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MANAGEMENT REGIME AND ITS IMPACT ON THE WETLAND FISHERIES IN ASSAM

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The floodplain wetlands (beels) in Assam extending over one lakh hectare, constitute the most important fishery resource of the state. These wetlands are the common property resource and under various management regimes, *i.e.*, private management (individuals and groups), fishermen cooperative management, Community-based fisheries management (decentralized management, Government works as facilitator) and open access. Most of the unregistered beels are under open access. An impact study was undertaken in two wetlands of Assam under private and cooperative management regimes with the objectives of to assess the impact of management regimes on the productivity of the beel; to assess the economics of beel fisheries management; and to assess the impact on the livelihood of the fisher community of wetlands.

An impact pathway was formulated for the impact analysis of management regimes on the productivity of the selected wetlands. The data were collected using structured questionnaire and focused group discussion with the lessee for privately managed beels and with secretaries for beels managed by Cooperatives. The productivity of Rawmari beel was 850 kg ha^{-1} yr^{-1} in comparison to 410 kg ha^{-1} yr^{-1} in Charan beel. The benefit accrued from private managed beels was better than the cooperative managed beels. This communication discusses in detail the positive and negative outcome of management regimes on the beel fisheries management. This communication also discusses about the sharing arrangement and benefit to community in the private and community managed wetlands.

Key words: Floodplain wetland, common property resources, fisher, lessee, management regimes, productivity

Introduction

India has extensive floodplain wetlands, defined as low lying areas bordering large rivers, which are seasonally inundated by the spillover from the main river channel. Floodplain wetlands are important fishery resources and contribute significantly to the Indian Inland fisheries. These wetlands are integral component of the Ganga and Brahamputra river basins, covering an area of more than two lakh hectares. These wetlands can be divided into (a) plains which include the river channel(s) and (b) the permanent or semi- permanent standing waters that the receding floods leave in various forms. These water bodies expand and contract with response to flood and dry season.

Floodplain wetlands in Assam

The state of Assam is endowed with large aquatic wealth in the form of wetlands, swamps, ponds and rivers. With the total area of nearly 4.89 lakh ha, the total fisheries resources of Assam is highest in the country. The floodplain wetlands (locally known as beel) extending over one lakh hectare, constitute the most important fishery resource of the state. There are about 1197 listed floodplain wetlands in Assam of which 430 are registered and remaining 767 are unregistered and under the control of both government (505) and private ownership (262). These wetlands are distributed over the valleys of Brahmaputra (about 92000 ha) in the northern and central Assam and Barak valley (about 8000 ha) in southern Assam.

Registered beel are under the administrative control of state mainly under revenue department, Assam Fisheries Development Corporation, local Panchayats. The beels are considered to be one of the most productive ecosystems owing to their characteristic interactions between land and water system. The floodplain wetlands, the prime fishery resources in Assam, are highly productive ecosystems (Dey, 1981; Choudhury, 1998; Sugunan and Bhattacharjya, 2000; Chandra, 2007; Chandra, 2010; Chandra and Sharma, 2011; Chandra *et al.,* 2013) providing livelihood support to a large section of the population next only to agriculture.

Stakeholder in floodplain wetlands of Assam

There are a large number of stakeholders, which are associated, directly or indirectly with beels (Chandra, 2009; Chandra, 2011).

The production and productivity of fisheries in wetlands were determined by the level of management and the management regimes operating in that wetland. In this context, an impact study was undertaken in two wetlands of Assam under private and cooperative management regimes with following objectives:

1. To assess the impact of management regimes on the productivity of the wetland,
2. To assess the economics of wetland fisheries management; and
3. To assess the impact on the livelihood of the fisher's community of wetlands.

Materials and methods

Location of the study

Two floodplain wetlands namely Rawmari in Nagaon district and Charan in Morigaon district, situated in Central Assam Brahamputra valley were selected. These wetlands were perennial in nature and under the management of lease holder mostly fishermen and fishermen cooperative society. The property and water regimes of the selected wetlands under study are mentioned in Table 1. The ownership of the wetlands were with Assam Fisheries Development Corporation (AFDC). The fishing right of the beels were leased out to the highest bidder (they should be from fisheries community or a fishermen cooperative society as per the Assam Fisheries Act 1953) after competitive bidding for a stipulated period of time (not less than five years) by the government. Charan beel was run by the fishermen Cooperative Societies; whereas the other beel Rawmari was managed by individual fisher. The lease, earlier fixed for five years has been extended for seven years. The lease value per year was in the range of Rs. 66000 (Rawmari) to 255000 (Charan). The variation in the lease value may be due to the productivity of the beel and the competitive bidding for management control of the beel. The longer period of fishing rights and management control provide an incentive to the lessees for increasing the productivity of floodplain wetlands through stock enhancement and better management.

