Impact Assessment of Some Selected AFGRP Funded Projects in Bangladesh

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Acknowledgements

Aquaculture and Fish Genetic Research Programme (AFGRP) projects in Bangladesh were diverse in nature and were able to cover a large number of target people all over the country. The main goal of such projects was to improve livelihood conditions of the rural poor through enhanced production of fish and thereby creating income-employment opportunities in fish production with proper management of renewable natural resource systems. The projects and research processes encouraged participation of a large number of stakeholders as follows:

- the individual fish farmers/households who received training & field experiences for developing their awareness & knowledge and technical skills & capabilities;
- local communities and their leaders by extending their good will and support;
- non-governmental organizations by their continuous field contacts and follow up monitoring;
- government officials at the field and policy-decision levels by their approval and guidance;
- academic people and researchers; and
- donors through their financial contributions and moral support.

Every one had a definite role to play and to contribute to achieve the goals of AFGRP-funded projects. During the field investigations, the study noted and found evidences of such role and contributions. Thus, every stakeholder deserves appreciations and thanks for their contributions in the AFGRP-funded projects in Bangladesh.

The sponsors of the study, AFGRP, DFID-UK and Bangladesh Fisheries Research Forum (BFRF) also deserve special thanks for their support and collaborations.

As coordinator of the three study teams- headed by (a) AM Hasnein Bin Tareque, Fisheries and Marine Resource Technology Discipline, Khulna University & four research associates for Seed Decentralization; (b) Dr Nesar Ahmed, Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh & four research associates for Self Recruiting Species (SRS); and (c) Dr Niamul Naser, Department of Zoology, Dhaka University & four research associates for Cage Culture also deserve my personal appreciation and thanks for their hard work and commitment to the cause of research and assessment. Dr Md Akhteruzzaman, Coordinator, BFRF had been the real moving stirrer behind the whole process of the study and thus deserves a very special thanks for his special role of shaking every one to work.

Thomas Costa, Ph.D.
Coordinator,
Impact Assessment of three AFGRP-funded projects in Bangladesh

The purpose of the assessment and outcome

The overall goal of this study-project was to assess socio-economic impact and sustainability of AFGRP-funded projects in Bangladesh. To achieve this goal, the specific objectives were:

- To determine whether the goals of these three projects are achieved during the project period.
- To assess how these projects contribute to fish-technology transfer and to improve livelihoods of the rural poor and thus contribute to the national goal of poverty reduction in the country.
- To assess the economic feasibility, social acceptance and socio-economic transformation of projects' farmers.
- To examine gender role and women involvement.
- To identify any environmental and technological impacts.

The assessment basically focused on understanding field impacts and continuity of such impacts at the farmers and their community levels on the basis of sampling. Thus, it is quite difficult to draw generalized conclusions. However, field observations and findings have critically been drawn for a clearer understanding. In general, findings are positive, except in some cases of Cage Culture. All three projects achieved their goals and contributed significantly to fish-technology transfer and to improve livelihoods of the rural poor. Social acceptance of the projects, including participation of women (except for Cage Culture in a limited way) at the farming and community levels were also found to be quite high. Environmental and technological impacts of all the three projects were observed to be favourable.

Study methodology

The following rapid assessment approaches have been employed for gathering indepth understanding and learning on the study projects:

1) Initial selection of study areas and contacts: Initially seven districts viz. Rangpur, Dinajpur, Natore, Jessore, Dhaka, Comilla and Barisal were selected; but because of time constraint and for more intensive investigations Dinajpur- Punchagar-Rangpur-Rajshahi areas was selected for field study where farmers adopted selected fisheries technologies. Initial contacts began with the projects' areas and their target groups (stakeholders, NGOs) were identified through discussion with project staff, local NGOs, DoF Officials. A check-list (annex-1) was developed and shared with the stakeholders for facilitating participatory tools and techniques.

2) Secondary data collection: Available documents and internet facilities were utilized for reviewing secondary sources of information to assess the impact of AFGRP funded projects on the livelihoods of poor people. These exercises included use of secondary data, relevant literatures, project plans (log frames), reports, etc.

3) Primary data collection: Primary data were collected through field surveys, primary information was checked and cross-checked with the secondary data. Field surveys mainly involved inspections of the study communities and people to see and understand project performances. For primary data collection, *individual interviews, field observations and other participatory rapid appraisal (PRA)* tools such as focus group discussion (FGD), seasonal calendars, trend analysis, SWOT (strengths, weaknesses, opportunities and threats) analysis, etc. were used. In addition, cross-check interviews were also conducted with the key informants such as District and *Upazila* Fisheries Officers, relevant NGO workers and project staff.

Aquaculture and Fish Genetics Research Programme (AFGRP) in Bangladesh

The Institute of Aquaculture, University of Stirling, UK initiated various aquaculture and fish genetics research projects with financial support of DFID, UK in developing countries including Bangladesh to improve their livelihoods.. All such projects aimed at improving the livelihoods of the poor people through sustainably enhanced productions and productivity of renewable natural resource systems. While aquaculture and fish genetics research projects need important technical skills, all such projects placed specific attention on the delivery of benefits to poor households and communities, which also required specific approaches and understanding of the needs and aspirations of the targeted people. AFGRP with the support and collaboration of DFID, BFRF, different Universities and NGOs so far implemented seven different projects in Bangladesh of which the above mentioned three projects were selected for assessment. It may be noted that all the said projects have already been implemented as per project design. The assessment was keen to measure the present-day condition of each of the above mentioned three projects and their impacts on the people as individuals, households and communities as against final outcome at the end of each project.

The study proposal submitted to AFGRP-DFID,UK for assessment of impact selected the proposed study of - Seed Decentralisation, Self Recruiting Species (SRS), and Cage Culture components of Northwest Fisheries Extension Project (NFEP) and TROPECA on the basis of opinions expressed by various stakeholders, as each of the projects was able to create its need and potential in Bangladesh.

Decentralised fish seed production in rice fields (DS)

The decentralised fish seed production (DS) in rice fields in north-west region of Bangladesh was mainly promoted by CARE-Bangladesh. Originally trailed in a DFID supported project (NFEP), CARE piloted the project with farmers in 1992 in Rangpur, Chittagong and Manikganj districts with support from FAO. From 1993 to 2000 the INTERFISH (IF) of CARE implemented the project in Rangpur, Jessore, Noagaon and Bogra districts with financial support from DFID. During 2000 to 2004 such promotion is further extended by CARE with continued support from DFID through their GO-INTERFISH (GO-IF) project. The GO-IF project carried out their activities in 9 districts in northwest Bangladesh. For seed production the concept was originally limited to the use of common carp, but extended in 1999 to the use of an improved strain of Nile tilapia (GIFT strain) after its trial with 19 households in two communities.

