

Produced by



The WorldFish Center
Bangladesh and South Asia Office
House 22B, Road 7, Block F, Banani, Dhaka, Bangladesh
Phone (+880-2) 881 3250, 881 4624
Fax (+880-2) 881 1151
E-mail: worldfish-bangladesh@cgiar.org

In collaboration with



The Department of Fisheries
Matshya Bhaban, Park Avenue,
Ramna, Dhaka 1000, Bangladesh.
Tel: (+880-2) 9571696
Fax: (+880-2) 9571696.
E-mail: cbfm@dhaka.net

FLOODPLAIN AQUACULTURE

In Association with: SHISUK



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Text Rick Gregory, Kazi Toufique
Edited by Alan Brooks
Coordination A.K.M.Firoz Khan and Md. Muzaffar Ahmed
Photo credit Khaled Sattar- MAP, Alan Brooks, A.K.M.Firoz Khan, WorldFish Center

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INTRODUCTION

Bangladesh's natural floodplain fisheries remain vital in providing food, income and employment opportunities for millions of poor people in Bangladesh. These extensive open water areas, covering more than 4 million hectares probably produce in excess of 500,000 metric tonnes of fish, annually. However, pressure on this important resource is steadily increasing and there are fears that Bangladesh's floodplain fisheries may be in a state of irreversible decline.

Since 1970s, Bangladesh's aquaculture sector has developed rapidly, and production & system diversity continues to grow. Aquaculture is regarded by many as the most realistic way to secure the Nation's current and future fish supply needs. Production techniques are well established; inputs such as seed and feed are widely available; and thriving service provision and marketing networks are in place.

In the past decade, the stock enhancement of large water

bodies has been achieved through the release of juvenile fish, and initiatives have now shown that production from impounded floodplain areas can also be increased through stocking and management. Yields from these 'floodplain aquaculture systems' may be many times higher than from conventional floodplain fisheries. It is this significant increase in fish production and the revenues generated that is driving the development of floodplain aquaculture forward.

1. Fish Production

Typical fish production yields from floodplain aquaculture are between 1,000 - 3,000 kg /ha, compared to wild fish yields of 150 - 350 kg /ha from conventional floodplain fisheries. Floodplain aquaculture yields are comprised of both exotic and indigenous fish species. A small percentage, (usually around 10%) of the total catch weight is made up of indigenous floodplain fish species.



In 2006, the five SHISUK projects in Daudkandi produced more than 800 tonnes of fish from a total floodplain area of 344 ha. It is estimated that around 7,500 tonnes of fish, worth around 450 million taka, (6.4m US\$), are now being produced each year, from floodplain aquaculture projects in the Daudkandi area.

IMPORTANT PRODUCTION, ECONOMIC, SOCIAL AND ENVIRONMENTAL ISSUES

The management necessary for successful floodplain aquaculture effectively turns an open access common property resource into a closed private property resource and this raises a number of social and environmental issues that must be considered, relative to the production and economic gains. This paper uses case study materials from the SHISUK Project in Daudkandi Upazila, Comilla District, to highlight 11 floodplain aquaculture developmental issues and proposes a set of rational steps forward for the institutions involved.



In 1996, the Pankowri Fisheries Project was established and became one of the first successful cooperative floodplain aquaculture projects to involve local landowners, VIPs, and a NGO. In recognition of its outstanding contribution to rural development, SHISUK was awarded the National Gold Medal in 1999. News of the successes of the Pankowri Project spread rapidly in the surrounding area and by 2004 more than 90 similar floodplain aquaculture projects, covering around 5,000 ha were operating in Daudkandi, and neighbouring Upazilas.

2. Economics

Local economies can gain significantly from both the direct benefits of floodplain aquaculture projects, (i.e. increased production, profits, incomes etc.) and from the indirect benefits that are transmitted through employment and service provision linkages. Some of these employment opportunities occur during the 'traditional floodplain famine months' of September - October, each year. The creation and maintenance of embankments creates significant work opportunities and further enhances local economies through facilitating the movement of people and goods, year round.



Near to the Pankowri Project Office, a growth centre, featuring small shops and businesses has sprung up in an area which traditionally enjoyed very little economic activity. A PRA exercise carried out in the nearby Baronager Project suggested that around 330 man days/ha of employment and direct service provision work were being generated by the floodplain aquaculture project.

3. Organisational & Financing Arrangements

In order for floodplain aquaculture projects to be successful, organizational aspects are as important, if not more important than basic technical competencies. Community mobilization work by individuals or NGOs, is essential prior to the raising of capital for the embankment work that makes floodplain aquaculture possible. The capital for the basic infrastructure, (usually the main embankment) is accumulated through offering shares in the aquaculture enterprise, to those people with land holdings in the floodplain area. To a large extent, this eliminates the need for project support to infrastructure development. Shareholders who invest, stand to receive an annual income from the rental cost of their land holding and in a successful year, a dividend payment per share owned.



