

References

- NACA/FAO (Network of Aquaculture Centres in Asia-Pacific/Food and Agriculture Organization of the United Nations). 2006. Quarterly Aquatic Animal Disease Report (Asia and Pacific Region) 2006, 3 July-September 2006. NACA, Bangkok, Thailand. On-line version, <http://www.enaca.org/modules/wfsection/article.php?articleid=7>.
- Flegel, T.W. (2006) The special danger of viral pathogens in shrimp translocated for aquaculture. *Science Asia* 32: 215-221. http://www.scienceasia.org/2006.32.n3/v32_215_221.pdf.
- Briggs, M, Funge-Smith S., Subasinghe, R. and Phillips, M. (2004) Introductions and movement of *Penaeus vannamei* and *Penaeus stylirostris* in Asia and the Pacific. RAP publication 2004/10. Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific, Bangkok, 2004, 70 pp.
- Senan, W., Tangkrock-olan, N., Panutrakul, S., Barnette, P., Wongwiwatanawute, C., Niphonkit, N., Anderson, D.J. (2007, in press). The presence of the Pacific white leg shrimp (*Litopenaeus vannamei* Boone, 1931) in the wild in Thailand.
- Wyban, J. 2007. Thailand's shrimp revolution. *Aquaculture Asia-Pacific, Magazine*, May- June 2007, 15-18.

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Sustainable livelihoods of pangus farming in rural Bangladesh

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Development of aquaculture has generated considerable employment opportunities in Bangladesh through the production and marketing of fish and associated activities. Around 400,000 ha of freshwater ponds/ditches and more than 900,000 households are involved in aquaculture (ADB, 2005). Conditions are highly favorable for the rapid expansion of aquaculture as the quantity of seed produced has risen rapidly in recent years (Muir, 2003). Bangladesh is considered one of the most suitable countries in the world for small-scale freshwater rural aquaculture, because of its favorable resources and agro-climatic conditions. Over the last three decades, there has been a steady increase in inland freshwater aquaculture production. In Bangladesh, total fish production was estimated at 2.2 million tons in 2005 of which 882,091 tons (40%) were from inland freshwater aquaculture, 859,269 tons (39%) from inland capture fisheries, and 474,597 tons (21%) from marine fisheries (DOF, 2006). The main production systems for freshwater aquaculture in Bangladesh are extensive and semi-intensive pond polyculture of carps which accounts for 80% of the total freshwater aquaculture production (ADB, 2005; Ahmed, 2005). The remaining 20% are mainly from pangus, tilapia, small indigenous species (SIS) of fish and rice-fish farming (Muir, 2003). A current



focus is on promoting pangus farming for food supply, increase income, and employment opportunity – all of these are important parameters of sustainable livelihoods.

Sutchi catfish, *Pangasianodon hypophthalmus* is an indigenous fish species of Thailand, living in the Mekong River (Roberts and Vidthayanon, 1991). The origin of pangus was from the Mekong River of Vietnam to the Chao Phraya

River of Thailand and then their distribution was spread to other countries such as Malaysia, Indonesia and China. It was introduced to Bangladesh from Thailand in 1989 (Banglapedia, 2006). Because of its introduction from Thailand the fish is popularly known as Thai pangus.

There is a great potential for Thai pangus culture in Bangladesh. The climate, water and soil conditions of Bangladesh have proved totally suitable for pangus production. Pangus is one of the most suitable catfishes for rearing in ponds. Pangus culture has proved itself as a profitable enterprise due to year round production, quick growth and high productivity. In addition, pangus can be stocked at a much higher density in ponds compared to other cultivable species (Ali et al., 2005). There is a huge demand for pangus in local markets, because of lower market price. Moreover, the vast majority of poor people consume pangus as this fish is delicious and tasty due to its high fat content. A large number of rural poor, most of them living below the poverty line, find employment in the pangus production and marketing systems. This study sought to broadly understand the livelihoods of pangus farmers and associated groups.