Northwest Bangladesh has been identified as the most important area for carps and tilapia farming, because of the availability of fry produced from centralized (i.e., commercial hatcheries) and decentralized (i.e., rice field based systems in Rangpur) hatcheries, favourable resources and climatic conditions such as the availability of ponds and rice fields, warm climate, fertile soil, and cheap and abundant labour. In spite of long history of tilapia introduction to Bangladesh since 1954, incorporation of tilapia has not yet been well established in pond aquaculture, as still tilapia culture is beset with technological and institutional constraints.

Fish seed availability and quality appeared to remain an important constraint in the region. Decentralized seed production strategies have been identified as mechanisms to overcome these constraints and have now been introduced and piloted with farmers as part of a series of development projects. Indian major carps and the exotic silver carp are the main species produced in hatcheries but specialized skills are required to make them mature and spawn. The common carp and tilapias in contrast can mature and breed in ponds and rice fields with little assistance. The concept had been introduced to different communities using a range of approaches and at different times. The purpose of the project was:

- Promotion of common carp fingerling production in rice fields by NFEP/CARE.
- Nile tilapia fingerling production in rice fields in NW and in other areas of the country.
- Adoption and dissemination strategies for rice field based fingerling production.

To assess the impact and sustainability of this project, 17 randomly selected communities of 9 *upazilas* under Dinajpur, Rangpur and Thakurgaon districts were surveyed. Randomly selected adopters of seed production strategy had been selected and interviewed with a structured questionnaire as well as some focus group discussions were arranged to assess the present status of the adopters. A stakeholders meeting was also attended at Bahagili community in Rangpur district arranged by a monitoring group of AFGRP, DFID.

The potential of self recruiting species (SRS) in aquaculture for sustaining the livelihoods of rural poor in Bangladesh

The first phase of SRS started in March 2001 and in March 2006 the implementation of the third phase was completed. Intermediate Technology Development Group- Bangladesh (ITDG-B) presently renamed as Practical Action-Bangladesh, an international NGO with the University of Stirling based AFGRP programme and with financial support of DFID,UK implemented the SRS project among 650 households in 6 northwest districts of Bangladesh. The project aimed at reducing vulnerability of poor communities. The research focuses on development of some adaptive management strategies for managing the wild species of aquatic animals from environmental, biodiversity and equity perspective.

In fact, the SRS are important in people's nutrition and livelihoods in rural Bangladesh. This AFGRP-funded project in Bangladesh highlighted the importance of SRS in both managed and natural habitats to the livelihoods of the rural poor. However, the SRS living in perennial ponds and rice fields are under threat due to various reasons, such as: most of the ponds in floodplain areas tend to dry out due to unilateral with drawl of pond water for irrigation, destructive harvest by the farmers that hardly allow the brood fish and wild stock to survive till the next breeding seasons, etc. This situation has become common and has created a tremendous negative impact on the availability of SRS. It is, therefore, essential to develop strategies for protecting SRS and to ensure their access to ponds and rice-fields to increase productivity and income of the rural poor with their greater participation in the total process. The aim of this project is to identify the constraints and to suggest measures to solve those through field test approaches that include SRS in order to optimise overall benefits to the people in general and the poor, in particular. SRS research included SRS-activities of 2002-2005 periods in greater Dinajpur and Rangpur districts. Field investigation and primary data were collected from rural communities having the SRS component in Panchaghar sadar and Bodha *upazilas* (sub-districts) under Panchaghar district.

- The purpose of the project was to characterise the role of self-recruiting species in different aquaculture systems, and to develop management approaches that enhanced the production of and access to such resources by the poor.

- Development of appropriate management techniques for sustainable production and conservation of SRS along with large cultured carps to ensure nutritional security, access to fish and livelihoods of the poor households.

- The project investigated the role of SRS in aquaculture and the importance of incorporation of SRS in aquaculture systems in the rural livelihoods in south central and north-west Bangladesh.

Cage culture under Northwest Fisheries Extension Project (NFEP) and TROPECA

Fish culture in cages is not a traditional practice in Bangladesh like fish culture in ponds. It is relatively a new technology in Bangladesh though it has had successful history in many other countries in Asia. In Bangladesh, the first documented attempts on cage culture were small-scale research projects conducted at research institute campuses in 1970s and 1980s. The first serious attempt to introduce cage culture in Bangladesh occurred during 1980s in the Kaptai Lake (Flexi, 1987: Bangladesh Aquaculture Development Project No. 86). In 1991 and 1992, Department of Fisheries (DoF) and Overseas Development Agency (ODA now DFID, AFGRP-funded), supported the Northwest Fisheries Extension Project (NFEP) in collaboration with CARE started cage culture in northwest Bangladesh. NFEP-1 worked in five districts (Dinajpur, Gaibandha, Nilphamari, Panchagar and Thakurgaon); NFEP-2 worked across eight administrative districts in northern Bangladesh (Dinajpur, Gaibandha, Kurigram, Lalmonirhat, Nilphamari, Panchagar, Rangpur and Thakurgaon). This is an area of 16,058 km, with the population of about 10 million. The estimated water bodies covered 20,000 ha which included 88,941 number of ponds (about 67% of the water area). The target groups were women and several villages of Northern Bangladesh were covered. Initially the project initially was successful but later failed due to various reasons. Later on, CARE's CAGES project that started from 1998 was the first aquaculture development project which was exclusively on cage culture in six districts (Barisal, Comilla, Dhaka, Jessore, Natore and Sylhet) of Bangladesh. Introducing cage culture to the women groups having very limited previous experience was the main concern in the first three years of this project. Returns and profits from cage culture had increased each year since inception of the project. The target groups were the resource poor women who had no ownership or access to pond as cages can be set in many different water bodies.

The objectives of the project were :

- Increase the aquaculture production through cage culture.
- Improve the fisheries extension services by imparting training to the personnel of support-services.
- Increase household income through cage aquaculture.

The major expected outputs were :

- Improved brood stock and fish seed supply.
- Improved fish culture methods.
- Extension strategies.
- Training for the personnel of support-services.

