

**DRIVERS OF SOCIAL AND ECOLOGICAL CHANGE  
IN FLOODPLAIN RICE-FISH SYSTEMS  
IN BANGLADESH**

Ronald W. Jones

A thesis submitted to the faculty of Graduate Studies  
in partial fulfillment of the requirements for the degree  
**Master of Natural Resources Management**

Natural Resources Institute  
University of Manitoba  
Canada R3T 2N2

April 2008

**THE UNIVERSITY OF MANITOBA**  
**FACULTY OF GRADUATE STUDIES**  
\*\*\*\*\*  
**COPYRIGHT PERMISSION**

**DRIVERS OF SOCIAL AND ECOLOGICAL CHANGE IN FLOODPLAIN  
RICE-FISH SYSTEMS IN BANGLADESH**

**BY**

**Ronald W. Jones**

**A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of  
Manitoba in partial fulfillment of the requirement of the degree  
Of  
MASTER OF NATURAL RESOURCES MANAGEMENT**

**Ronald W. Jones © 2008**

**Permission has been granted to the University of Manitoba Libraries to lend a copy of this thesis/practicum, to Library and Archives Canada (LAC) to lend a copy of this thesis/practicum, and to LAC's agent (UMI/ProQuest) to microfilm, sell copies and to publish an abstract of this thesis/practicum.**

**This reproduction or copy of this thesis has been made available by authority of the copyright owner solely for the purpose of private study and research, and may only be reproduced and copied as permitted by copyright laws or with express written authorization from the copyright owner.**

## **Abstract**

This thesis examines the role of a diversity of drivers on the development of institutions at three case study sites encompassing different management strategies of rice-fish floodplain systems. Objectives of the study were to document drivers of change and institutional responses at selected rice-fish farming sites; to document the key cross-scale institutional linkages at selected rice-fish sites; and to build scenarios to explore farmer/fisher perceptions of the future of ricefield fisheries and other resources, using information on key drivers influencing change in the local area.

Bangladesh floodplain beel ecosystems (perennial floodplain depression) are complex and dynamic. They are extremely important in providing fish protein for the rural poor, including a class of mobile, landless fishers. Multiple-use areas beels are valued by different user groups for different reasons. These systems are experiencing widespread alterations, impacted upon by a number of different forces or drivers originating from a complex interaction of social, cultural and environmental factors. These forces have historic roots in both the pre and post colonial and contemporary contexts of Bangladesh. The management institutions in place are created or modified in response to these drivers, in conjunction with the social-political interactions of local governance; different levels of economic and political power; and elite capture of resources.

The key drivers of changing agro-ecological context and conditions were: demographic and migration (mobility) changes, increased emphasis on decentralization, the privatization of provisioning and forces of globalization are challenging and redefining the meaning and methods of participation in Bangladesh civil society. Alternate resource governance strategies included private floodplain culture-based fisheries (which received widespread government promotion), and self-organized forms of management, including community-based and co-managed fisheries.

Based on scenario exercises, many groups of local people felt excluded from the broader management process. They had different perceptions and narratives on the impacts of different schemes and the future of rice-fish systems. The inclusion of these insights and other knowledge sets are necessary for the future development of sustainable floodplain resource use policy. Scenario exercises elucidated people's concern with changes in the landscape and resulting impact on the future of fishing and farming. These in turn shape their sense of identity and the future world of their children.

## **Acknowledgements**

I would like to acknowledge the assistance and support of the staff of the WorldFish Center Dhaka, and staff of the CP-35 project, especially Dr. Benoy Barman who went out of his way to make my field work and stay in Bangladesh extremely interesting. I sincerely thank my field assistants, Misters Kashem, Mannon and Nasir, despite the challenges, for their work running the groups and helping with interviews. I want to express my gratitude to all the villagers of Bhatibarerepar, Dariakandi, Takevita (Solimari/Gheramari), Chandpur (Chandpur Beel) and Melandi (Beel Mail) who all came out, participated and expressed their views and ideas. I also want to thank and my friends at CNRS for their academic enthusiasm and patience.