Methodology

Study area

The primary area for the study was Bhaluka upazila (sub-district) under Mymensingh district, situated in the north-central part of Bangladesh. Mymensingh district is divided into 12 upazilas. Among them only Bhaluka upazila was selected for this study since it is an important area for pangus farming due to the availability of hatchery-produced fry, favorable resources and climatic conditions such as the availability of pond, warm climate, cheap and abundant labor, and favorable socio-economic conditions. In addition to these, farmers of this area

got training on pangus farming with the help of the Mymensingh Aquaculture Extension Project (MAEP) which was financed by the Danish International Development Assistance (DANIDA). This upazila was therefore selected for this study.

Data collection methods

A combination of participatory, qualitative and quantitative methods was used for data collection. Data were collected for five months from October 2005 to February 2006. The Participatory Rural Appraisal (PRA) tool Focus Group Discussion (FGD) was conducted with pangus farmers and associated groups (fry traders, fish traders, transporters



A typical pangus farm.



A series of ponds – pangus farming is expanding rapidly due to high economic return.



Pelleted feed is wide used for commercial pangus farming.



Construction of ponds - employment opportunity for the rural poor.

and day laborers). FGD was used to get an overview of particular issues such as existing practices of pangus farming, socio-economic conditions and livelihood situation. A total of 10 FGD sessions were conducted where each group had 6 to 12 persons and duration was approximately two hours. For questionnaire interviews, a total of 60 farmers were conducted. Farmers were interviewed at their houses and/or farm sites. The interviews focused on farming systems, production technology, productivity, production constraints, and livelihood outcomes. The DFID (Department for International Development) sustainable livelihoods framework (DFID, 1999) was applied to structure the analysis of collected data (Figure 1).

Livelihood strategies

The livelihoods of a large number of small and marginal farmers are associated with pangus production in the study area. Pangus farming was first started in 1998 in Bhaluka upazila of Mymensingh district. Before pangus farming, most farmers were involved in fry rearing, tilapia farming, integrated rice-fish farming, etc and a few were involved in carp polyculture, although this area is not suitable for carp farming due to lower soil fertility. The vast majority of respondents (90%) produced pangus because of its profitability although few farmers cultured for their own consumption.

According to the survey, all interviewed farmers were observed to practice monoculture of pangus in

the study area. The peak season of pangus farming is from March to December/January. The majority of farmers stocked their ponds from as early as March to May and harvested their fish at least three months after, and subsequently at intervals until the end of the year. In general farmers practiced three categories of farming systems namely: i) intensive, ii) semi-intensive, and iii) traditional. Pangus farms based on traditional feeding practice generally use supplementary diets consisting of mixture of locally available feed ingredients such as rice bran, wheat bran, oil cake, etc. Farmers with intensive feeding practice depend on commercially manufactured pelleted feeds while a semi-intensive category refers to a feeding system

on farm-made aquafeed, i.e., mixture of feed preliminary comprised of rice bran, wheat bran, oil cake, fish meal, flour, dried fish, oyster shell, salt, and vitamins.

Regardless of farming systems, the average annual stocking density of fingerlings was estimated at 23,847 per ha. Most respondents reported multiple stocking while few farmers (mainly traditional) stocked once per year. Little pond preparation measures such as dike repairing, removal of aquatic weeds and predatory fish were undertaken by the pangus farmers before the stocking of fingerlings.

Most of the farmers used fertilizers for grow-out of pangus. The purpose of using fertilizers in the pond is to create conditions which would help to increase the growth of natural food (e.g., phytoplankton, zooplankton and benthos) thereby increasing fish production. In general, farmers used two types of fertilizer namely organic (cow dung) and inorganic - urea and triple super phosphate (TSP). According to the survey, 60% of farmers used cow dung, 57% urea and 43% TSP at varying frequencies. On average, annual fertilization rates were estimated at 903 kg/ha of cow dung, 259 kg/ha of urea and 192 kg/ha of TSP (Table 1).

The productivity of pangus is closely related to feed inputs. Supplementary feeds were used by all of the farmers for pangus farming. On average the annual quantity of feed supply was estimated at 13,723 kg/ha. These days industrially produced commercial fish feeds are



Feeding of pangus in



Live pangus in a market.

widely used to increase pangus production in the study area. All respondents under intensive farming system were found to use industrially manufactured pelleted feeds.

