Marketing of low-valued cultured fish in Bangladesh: An evaluation of value chain

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Bangladesh is considered one of the most suitable countries in the world for freshwater aquaculture, because of its favourable resources and agro-climatic conditions. A sub-tropical climate, vast areas of pond, low-lying agricultural land and seasonal semi-closed shallow water provide ideal conditions for fish production. The freshwater inland aquaculture production in Bangladesh is the second highest in the world after China (FAO, 2009). The total annual fish production was estimated to be 2.56 million tons in 2007-08 (Bangladesh fiscal year: 1 July-30 June), of which 1.00 million tons (39%) were obtained from inland aquaculture, 1.06 million tons (41%) from inland capture fisheries, and 497,573 tons (20%) from marine fisheries (DOF, 2009). The main production systems for freshwater aquaculture in Bangladesh are extensive and semi-intensive pond polyculture of Indian major carps and exotic carps which accounts for 80% of the total freshwater aquaculture production. The remaining 20% were mainly from catfish, tilapia, small indigenous fish and rice-fish farming (ADB, 2005).

In Bangladesh, bighead carp (*Aristichthys nobilis*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*) and sutchi catfish (*Pangasianodon hypophthalmus* - locally known as pangas) are commonly known as low-valued cultured fish, all are exotic species. These species are of foreign origin and introduced to Bangladesh during the last few decades to supplement fish production (Table 1). Among these species, silver carp is fast growing, reaches 300-400 g within three months of stocking. Silver carp contributes around 20-23% of total aquaculture production and has become an important food fish for the poor, together with other exotic carps. All of these exotic carps have contributed substantially to commercial aquaculture in Bangladesh, an average 28% of the total aquaculture production (De Silva et al., 2006). These exotic carps including pangas have become important food fish for the poor and contribute significantly to the food security.

Low-valued exotic species for aquaculture is becoming an increasingly important food production process in many Asian countries (De Silva et al., 2009).With rising population and demand, expansion of fish supplies to maintain food security has emerged as a priority concern for Bangladesh. In order to meet the soaring demand for food, there is a huge potential of low-valued fish farming in Bangladesh, because

Harvesting of pangas.

of many positive culture attributes including no significant adverse environmental impacts (ADB, 2005). However, while farming of low-valued fish species has huge potential in Bangladesh, their commercial viability and sustainability depends on markets. The market is associated with strong demand, driven by continued increases in population. Mainly due to population growth there is a growing gap between supply and demand of fish in markets. Narrowing the gap not only requires increasing production but also improvements of all aspects of fish marketing and distribution systems (Kleih et al., 2002; Ahmed and Sturrock, 2006; Ahmed, 2007 and 2008). It is therefore worthwhile to understand existing marketing systems of low-valued cultured fish. Aside from a better understanding of fish marketing systems, it seems important to identify marketing inefficiencies that have negative impacts on poor farmers, traders and associated groups.

This article describes the existing marketing systems of low-valued cultured fish with its value chain analysis. The aim of this paper is to highlight key issues determine efficient marketing systems of low-valued cultured fish to enhance

Table 1. Low-valued cultured fish introduced in Bangladesh (Source: Banglapedia, 2009).

Common name	Scientific name	Country of origin	Introduced from	Year of introduction
Bighead carp	*Aristichthys nobilis*	China	Nepal	1981
Common carp	*Cyprinus carpio*	Temperate Asia, China	India	1960
Grass carp	*Ctenopharyngodon idella*	China	Hong Kong	1966
Silver carp	*Hypophthalmichthys molitrix*	China	Hong Kong	1969
Sutchi catfish	*Pangasianodon hypophthalmus*	Southeast Asia	Thailand	1989

food supply. It is assumed that sustainable marketing of low-valued cultured fish can provide food and nutrition to the people of Bangladesh.

Harvesting of low-valued cultured fish of exotic carps.

Common carp with other fish for marketing.