Data collection and analysis

The present impact study was conducted during the year 2006-08. Detailed field visits were conducted and data was collected using structured questionnaire and focused discussion with the lessee for privately managed beels and with secretaries for beels managed by Cooperatives. The data were analyzed using various parameters given in the Impact pathways.

Table 1. Property and Water Regimes of Selected Floodplain Wetlands under study

Beel	District	Avg. Size (ha)	Owner ship	Lease		Fishing regime	Water regime	Type of beel
				Rent (Rs.)	Period (Year)			
Rawmari	Nagaon	20	AFDC	66,000	7	Private	Perennial	Open
Charan	Morigaon	60	AFDC	2,55,000	7	Coop	Perennial	Open

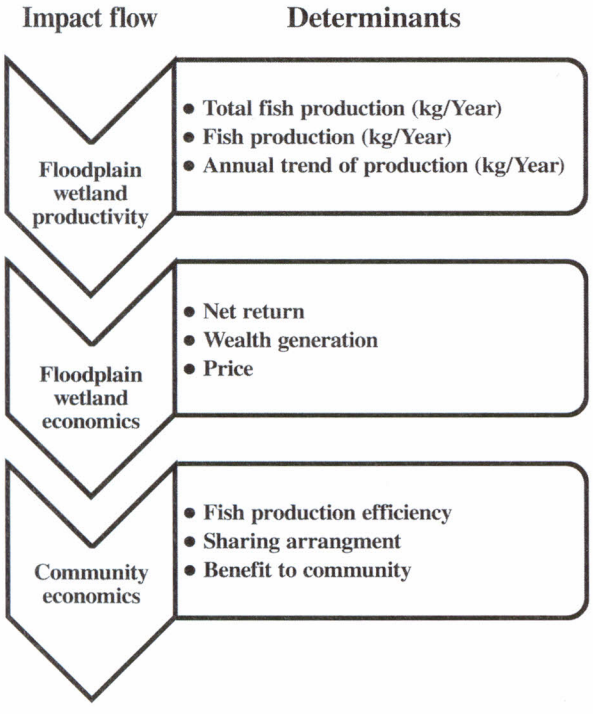

Fig. 1. Impact pathway for assessing impact of management regime on floodplain wetland fisheries

Impact pathway

A new impact pathway was designed for analyzing the impact of management regimes on the production and productivity of the selected beel (Chandra, 2010; Chandra *et al.* 2013) as given in Fig. 1.

Results and discussion

Management Regimes of Floodplain Wetlands

Livelihood of fishers' family from time immemorial is dependent upon fishing in floodplain wetlands. Based on the property rights and access the management regimes of the floodplain wetlands of Assam can be categorized into four types *i.e.* Private management (individuals and groups), Fishers' cooperative management, Community-based fisheries management (decentralized management, Government works as facilitator) and Open access with no management (Chandra, 2011). The ownership of floodplain wetlands comes under the different government departments' *viz.* Department of fisheries, Revenue department, department of forest, Assam fisheries Development Corporation, Gram panchayats *etc.* The management rights of registered beels were given on lease to the highest bidder (either individual or Fishermen Cooperative society).

Private management

Private management relates with the management of beels *de facto* by lessee. The lease period which was earlier one to five years has been amended to seven years for providing incentives to lessee for adopting stock enhancement measures. The management of beel including the fishing operation is done by the lessee according to his choice subject to the restriction that (a) no wetland should be drained dry by the lessee, who shall be required to leave sufficient water for the protection of fish fry and drinking water purpose of the cattle (b) the lessee must keep the fisheries (beel) clear of water hyacinth and other water weeds (c) fishing by more than 25 persons at a time for their own consumptions, even on

payment of the lessees, is prohibited in as much as it is highly detrimental to the interest of both the lessees and the government. The beel fisheries management including stock enhancement measures, weed management, fishing in the beel is done by the lessee. Access of other fishermen operates in the beel on paying some amount to the lessee or coming under the sharing arrangement, where a share of the fish catch is taken by the lessee as fee.