The average annual yield of pangus was estimated at 8,343 kg/ha. The productivity of pangus is significantly higher than carps. The annual yield of carps in the greater Mymensingh area averaged 3,300 kg/ha (Winrock International, 2004). Responses concerning the reasons for increased pangus productivity included an increased supply of feed and quality fry, maintenance of water quality, disease control, and overall better management of the pond.

A large number of rural poor are involved in the domestic pangus marketing chain as local agents, traders, intermediaries, day laborers and transporters. The domestic market chain from farmers to consumers encompasses mainly primary, secondary and retail markets, involving sales agents, suppliers, wholesalers and retailers. In general, trucks and pickups are used to transport live pangus to the markets. Plastic containers with water are commonly used for keeping the pangus during transport. Pangus are traded whole, un-gutted, and fresh without processing. The price of pangus depends on quality, size and weight, seasonality, market structure, supply and demand, and

taste. The average farm-gate price of pangus was estimated at US\$ 0.62 per kg.

Livelihood assets

Different combinations and components of capital assets are required for people to engage in pangus farming in rural Bangladesh. The sustainable livelihoods framework draws attention to five types of capital upon which pangus farmers' livelihoods depends: human, natural, financial, physical and social (Scoones, 1998; DFID, 1999).

i) Human capital

Human capital represents the skills, knowledge, ability to labor and good health that together enable people to pursue their livelihood strategies (Ashley and Carney, 1999). As well as being of intrinsic value, human capital is required in order to make use of any of the four other types of asset (Carney, 2002). It is therefore necessary, though not on its own sufficient, for the achievement of positive livelihood outcomes. In the pangus farming sector, people are moderately healthy and they have built up skills through their own knowledge and in some cases through the technical assistance from DANIDA-funded MAEP. Respondents from questionnaire interviews had an average of 5.6 years of experience in pangus farming. Most farmers were quite young, with an average age estimated at 39 ranging from 29 to 50. Amongst the surveyed group of pangus farmers, the reported illiteracy rate was found to be 58%.



Pangus farming has generated employment opportunity for day laborers.



A fish trader with pangus.

ii) Natural capital

Natural capital of pangus farming represents the natural resources - land, water and wider environmental goods that are stable for farmers to support production. However, rapid population growth in fish farming communities have led to accelerated natural capital depletion that has affected pangus production as well as income. According to the survey, most of the households (87%) had a single pond, and the remainders (13%) had two ponds. The average area of pond was found to be 0.23 ha. Farmers relied on rainfall and ground water for pangus farming.

iii) Financial capital

Financial capital denotes the financial resources that people use to achieve their livelihood objectives. Financial capital of pangus farming represents the incomes, savings, credits, etc. The pangus culture industry has the potential to generate considerable amounts of financial capital. Across the study, the average annual net return from pangus farming was estimated at US\$ 2,170 per ha (Table 1). Almost all respondents reported pangus farming to be their primary occupation and their major incomes to come from pangus farming, on average 71% of their total income. In the study area, 70% of respondents used their own money for pangus farming, while the rest received small loans from various sources such as moneylenders, fish traders, NGOs, and banks. The average amount of credit received by a farmer was estimated at US\$ 220 per year.



Transporting feeds by a van.

Local branches of national banks provide credit to the pangus farmers. The Grameen Bank, Bangladesh Krishi Bank and other national banks have been providing loans for developing pangus farming. The Grameen Bank, a specialized bank for micro credits that awarded the Nobel Peace Prize for 2006, is active in several villages of pangus farming areas.

iv) Physical capital

Road, transport, shelter, market etc are the physical capital of pangus farming that enables people to pursue their livelihood strategies. However, pangus farming communities are often disadvantaged due to the poor road and transport facilities, higher transport

costs, poor infrastructure of markets, and lack of electricity facilities. Most of the farmers lived in very poor housing conditions, their houses typically made of mud, bamboo and paddy straw. These factors in turn affect the livelihoods of the pangus farmers.

v) Social capital

Almost all community people are disadvantaged in social capital such as the networks, groups, trust, access to institutions, etc. The lack of social capital has affected livelihoods of poor people in fish farming communities. Low levels of social capital are both cause and consequence of the vulnerability of the poor. In the study area, rich farmers and wealthy people forced poor farmers to sell their pond and land. Friction between the two sides sometimes led to scuffles involving villagers. Unfavorable social environment can also pose risk of losses through poaching of fish and poisoning ponds. These incidents were reported to be significant in the study area.