There was no detailed study for assessing the impacts of the above AFGRP-funded projects. For instance, here was no effort given to evaluate the NFEP cage projects in light of the successful efforts of CARE-CAGES. Besides, a few studies were conducted that addressed the impact of aquaculture on livelihoods of the rural poor. In this regard, the proposed study is very

important and would be of help to identify the sustainability of these projects benefiting the poor. Field investigation and primary data were collected from rural communities of Chirirbander, Dinajpur Sadar under Dinajpur district, and Domar and Dimla under Nilphamari district for the cage culture component.

Besides, another project component from TROPRCA was evaluated from Rajshahi region. Cage culture in ponds at Putia *Upazilla*, Rajshahi has been set up in association with the NGO Peoples Association for Sustainable Development (POSD) by TROPECA project. This NGO was previously associated with the CARE cages project.

The main objectives of the TROPECA project were :

- To engage farmers more closely in identifying, monitoring and understanding environmental and water quality issues, and in developing methods and techniques to minimise water quality problems.
- To identify and promote feeding, fertilization and production regimes which maximise benefits to both the cage and pond fish farmers, with minimal short and long term risk of collapse due to poor water and/or soil quality.

The major expected outputs of TROPECA project were :

- Improved understanding of the environmental quality and some indicators.
- Improved fish culture methods: Some beneficiaries are still culturing fish. They can culture other fishes, such as carps in cages. These fishes showed no prospects during the programme carried out in CARE-CAGES project. Culturing indigenous fishes in cages could open an avenue to the acceptance of cage culture in wider fish culture community.

Sustained impacts of AFGRP-funded projects in relation to Bangladesh poverty and the target-people

Socio-economic country context : Bangladesh has enjoyed macro economic stability and sustained growth for more than a decade, with a GDP growth rate between 3%-5%. The garment industry played a significant role in this context, as it employed a greater part of the work force, particularly women. But it is facing difficulties since the phasing out of the Multi-fibre Agreement, global increase of petroleum prices, paramount international pressure on liberalization of the economy, which will bring both positive as well as negative effects on the socio- economic situation.

Political uncertainty in the run-up to the next elections due by January 2007, weak governance and bureaucratic red tape may also hamper expected growth of the private sector.

Social indicators show a general improvement, particularly in basic education at national level. Bangladesh expanded gross primary school enrolment, from 72 % in 1980 to 98 % in 2001 and has achieved the Millennium Development Goals (MDGs) of eliminating gender disparity in primary and secondary education. Other HD indicators such as life expectancy, infant and child mortality also show a positive trend.

Bangladesh had managed to eliminate the "food gap" between net domestic production of food grains (rice and wheat) and had reached targeted availability of 454 grams per person per day.

However, near-famine situations, known as "*Monga*" are recurrent in drought prone areas in the northern part of the country.

Poverty moderately declined by 1% per year in the past decade. It was officially less than 50 % in 2000 but the number of people living in absolute poverty remains at the same level (some 63 million) as it was a decade and a half ago. Poverty has fallen unevenly across regions, with most of the gains in the Dhaka division while Rajshahi, Chittagong and Khulna have large pockets of poverty. Inequalities between the richest and the poorest quintile of the Bangladeshi population are very high on indicators such as under five mortality and girls' education. [i] Persistent adult illiteracy is coming down very slowly, particularly for women. Even though Bangladesh has a low malnutrition rate as compared to the rest of South Asia, over 40% of adult Bangladeshi women are severely malnourished.

To achieve the MDGs, the country will need to substantially accelerate growth to 6%-7% per annum and reduction of inequalities should be given the highest priority (mostly urban) from rural areas where more support (with mitigating safety net measures) should be allocated for economic growth. Social safety nets are accorded high priority in the PRSP, although administration of these programs is still unsatisfactory. Non-cash-based social safety programs such as the *Food for Education* program are plagued by large leakages; Government is now monetizing some of its larger programs to reduce corruption and transaction costs.

Delivery of essential social services is handled through programmatic approaches:

- In the Education sector, the Government has launched several reforms to address the problems of poor quality and weak accountability. At the primary education level, a multi-donor group is supporting the Ministry of Primary and Mass Education to implement the Primary Education Development Program II (PEDP II) which aims to strengthen access, and improve quality and efficiency of primary education.

- The Health sector is beset with weak governance. Providers outside of the public sector deliver 60-70 percent of health care services. Public sector service providers are generally not accountable to clients, especially the poor and, with some exceptions, service quality has deteriorated significantly while the share of public sector spending going to delivery of primary health care has actually declined over the last years.

With the recent Health, Nutrition and Population Sector Program (HNPSP) umbrella, development partners support GoB's Strategic Investment Plan 2003-2010 to assume the essential functions of the public sector. It aims at restructuring the way through the services are provided i.e. ensuring greater efficiency by enhancing workforce, guaranteeing free provision of emergency services to those in need and improving equity through a revision of norms for per capita allocations to districts.

GoB has encouraged the NGO movement to grow to a considerable size and importance. NGOs now employ a larger workforce than the public sector and deliver major portions of health, education and micro credit services, which now reach as many as 37% of all Bangladeshi households and around 60 % of the poor households.[ii]

The strong focus in the PRSP for women's issues provides the basis for further advancing towards gender equality. So far, gender parity in primary and secondary schools remains the major, if not only, tangible achievement, all other social indicators showing alarming disparities. Legal steps have been taken: Bangladesh has ratified the Convention on the Elimination of All forms of Discrimination against Women, with a few reservations. Special clauses have been included in family laws to give women the right to divorce and the power to stop practice of polygamy by husbands. Tougher laws for preventing violence against women (VAW), e.g.,

throwing acid on women, were enacted in 2003 and quick trial courts under these acts were established in 2004 for punishing the perpetrators.

(i. World Bank (2005) Bangladesh Bi-Annual Brief; ii. ADB (2005) Quarterly Economic Update, Bangladesh PRSP Forum Economic Update &. Poverty Reduction Strategy Paper (PRSP), titled "Unlocking the Potential: National Strategy for Accelerated Poverty Reduction."Aug.2005 version)

In view of the above socio-economic conditions of the country, the AFGRP-funded projects were very relevant as means of poverty reduction and improving nutritional conditions of the rural communities and especially the poor and disadvantaged households.

For impact assessment of three AFGRP- funded projects in Bangladesh the following areas were focused in assessment on the basis of research project proposal: whether DSPS, SRS and Cage projects have any roles and importance to people in the working area ? Do stocking of fish in rice field for seed production, and farming of fish in rice field and cage culture have different impacts on livelihoods of the poor farmers?