Methodology

Study area

The study was conducted in Trishal and Bhaluka sub-districts under Mymensingh district of north-central Bangladesh. Geographically both areas have been identified as the most important and promising for low-valued fish farming, because of the availability of hatchery-produced fry, favourable resources and climatic conditions, such as the availability of pond, warm climate, fertile soil, and cheap and abundant labour. As a result, there has been a dramatic increase in low-valued fish production over the last few years. Table 2 shows average productivity and culture systems of low-valued fish in the study areas.

For the market survey, two important fish markets in Mymensingh town, namely Machua Bazaar (i.e. fish market) and Nutun Bazaar (i.e. new market) were selected based on market history, supply of low-valued fish, number of traders involved, and the duration of trading season. Similarly, two important fish markets in the capital city of Dhaka, namely Kawran Bazaar and New Market were selected to carry out comparative studies of low-valued fish marketing between Mymensingh and Dhaka.

Data collection methods

Data were collected for a period of three months from December 2008 to February 2009. Primary data were gathered by field survey. This survey involved the inspection of the study area in terms of low-valued cultured fish distribution and marketing systems. A combination of participatory, qualitative and quantitative methods was used for primary data collection. A total of 12 Focus Group Discussion (FGD) sessions were conducted with fish farmers in Trishal and Bhaluka sub-districts (6 FGD in each area) where each group consisted of 6-12 farmers (total 97 farmers) and the duration of each session was approximately three hours. FGD was used to get an overview of existing low-valued cultured fish harvesting and marketing systems, farm-gate prices and constraints of fish marketing. For questionnaire interviews, a total of 60 fish traders (15 in each market x 4 markets) were conducted in Mymensingh and Dhaka markets. The interviews, lasting about an hour, focused on low-valued fish marketing systems, pricing mechanisms, marketing costs and margins, and

Table 2. Farming systems and average productivity of low-valued cultured fish.

Fish species	Culture system	Productivity (kg/ha/yr)	Reference
Bighead carp Common carp Grass carp Silver carp	Polyculture with Indian major carps Small-scale extensive (80%) and semi-intensive (20%) Low input farming system Using locally available feeds: rice bran, wheat bran, mustard oilcake and fish meal	3,000-5,000	Ahmed (2009)
Pangas	Mainly monoculture Extensive (60%), semi-intensive (30%) and intensive (10%) farming system Using home-made, locally available feeds or industrially manufactured pelleted feed	4,000-8,500	Ahmed (2009)

identification of bottlenecks. For the validation of collected information, a total of 25 key informants were interviewed including wholesalers, informed farmers, government fisheries officers, policymakers and researchers. Collected data were coded and entered into a database system using Microsoft Excel software to produce descriptive statistics. Results from the data analysis, in combination with qualitative information collected through different methods, were used to describe low-valued cultured fish marketing systems.

Harvesting and marketing of fish

Harvesting of low-valued fish starts as soon as fish reach marketable size. The peak fish harvesting season is from August to December. Most farmers harvest fish by themselves although a few large farmers depend on commercial harvesters. Normally, fish are harvested at very early hours in the morning. Most farmers practice partial harvesting of larger fish which allows smaller fish to grow, while a few farmers practice total harvest. Farmers harvest fish by using cast nets and seine nets. Harvested fish are cleaned with tube-well water and kept in aluminium and plastic containers or bamboo baskets until they are sold.

Almost all produced low-valued fish is marketed internally for domestic consumption. Depending on the transaction volumes, farmers sell their fish to the local agents or suppliers. Vans and rickshaws (i.e. pedal tricycle) are commonly used to transport fish from remote villages to the main road side which takes 30 minutes to an hour, depending on distance. According to the survey, 65% of fish are transported to the capital city of Dhaka, around 75-100 km south from the fish producing areas. The rest (35%) of the fish are transported to nearby Mymensingh town markets (10-25 km north from the fish producing areas). The farm-gate prices of fish depend on their species, quality, size and weight, supply and demand, and seasonality. The average farm-gate price of fish was estimated at US$ 0.70 per kg, varied between US$ 0.59 and 0.81 per kg (Table 3).