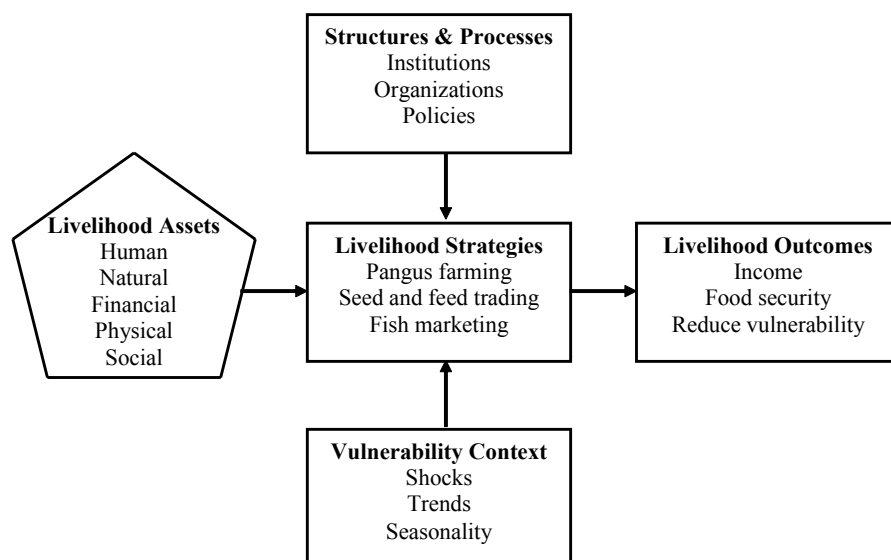
Vulnerability context

The livelihoods of farmers and associated groups as previously defined in terms of capital assets are further affected by the vulnerability context. The vulnerability context refers to the shocks, trends and seasonality that have affected livelihoods of people in pangus farming communities. The external environment of pangus farming in which people exist:



Trucks are commonly used for transporting live pangus to the markets.

Figure 1: A simplified form of the sustainable livelihoods framework (adapted from Rabbani et al., 2006).



- Shocks – illness, natural disasters (flood, drought and heavy rain), conflicts among community people, diseases of fish etc are the shocks of pangus farming.
- Trends – population trends, political trends, economic trends etc may aggravate the problem of meager incomes of pangus farming communities.
- Seasonality – of production, of prices, and of employment opportunities have affected livelihoods of poor people.

livelihoods. An absence of appropriate structures and processes is a major constraint to the sustainable development of pangus farming in rural Bangladesh. Many organizations - both private and public sector do not reach pangus farming areas. NGOs have not played much of a role in the development of the industry in general. Thus, lack of institutional and administrative help, inadequate extension services – all have affected livelihoods of poor farmers and associated groups.

Transforming structures and processes

Transforming structures and processes are the institutions, organizations, policies and legislation that shape

Livelihood outcomes

In spite of poor resources, livelihood outcomes of pangus farming are positive and most farmers (90%) have increased their income, food security, and basic needs. Basic needs include drinking water, housing, health facilities and economic security. Most of the

Table 1. Inputs and returns of pangus farming in the study area.

Items	Mean	SD	
Pond size (ha)	0.23	0.09	
Inputs	Stocking (no./ha/year)	23,847	
	Feeding (kg/ha/year)	13,723	
	Fertilization (kg/ha/year)		
	Cow dung	903	241
	Urea	259	89
Outputs	TSP	192	56
	Productivity (kg/ha/year)	8,343	3,231
Feed conversion ratio (FCR = quantity of feed/ productivity)	1.64	0.41	
Cost-return analysis (US\$/ha/year)	Production cost (PC)	2,964	853
	Gross revenue (GR)	5,134	1,761
	Net return (NR=GR-PC)	2,170	696
Benefit-cost ratio (BCR = GR/ PC)	1.73	0.43	

SD: Standard deviation

farmers have improved their social and economic conditions through pangus farming. Almost all farmers who reported improved conditions noted that before pangus farming they took food only once or twice in a day. Now farmers' households are able to eat rice three times a day and also eat better quality food. Clearly there have been visible qualitative and quantitative changes in standard of living, food consumption, and level of economic activity in the pangus farming areas. Before pangus farming, a large number of farmers lived below the poverty line. The pangus farming has increased their economic solvency and improved social status which substantially improved their livelihoods.