Findings of the field investigations were specifically focused on the impact of AFGRP-funded projects at the level of farmers, their households/family, rural village community level beside environmental, technological impacts and impacts on rural women at large as stated below:

Impacts at farmer's level

- The awareness and knowledge on three projects of fish culture and on water quality of ponds have been gained and improved noticeably.
- Technical skill and capacities on fish culture systems and methods were developed aided by previous training and experience.
- The beneficiaries have developed skills to solve most of the constraints of fish cultivation by themselves.
- Respect and dignity of farmers and their family level improved to some extent through adoption of the new skills, additional income and more scope of economic activities.
- SRS and Seed Decentralization Projects had the potentially to provide double benefits to the rural poor: nutrition and income. It is now treated as both food crop and cash crop. Survey results showed that on average 60% of farmed SRS are consumed by the households and 40% are sold in local markets. Some SRS such as *koi, shing, magur, shole* etc. can be a large income source especially when sold at *upazila* or district markets, even double the price of cultured fish. It was found that comparatively rich farmers tend to eat more SRS than to sell, whereas poor farmers sell more SRS than to eat. Since introducing SRS in aquatic systems, farmers' income has increased significantly. Across the study, the average annual net income of farmers was estimated at Tk 12,000 (US$ 171) from SRS production. It is calculated that on an average 9% of the income has increased due to presence of SRS in their ponds, ditches and rice fields.
- Farmers of DSPS areas are getting marked nutritional support through protein intake. In the production season, they consume fish 2-3 days per week. Earlier (before DSPS intervention) they used to take fish once or twice a month. Household members, relatives and even day labours are enjoying nutritional support. The nutritional dynamics also

changed due to this intervention. Farmers are purchasing meat from the market by the money earned from the DSPS.

- DSPS farmers are getting more benefit from rice production because they are now repaying loan from the income of fish production. Generally, during *Boro* season farmers have to invest more inputs to their rice fields because the *Boro* season mostly depends on irrigation, which is cost intensive. Their sources of investment mostly come from the high interest private loan (*from Mohajan*) that need immediate repayment after rice harvesting when market price of rice is very less.
- If the farmers are able to repay loans from the fish selling, they can keep rice for long time and sell at high price and earn more. From the income of DSPS some of the farmers supplement the expenses of child education, wedding, treatment, household expenditure etc. Some of the farmers developed household resources like house, pond, livestock, etc.. Some of the farmers installed household pump (diesel/electric) to provide irrigation to the rice-plot for brood stock survival. The expenditure was supplemented from the income of DSPS. In the market, retailers can keep tilapia for long time alive. They can sell the live tilapia and earn more. The market price of tilapia is not so high so, the people belonging to the lower and middle income groups can purchase it easily. The market price of tilapia ranged from Tk. 60-90/kg. Some of the farmers opined that the DSPS intervention is less capital and labor intensive than the other agricultural interventions such as vegetable gardening, poultry rearing etc.
- Employment opportunities for the rural poor in the working areas have increased since these projects started. The opportunities for day labourers to find work has increased significantly which includes: digging of ponds, irrigation of rice fields, removal of aquatic weeds and construction of dikes in the rice fields, harvesting and marketing of fish etc.

Impacts on women

DS and SRS culture have also provided employment opportunities for women. The role of women in SRS and DS related activities is potentially very important. Women are involved in various facets of SRS farming, including feeding of fish, fertilization, supervision and management of ponds and rice fields, fish harvesting, etc. In general, women provide partial assistance to men in SRS and DS supervision and management, in the administration of feed, lime and fertilizer. Women also involved themselves in cleaning and re-excavating the canals of rice-fields. A few women (10%) work as wage labourers in rice fields for irrigation and cleaning of aquatic weeds. Women are also involved in fish harvesting from their ponds and rice fields. In general, daily harvest of fish for family consumption is done by women with the help of children. It is true that women's workload has increased due to cultivation of SRS and DS activities. Nevertheless, women noted that they would like to spend more hours in SRS farming because of better economic return and nutritional value.

Women involved in cage culture

Women involved in the cage culture with NFEP project had good grasps and attitude for cage culture. However, they lost most of their inputs with the closure of the project. At present some beneficiaries from NFEP 1 and 2 are culturing the fish in cages with the assistance of a GoB project, although they were found to be suffering from various constraints. Women involved

with TROPECA project had good understanding on water quality criteria for sustained cage culture. Again, some constraints led them to stop culturing the fish in cages.

	
Name : Alif Jan Husband's name: Abul Kasem She got 400-500g sized tilapia from her cage and sold @ 60 Tk/kg. She was interested in cage culture but do not have access to water body due to the ownership problem. She was a TROPECA beneficiary.	Name : Khadija She used to produce tilapia (average size 500g) in cage in two cycles. She sold tilapia @ 50 Tk/kg. She is interested in cage culture but do not have access to water body due to the ownership problem. She was a TROPECA beneficiary.

Impacts at household/family level

- Income has increased at household level.
- Employment scope has increased.
- Reduction in malnutrition and vulnerability have achieved.
- Respect and dignity in family level have improved.
- The most significant change was observed in food consumption at farmers' house hold level. In all cases, viz. Seed Decentralization Project (DSPS), SRS and cage culture had made important contribution to the consumption and income of poor families. Almost all farmers noted that they took fish once or twice a month before these projects launched. Now they are able to eat fish at least 2-3 days a week and to secure ample of rice. Survey results showed that 90% of fish eaten by the households are SRS.
- Through ITDG posters, trainings and workshops households of farmers also become aware that SRS can play an important role in increasing vitamin A, calcium, iron and zinc intakes; and thus human nutrition can be greatly improved by producing SRS. Farmers also noted that SRS has particular importance in the diet of children and lactating mothers to avoid child blindness and infant mortality. A few farmers mentioned that *koi, shing,* and *magur*, are used as patients' diet and for the entertainment of valuable guests.