I would like to thank my committee members Dr. Fikret Berkes (thesis supervisor), Dr. Emdad Haque of NRI, Dr. David Lobb, Soil Science who reviewed the thesis and made helpful comments.

This thesis work was financially supported by the Canada Research Chair in Community-based Natural Resources through Dr. Fikret Berkes with additional support from IDRC, Ottawa and in-kind support from WorldFish Center-Dhaka. A special thank you to Jackie Rittberg, NRI, for her help proofreading and her support throughout my stay.

**This thesis is dedicated with love to Jane O' Brien. A soul who has supported me in everything I have attempted or managed to do since May 8, 2001.**

## Table of Contents

Abstract.....	i
Acknowledgements.....	ii
List of Figures, Boxes and Tables.....	iv
Acronyms.....	v
Technical Terms.....	vi
<b>Chapter 1: Introduction.....</b>	<b>1</b>
1.1: Poverty and Bangladesh: The Context.....	1
1.2: Theoretical Background.....	10
1.3: Problem Statement.....	14
1.4: Research Objectives.....	17
<b>Chapter 2: Research Area and Study Methods</b>	
2.1: Study Sites and Village Context.....	19
2.2: Research Methods.....	24
<b>Chapter 3: Key Drivers of Change in Floodplain Rice-Fish Systems</b>	
3.1: Introduction.....	27
3.2: Drivers of Change in Floodplain Systems.....	32
3.2.1: Population and Fisher Mobility Increase.....	36
3.2.2: Floodplain Land Use Changes.....	39
3.2.3: The Cash Economy, Markets and Fish Prices.....	40
3.2.4: Key Governmental Policies and Management Strategies.....	41
3.3: Conclusions.....	44
<b>Chapter 4: Three Models of Governance</b>	
4.1: Introduction.....	49
4.2: Soliamari Beel: Private Property Model.....	54
4.3: Beel Mail: Co-Management Model.....	62
4.4: Chandpur Beel: Community-based Model.....	67
4.5: Conclusions.....	69
<b>Chapter 5: Scenarios and Synthesis: Implications for Future Policy</b>	
5.1: Introduction.....	73
5.2: Scenarios.....	74
5.3: Policy for Resilient Floodplain Resource Management.....	81
<b>Chapter 6: Discussion and Conclusions.....</b>	<b>89</b>
<b>Epilogue.....</b>	<b>103</b>
<b>References Cited.....</b>	<b>107</b>
Appendix A: Open Ended Questions (Fishing).....	117
Appendix B: Open ended Questions (Actors, Issues, Informants).....	118

## List of Figures, Boxes, Tables

Figure 1: Rice Cultivation as an Integrated System.....	5
Figure 2.1: CGIAR Institutional Linkages.....	20
Figure 2.2: Map of Bangladesh.....	21
Figure 3.1: Driver Typologies.....	29
Figure 4.1: Research Site Timelines.....	54
Figure 4.2: Governance Interactions.....	70
Figure 5.1: Possible Networking Arrangements.....	82
Box 1.1: Characteristics of Complex Fisheries.....	14
Box 3.1: Examples of Different Types of Drivers.....	30
Box 4.1: Community Views on Ricefield Fisheries.....	57
Table 2.1: Upazila Demography and Fisheries Resources.....	21
Table 3.1: Description of Key Drivers.....	34
Table 3.2: Driver Influence on Project Site.....	35
Table 3.3: Impacts of Drivers at Different Levels of Organization.....	37
Table 4.1: Research Site Synopsis.....	66
Table 5.1: Comparison of Floodplain Scenarios .....	76