A range of associated groups have also benefited from pangus farming. Pangus production has generated employment opportunities for the rural poor. Improvements in the standard of living which have occurred for fry traders, fish traders, intermediaries, transporters and even day laborers including women and children. The opportunities for day laborers to find work have increased significantly due to pangus farming. Additional employment opportunities are also generated in the commercial fish feed industries, fish hatcheries, fish markets especially transport sector from rickshaw pullers to large trucks which carry pangus to local markets.

Conclusions

The pangus farming sector plays an important role in the economy of particular areas of rural Bangladesh, contributing to increased food production, diversifying the economy, and increased employment opportunities. There has been a steady increase in the production of pangus by small and marginal farmers. However, concerns arise about the long-term sustainability of pangus farming due to high production costs mainly for feed, lack of credit facilities, limited resources, poor institutional support, and inadequate extension services. It is therefore necessary to provide technical assistance and low-interest credit with institutional and policy support for sustainable pangus farming as well as for sustainable livelihoods to the farmers and associated groups.



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References

- ADB. 2005. An Evaluation of Small-scale Freshwater Rural Aquaculture Development for Poverty Reduction. Operation Evaluation Department, Asian Development Bank (ADB), Manila, Philippines.
- Ahmed, G.U. 2005. National Aquaculture Sector Overview – Bangladesh. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy.
- Ali, M.Z., Hossain, M.A. & Mazid, M.A. 2005. Effect of mixed feeding schedules with varying dietary protein levels on the growth of sutchi catfish, *Pangasius hypophthalmus* (Sauvage) with silver carp, *Hypophthalmichthys molitrix* (Valenciennes) in ponds. *Aquaculture Research* 36:627-634.
- Ashley, C. & Carney, D. 1999 Sustainable Livelihoods: Lessons from Early Experience. Department for International Development (DFID), London, UK.
- Banglapedia. 2006. Exotic Fish. Banglapedia, National Encyclopedia of Bangladesh.
- Carney, D. 2002. Sustainable Livelihoods Approaches: Progress and Possibilities for Changes. Department for International Development (DFID), London, UK.
- DFID. 1999. Sustainable Livelihoods Guidance Sheets. Department for International Development (DFID), London, UK.
- DOF. 2006. Fishery Statistical Yearbook of Bangladesh 2004-2005. Fisheries Resources Survey System, Department of Fisheries (DOF), Dhaka, Bangladesh.
- Muir, J.F. 2003. The Future for Fisheries: Economic Performance. Fisheries Sector Review and Future Development Study, Commissioned with the association of the World Bank, DANIDA, USAID, FAO, DFID with the cooperation of the Bangladesh Ministry of Fisheries and Livestock and the Department of Fisheries, Dhaka.
- Rabbani, M., Prakash, V.A. & Sulaiman, M. 2006. Impact assessment of CFPR/TUP: a descriptive analysis based on 2002-2005 panel data. CFPR Working Paper Series No. 12:1-31, BRAC and Aga Khan Foundation Canada.
- Robart, T.R. & Vidthayanon, C. 1991. Systemic revision of the Asian catfish family Pangusiidae, with biological observations and descriptions of three new species. *Proceedings of the Academy of National Sciences of Philadelphia*, 143: 97-144.
- Scoones, I. 1998. Sustainable rural livelihoods: a framework for analysis. IDS Working Paper 72, Institute of Development Studies (IDS), Brighton, UK.
- Winrock International. 2004. Mymensingh Aquaculture Extension Component Impact Evaluation Study. Winrock International, Dhaka.



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