Livelihood implications

Among the different farming systems, integrated rice-fish culture and fish fingerling production were more profitable at the farm level. Farmers earned a net return of Tk. 49,714/ha for integrated fish culture with boro rice while the net return of boro rice-alone was only Tk. 11,179/ha. This indicated that farmer could earn 218% higher net return from integrated rice-fish farming than that of boro rice-alone farming. Moreover, integrated rice-fish culture also reduced pesticides cost to about 77% and weeding cost to about 51% in boro season. Fish fingerling culture accounted for highest net returns among the three technologies in the study locations. Farmer earned almost Tk 70,000/ha/yr as net profit for fingerling production.

Bangladesh J. Fish. Res., 9(1): 87-88

Livelihood and seed mortality related vulnerability of carp seed traders of Bangladesh

M. Hasan* and A.N. Bart
Asian Institute of Technology
School of Environment Resources and Development
Post Box 4, Khlong Luang, Pathumthani 12120, Thailand
* Corresponding author
Email address: mahmud_66@yahoo.com (M. Hasan)

Abstract
Carp seed traders in Bangladesh are considered as one of the poorest, most vulnerable and least studied sub-population. Millions of fingerlings are transported annually to various parts of the country using bus tops and/or truck-beds in open and hand agitated method by the traders and as a result they encounter mass seed mortality. They are the key players in augmenting aquaculture activities by distributing fish fry and fingerlings to the fish farmers. Assessment of the seed sources and the livelihood of the traders are important to identify their point of entry to the aquaculture sector and further improvement. Status of household asset, income profiles, and risks involved were examined using DFID's sustainable livelihood approach (SLA) framework. Tools used to collect data included group discussions (GD), semi-structured and structured household (HH) survey. Samples (n=637) were randomly drawn purposefully from 10% of the carp seed traders within 11 districts. Sampled HH were classified into six land classes.

Key words: Carp seed traders, Livelihood Vulnerability

Research findings

- Of the sample HH surveyed, approximately 92% of the carp seed traders were poor in terms of land holding.
- Half of the traders were absolutely landless, further quarters were landless and 16% ware marginal.
- Most traders (92%) owned homestead land, 40% owned cultivable land and 18% owned cultivated land.
- Land was found to be the main asset that contributed about 40% to the total asset value.
- Only 25% carp seed traders had primary level, 12% had high school level education and half of the traders had no education at all.
- Most traders (76%) suffered from fever and cold (64%) directly due to their trading activities.

- Across the land classes, half of the sampled HH (55%) owned no cattle but most (77%) owned goats. Most (68%) HH had access to NGO's and was followed by local money-lender (22%) and Govt. Bank (17%) as source for their credit. Interestingly, most traders (70%) had political party affiliation.
- Both seed trading and labor selling were equally (22%) important as sources of income. Income from carp seed trading to their livelihood had highest (52%) return.
- Most traders (84%) encountered mass mortality of fish seeds. Each trader lost about US$ 110 due to seed mortality which is a significant portion (10%) of HH annual income.

Policy implications

- There should be a NGO's consortium to transform currently used earthen ponds into cemented cisterns as holding tank in the fish seed markets with electricity supply and public toilet facilities;
- Continuous supply of well-water in the fish seed trading market with re-circulation facilities should be ensured;
- Local participatory approach need to be adopted for resolving conflicts between the middlemen and seed traders;
- There should be option of microfinance for the traders both at the beginning of the season and in case of capital loss resulting from mass seed mortality;
- There should be formulation and enforcement of law for the fingerling producers to condition their fish seeds for 4 days prior to sale;
- There should be facilities for micro-credits to buy small aerators and transforming the seed carrying trucks with aeration facilities for seed transportation;
- Proper licensing from the DoF/other appropriate authorities for selling different chemicals to be used for enhancement of transport.