## Acronyms

BARC: Bangladesh Agriculture Research Council  
BFRI: Bangladesh Fisheries Research Institute  
BRAC: Bangladesh Rural Advancement Committee  
CBFM: Community-based fisheries management  
CGIAR: Consultative Group on International Agriculture Research  
CIAT: International Center for Tropical Agriculture, Cali, Columbia  
CNRS: Center for Natural Resources Studies, Dhaka  
CPWF: Challenge Program on Water and Food  
DC: District Commissioner  
DFID: UK Department for International Development  
DFO: District Fisheries Officer  
DoF: Department of Fisheries (GoB-MoFL)  
FMC: Floodplain Management Committee  
GoB: Government of Bangladesh  
ICLARM: International Center for Living Aquatic Resource Management now WFC  
IFPRI: International Food Policy Research Institute Washington, D.C  
IRRI: International Rice Research Institute. Los Banos, Philippines  
IWMI: International Water management Institute, Colombo, Sri Lanka  
MACH: Management of Aquatic Ecosystems through Community Husbandry  
MoFL: Ministry of Fisheries and livestock (GoB)  
MoL: Ministry of Land (GoB)  
MFC: Melandi Fisherman's Cooperative  
MMT: Million metric tons  
NGO: Non-governmental Organization  
PIC: Project Implementation Committee  
PPP: Public-Private Partnership  
SES: Social-Ecological System  
SIS: small indigenous species  
SUFO: Senior Upazilla Fisheries Officer  
UFO: Upazilla fisheries Officer  
WFC: World Fish Center, formerly ICLARM, head office in Penang, Malaysia, with the South Asia regional office in Dhaka, Bangladesh

### **Technical Terms (Bangla):**

Aman/Amon season: Wet season planting. (T Aman in July to November)

Beel: seasonal open water body containing low lying agricultural land; often surrounded by ricefields.

Aus season: Summer rice between March and July, direct-seed or transplanted pre-monsoon

Boro Season: Winter (November to April/May), irrigated, transplanted (Feb) dry-season, maximum rice production

Current Jal: fine mesh gill net

Ghosti: a patrilineal lineage

Gram Sakar: village government

Imam: Islamic priest, head of a mosque

Jalmahal/Jalmohal: roughly translates to "water or fishing place" is the designation of a leased public water body under Ministry of Land jurisdiction.

Kata: a brush park set up as a fish aggregating device, usually found in rivers.

Khals: rivers, flowing waters

Khanda: historical elevated floodplain land for settlement

Khas land: Public land that is leased via auction or managed by the state

Kua: a trench dug into a floodplain in order to trap fish as flood waters recede.

Madrassa: an Islamic primary school

Rabi: the dry (not irrigated) cropping season

Salish: informal judicial system for conflict resolution

Samaj: Local, informal institution or "brotherhood" which exerts power and influence via social or religious means.

Somitie: a management committee or group

T Aman: Transplanted Aman rice in July

Union: smallest political unit (sub-upazila), people cast votes at this level

Upazila: a political administrative unit-sub-district (6-9 unions)

Zamindar: historical, landlord or rent collector for British colonial powers who had control over fishing access in jalmahals

They hang the man and flog the woman  
That steal the goose from off the common,  
But let the greater villain loose  
That steals the common from the goose.  
—English folk poem, circa 1764.

*“It is counterproductive to attempt to resolve contentions over common pool resources through ad hoc measures such as creating project-led village natural resources committees outside the regular organs of village governance. Whatever the short term successes of such measures, in the long run, they are neither sustainable nor politically viable and much less rooted in local politics”.* (Shivji, 2002)

## **CHAPTER 1: Introduction**

### **1.1: Poverty and Bangladesh: The Context**

This thesis is about integrated rice-fish production in floodplains of Bangladesh, and although not directly related to narratives on poverty reduction, it is related to questions concerning the nature of poverty and the drivers of social-ecological change that can facilitate conditions of poverty in highly variable agro-ecosystems. This section starts by casting a wide net to consider global poverty and provides a broad-based background to Bangladesh.

