carried out in Chitwan and Nawalparasi districts in Nepal between 2000 and 2007, with the objective of diversifying livelihood options of these ethnic minorities. The project was jointly implemented by Institute of Agriculture and Animal Science (IAAS), Nepal, Asian Institute of Technology (AIT), Thailand, and Rural Integrated Development Society-Nepal (RIDS-Nepal), a local NGO. The project, considering social, economic, ecological and institutional aspects, has successfully developed a model for small-scale aquaculture development in Nepal, which is described in a separate paper (Shrestha et al., 2009) in this volume. In this paper, based on a survey carried out with the project households in Chitwan in January 2009, we present the key processes of aquaculture development and women’s empowerment side by side, and discuss how aquaculture sub- system complemented with existing rural livelihoods of ethnic minority communities and contributed towards building them resilient.

2. Declining fisheries: Aquaculture as a safety net

Semi-subsistence farming was essentially the only source of livelihood of the majority of the project households. The farming systems were characterized by cultivation of crops, paddy, wheat and maize in particular, in multiple cropping systems; and raising of a few heads of livestock, namely cattle, buffaloes and goats. Most of the households also raised a few scavenging chickens/ducks.

Household food sufficiency from on-farm sources, one of the major indicators of social well-being in rural Nepal, ranged between 3 and 12 months, with an average of 11.5 months (Standard deviation: 1.9), reflecting a situation where some of the households are required to augment their family incomes through alternative sources for their sustenance. Off-farm works such as unskilled/semi-skilled labor contributed significantly to the household income of a notable number of families.

Whilst most of the project households belonged to traditional fishing communities, fish captured from local water bodies had contributed significantly to their food and nutrition security in the past. Besides, some of the households had also augmented their incomes through selling their catches that were surplus over household consumption. Most of the households used to go for fishing when the agricultural activities were slack. Drying and storing of surplus fish over fresh consumption was common among these communities. Treating guests with a meal without fish or meat is rather uncommon in these communities. Family deities are offered with the preparations made from fresh or preserved fish on special occasions (personal communication - Mr. Jiyan Chaudhary).

However, there has been a sharp decline in natural fish stock over time due essentially to increased fishing pressure. Declining availability of natural fish among the traditional fishing communities has negative implication not only for food and nutrition security but also for their cultural and social values. Whilst reducing exposure and sensitivity, and increasing adaptive capacity (Beveridge, 2009) to cope with socio-economic and environmental perturbations are key to increasing resilience, rationale for the introduction of aquaculture was to reduce the dependence of these communities on ever-declining capture fisheries and at the same time to ensure sustainable supply of fish for family consumption as well as to augment household income from the sale of surplus. Besides, aquaculture development in the area was also believed to have positive impact on local aquatic resources by reducing fishing pressure.

3. Small-scale aquaculture development: Key processes

The project interventions were centered around two key areas - one was development of sustainable aquaculture aimed at improving food and nutrition security and augmenting household income, and the other empowerment of women through organizing them in cooperative owned and managed by themselves. The project followed a systematic process in both the interventions which we summarize in this section of the paper.

3.1. Sustainable aquaculture development

Unlike crop and livestock production, indigenous technical knowledge on aquaculture is virtually inexistent due essentially to its being a relatively new farming activity in many areas. Therefore, integration of aquaculture, particularly in small-scale farming systems, requires a systematic process (Pant et al., 2004 and 2005) as any perturbation in the initial years may even lead to the abandonment of aquaculture practice. Considering this, the project judiciously emphasized on introduction of backyard pond aquaculture during the first phase (2000-2002); its integration with livestock and horticultural enterprises in the second phase (2003- 2005); and intensification of fish production system through development of freshwater prawn-fish integrated systems in the third phase (2005 -2007).

Although most of the project households belonged to traditional fishing communities making their living partially from capture fisheries, none of them had experience in culturing fish. Converting a paddy plot into a pond was a crucial turning point for the participating households to transform their livelihood from crop- livestock-based to ones based on IAA during the first phase. Excavation of ponds was carried out by using family labor force but a partial subsidy covering 50% of labor costs was provided to ease the transition. Size of pond, which ranged between 59 and 300 m², with an average of 234 m² in the initial years, largely depended on land availability, size of family labor force, and willingness of the households to convert their lands into ponds (Bhujel et al., 2008). However, farmers continued expanding their ponds, resulting in an average size of 314 m² (range: 33-3,019 m²) by the end of the third phase (2005 - 2007). Besides, spillover effects of the project have been quite impressive as over a dozen of relatively better-off farmers in the area have also started fish culture at Small and Medium Enterprise (SME) level in recent years, which would inevitably contribute towards ever-growing fish demand in the area. The project households were provided with a series of practical trainings on pond construction, stocking, feeding and water quality management, harvesting and post-harvest handling, and maintaining farm records during the project period.