A number of constraints were reported by farmers in marketing of fish, including poor road and transport facilities, higher transport costs, inadequate knowledge on marketing systems, low market price and exploitation by intermediaries. Farmers are in a particularly weak position (i.e. no bargaining power on price) in relation to intermediaries of fish marketing. Farmers often feel exploitation by the intermediaries as the prices they received for fish do not adequately reflect the prices paid by the consumers.

Table 3. Average farm-gate prices of low-valued cultured fish.

Species	Product share (%)	Price (US$/kg)*	Total average price US$/kg)
Bighead carp	5	0.76	
Common carp	12	0.70	
Grass carp	8	0.81	0.70
Silver carp	35	0.66	
Pangas	40	0.59	

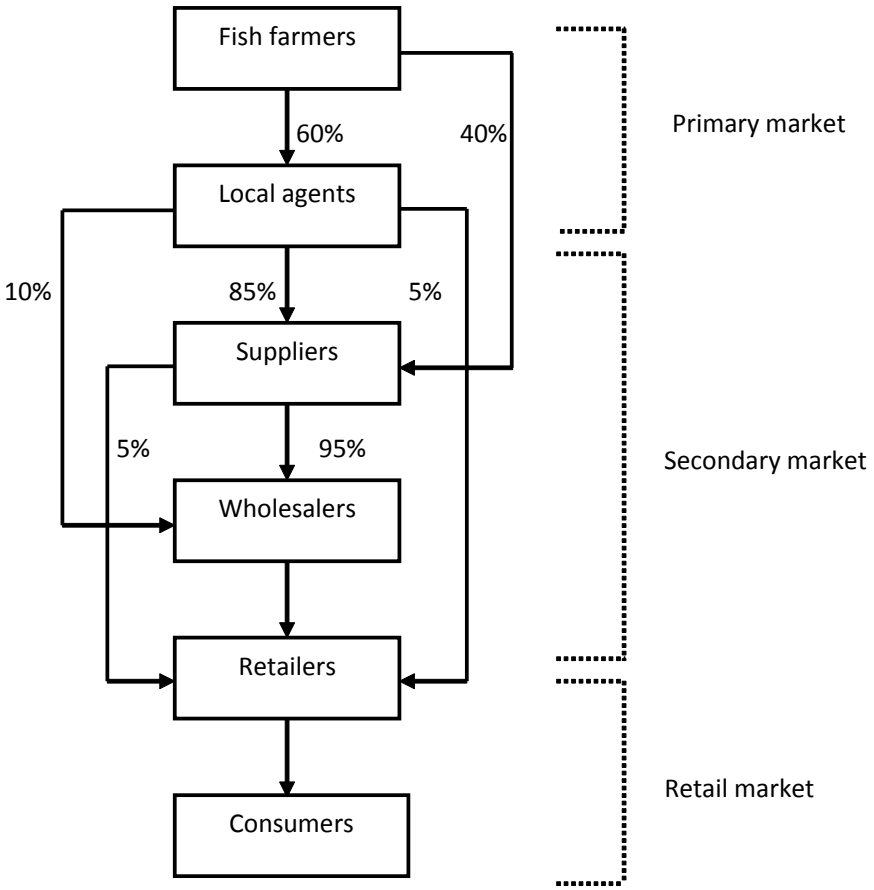
** Price estimated for 1 kg size of fish; US$1 = Tk 68 in February 2009.*

Table 4. Average prices (US$/kg) of low-valued cultured fish in retail markets.

Species	Mymensingh market	Dhaka market	Total average
Bighead carp	1.34	1.56	1.45
Common carp	1.27	1.51	1.39
Grass carp	1.32	1.59	1.46
Silver carp	1.24	1.50	1.37
Pangas	0.97	1.18	1.07
Average	1.23	1.47	1.35

Price estimated for 1 kg size of fish.

Figure 1. Low-valued cultured fish marketing systems from producers to consumers.