Livelihood implications

NGOs should be engaged in fisheries and aquaculture activities for the production of good quality fish seed and selling them to the small-scale seed traders at least at 10% discount than the prevailing market price. There may be an arrangement for production of table fish and selling them back to the seed traders during off-season. This will provide the poor fish seed traders a continuous income flow to their household and sustain their livelihood. There should be a permanent policy for gradual improvement of the present carp seed transporting technique and facilities for reduction of risks resulting from transport stress and mortality vis-à-vis increasing income. Fish seed trading is the most significant component of the seed traders' livelihood and income profiles. Any risk to the seed trading may negatively affect their livelihood and aquaculture production.

Bangladesh J. Fish. Res., 9(1): 89-90

Sustainable livelihood approach of prawn production and marketing systems in Mymensingh, Bangladesh

N. Ahmed*, M. Sultana, M. Podder and M. Bulbul
Department of Fisheries Management, Bangladesh Agricultural University
Mymensingh2202, Bangladesh
*Corresponding author
Email address: nesar_2000@yahoo.com (N. Ahmed)

Abstract
An investigation was carried out in Phulpur upazila, Mymensingh to examine the current production practices of freshwater giant prawn, *Macrobrachium rosenbergii* and its marketing systems with sustainable livelihood approach. The livelihoods of a considerable number of rural poor are associated with prawn production in Phulpur upazila. Based on a sample of 50 farmers, about 94% farmers were found to culture prawn with fish in their ponds. Only 4% and 2% farmers were found to culture prawn-fish-dike crops and only prawn respectively. Prawn marketing is almost exclusively a preserve of the private sector where the livelihoods of a large number of people are associated with its distribution and marketing systems. The market chain from producers to consumers passes through a number of intermediaries. About 40% of the produced prawns are exported and the rest 60% are sold to local markets. The price of prawn depends on quality, size and weight. The average farm-gate price of prawn varied from Tk. 110 to 160/kg, whereas it's market price varied from Tk. 150 to 350/kg. Most of the farmers and traders have improved their socio-economic conditions through prawn farming and marketing activities. However, concerns arise about the long-term sustainability of prawn farming and marketing systems due to lack of technical knowledge of prawn farming, poor road and transport facilities, higher transport cost, poor supply of ice, lack of cash and credit facilities. It is therefore essential to provide institutional and organizational support and credit facilities for sustainable prawn production and marketing systems.

Key words: Prawn production, Marketing, Livelihood approach

Research findings

- The livelihoods of prawn farmers are associated with prawn production and marketing.

- The market chain from the farmers to the consumers passes through a number of intermediaries: local agents, wholesalers and retailers.
- The average farm-gate price of prawn varied from Tk. 110 to 160/kg, while the consumers' price varied between Tk. 150 and 350/kg in local markets. Most of the farmers and traders have improved their socio-economic conditions through prawn farming and marketing activities
- Constraints of prawn farming and marketing systems as reported by the farmers and traders were: lack of technical knowledge of prawn farming, poor road and transport facilities, higher transport cost, poor supply of ice, and scarcity of money and credit facilities.

Policy implications

- Considering the lack of technical knowledge in prawn farmers, training on integrated prawn farming should be provided to the farmers with the help of DOF, BFRI and NGOs.
- Improvement of prawn transport, handling, preservation and shipment facilities are essential to supply quality product.
- A sufficient number of ice factories should be established at the farm site for preservation and marketing of quality prawn.
- Prawn market operators should be provided with training on prawn handling, icing, preservation and curing.
- Improvement and maintenance of hygienic conditions of prawn landing centers and markets are essential for producing quality product.

Livelihood implications

In spite of poor resources, most of the farmers and traders have improved their socio-economic conditions through prawn farming and marketing activities. Prawn farming and marketing have clearly brought out a positive change in their economic activities. Farmers and traders have broadly improved their food consumption, standards of living, purchasing power, choice, and ability. However, poor resources, weak transforming structures and process, vulnerability context, poor institutional support and lack of extension services – all identified as constraints for long-term sustainability as well as for sustainable livelihoods to the prawn farmers, traders and associated people. It is therefore essential for institutional, organizational and government support towards more research, extension and knowledge of prawn farming and marketing for sustainable livelihoods.