Integration of aquaculture with crop and livestock enterprises was the focus of the second phase (2003-2005). A farm pond in crop-livestock-based farming systems in rainfed areas plays a central role in increasing food security and diversifying livelihood options. In resource-poor areas, it is not only meant for fish culture, but it also serves as a reservoir for irrigation to crops in the pond dykes and adjacent farm plots. Benefits of aquaculture in the area were adequately realized through increased fish consumption and supplemental income from the sale of surplus. In the third phase (2005-2007), integration of freshwater prawn with fish resulted in further increased efficiency of aquaculture as the farmers realized additional returns from prawn without compromising fish yields. Aquaculture sub-system complemented well with their existing farming systems.

3.2. Empowerment of women through organizing them in cooperative

Women's empowerment through developing and strengthening farmers' organization was key focus of the project throughout. Therefore, concurrent to aquaculture intervention, savings groups involving women members of the households were formed in the initial years, which later developed into a full-fledged cooperative by the sixth year. During the first phase, all the members organized themselves in savings groups in which each of them saved a small amount on a monthly basis. They were registered as aquaculture farmers' groups with Agriculture and Cooperative Office at the district level during the second phase. They continued increasing their monthly savings, corresponding to increase in returns from aquaculture. In 2006, the women's groups were developed into a full-fledged women fish farming cooperative exclusively owned and operated by the women themselves.

Initially, a total of 63 women farmers were embraced by the cooperative. The project provided a sum of NRs 200,000 (1 US\$ = NRs 72) as seed money, while the members deposited NRs 183,000 of their savings as share (a total of 183 shares). The cooperative has been providing loan to its members at the interest rate of 12% for a maximum of six months per loan cycle. Members can apply for loan equivalent to a maximum of 20 times of their share in the cooperative. As of May 2010, over NRs 400,000 was disbursed - mostly for aquaculture and no defaulters have been reported so far.

4. Increasing resilience of rural livelihoods: Can aquaculture help?

The project households reported a range of benefits related to livelihood resilience that they realized from fish farming (Table 1). The major one was improved household food and nutrition security. In the past, cash expenses on meat or fish items were high as they had to buy these from market. However, expenditure on these items has reduced substantially in recent years due essentially to the availability of fish in their own ponds. In addition, fish culture has been a good source of household income. Returns from fish were reported higher compared to other enterprises. Yet, labor requirement was substantially lower and the practice was considered rather easy. Institutional development and women's empowerment were indirect benefits realized (Fig. 1). The role of aquaculture in improving household food and nutrition security, augmenting household income and empowering women is described below, along with its contribution towards increasing resilience of rural livelihoods.

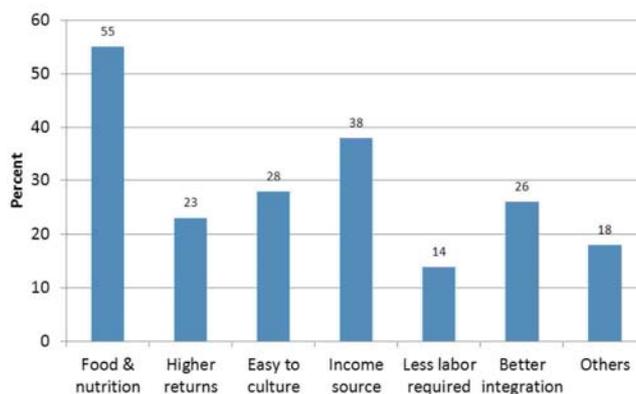


Fig. 1. Households' responses on benefits of fish culture in Kathar, Chitwan (n=98). Rounding number exceeds 98 due to multiple responses. Source: Household survey, 2009

4.1. Increased food and nutrient security

A notable improvement in household food and nutrition security was evident among the project households. Per caput fish consumption was estimated at 11 kg (range: 0.5-42.5 kg), which was over 7 times higher than the national average of 1.5 kg (FAO, 2010). In the initial years (2001-2002), average per capita fish consumption among the same communities was estimated at 3 kg (Bhujel et al., 2008), which increased steadily reaching 11 kg in 2009 (Table 1). Such an increase in fish consumption was associated with the corresponding increase in fish production over time due to increase in productivity as well as expansion of pond areas by the majority of the households.

Even in small quantities, fish can have a significant positive nutritional impact by providing essential amino acids that are often present in vegetable-based diets but in low quantities. Clearly, as opposed to very low national average in Nepal, per caput fish consumption among the project households was estimated to be close to the same in Bangladesh - one of the top 10 food fish producing countries. Frequency of fish consumption by the project households was estimated at over 6 times per month. In a situation where the majority of the project households were practicing semi-subsistence farming, their frequent consumption of fish - an expensive food item - has been possible only due to its on-farm production, confirming the pivotal role of aquaculture in improving household food and nutrition security.