SHISUK projects are steered by a Board of Directors, composed of eligible leaders from within the community. There is evidence to suggest that floodplain aquaculture project resources and benefits, over time, tend to be accumulated by the most influential members of the Board of Directors. It is SHISUK's intention to facilitate the democratic appointment of the Board members. The distribution of net profit amongst the members of SHISUK projects is organised as follows; 50% is paid in the form of dividends to the owners of project shares; 27% is paid out as land rent; 20% is kept as reserve for re-investment, the following year and contingencies; 3% is earmarked for social welfare projects, such as donations to mosques or temples. SHISUK maintains a 20% shareholding in the Project. In latter projects, SHISUK have withheld 5-10% of the shares for allocation to landless households.



In more recent projects, SHISUK has attempted to facilitate share allocations to poor people, through holding a small number of shares, (4-10% of the total share offering) in reserve for the landless. PRA exercises conducted in 2 SHISUK project villages suggest that poor people are only receiving direct benefits, in a small number of cases and the elite capture of shares and project resources was occurring.

4. Project Beneficiaries

As direct participation depends on land ownership on the floodplain, this excludes most poor and landless households, from receiving direct benefits from floodplain aquaculture, through share holdings or land rents. For those households with small land holdings in the floodplain project area, even if they do acquire a small number of shares, it is questionable whether they will be able to retain them over time. A strong social development influence, such as an NGO, it necessary to prevent the majority of shares in profitable aquaculture projects, ending up in the hands of a small number of influential people

5. Work & Service Provision opportunities

Seasonal unemployment and out-migration is common in many floodplain areas. Floodplain aquaculture provides a range of employment opportunities, some of which are available during the traditional off season labour periods. Through stimulating the local economy, floodplain aquaculture, allows a range of other employment and service provision opportunities to emerge. In some floodplain aquaculture areas, seasonal out-migration has been replaced by seasonal in-migration.



Many service provision opportunities were found supporting the Shisuk Projects in Daudkandi. These included; fish hatchery operators; nursery operators; fingerling traders; fish feed sellers; lime traders; fertiliser dealers; bamboo fencing makers; cow dung /poultry litter suppliers; ice plant operators; ice suppliers and carriers; fish aratders & middlemen; bamboo fish basket makers; transport truck / trolley owners; rickshaw van owners.

6. Access to Common Property Resources

The collection of fish and other aquatic produce from inundated private land has always been considered an 'open access' issue in Bangladesh. However, floodplain aquaculture is, by definition, a 'privatisation of the commons' and changes a seasonal, open access, common property resource into a year round, closed, private property resource. As a result there are a number of lost livelihood practices, many of which are important to the poor. These include; subsistence fishing, duck raising; fuel material collection; fodder material collection and jute retting.



People in Chargram Village complained that they could no longer raise ducks on the same scale as before the floodplain aquaculture project, as the snails which used to form an important duck food source, are no longer as abundant.

7. Fish Consumption

Floodplain aquaculture projects can make a significant contribution to nutrition in terms of the amount of fish consumed but not always in terms of the quality of fish consumed, as many of the larger cultured fish lack the micro-nutrients found in the smaller wild caught floodplain species.



The small, delicious, indigenous fish species, which their families used to eat during the wet season can now not be accessed and have been replaced by cheap, larger cultured fish. 'Before, the project, eating big fish was a dream' stated one member of the Chargram Women's Group. However, they admitted that they still prefer to eat the smaller, indigenous wild fish. During the peak fishing season, the women reported that they are now eating fish 6-7 times/week. During the dry season this drops to around twice/week. Silver Carp, generally the cheapest fish produced, sells at 40 -75 taka/kg, depending on the time of year. Prices are lowest at the end of the wet season.

8. Opportunities for Women

Traditionally, where Bangladeshi women have been involved in fishing related activities, it has been at the post harvest stage of the production process. Floodplain aquaculture does create the conditions for a diversification of their involvement, through the service provision opportunities, such as basket making, that arise. In a small number of cases, women were observed having a more significant role in the process, either as nursery operators or as fishers.



Women interviewed reported that the floodplain aquaculture projects had greatly enhanced their mobility and the degree of respect that they could earn through their involvement in the new economic opportunities.

9. Community effects

Floodplain aquaculture cannot be labeled as a truly 'inclusive community approach', as direct participation depends upon landholding in the floodplain area, which excludes many members of the community. In addition, there is a basic incompatibility between

floodplain aquaculture and floodplain fisheries and future conflicts between traditional fisher communities, (many of who are landless) and farmer landowners wishing to establish floodplain aquaculture projects, seem inevitable. However, in

several cases studied, it appears that floodplain aquaculture projects have a general calming effect on communities, and local law and order situations tend to improve, once projects are successful.



The law and order situation around Pankowri has improved markedly in recent years. This is thought to be due to the economic opportunities that are now available to previously idle persons. The Pankowri Board of Directors has, on occasions found agreeable solutions to local conflicts, without a case going to court.