- The nutritional inputs and social norms were improved by cage culture. The culturists were able to get fish whenever they want for household consumption as well as to entertain the guest. They all appreciated the extra income incurred due to the fish sale from cages. The most important thing that was learned from the cage owned women that they can spend the money by themselves. It was also learned that the husband was completely unaware of the money that comes form the cages in most cases. While asking about the income from cages, husbands of most of the women believe that little income may come from such as small (one cubic meter) cages, which they do not count about.
- The knowledge on cage culture has been gained: The beneficiaries were found to develop skill to handle small cage culture issues. The awareness on cage culture has been improved so that the interest on cage culture is still evident from all groups. However, technical skill and capacities were not developed. The beneficiaries were not been able to solve any constraint. This was due to improper supervision by the NFEP personnel, where every problem was handled by the project people but not by the farmers. For women, respect and dignity in family level have improved

Case Study: SRS farming for household consumption

Mosharaf Hossain lives in Shomshernagar village of Bhoda Upazila under Panchaghar district. He is a small farmer of about 49 years of age with 8 family members (6 children: 4 daughters and 2 sons). He has primary level of education (class 4). He owns a pond of 11 dec and 35 dec of rice fields. In 2003, Mosharaf first started SRS farming in his pond with the help of ITDG. For SRS culture, he collected SRS brood and fry from his rice fields. As SRS farming requires no capital, therefore next year he started SRS production in his 16 decimals rice field. First year he harvested around 15 kg of SRS from his pond of which almost all was consumed by the households. In 2004, he produced 27 kg of SRS in the pond and 33 kg in the rice field (total 60 kg), of which 70% were consumed by the household and the remainder (30%) were sold to the local markets and earned Tk 2,700. In 2005, Mosharaf earned around Tk 11,600 by selling the SRS produced in his pond and rice fields. According to Mosharaf, SRS production in the rice field is comparatively lower than that of pond, because of limited water and space. Sufficient rainfall may increase SRS production in rice field. However, SRS production in both pond and rice field gave significant return.

Although Mosharaf's living conditions is poor, he has improved his socio-economic conditions through SRS production. His family members also like to consume SRS. Now his household members are able to eat fish 2 to 3 days in a week with better quality rice. In addition of household consumption, SRS can potentially provide income. Due to increase in income, Mosharaf has improved his katcha house through replacing the bamboo roofs and walls with tin sheet and wood. He is now able to send his children to school, and buy clothes for households. Profits from SRS also invested to agricultural inputs such as fertilizers, seeds, fuel for irrigation machines, etc. He has a plan for construction a sanitary latrine in the next year. Mosharaf believes that most small farmers have the opportunity to improve their socio-economic conditions through SRS production.

Impacts at community level

- Both SRS and Decentralization Fish Seed Production projects (DSPS) made significant positive impact at the local community level, but not the cage culture. Though farmers' living conditions are poor, the field investigations found that almost all farmers have improved their social and economic conditions through the first two projects. Such improved conditions can

be described on the basis of qualitative indicators. These could include increased food consumption, increased social status, employment opportunities, etc. Study results suggest that farmers have broadly improved their standards of living, purchasing power, choice, and ability as an economic sector.

- Social acceptance to the new fish culture technology has increased. The evidences are very clear in case of SRS and Seed Decentralization; but could not produce good outcomes in case of Cage Culture. Various factors are responsible for failure of Cage Culture. Social acceptance to new technology (cage culture) has not yet achieved. The idea of community approach in most cases was initiated or developed by the project (NFEP) for cage culture
- Some multiplier impact was noticed in case of SRS and DS projects. Farmers from adjacent communities are visiting the ponds and rice fields of these two projects to see the methods of cultivation and learn from the experience of the project farmers. From TROPICA cages one secondary farmer (middle income group) from a distance is now producing fish from 600-700 small cages on commercial basis.
- Informal interactions, discussions and visits for fish culture and other purposes by farmers from one household to another have increased to a great extent. Indirectly, all such interactions are contributing to community level unity and more positive cooperation among farmers.
- However, most farmers expressed the need of more formal and organized ways of their unity for having sustainability of their initiatives. In others words, farmers would like to form fish farmers community cooperatives for creating more opportunities of learning, sharing experiences and for building small community funds out of their own regular savings. For this, some facilitation, learning of rules and methods and extension services are required.
- Through DSPS farmers are coming to an aquaculture community. Good relations are being observed among the people due to seed production, exchange of seeds, fish and brood fish. Because of the social relations, pouching of fish from culture system has been decreased dramatically in some of the areas.
- Relation of farmers has been developed with fry traders who are helping them to sell their seeds and benefiting each other. Farmers also developed the relationship with fish traders in the market as well. Local market of DSPS area are getting tilapia for selling to the local people. Through DSPS, women empowerment is taking place. Women are now involving in aquaculture particularly to feed fish and they are sharing ideas on different activities of DSPS.
- The local institution had been formed through the intervention of rice fish cultivation in the northwest Bangladesh which is termed as FFS (Farmer Field School). Within the FFS members there was a good relation towards cooperation for solving the existing problems related to cultivation of rice and fish. Farmer field school was helping the farmer's community members to keep their broods in other member's ponds in the dry season.

Environmental Impacts

The development of SRS farming in rice fields and ponds has brought about several positive environmental impacts. The major changes in the environment that have been found include integrated pest management (IPM) in rice fields, conservation of native fishes including wild lives (i.e. snails, frogs, aquatic birds, etc.), increased fish and rice production, maintained

ecological balance in rice fields, reduced flood risks due to construction of higher dikes around the rice fields and irrigation canals, etc. Use of rotenone and dewatering for complete harvest have reduced during pond preparation, which in turn ensured culture of SRS for next year.

Integration of fish seed production from rice field is a very important practice that promotes sustainability, increases productivity, profitability and as well biodiversity conservation in rice fields. Integration of SRS with rice is the most efficient way of increasing production from per unit area of land. SRS culture in rice fields provides not only an additional income from the yield of fish, but also improved the yield of rice.

The practice of SRS with rice farming and seed production in rice fields are likely to be positively affected by the wild fisheries. According to farmers, access to the fish resources in the rice fields and ponds has been increased through irrigation canals. Some community members stated that opportunities for raising ducks and other aquatic birds have increased in the rice fields. This practice has also positively affected the population of the Indian bullfrog *Rana tigrina*. Farmers noted that frogs play an important role in rice farming systems adding that they are regarded as the farmers' friend, as they consume large quantities of insects. According to Chengjie (1995), rice production increases if bullfrogs are present in the rice fields.

According to the survey, the freshwater snail (*Pila globosa*) has been found in the rice fields. Framers stated that opportunities for raising ducks have increased as a result of snail availability which is a suitable feed for duck. This snail is traditionally and commercially used as prawn feed in many parts of Bangladesh (Ahmed, 1998). According to Xoing *et al*. (1987), *P. globosa* can easily be cultured in fertilized fish ponds and rice fields. The snail is a valuable aquatic resource and maintains ecological balance (Halwart, 1994). They feed mainly on leaves of aquatic plants (Haniffa and Pandian, 1978; and Ahmed, 1996). Removal of the snail is likely to result in an increase in the growth of at least some species of aquatic macrophytes. This could reduce light penetration as well as photosynthesis and could lead to eutrophication of water bodies (Gain, 1998).