Bangladesh J. Fish. Res., 9(1): 91-93

Marketing of small indigenous species of fish (SIS) in three selected fish markets of Mymensingh

M.A.R. Hossain*, N.S. Chowdhury and M.Z. Ali
Department of Fisheries Biology & Genetics, Bangladesh Agricultural University
Mymensingh 2202, Bangladesh.
*Corresponding author
Email address: marhossain@yahoo.com (M.A.R. Hossain)

Abstract
A socio-economic survey was conducted round the year in three fish markets at Mymensingh, Bangladesh. The selected markets were categorized as rural market (Sutiakhali market), a peri-urban market (Kamal Ranjeet market, BAU) and an urban market (Notun Bazar market, Mymensingh town). It was learnt from the survey that the availability of Small Indigenous Fish Species (SIS) declined to a great extent over the last few years and at presently many of such fish species are either threatened or at the edge of extinction. The supply of SIS was highest in KR market (37 % of total) and more or less similar in Notun Bazar and Sutiakhali fish market (25 and 27 % respectively). The total supply of SIS fluctuated from 25% to 35% throughout the year in these markets. About 48 SIS were found in the sampled markets over the survey period. The highest number of species (45) was found in KR market followed by Notun Bazar (42) and Sutiakhali (37) fish markets. During the survey, three critically endangered species namely, schilbid catfish, garua catfish and rita were found in these markets. Beside these, other 11 and 10 species were listed to be endangered and vulnerable respectively. The biodiversity of 21 SIS found in three markets were no threat at all. Three species (guntea loach, Indian glass barb and flying barb) were 'data deficient' as reported by the IUCN Red Book (IUCN-Bangladesh 2000). From the supply point of view small prawn, spotted snakehead, stinging catfish, pool barb, striped dwarf catfish, Gangetic mystus, walking catfish and tank goby were the prominent fish. The least available species found in this survey were lesser spiny eel, barred spiny eel, Gangetic ailia, freshwater garfish, zig-zag eel, flying barb, Ganges river sprat, freshwater river shad and dwarf gourami. The weight of SIS available in Notun bazar was highest and nearly double than other two markets. There was no significant difference recorded in the supply of SIS in Sutiakhali and KR markets. The average monthly SIS supply was 185, 192 and 467 kg in KR, Sutiakhali and Notun Bazar, respectively; therefore, the cumulative average supply was 844 kg per month in three markets. The price of SIS ranged widely from taka 50-450/kg depending on species, location of market, time of purchase and the condition of fish. In general small prawn, ticto barb, dwarf gourami, Gangetic leaffish, and Annandale loach were sold at a lower price (ranged taka 50 – 100/ kg) and these species could be considered at the bottom of the market-price list. Other SIS like walking catfish, climbing parch, butter catfish, cotio and schilbid catfish valued as highest price (ranged taka 150 – 450 /kg). There was no specific marketing chain for SIS in Mymensingh region. The components

of marketing channels and their expansion varied with seasons and locations. The general pattern, however, was as this - after buying fish from fish farmer/fishermen, middlemen (locally known as *Foria*) used to buy fish to wholesale market and sell to the wholesalers. The retailers used to buy fish from wholesaler through auction to the highest bidders. The retailers then send the fish to particular market where the fish reached the consumers.

The livelihood strategy of SIS retailers in three fish markets showed that socio-economic constraints such as low income, poor educational background, low economic status and lack of capital are the main constrains. Most of the retailers proposed that government should control the fish price throughout the year, so that the producers can get reasonable and stable price. Construction of cold storage and preservation facilities at market sites, improvement of road and communication, improvement of physical market facilities and reduction of market chain is essential. Credit facilities, improvement of their standard of living, health and sanitary condition, housing condition, children education and access to drinking water facilities were identified as additional aspects to improve socio-economic condition of SIS retailers.

