

Brackish Water Fishery : An Adaptive Strategy in the Sundarbans Ecology

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ABSTRACT This paper aims to show that the development of brackish water fishery results from the positive utilization of different environmental factors in the Sundarbans ecology. It also stresses that the brackish water fish farming is more adaptive than agriculture in this estuarine ecology.

INTRODUCTION

The Sundarbans is the largest active delta in the world. Geographically, it is located between 21°30' and 22°30' north latitudes and between 88°51' and 91°30' east longitudes in the south eastern part of the state of West Bengal (Mandal and Ghosh, 1989). This region measures about 9,630 sq. km (SDB, 1979). The major part of the Sundarbans is at present within the territory of Bangladesh. A large number of tribals and Mag coolies from the eastern frontier were brought there for the reclamation of such forest tract to open up agriculture (Hunter, 1875; O' Malley, 1914; Das and Raha, 1963; Mukhopadhyay, 1976). Over the years the people of this delta subsist on the differential utilization of three basic physical resources—land, forest and water. Agriculture is still the dominant mode of production in the greater part of this region. For a decade or so, the brackish water fishery locally called *jalkar* or *nona gheri* particularly in the northern sector of the Sundarban grows rapidly at the expense of agriculture. The local economy in the fishery dominated area is subject to a fair transition from subsistence agricultural mode of production to export oriented brackish water fish farming.

ECOLOGY OF BRACKISH WATER FISHERY

The potentiality for the development of brackish water fishery in the Sundarbans relates to the active role of various ecological factors (Dutta et al., 1983).

Low Lying Areas

The extensive low lying areas with saline soils having no apparent agricultural value are best suited for the development of brackish water fishery as the estuarine tidal water from adjacent rivers, creeks, canals etc. enters there easily.

Salinity

A certain amount of salinity is a pre requisite for brackish water fish farming. In the estuarine part of the Sundarbans the naturally produced salinity in water varies from 8 ppt (moderate) during monsoon period (July - September) to 25 ppt (high) during pre monsoon period (March - June).

Tropical Climate

The tropical climate is also highly conducive for fishery development. The average

annual rainfall is around 180 cm and the peak period lies between May and October. The dissolved oxygen content in water is 5-9 ppm. On the whole, the water temperature is higher in premonsoon months (March - June) and lower during post monsoon months (November - February). The air temperature varies with maximum values (30 - 35°C) in June - July accompanied by 70 - 80 per cent (high) relative humidity and minimum (20 - 24°C) during January - February (Bhunia and Chaudhury, 1981; Dutta et al., 1983).

Tidal Amplitude

Being located within intertidal zone the greater part of the landmass in the Sundarban is subject to tidal fluctuation throughout the year. It ranges between 3 and 5 m at different seasons. Owing to this phenomenon, the local people fill up their fisheries with estuarine water at the time of spring tide mainly during the new and full moon locally called *gan*.

Zoo - and Phyto-plankton

The Sundarban ecology produces a heterogeneous assemblage of zoo-and phytoplankton. The salinity with its range of fluctuations appears to be the chief factor controlling the seasonal distribution of zoo-and phytoplankton which together constitute a unique *eco-niche* for fishery resources (Dutta et al., 1983).

Shrimp Larvae and Mullet Fingerlings

The estuarine Sundarbans is known as the gold mine of naturally producing larvae of shrimps (*Penaeus monodon*, *Penaeus indicus*) and fingerlings of mullet such as *bhetki* (*Lates calcarifer*), *parse* (*Liza parsia*), *bhangor* (*Liza tade*) and some other species. With the ingress of tidal flow during the new and full moon a large number of them automatically enter into the fisheries.

PROCESS OF FARMING

Structurally a fishery is an embanked area of 0.75 - 1.0 meter deep and consists of one or more passages that maintain connection with the tidal creeks, rivers, canals and so on. Each such passage is lined with sluice system by means of inverted 'V' or 'W' shaped bamboo split frame called *pata* and has at its mouth one or two box traps for catching fishes. A densely meshed nylon net is attached to the lower part of this bamboo frame to prevent the escape of fishes from the fishery. Occasionally, a twig is vertically implanted at the middle of the fishery to measure the required level of water. Some watchman shelters encircling the fishery are constructed along the embankment at regular interval. In size, a single fishery varies from 0.15 - 3.00 acres for economically weaker section *i.e.*, scheduled castes and tribes to as large as 80 - 100 acres for big farmers.

The local people practise a polyculture system in which some species of highly prized shrimp as well as mullet are reared simultaneously in the same fishery by following indigenous method. The development of brackish water fishery involves a number of activities that are influenced by the estuarine ecology. All the activities are primarily grouped into four main stages.

Preparation of Fishery

The dry spell of year in the Sundarbans starts from the middle of October. The fish farmers rightly choose the months of November and December for removing the water of the preceding season to dry up the fishery. This water free fishery is allowed to dry under scorching sun for 6 - 8 days. Meanwhile the erection of embankment along its perimeter is completely done. Often the bed of fishery is treated with *mahua* oil cake to remove predatory and weed fishes. From the first week of January the fishery is exposed to the ingress of tidal water mainly three days before and

after the new and full moon. In this way it becomes full of saline water by the end of December. Quick lime is sometimes added into the water to enhance its fertility.