Cooperative Management

Under Assam Fisheries rules, the lease of the fisheries in wetlands on priority should be given to the fishermen or fishermen cooperative societies. In Cooperative management of floodplain wetlands, the management of fisheries operations is done by the members of the cooperative society as per the rules prescribed by the society. Here the access of property is governed by the membership of the cooperative society. Two types sharing arrangement of cooperative society and individual members are prevalent. In some societies, the fish catch is pooled together and sold in the market and a part of income shared among the members of the communities. In other societies, fishers give twenty five percent of their catch to the society as share of revenue.

Community Based Fisheries Management

In Assam, floodplain wetland fisheries are following the history of traditional management and lessee based management approaches and there is currently much interest among government agencies and NGOs in community based and Co- management approaches, which involves local communities in beel management and conservation. Government of Assam under AACP has initiated community based fisheries management in several beels of Assam under the aegis of Department of fisheries. These beels have now been put under the administrative control of fisheries department from the revenue department. In these wetland, beel development committee has been formed with the membership of fishermen and women of adjoining village. The *beel* development committee is a group of 20-500 individuals living in the adjacent village of a floodplain wetland coming together for effective utilization of the natural fisheries resources, better price of the produce and more market power for enhancement of livelihood in a sustainable manner by the landless, small and marginal beel users. The number of individual of BDC is depending upon the size of the beel and number of surrounding village. The beel development committee then selects their executive committee for day to day operation of beel fisheries. The fisheries department works as a facilitator in community based fisheries management.

Open access

Most of the unregistered *beel* are open access in nature means there is no control of access. But in fact the access of these beels is also based on local rights i.e the fisherman operating in these beels must be from the adjoining locality or same community or tribes *etc.* Only capture fisheries are practiced in these beels based on the automatic recruitment during the flood period. In some open access beel even separate *katal* has been erected by all the families live in the vicinity of that *beel.*

Table 2. Production and productivity per hectare of selected *beel*

Wetland	Production (in Kg)	Productivity (in Kg)	Size of beel
Rawmari	17000	850.00	20
Charan	24650	410.83	60

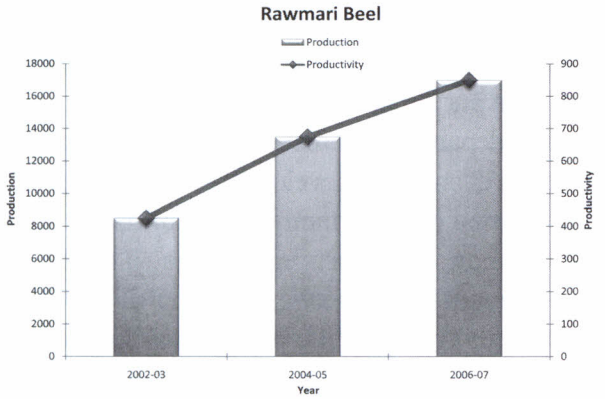

Fig. 1. Annual trend of production and productivity in Rawmari Beel

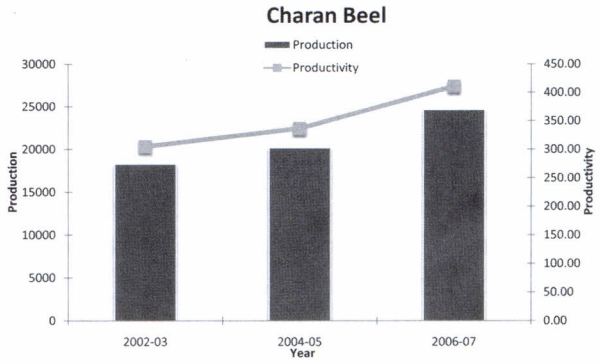

Fig. 2. Annual trend of production and productivity in Charan *beel*

Fisheries in selected wetlands

Lessee in private managed *beel* and secretary in Cooperative managed beels were working as managers and with the help of other fishermen control the management of fisheries. Culture based fisheries by adopting stock enhancement measures through pen culture were followed by the managers of both the wetlands. The production and productivity of the selected two wetlands have increased sharply after adoption of stock enhancement measures in beels. The productivity of Rawmari beel was 850 kg ha^{-1} yr^{-1} in comparison to 410 kg ha^{-1} yr^{-1} in Charan beel (Table 2).

Annual trends in production and productivity

The time series data from 2002-03 revealed that the production and productivity of the beels have increased sharply within a period of three to five years. With the adoption of stock enhancement practices by the fishers the productivity of the beels shows a paradigm shift and consequently production has increased. Beels of Assam were rich in nutrient status and the stocked fishes had used the remaining nutrients for higher growth.