Key words: SIS, Demand, Supply, Retailers, Socio-economic aspects

Research findings

- About 48 small indigenous species of fish were recorded from three selected markets of Mymensingh. The highest number of species (45) were found in Kamal Ranjeet market and the number of species found were 42 and 37 in Notun Bazar and Sutiakhali, respectively.
- Three critically endangered species (schilbid catfish, garua catfish and rita) were found in the survey. Among the SIS found 11 were endangered and 10 were vulnerable. The biodiversity of 21 SIS found in three markets were not threatened, and three species (guntea loach, Indian glass barb and flying barb) were data deficient as listed in the IUCN Red Book (IUCN-Bangladesh, 2000).
- The average supply of SIS was merely 30% of total fish supply in three markets. The comparative SIS supply was highest in Kamal Ranjeet market (37 %), whereas more or less equal (25≈27 %) supply were found in Notun Bazar and Sutiakhali fish market. The total supply of SIS (%) fluctuated between 25% and 35%. It declined gradually from March to July and then started to increase again. The highest % of SIS was observed in March and April (35%) and it was the least (25%) in July.
- From the supply point of view small prawn, spotted snakehead, stinging catfish, pool barb, striped dwarf catfish, Gangetic mystus, walking catfish and tank goby were the prominent fish. The least available species found in this survey were lesser spiny eel, barred spiny eel, Gangetic ailia, freshwater garfish, zig-zag eel, flying barb, Ganges river sprat, freshwater river shad and dwarf gourami. The 5 highest

available SIS were striped dwarf catfish, spotted snakehead, small prawn, stinging catfish, and pool barb collectively in three markets.

- SIS like walking catfish, climbing parch, butter catfish, cotio and schilbid catfish fetched the highest price in these markets and considered to be fish for rich man.
- Socio-economic constraints such as low income, poor educational background, low economic status and lack of capital are recorded as the main constraints for SIS retailers.

Policy implications

- The government should support the construction of cold storage and preservation facilities in fish markets
- Improvement of road, communication, physical facilities and reduction of market chain will be useful.
- It is essential to improve socio-economic condition of SIS retailers such as financial supports as well as credit facilities, uplift of standard of living, health and sanitary condition, housing condition, children education, drinking water facilities etc
- Therefore in depth long-term investigation of SIS is urgently needed not only for the conservation and rehabilitation of SIS but also for creating the awareness among the policy makers to the government and non-government organizations, groups and general mass.

Livelihood implications

Study on quantitative and qualitative supply of SIS, countrywide livelihood strategy analyses of the retailers depends upon the SIS marketing in Bangladesh. Such attempt will not only pave the way for better-protected biodiversity of SIS but will also be useful to the people who make their living on SIS with a more sustainable livelihood approach in near future.

Bangladesh J. Fish. Res., 9(1): 95-96

Fish seed production and marketing in some selected areas of Bangladesh

M.S. Islam
Department of Agricultural Economics
Bangladesh Agricultural University
Mymensingh 2202, Bangladesh
Email address: islam @ royalten.net (M. S. Islam)

Abstract
The main objective of the study was to assess the production and marketing system of fish seed and examining the demand for and supply of fry and fingerlings in some selected areas viz. Mymensingh, Netrokona and Tangail in Bangladesh. The present study selected the related stakeholders like 20 Fish Seed Multiplication Farms (FSMF) owners, 80 nursery operators, 20 fry traders and 90 fish farmers who are the beneficiaries and directly involved with the fish seed production and supply chain, and marketing system of fish seed. In case of nursing and rearing fingerlings, only those stakeholders (nurserers and fish farmers) attached with NGOs were selected and the NGOs were GRAMUS, SARA and ORD from Mymensingh and SATU from Tangail district. Data were collected for the period 2004 – 2005 and most analyses were done by using tables and flow chart to determine production and marketing system of fish seed.

Key words: Fish seed, Production, Marketing

Research findings

- Amount of fish seed production of FSMFs depends mainly on number of hatchery irrespective of jar type and circular type owned by the individual hatchery, and number and size of brood fish ponds and nursery pond managed, and number and quality of brood fish reared.
- The study revealed that average farm size was almost same for Government Fish Seed Multiplication Farms (GFSMFs) (3.60 ha) and Private Fish Seed Multiplication Farms (PFSMFs) (3.50 ha) but the average number of hatcheries, and total pond area and pond size were exceptionally higher in PFSMFs compared to Government GFSMFs.
- Production of spawn per farm in PFSMFs (1,495 Kg) was more than three times higher compared to GFSMFs (450 Kg).
- In general, 75 – 100% FSMFs produced fish seed of Rui, Catla, Mrigal, Silver Carp, Grass Carp and Calbaus.