Table 1: Timings of different cultural operations

<i>Name of operations</i>	<i>Name of Months</i>
<i>Preparation of Fishery</i>	
Drying up fishery	November and December
Construction of embankment	December
Treatment with mahua oil cake	December
Filling up fishery by water	January and February
Addition of lime	January
<i>Release of Larvae and Fingerlings</i>	
First time	February
Second time	May
Third time	August
<i>Maintenance of Fishery</i>	
Embankment repairing	July to September
Maintenance of salinity	July to September
Watching	March to November
<i>Catching Operations</i>	
First time	June
Second time	September
Third time	December

Release of Larvae and Fingerlings

With the natural ingress of brackish water during spring tide an abundant amount of shrimp larvae and fingerling of mullet enter into the fishery. At the following receding phase of tidal flow during neap tides the bamboo made 'V' or 'W' shaped frame prevents them to escape from it. Despite the automatic ingress of larvae and fingerlings, the fish farmers purchase them from local traders. In the second case the larvae and fingerlings are first stocked in penned nursery within fishery to acclimatize them to the aquatic environment. Special care is always taken particularly of the nursery. Some precautionary measures with regard to environmental exigencies are followed while releasing them to the nursery. Before releasing

them, they test the salinity of water by a crude method of touching it to their tongue. If the salinity level drops down, some common salt is added to water in order to maintain its required level. The native experience reveals that the survival of larvae and fingerlings faces greater risk if their release into nursery is followed by rain. Because they die immediately after being struck on their head by raindrops. As a matter of fact they avoid cloudy and rain drenched days for releasing them. After remaining in nursery for a period of 10 - 15 days they are transferred to the main fishery. Their release takes place two to three times a year - mainly in February and May, and sometimes also in August. The shrimps grow there to marketable size of about 15-20 cm and 30 - 40 g weight within 100 - 110 days. On the other hand, mullets depending on the species attain weights of 50 - 200 g at the time of catching.

Maintenance of Fishery

There are some important cultural operations designed to maintain the ideal condition of the fishery. For the period from release to catching of shrimps and mullets water remains almost undisturbed in the fishery except for a few occasions. For example, rain water dissipates salinity of the fishery during monsoon period. At those times, the process of entry and exit of water continues for a few days. Furthermore, heavy downpour loosens soil and damages the embankments of the fishery to a great extent. On such occasions, the repairing of the embankments becomes an absolutely important task. The fish farmers make their own arrangement to guard their fisheries from theft mainly at night. At least one person is posted at each watchman shelter to keep watch.

Catching Operations

Although the catching continues throughout the period from June to the middle of Decem

ber, the fish farmers catch shrimp and mullet mainly in June and September; and sometimes also in December. They employ some indigenous devices to catch them. For small size fishery, the catching operation is exclusively done by different classes of cast nets called *khaplajal*. Some different strategies are followed in cases of medium and large fisheries. One prevailing device is to drag a long rectangular net from one side of the fishery to its opposite side and fishes are caught in this manner. In an alternative device, two men stand wide apart and hold two ends of a very long net locally called *ber jal*. A few other persons, equipped with small sticks, start moving from other side of the fishery towards the net and drive the fishes into the net by means of jabbing the sticks into water. As a result, the fishes get entangled into the net. On several occasions, the catching operation is facilitated by letting out some amount of water from the fishery in order to accumulate fishes in a relatively reduced area.

FISHERY AS AN ADAPTIVE STRATEGY

The ecology of the Sundarbans provides differential adaptive responses to agriculture and brackish water fish farming. Agriculture, though dominant in major part of the region, is characterized by low productivity due to saline soil, brackish water and other environmental hazards such as periodical flood, severe cyclone etc. Thus agriculture is always subject to greater amount of environmental risk. Nowadays the land already put to agriculture is largely being transformed to fishery development. This replacement implies the fact that the brackish water fish farming is more adaptive to this ecology than agriculture. The potentialities favourable to brackish water fishery are low lying area, high natural productivity of estuarine water, saline soil, tropical climate, tidal amplitude etc. Moreover, some ecological factors such as salinity in soil and water which constitute the basic difficulties for agriculture

are paradoxically very much productive for the development of brackish water fishery.

Along with the potentialities lying in several ecological factors, the shift from agriculture to fishery is due to the economic feasibility of the latter is more than the former. Previously the Sundarbans was a mono cropped area and aman paddy was the only crop. The cultivation of summer paddy called boro as second crop is now being practised with the introduction of irrigation facilities. The shrimps, on the other hand, could be grown three times a year. A comparison between the two reveals that the people earn a very large profit from shrimp farming than agriculture. The margin of profit accounts for about 40 -50 per cent and 60 -70 per cent of the selling prices of shrimp and paddy, respectively. Therefore, the utilization of physical resources in the form of brackish water fish farming is ecologically adaptive as well as economically more feasible than local agriculture in this estuarine ecology.

Table 2 : Production and selling price of paddy per acre

Production in kg			Total selling price in Rs.
Aman	Boro	Total	
900-1200	1500-1900	2400-3100	7200-9300

Source: Primary Survey

Table 3: Production and selling price of shrimp per acre

Production in kg				Total selling price in Rs.
1st time	2nd time	3rd time	Total	
80-100	90-110	100-120	270-330	32400-39600

Source: Primary Survey

Table 4: Comparison of selling price and profit between the production of paddy and shrimp per acre

Selling price in Rs.		Profit margin in Rs.	
Paddy	Shrimp	Paddy	Shrimp
7200-9300	32400-39600	4320-6510	12960-23760

Source: Primary Survey

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