Technological Impacts

Management of SRS in farmer managed aquatic systems in Northwest Bangladesh is very important in terms of technological point of view. In pond systems, polyculture of Indian and exotic carps along with SRS has great potential for expansion, diversification of aquaculture and benefit of the rural poor. SRS-carps farming can be considered as a method of combining hatchery and wild fish culture. Farmers stocked wild SRS collected from rice fields using bamboo traps. Rice fields are a relatively larger source of wild fish. Trap ponds are also significantly important source of wild fish. The number of trap ponds has increased in recent years in the study area. It was found that small trap ponds are dug to collect SRS as the floodwater recede. In areas where water is abundant, farmers have at least one trap pond in their fields. To attract fish to come to their field, at the beginning of rainy season, farmers open up the buns to trap the fish by letting in the water. Expansion of trap ponds or by digging small ditches at the corners of rice field to trap more fish can increase wild stock. Ponds may often contain wild fish throughout the year unless the farmer takes active measures to control them.

According to the survey, both seed production and SRS farming requires no capital investment (or very limited capital) in pond systems or rice fields, but provides benefits in terms of food and income. More and more people are being attracted to produce fish seed for SRS farming in their rice fields as it brings more profit than only carp or rice farming. The expansion rate is calculated at 22% per year (33 farmers was in 2003, now 55 in 2006).

On the other hand, farmers opined that a problem aroused against rearing of livestock due to DSP intervention. Common carp seed production has negative impacts in the rice-field plots as they destroy the dykes of rice plots that needed more investment on labours for repairing in the following year. In case of IF/GO-IF project, CARE Bangladesh donated fish seed for the first time to the farmers. The farmers have produced brood from those fry and further continued from

the same brood stock. The neighbours who started seed production getting fry from the primary adopters, were using the same stock for seed production. Most of the farmers did not practice any selection of the brood and effective management for brood fish was not found. So, ideal situations for inbreeding depression were found because of the mating between two closely related generations. The present study got evidences that a 3 years old common carp become only 10 inch (25 cm) long and are used as brood (Plate 2).

Plate 2. Smaller sized common carp brood.

Growth rate of the offspring of this brood is quite slow and those get quick maturity. The study also got evidences of the deterioration of the phenotypic quality of GIFT in the DSPS region (Plate 3).

Plate 3. GIFT brood found in the present study area.

Challenges for continuity

The study reveals the challenges, some SRS are critically endangered in Bangladesh and thus need immediate attention for their conservation and this is due to environmental modification and man made interventions. Rice fields are the natural habitats for a variety of SRS. Most of the SRS breed naturally in rice fields during the monsoon (June to September). It is therefore, suggested that SRS production in rice fields should be strengthened for conservation of some endangered species.

However, concerns arise about the long-term sustainability of SRS farming due to lack of technical support to the farmers, inadequate training facilities, poor institutional support, and lack of extension service. It is therefore, necessary to provide institutional and organisational support, government support, extension service, more research and knowledge on SRS farming for its sustainability. Although SRS contributes significantly to food and income, the culture of SRS has not yet been attempted in large scale in the working area and even else where in the country.

A video documentary was telecasted through a satellite television channel (ATN Bangla) on SRS culture for wider audience, but the farmers mentioned that the impact was very low because the rural farmers have no access to satellite television.

Flood is a great problem in North-West region of Bangladesh. There are approximately 42 large rivers and 167 small water channels entering into Bangladesh from India through North-West region. India has constructed dams across all the water channels. It closes the water channels during the summer and opens during the rainy season that raises the water level suddenly in the North-West region of Bangladesh. And flood washes away the crops including fishes and fish seeds. The study found a couple of drop out cases of fish seed production, frustrated by flood consequence.

There were some farmers, who become interested to decentralized seed production and live in a joint family. But when their joint family was broken eventually the land and the adjacent ditch became unsuitable for seed production.

Again, there were some members within several communities who could not run decentralized seed production project for lack of capital to pay for the leased land. There were many farmers, who have no land of their own. They depend on the leasing of other's land. Some farmers started decentralized seed production through the demonstration process of CARE. But when the land owners took back their lands, the farmers were dropped out from the decentralized seed production project.

In the Northwest region of Bangladesh, there was a great problem of water supply. Agriculture and fishery of this region entirely depend on water supply through pumps as all the ponds and lakes are seasonal and most of the rivers are dead or almost dead. There are some farmers who have no pumps of their own. They mostly depended on the hired pumps through instant payment or seasonal payment. The pump-ownerships were found to be a critical factor for sustainability of the seed production.

In some community, decentralized seed production program (DSPS) ran through PNGOs. But there were complexities in demonstration process and many of the PNGOs were dropped after completion of the project, having no further monitoring and continuation.

In each decentralized seed producing community, CARE trained equal number of female members with male farmers at each field school (FFS) level. But most of the farmers in the community became detached from decentralized seed production after completion of the project.

Case study- Decentralized Fish Seed Production Strategy (DSPS)

Mrs. Ayna Begum lives at Pahardanga village of Thakurgaon sadar Upazilla of Thakurgaon district. Her educational qualification is up to class two. She was introduced with GO-IF in 2000 by CARE. She was a member of FFS (women group) and successfully adopted the techniques and continued decentralized seed production until 2005. She was selected as CO of Pahardange Kone Para community. Now, Mrs. Ayna is the owner of 1000 dec land and she uses this land for the decentralized seed production as suggested by GO-IF. Mrs. Ayna uses community ponds for collecting eggs of common carp. Later those eggs were shifted to the ditch in her own land. She mainly produces seed for commercial purpose and only a little amount of the seed is used for her own culture purpose. Last season she sold 10 kg fingerlings, the market value of which was around 1000 Tk Mrs. Ayna wishes to continue decentralized seed production techniques if water supply is ensured. In the present year she stocked brood fish in the community pond but she in not continuing to production of seed because of insufficient water supply from deep tube well. Pahardange Kone Para community has a deep tube well but most of the time it remains inactive due to poor electric supply. She is interested to produce fingerlings by decentralized seed production technique because of economic benefit, protein demand of her family and it needs less effort. Mrs. Ayna Begum may be dropped out if water supply becomes uncertain.