10. The Environment & Biodiversity

Floodplain aquaculture projects sometimes claim their activities are having a positive effect on wild fish stocks and the

environment. Wild fish make up between 5-15% of the total harvest biomass. However, their contribution to total fish

production tends to decrease as cultured fish production increases. Wild fish stocks may be benefiting from the feed and fertilizer applied; the extended inundation period and water depth and the absence of fishing pressure during the grow-out period. However, the fertile 'pond like' conditions created on the floodplain mean that many natural ecological niches no longer exist and the enrichment of the water column will not suit all aquatic species. The predominance of exotic fish species of between 8-10 species, (including a number of 'new species, such as *Pachu*), are used



The targeted protection of certain high value fish such as Chital, (*Notopterus chital*) and Aye, (*Mystus aor*.) in dry season sanctuaries may be making a significant contribution to the availability of these species on the floodplain in the wet seasons that follow

by many projects and may also pose a threat to indigenous biodiversity, through their escape and establishment of feral populations in adjacent water bodies.

In many floodplain aquaculture projects, dry season sanctuaries have been excavated. These internal refuges are not thought to be having a particularly significant effect on the re-

establishment of wild fish populations, during the following wet season. However in cases where rarer species had been deliberately targeted for conservation and induced propagation, positive claims are more justified. The movement of wild fish larvae and fry into and around the impounded floodplain is facilitated, to some extent, through the use of large mesh screens on embankment culverts,

although the movement of brood stocks is restricted.

It seems inevitable that floodplain aquaculture will result in increased fishing pressure in floodplain areas outside of the aquaculture projects, as people are no longer allowed to fish within the impounded aquaculture area, during the growing season.

11. Agriculture productivity



Farmers with land under floodplain aquaculture, in Daudkandi are reporting increased rice production of between 10-15% and a corresponding reduction in ploughing, irrigation, weeding, fertilizer and pesticide costs, making rice farming more profitable than before the project.

Floodplain aquaculture projects tend to result in extending the periods of inundation so that larger, more valuable fish can be produced. This may have a negative effect on crop diversification as there may not be enough time to produce some dry season crops, such as Aus Rice and tomatoes, in addition to the Boro Rice crop. Other crops

such as jute are incompatible with aquaculture due to the deleterious effect that retting has on aquatic life. The nutrient enriched soils that result from the heavy fertilizers and feeds applied during the aquaculture cycle seem to favour Boro rice yields but may have negative effects on other crops such as potatoes. Rice production cost

savings are also being claimed through reductions in fertilizer use, ploughing, pest control and weeding.

Farmers can be expected to quickly work out which crops perform best in post floodplain aquaculture conditions and it is likely that these benefits and savings will result in a net gains to agriculture production and economic return. Whilst this may make some large landowners richer, it may also maintain the viability of small landholdings, perhaps reducing pressure on some poorer farming families, to sell unviable farms.

Floodplain aquaculture also seems to produce an increased level of general environmental awareness amongst stakeholders, who may be more willing to adopt Integrated Pest Management (IPM) principles for their rice farming, in an attempt to protect adjacent/future fish stocks.

PROPOSED ROLES OF DEVELOPMENT INSTITUTIONS

This paper has attempted to present a balanced view of the major issues facing floodplain aquaculture development and to highlight some the winners and

losers that emerge from the new resource system. In order that floodplain aquaculture proceeds in an organised, systematic and sustainable manner, it is

recommended that Government and development organisations focus on the following four areas.

1. Research

A significant number of knowledge gaps exist and require further study and quantification. These include:

- the extent of lost livelihood opportunities;
- the social, economic & organisational aspects of floodplain aquaculture projects ;
- sustainable ways to involve poor & marginal households;
- the quantification of employment and service provision opportunities;
- the design and effectiveness of dry season refuges;
- the effect of floodplain aquaculture projects on indigenous fish stocks.



Until these and other research issues are better understood, it is recommended that Government and non government development agencies adopt a precautionary approach to floodplain aquaculture development.

2. Policy Development

As floodplain aquaculture develops, a number of critical policy questions need to be addressed by Government; These include the following:

- Should Bangladesh accept increasing inequality and lost

livelihoods in return for the increased fish production that results from floodplain aquaculture?

- How can the traditional livelihoods of fishing communities be best protected in areas

within/adjacent to floodplain aquaculture development?

- How can the needs of community members who lose their traditional fishing and other livelihood opportunities best be addressed?



Construction of embankment and sluice gate for floodplain aquaculture

3. Regulation

Government is urged to carry out a comprehensive zoning exercise to enable the effective, planning, monitoring, regulation and control of floodplain aquaculture and thereby avoid potential conflict situations between traditional fisher communities and floodplain aquaculture farmers developing. In addition, the movement and use of exotic species needs to be more carefully regulated.



Embankment and enclosed area for floodplain aquaculture



Overwintering fingerling pond with enclosure

4. Promotion

Government and NGO supported projects can assist landowners in setting up floodplain aquaculture projects in suitable locations and in establishing core organizational principles including, good governance, transparency and accountability, together with more equitable approaches. As much of the success of projects depends on the ownership achieved through the raising of capital and share arrangements, there is little point in development agencies supporting major infrastructure costs although donors may actively support continued research initiatives. Pro-poor and pro-women development programmes should instead focus on enhancing the employment and service provision opportunities that result from floodplain aquaculture development.



Dry season refuge for indigenous fish within enclosure