Fish marketing systems

The fish marketing system is traditional but plays a vital role in connecting the farmers and consumers, thus contributing significantly in the value adding process. A large number of poor people find employment in the fish marketing chain as farmers, local agents, suppliers, transporters, traders and day labourers including women and children. Farmers are the primary producers in the fish marketing systems. With a few exceptions, farmers never directly communicate with consumers. The market chain from farmers to consumers encompasses mainly primary, secondary and retail markets, involving local agents, suppliers, wholesalers and retailers (Figure 1). The demand for fish is high in markets but supply is limited, and a strong network has developed with intermediaries and traders. Communication between the suppliers and wholesalers is generally good and takes place by mobile phones. Suppliers are tied to a limited number of wholesalers. Suppliers commonly use trucks, buses, pickups and taxis to transport fish to wholesale markets in Mymensingh and Dhaka, which takes 1-4 hours depending on distance and mode of transportation.

As soon as the suppliers land fish in the wholesale market, the wholesalers take care of landing, handling and auctioning by species and size-groups. A number of day labourers work with the wholesalers to perform post-landing tasks that include cleaning, sorting, grading and icing of fish. Normally, the auction sale is made by heaps and wholesalers follow the incremental price system. It is the most competitive form of auctioning and ensures better prices. Auctioneers get commission at different rates of the sale proceeds, normally 2-5% of the auction price, for their services and costs involved. Auctioneers appointed by wholesalers, call out bid loudly in the presence of buyers (i.e. retailers). Retailers often take temporary credit from wholesalers, buying fish one day and paying one or two days later. Retail sales are made at stalls in fish markets. Fish are traded whole, gutted and fresh without processing, apart from sorting and icing.

Weighing of pangas for marketing.

Harvested silver carp contributes significantly to aquaculture production.

Fish trading in retail markets

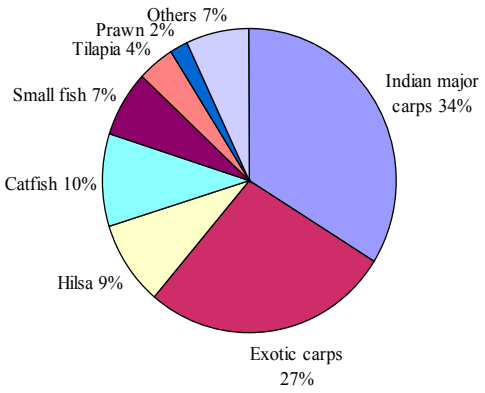
According to the survey, a typical retailer in Dhaka markets sold an average of 34 kg/day low-valued fish during the peak season from August to December, while in Mymensingh markets sold an average of 25 kg/day. The supply of fish in Dhaka markets was higher due to the higher number of traders and consumers associated. On the other hand, the supply of fish in Mymensingh markets was lower due to the lower number of consumers involved. Nevertheless, it was estimated that 27% of market share was exotic carps in Mymensingh markets while it was 24% in Dhaka markets (Figure 2). Among catfish, 70-80% comprises pangas in market share.

Low-valued cultured fish are sold according to species. The retail market prices of fish depend on quality, size and weight, season, supply and demand, and market infrastructure. The average price of fish from traders to consumers was estimated to be US$1.35 per kg, ranging from US$0.97 to 1.59 per kg (Table 4). Overall, the prices of fish were considerably higher in Dhaka markets than Mymensingh due to a larger concentration of consumers and superior family incomes.

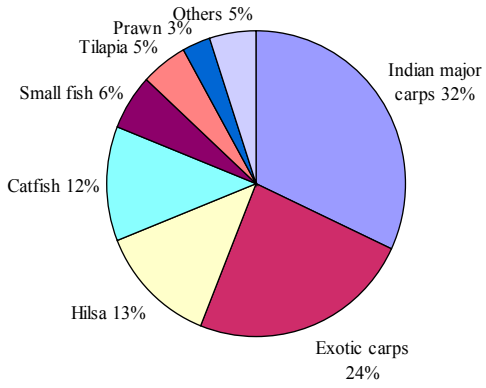
The consumption of low-valued cultured fish at household level has been increasing. It was reported by the traders that consumers usually prefer fresh fish without ice. In general, the high income groups (i.e. high officials and rich businessmen)

Figure 2. Market shares of different groups of fish in retail markets.