The outcomes of recently completed studies by Dr. B. K. Barman showed that among 80 communities (25%) of IF and GO-IF there was no adoption of rice-fish after withdrawal of support from CARE. In 50% of the communities there were medium level of adoption (around 5 household/community) and in 25% of the communities there were higher level of adoption (around 10 households/community). According to this estimate, the approximate numbers that adopted rice-fish was around 10,000 households.

The marketing channel around the decentralized seed producing communities has not been well established. So, the seed produced was not found to be marketed to some significant extent. Except some extraordinary cases, most of the seed produced is distributed free of cost, or at a minimum cost to the neighbours.

Nobody is interested to do cage culture of their own investment for the second time/beyond project's support period. The approach is not good for the pro-poor, as they do not have any access to water.

Impact: Institutional and institutionalizing

The critical assessment identified that the institutional impact has to be understood at two levels - at the level of technology & support **providers** and at the level of technology & support **recipients**; however both the levels learned and gained experience in the process. As a matter

of fact, it was crucial for all the three project-components to be able to identify right individuals for learning the new technologies, right households searching for new ways & means in changing their conditions and the right rural communities ready to accept & provide cooperation for testing the new technologies. In case of all the three components, selections were quite alright. In addition, institutional support provided by the " provider- institutions" were also done quite successfully. No institutional support-lacking was noted by the assessment. The learning and gaining experience aspect by the provider-institutions are also remarkable as noted in various available documents.

However, institutionalizing the impact by the recipients achieved some successes, but are diminishing in general due to lack of required essential follow up and further institutionalizing by the recipient-individuals, households and communities. In fact, due attention was not paid on this important aspect of the process. In other words, the initiatives were taken by the provider-institutions, but could not be completed developing recipients-institutions. Technological adaptations and institutionalizations are normally left to the will and interest of the people. It should be noted here clearly that the AFGRP-funded projects give special attention to the benefit of the rural poor, which required some additional measures for institutionalizing. The recipients specifically identified some points and measures that demand further critical review for future strategies and policies: - forming community-based cooperatives of the farmers, providing short-term loans for inputs, as well as providing support for getting water for fish culture.

Lessons learned

The experience, attitudes and relationships that people have developed during AFGRP funded projects in Northwest part of Bangladesh can be used for the future development projects.

Not all forms of aquaculture production are accessible to poorer or more vulnerable groups. However, some forms, if properly selected, have good potential for financial returns and not add significantly risks. Seed production and SRS production from rice fields is a low risk and less inputs cost are affordable for poor farmers. In Bangladesh, women and children have normally been involved in household linked activities such as preparing feeds, mending gear and collecting fish for domestic use. Some form of aquaculture can increase their direct involvement in production and for women to gain greater financial standing.

Common carp in the rice field has negative impact; they destroy the rice plot dyke and hampered irrigation process and require extra cost for repairing. Replacement of brood stock is necessary to produce good quality fish seed. Incorporation of Indigenous species (SRS) and diversification of aquaculture increased household income and consumption. Diversified fish farming is ensuring food security, protecting biodiversity and saving wild fish for the current and future generation.

Decentralised fish seed production (DSPS) and SRS culture has significant impact at the community level but large scale farmers' participation was not seen during the study which indicates that large scale culture should be adapted with the assistance of extension partners like DoF, NGOs, donor agencies and other stakeholders.

The three AFGRP funded projects have a positive impact during the project period but a dissemination strategy to the wider context was not sufficient. In case of SRS, video telecast in

a satellite television channel was not enough for rural farmers who do not have any access to satellite television.

Social acceptance to new technology (cage culture) should come from community. Understanding on new approaches by the users is vital. The idea of community approach for cage culture were taken by the provider/institutions, or was developed by the project (NFEP). However, using landless women groups for cage culture was not sustainable as after project period women groups have no access to use the khas land/water to setup their cages.

Cage culture is obviously a good approach to work with but the members, who are mostly from the poorer households, are not interested to do cage culture by their own investment for the second time/beyond the project supported period. To achieve success in the cage culture effort, the beneficiaries should be organized in groups by themselves and should be self motivated to start cage culture by their own. The approach is not good for the pro-poor, as they do not have any access to land, water and society to safeguard the cage culture. They cannot protect their cages by themselves. Thus, middle and high income-category of people should be selected for cage culture project. A lesson from case study of Mr. Sherajuddin Pramanik is an example that technology is shifting to middle or high income group of people from poor people.

Case Study-Cage culture

Mr. Sherajuddin Pramanik is living in Koi Pokuria village under Putia Upazilla of Rajshahi district. He is a middle class agricultural farmer. His father died by snake bite. He has a big pond with an area of 3.3 acres where he grows fish for commercial purposes. Now he is growing fish in cages fixed in his big ponds. He got his interest from the CARE-CAGES project and later from the beneficiaries of the TROPECA project. He got technical support from POSD (Peoples Organization for Sustainable Development) and got 22 net cages from CARE. He made 900 cages with his own investment. He stocked 200,000 tilapia fingerlings in 900 cages and 35,000 carp fingerlings in ponds for culture. For this purpose he invested Tk 900,000 for his cage and pond fish culture. Total sell of his cultured fish was Tk1,600,000 and he got net profit Tk 700,000 in the first year. In first year, he selected GIFT for cage culture. But in following culture cycle, he stocked monosex (all male tilapia) tilapia. He collected this monosex tilapia from Chittagong at 0.70 Tk/fry. He put 240 tilapia fries per cage after 8-10 days of acclimatization in separate hapas. Total growing period in one cycle was 5-6 months and in this time partial sell was also done. He sold big sized tilapia 80 Tk/kg and small sized 50 Tk/kg. He set these cages at 1meter distance. Ready feeds were supplied to the cultured fishes and the expense was Tk15/kg. No disease outbreak was observed so far. But the excessive heat during summer killed some fishes. He pumped extra water into the pond to supplement the evaporation factors. He got "President Award, 2005" for the contribution in agriculture and fish culture for the country

Implications for future

The impact assessment identified the following implications for the future projects:

- For future expansion of AFGRP activities, support and supervision of DoF, local NGOs and donor agencies, like DFID are essential.