- Along with the production and selling of spawn, FSMFs also produce fingerlings in small scale in nursery ponds located in hatchery areas and per farm production of fingerlings were 836,920 and 1,761,350 for GFSMFs and PFSMFs respectively, indicating that production of fingerlings for PFSMFs was about 2 times higher than that of GFSMFs.
- PFSMFs produced higher amount of fish seed, which also yielded higher gross margin as well as net return compared to GFSMFs.
- Sales price of fish seed (spawn and fingerlings) was relatively low and cheaper in PFSMFs but nursery Operators and fish farmers preferred to buy and stock fish seed produced from GFSMFs due to its better quality and quick growth.
- PFSMFs produced higher amount of fish seed which made the total marketing profit higher compared to GFSMFs.
- Large variation of demand for and supply of fish seed was observed. During mid February to April, there was higher demand for fish seed and per Kg spawn of major carps was sold by Tk. 3,000 – 3,500 but its sales price decreased to Tk. 500 – 700 during the period from July – October. Even with the large price variation, supply of fish seed was adequate during the production period.
- With the increased supply, average sales price of fish seed decreased gradually for the last few years. Per Kg price of spawn (carps) was Tk. 6,000 – 7,000 in 1992 – 1993 which decreased to Tk. 500 – 700 by 2004 – 2005.

Policy implications

- Brood fish management should be improved specially for PFSMFs to improve the quality of fish seeds.
- Nursery operators and to some extent, operators of FSMFs should stock healthy fish seed to ensure better growth and production of fingerlings.
- DoF, BFRI and other related organizations should take necessary steps and measures to control the quality of fish seeds that to be produced by FSMFs.

Livelihood implications

Four categories of stakeholders such as owners of FSMFs, nursery operators, fry traders and fish farmers are directly involved in fish seed production and marketing. First three categories of stakeholders considered fisheries activities as their main occupation while most of the fish farmers considered it as a supplementary source of household income. However, all these stakeholders could improve their livelihoods with the active participation and involvement in fish seed production and marketing.

Bangladesh J. Fish. Res., 9(1): 97-99

Shifting rice farming to fish culture in some selected areas of Mymensingh, Bangladesh: the process, conflicts and impacts

M. Akteruzzaman
Department of Agricultural Economics
Bangladesh Agricultural University
Mymensingh 2202, Bangladesh
Email address: akterbau@yahoo.com (M. Akteruzzaman)

Abstract
The evolutionary process of converting low-lying paddy fields into fish farms and its impact on agrarian communities in some selected areas of Mymensingh district were studied. This study was conducted through participatory rural appraisal (PRA) covering 12 villages from each of selected upazillas *viz.* Fulpur and Haluaghat of Mymensing district. A total of 12 PRA sessions were conducted where 90 farmers participated during 29 July to 26 August 2004. It is seen that the use of low-lying paddy fields was mostly confined to Broadcast Aman (B. Aman) rice production until 1960s. With the introduction of modern rice farming technology, the farmers started to produce Boro rice in Rabi season and B. Aman rice in Kharif season. With the passage of time, aquaculture technologies have been evolved and the farmers realized that fish farming is more profitable than rice cultivation, and then they started to utilize their paddy fields for alternate rice-fish farming and rice-cum-fish farming. Now a days, aquaculture based crop production system is in practice in more than 25% of the low-lying paddy fields. Conversion of rice fields in to fish ponds has brought up a change in the livelihood patterns of the rural farmers. The areas where the farmers involved themselves in the new production systems were fingerling collection, transportation and marketing of fry and fingerlings. During 1960s to 1970s, a few people used to culture fish in the permanent ponds for their own consumption, the species produced were rohu, catla, mrigal, ghainna, long whiskered catfish, freshwater shark (boal), snake head (shol) etc. Small fishes like climbing perch, stinging catfish, walking catfish, barb, minnows etc. were available in the rice fields during monsoon season. In 1980s to mid 1990s, some rice fields were converted into fish ponds and the people started to produce fish for commercial purposes. When rice-fish farming became profitable, a large number of people started converting their rice fields in to rice-fish culture ponds. Culture of some exotic fishes like silver carp, tilapia, grass carp, silver barb etc. also started in the paddy fields. Higher income from fish farming contributed positively in improving the housing, sanitation and education system in the study areas. It is seen that the medium and medium high lands were only used for alternate rice fish farming. The net income was high in any fish based cropping system that motivated the farmers to introduce fish based cropping system in the low-lying inland areas. As a result, the regional as well as communal income disparities occurred. However, the extraction of ground water became common during the dry period as the water was used for both rice and fish farming. Mass