Table 1
Fish production, consumption and sales in Kathar, Chitwan (n = 98)

	Mean	Standard deviation	Median	Minimum	Maximum
Pond area (m ²)	314.0	395.0	198.0	33.0	3019.0
Fish production(kg/year)	114.0	105.0	80.0	10.0	550.0
Fish consumption:					
Household (kg)	58.0	49.0	50.0	7.0	200.0
Per caput (kg)	11.0	9.7	6.8	0.5	42.5
Frequency (times/month)	6.5	5.4	4.0	2.0	16.0
Income (US\$)	103.0	185.0	51.0	7.0	430.0

Source: Household survey, 2009

4.2. Increased income

Aquaculture played a vital role in augmenting household income right from the first year of project intervention. In the initial years, the project households used around 40% of the fish for household consumption and sold the remaining 60% (Bhujel et al., 2008). In recent years, however, they were using around 50% of the total production for household consumption. An average income from selling surplus fish over household consumption in the initial years was estimated at US\$ 47, which increased steadily over the years, reaching US\$ 103 in 2008. In addition to its significant contribution to household food and nutrition security, aquaculture has thus become a viable source to augment household income (Table 1).

Income from fish sale was used for a wide range of purposes (Fig. 2). Purchasing food and household merchandises and re-investing in aquaculture (pond expansion, seed and feed) were the major ones. Children's education (including school fees, books and stationeries, and school uniforms) was another important area where income from fish was being used. Besides, paying for health care expenses and repaying family loan were also reported by a number of households.

Essentially, all the project households were planning to continue fish farming. Whilst most of them had already expanded their pond area once, nearly a quarter of them were considering expanding it again in the years to come.

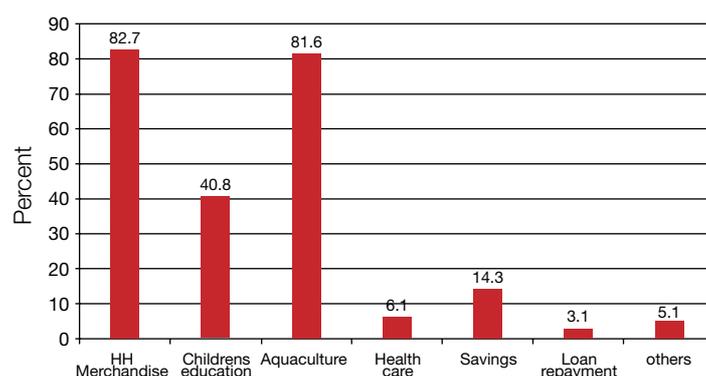


Fig. 2. Households' responses on use of income from fish sale in Kathar, Chitwan (n=98). Rounding number exceeds 98 due to multiple responses. Source: Household survey, 2009

4.3. Institutional development

Women fish farmers' improved access to resources and their increased role in household decision-making were noted as important outcomes of the project. Besides, organizing them through their own cooperative also contributed to their empowerment significantly. In over 40% of the households, farming decisions were made jointly by men and women, while it was exclusively men's domain in another 40%. Female members were the primary decision-makers in nearly a fifth of the households. These findings reflect that women were directly or indirectly involved in household decision-making in over 60% of the project households.

The majority of the women fish farming cooperative members have expanded the area of their ponds. Spillover effects of the project have also been impressive as over a dozen of relatively better-off households have voluntarily started SME-level fish farming in recent years, confirming a catalytic role of the cooperative in developing aquaculture enterprises in the area.

The cooperative was providing not only loans but also technical support to its members. It was coordinating in purchasing inputs, including seed and facilitating to schedule harvesting and marketing time. Moreover, increased participation of the cooperative members in a wide range of social activities was observed, reflecting the massive success of the endeavor - "empowering through organization". The role of the cooperative in addressing the problem of food security has been exemplary and secured a very good media coverage at local and national levels. The success of Women in Aquaculture project in Nepal in diversifying rural livelihoods and empowering women has been widely commended by governmental and non-governmental organizations both at national and international levels.

5. Conclusions

Upon the introduction of aquaculture sub-system, crop-livestock-based mixed farming systems of traditional ethnic communities, namely Tharu, Darai and Bote were turned into a more diversified IAA systems. Our work with these communities for over a period of a decade clearly demonstrated that IAA farming households are likely to be more resilient to cope with ecological, social and economic perturbations than their counterparts practicing traditional mixed crop-livestock farming. Increased capacity of IAA farming households to cope with social and economic stresses is attributed to such factors as improved food and nutrition security, increased household income and empowerment of women members who - after getting organized in a cooperative owned and managed by themselves - could enjoy improved access to and control over resources and increased decision-making role in the households and the community. Whilst the scope of this study was mainly to assess the role of aquaculture in social systems resilience, future research should focus on examining its role in agro-ecosystem resilience.

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