- For Cage-fish culture, a small cage does not require land but they do require access to water. Policy decision is required on right to access in government khas land/rivers by the landless households. The middle income group farmers having their own water bodies are likely to be quite potential targets for cage culture. As a good amount of nutrients are available from the cages, the pond owners need less cost for production of fish in the whole water body of a pond. The cage-fish cultivation in pond, in the long run, can make pond fish cultivation quite cost-effective.
- Local NGOs may be encouraged to come up with their support of micro-credit to the potential AFGRP fish farmers. Thus, the research projects need to have coordination with local NGOs from the beginning on the issue, so that the farmers have guaranteed to get credit facilities, as and when they need it.
- Introduction of new technology and method of fish culture through proper research works, are essential for increasing fish production and social acceptance by the rural communities.
- For long term sustainability of AFGRP activities, it is essential to create a conducive environment of fish culture in which the farmers are able to get technical services, training facilities, institutional support, etc. easily and nearer to their locality. This essentially requires a strong coordination and collaboration among all the key players, viz. DoF, farmers, research bodies (institutes and universities), donor (s) to achieve the same goal.

Looking toward the future

Recently, there was a boom in the use of shallow electric and diesel pumps in the study areas. All the farmers are using pumps for irrigation purposes, as well as for seed production. Even those who had no pumps of their own, can hire pumps. In a dry region like north-west of Bangladesh, where the water level is very low, the consequences of using a huge number of pumps for extracting ground water on the environment need further investigations.

The quality of fish seed is deteriorating in the project area. The main reasons are improper brood stack management and ignorance of the farmers. All the farmers are using the same stock which was donated by CARE and are not replacing, as a result mating occurs among closely related individuals and causes inbreeding and stunted growth of fish. During discussion with the farmers the following important issues for future attention were identified:

- Determination of quality of the fish seeds produced in the rice fields.
- Identification of other species of SRS that are suitable to grow in rice-fields without hampering the rice plots and rice production.
- Identification of indigenous fish species that does not require extra investment and do not destroy rice plots dykes for seed production in the rice-fields.
- Studies on socioeconomic and environmental consequences of using crop lands into aquaculture (eg. rice-fish farming).
- Formulation of low cost fish feed from locally available raw materials.
- Development of quality GIFT fry production and transportation techniques.
- Identification of fish species for rearing in cages.
- Determination of appropriate cage size for rearing different species/size of fishes.
- Policy formulation for institutional support towards the expansion of new technologies and techniques for fish culture in the region.

Policy requirement

Policy-makers, academicians and researchers need more understanding to influence for policy-priority of SRS and Indigenous fish species management for a greater benefit to the economy of Bangladesh for ensuring food security of the people. Thus, a policy brief on conservation and management of wild fish needs to be prepared for the policy-makers and planners of the country for saving biodiversity and proper management of the natural resources. Involvement of local extension department/local NGOs during implementation of new ideas and technology is essential for future sustainability of such initiatives.

Annex-1 Checklist used for Impact Assessment of AFGRP-Funded Projects in Bangladesh

01. The following four areas were focused in assessment on the basis of research Project proposal:

- Understanding ***impacts*** at the individual-participant, family and community levels with specific ***indicators.***
- Understanding ***implications*** of AFGRP projects looking towards the future.
- ***Lessons learned*** by the projects and specific ***research issues***.
- Three interesting Case Studies on impacts and learning, both positive and negative with 2 and 5 photographs for each case study and each project under study. Each project is expected to prepare 2-3 case studies.

02. Impacts with indicators

Impacts	***Indicators (quantitative and qualitative)***
Individual participants (Level)	• Awareness and knowledge about project's fish culture. • Technical skills and capacities achieved. • Successful use of new Knowledge and skills. • Were able to remove constraints. • More respect and dignity, especially in case of women.
Household/ family (level)	• Increase in income. • Increase in employment scopes. • Level of reduction of malnutrition and vulnerability. • Nature of change in the role of women in decision-making. • Increased recognition and dignity of family.
Community (Level)	• Social acceptance of new technology. • Concrete changes at the wider community level. • Concrete impacts on the hardcore poor and women. • Strengthened unity, partnership and influence.
Fish population as renewable natural resources (level)	• Sustained impact on poverty. • Able to continue without external support. • Nature of implications at the policy level. • Increase in catch per unit effort.

Annex-2 List of baseline communities and study dates

(a) Seed Decentralization

District	Upazila	Name of the Community	Date of Field visit	Adoption level	Adopters in the Community	Sample size
Dinajpur	Parbatipur	Sardarpara	12/03/06	High + secondary	15	05
”	”	Mothapara	”	Low	11	06
”	”	Munshipara	”	Medium	12	06
”	Birgonj	Khijiripara	13/03/06	Dropout	13	05
”	Khansama	Guliara	”	High	15	04
”	”	West Vadhki	”	Dropout	17	05
Thakurgaon	Sadar	Konepara	”	Medium	14	05
”	”	Dangipara	”	”	10	06
Rangpur	Mithapukur	Palpara	12/03/06	”	12	05
”						
”						

(b) Self Recruiting Species

District	Upazila	Name of the Community	Date of Field visit	Adoption level	Adopters in the Community	Sample size
Panchaghar	Bodha	Shomshernagar	10/3/06	High	06	04
Panchaghar	Sadar	Harivasha	11/3/06	Medium	04	02
Panchaghar	Sadar	Talma	12/3/06	High	06	04
Panchaghar	Bodha	Chandan Bari	13/3/06	High	06	04
Panchaghar	Sadar	Mirghar	14/3/06	Medium	03	02
Panchaghar	Bodha	Pach Bibi	15/3/06	High	06	04
Panchaghar	Sadar	Dhakkamara	16/3/06	High	07	04
Panchaghar	Sadar	Panimachpukari	17/3/06	Low	02	01
Panchaghar	Bodha	Bodha	18/3/06	Medium	03	02
Panchaghar	Sadar	Shakerhat	19/3/06	High	06	04
Panchaghar	Sadar	Hafizabad	20/3/06	High	05	03

(c) Cage Culture

District	Upazila	Name of the community	Date of field visit	Adoption level	Adopters in the community	Sample size
Dinajpur	Chirirbandar	Hatkhola	13/03/2006	Low	8	5
Dinajpur	Dinajpur Sadar	Rajarampur	13/03/2006	Low	12	4
Dinajpur	Parbatipur	Jaruardanga Asroyan Prokalpa	14/03/2006	Medium	6	5
Nilphamari	Domar	Khamar Bamunia	15/03/2006	Low	20	8
Nilphamari	Dimla	Baburhat	15/03/2006	Low	5	4
Rajshai	Sadar	DoF, POSD	17/03/06	Secondary	3	2
	Putia	Banesshar	18/03/06	High	6	4
	Putia	Koi Pokuri	18/03/06	High & Secondary	1	1

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