The annual trend revealed that the productivity of Rawmari beel has just doubled in these four years (Fig. 2). The productivity of Charan beel has increased to 150 basis points in these four years (Fig. 3).

Economics of beel fisheries management

The total capital expenditure incurred by the fisher and the income received after selling of their catch comes under the economics of beel fisheries management. The fixed cost include the lease amount paid to the government whereas the variable cost includes the expenditure incurred in fishing operation, cost of weed clearance, seed cost and other in practices. The economics of beel fisheries revealed that in better managed beel, the fixed cost was around twenty per cent, whereas in poorly managed beels the fixed cost has increased significantly. The expenditure incurred in lease payment was low in Rawmari beel where as this cost had become a burden in Charan. This economics also revealed that the better managed beels have more net profit and high benefit cost ratio than other beels. Rawmari beel had given a high B: C ratio of 3.73 whereas Charan beel has only 1.92. The average farm gate price of the different fish species were in the range of

Rs. 25-30/kg for small indigenous fishes, Rs. 40-45 for Silver carp, Rs. 50-55/kg for other exotic carps, Rs. 60-70/kg for Rohu, Catla and Mrigal, and Rs. 100-200/kg for catfishes like *W. attu, N. chitala, etc.* The prices of these fishes were almost doubled on and around 13th January every year due to the *Bhogali Bihu* festival. Almost one harvest was done on eleventh or twelfth of January every year for ripping higher profit.

Benefit to Community

The distribution of income in terms of a part of fish catch or a part of the net income between the lessee and the other fishers are based on the sharing arrangement either fixed before the fishing season or during the fishing calendar. The agreement involves catching as well as transporting catch to the market. The share of fishers varies between 30 and 50 per cent depending on the availability of catch, ease of catch, type of harvested fish, prevailing fishing practices, provision of craft and gear, membership of the fishing group, provision of food *etc.* The sharing arrangement in fisheries Cooperative managed wetlands was quite different from the Lessee managed wetlands. In lessee managed beels where stock enhancement practices were in operation the share of lessee and fisher was 70:30 *i.e.* Rawmari beel.

Table 3 Economics of Beel Fisheries Management

Items	Rawmari	Charan
Lease amount	66000	255000
	(26.29)	(56.67)
weed clearance	15000	20000
	(5.98)	(4.44)
Fishing operation	100000	100000
including Katal	(39.84)	(22.22)
Seed	45000	50000
	(17.93)	(11.11)
Other	15000	10000
	(5.98)	(2.22)
Transportation	10000	15000
	(3.98)	(3.33)
Total recurring	185000	195000
	(73.71)	(43.33)
Total cost of Beel	251000	450000
Management	(100)	(100)
Fish production	17000	24650
Return	935000	862750
Profit	684000	412750
B: C ratio	3.73	1.92

(Percentage in parenthesis)

Higher efficiency of management leads to better income as well as better remuneration to both lessee as well as other fishermen. The better managed beels provides more benefit to fishers. Share of benefits between the lessee and the fishers in Rawmari revealed that more or less every fisher family earned an income of Rs. 10018.00.

The sharing arrangement at Charan beel was quite different from private managed beel since it was managed by a fishermen Cooperative society. The net benefit received by the cooperative society was shared by the member fishers in 40:60 ratio at Charan beel. The cooperative society would have to keep the money for the payment of lease amount and for the next year expenditure. The total fishermen members' families were 65. The total annual income earned by each members of the cooperative society was Rs. 3810.00.

The benefits to fishers per family gives a glimpse of the livelihood to the fishing community at large who are totally depended upon these beels for their survival.

Conclusion

Floodplain wetlands in Assam are dynamic resources where a large numbers of actors

operate for gaining access and livelihood. An understanding of management regimes and fisheries governance may lead to a deeper understanding of how society orders its affair in relation to key resources and fishermen in general. Though the management rights through lease was given to the individual as well as the Cooperative society was based on the open tendering process, the fishermen cooperative society has one incentive of paying 7.5 per cent less than the individual bidder. The comparison of production and productivity indicated that the privately managed beels where the management was under the control of lessee has given more production in comparison to the beels managed by Cooperative. This also indicates that the individual lessee were more enterprising and having risk taking capacity. The other inference of the benefit sharing arrangement was that the benefit to each fishermen family was better in private managed beel.

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