Mymensingh market:



Dhaka market:



buy large fish, and the middle-class is able to afford medium-sized and small fish. The large segments of poor people also buy small fish. Nevertheless, most consumers preferred larger fish due to taste, but normally purchased smaller because of lower market price.

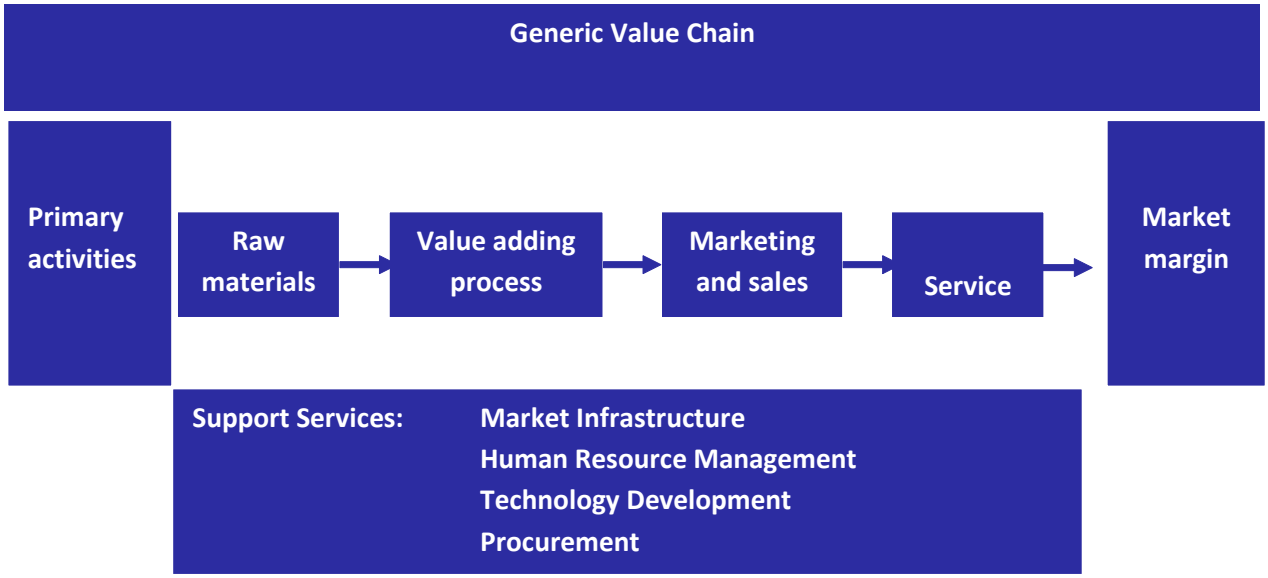
Value chain analysis

The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to final consumers (Kaplinsky and Morris, 2000; Jacinto, 2004). In fish marketing systems, value chain is a structure of physical, economic and social transactions between individuals and organisations engaged in raw material transformation into end products (Figure 3). Flows of fish products and money are exchanged through value adding transactions driven by profit and allocation.

In marketing of low-valued cultured fish, farmers can not earn a good profit because they have a limited access to market and they do not have enough knowledge on where to sell for their products. It was calculated that farmers received an average 52% of the retail price which is unduly low. The farm-gate prices of fish are low due to exploit by intermediaries. The intermediaries avail the opportunity and exploit both the farmers at the farm-gate level and consumers at the retail point. Farmers profit margins get reduce with the increase in number of intermediaries in the fish marketing channel. This implies that prices go up with increasing number of transactions in the fish marketing channel. Presence of intermediaries in the marketing channel mainly due to lack of government control over the trade.