conversion of paddy fields into rice-fish culture ponds caused water logging in the study areas. In most cases, the participated farmers mentioned that they could be easily benefited by producing fish with T. Aman or only fish during the monsoon season. They agreed that this was an impressive technology to them and they could generate employment opportunities throughout the year. Finally, the social, economic and technical problems which are acting as constraints to rapid expansion of fish production system were reported from the interviewee.

Key words: Rice farming, Aquaculture, Rice-fish farming, Conflicts and impacts

Research findings

- Farmers had a common tendency of converting low-lying paddy field into fish ponds for alternate rice-fish farming in the study areas
- The use of low-lying paddy fields was mostly confined to Broadcast Aman (B. Aman) rice production until 1960s. With the introduction of modern rice farming technology, the farmers started producing Boro rice in Rabi season and B. Aman rice in Kharif season.
- With the advent of aquaculture technologies the farmers have started to utilize their paddy fields for alternate rice-fish farming and rice-cum-fish farming. Now a days, fish based crop production system is in practice in more than 25% of the low-lying paddy fields.
- Conversion of rice fields in to fish ponds has brought in changes in the livelihood patterns of the rural farmers. The areas where the farmers involved themselves in the new production system were fingerling collection, transportation and marketing.
- During 1960s to 1970s, only a few people used to culture fish in the permanent ponds for their own consumption, the species produced were rohu, catla, mrigal, ghainna, long whiskered catfish, freshwater shark (boal), snake head (shol) etc.
- Small fishes like climbing perch, stinging catfish, walking catfish, barb, minnows etc. were available in the rice fields during monsoon season.
- In 1980s to mid 1990s, some rice fields were converted into fishponds and the people started produce fish there for commercial purposes. When rice-fish farming became profitable, a large number of people started converting their rice fields in to fishponds and some new varieties of fish like silver carp, tilapia, grass carp, silver barb and common carp were also stocked in the paddy fields.
- The net income was high in any fish based cropping system that motivated the farmers to introduce fish based cropping system in the low-lying inland areas. Higher income from fish farming contributed positively in improving the housing, sanitation and education system in the study areas. As a result, the regional as well as communal income disparities have been occurred.
- Mass conversion of paddy fields into fish ponds caused water logging in the

study areas. However, the extraction of ground water became severe during the dry period in some places as the water was used for both rice and fish farming.

- The demand for labourers has sharply increased in the study areas with the opening of a new era in employment generation that helped to improve their livelihood pattern.
- A set of social, economic and technical problems that are acting as constraints to rapid expansion of fish production system in the study areas were identified.

Policy implications

- Department of Fisheries (DoF) and Bangladesh Fisheries Research Institute (BFRI) and other development agencies should take steps to improve the management of fish production system in the rice fields in low-lying areas.
- GoB should adopt land use policy to ensure better use of crop land and shifting of land from crop farming to fish culture and other non-farm activities.
- Policy decisions should be taken to motivate farmers for utilizing the same plot for rice fish farming instead of only rice or fish farming.

Livelihood implications

Some useful information about livelihood of the farmers involved in inland fish farming and aquaculture-based crop farming systems have come out. Instead of producing only rice in low lying areas, the adoption of rice fish farming and/or aquaculture based crop farming has diversified the production system and increased the income of farmers, which in turn contributed significantly improve their housing and sanitations, health care, education and livelihood of the respective farm families.