For value chain analysis of low-valued cultured fish marketing, variables like marketing costs and margins, number of intermediaries in the marketing channel, distance between primary and retail markets, and consumers' behaviours on price are important factors. Amongst the intermediaries in the fish marketing channel, the highest average marketing margin per kilogram of fish was received by the wholesalers. As such, the highest average marketing profit per kilogram of fish was found in secondary market,

Figure 3. The concept of a value chain (adapted from Trondsen et al., 2004).



Fish distribution and marketing starts at the pond side.

Fish transporters at primary market.

Fish assembling centre at the road side.

followed by retail and primary market (Figure 4). Thus, the secondary market was identified as most responsible for price increase to the consumers.

Sustainable fish marketing

Despite importance of food supply, a number of constraints were identified for long-term sustainability of low-valued cultured fish marketing, including poor road and transport facilities, higher transport costs, insufficient supply of ice, unhygienic conditions, lack of credit facilities and poor infrastructure of markets (i.e. inadequate drainage systems, poor supply of water, limited ceiling and flooring space). This situation is further aggravated by the lack of transparency in the price formation process and asymmetric information flow, lack of capital for investment, and inadequate post-harvest infrastructure. Political disturbances such as strikes and road blocks also affect fish marketing.

In order to develop sustainable fish marketing systems, it is necessary to improve marketing strategies, including production, promotion, distribution and pricing strategy – all are important parameters of marketing mix (Figure 5). Better marketing facilities, transportation, fish marketing infrastructure, especially market centers and facilities would help to improve the situation. Efficient distribution systems for fish should be set up to serve the consumers better. It is also worthwhile to establish strong coordination between farmers and market actors to ensure a smooth supply of fish to the consumers.

In Bangladesh, low-valued cultured fish have great potential in terms of food supply. The sustainable marketing of low-valued cultured fish has a favourable impact on food supply to meet the growing demand for fish among consumers, including the poor. In order to sufficient supply of low-valued cultured fish in markets, it is worthwhile to provide institutional and organisational support, government support, extension services, more researches and public-private partnership for sustainable fish marketing.

Acknowledgements

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Figure 4. Value chain analysis of low-valued cultured fish in marketing channel.

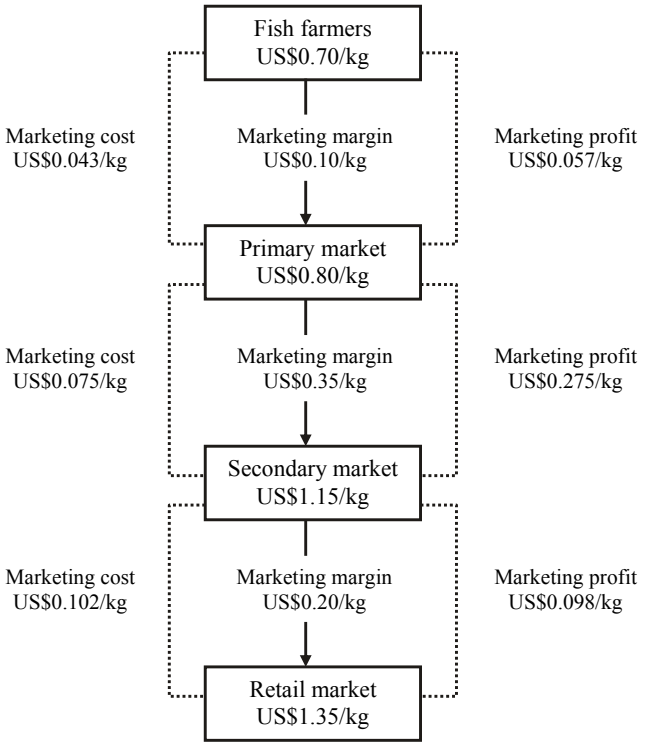

Figure 5. Components of the marketing mix for sustainable fish marketing (adapted from Rosenbloom, 2004).

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Low-valued fish trading at retail market.

Live pangas marketing – the cheapest fish in Bangladesh.