In the great decade of “international poverty reduction” from 1993-2003, 100 million more people became “poor” as world income increased by 2.5%/year. In 2007 1.3 billion live on less than \$1/day; an additional two billion are only a little better off. By 2030 five billion people are projected to be living on less than \$2/day with an estimated global population of 8.9 billion (2050) (Hawken, 2007). Currently 70% of the world’s poor are women despite growing 90% of the world’s food. Forty percent of developing countries have life spans of 40 years. At writing, 800,000-one billion people are globally threatened by poverty and are malnourished as a result of the systematic degradation of the ecological and social resource base. This degradation results primarily from the lack of legitimate and robust institutions of resource tenure and management (Tyler, 2006; Fernando, J.L. 2003).

Bangladesh is a small deltaic country of 147,500 square kilometers lying between 20° 23’ 26°39’ North and Longitude 80°41’ and 92° 41’. It is bordered to the north, northeast and west by India, Myanmar to the southeast, and the Bay of Bengal to the south. It has a population of over 145 million people, making it one of the most densely populated regions on earth. Bangladesh is located in the Gangetic Basin, drained by the Brahmaputra (*Jamuna*), Ganges (*Padma*) and the Meghna rivers. It is under the constant threat of massive flooding. Although these floods often spell widespread disaster for the rural people, the culture, society and livelihoods of rural Bangladesh are intricately connected to the seasonal inundations of the flood cycle. These floods also bring the rich alluvial soils and nutrients which drive the fertility for the rice and fish crops of the lowland floodplains. This flood cycle gives Bangladesh some

of the most productive agricultural soils in the world, yet it is one of the poorest and corrupt nations on earth (Naryjan and Petesch, 2002).

There is no typical "poor" person in Bangladesh. Poverty is multi-dimensional and dynamic condition of individuals over time and place. Therefore strategies to "alleviate" poverty must recognize its complex characteristics. In Bangladesh, 70% of the population is categorized as poor with 20% of total population in the poorest category. In Bangladesh, three-quarters of the population is rural with 85% of the poor engaged in rural livelihoods. The number of people living below poverty line declined from 43% in 1990 to 34% in 2000, yet over 40 million are living on a less than \$1/day with 50 million undernourished children (Ireland and Ashley, 2004). Agriculture employs two-thirds of the population and contributes 25% to GDP and 25% to export earnings. Fisheries and crops contribute 10% and 71% of the total agricultural GNP respectively (Lenne *et al.* 2007). But these quantitative criteria, such as "poverty lines" and economic growth indicators tell us little about the struggles and fears of the daily lives of these people and the myriad of ways they cope with stress and disaster. Poverty alleviation strategies must start with a fundamental understanding of the patterns and processes of the daily lives of the poor.

In the agro-based economy of Bangladesh, fisheries play an important role in nutrition, employment and foreign exchange earning, contributing 4% to GDP, 10% to export earning, 73% to animal protein intake, in addition to providing 1.4 M people full time and 11 M part-time employment. Out of total fish production of 2.1 MMT (2005), inland open water capture fisheries generate 34%, inland fresh aquaculture 44% and marine capture 22% (DoF 2006 in Ahmed *et al.* 2007). In the developing world, there is a dynamic relationship between fishing and poverty. This relationship goes beyond simple cause and effect models or a livelihoods discussion on fishing as a "social safety net" but requires a wider examination of poverty as a lack of power and entitlements stemming from multiple scale drivers and consequences often beyond the fishery sector (Bene, 2003).

Most land is used for agriculture, but the basic physical features determining all types of land use are the interconnected watercourses and standing water bodies. Bangladesh is one of the world's largest wetland areas, and during the rainy season about two-thirds of the country can be classified as wetlands as defined in the Ramsar Convention. Rivers cover an area of approximately 7,700 sq km in the wet season; this includes rivers of all sizes, except very small seasonal rivers (*kha/s*). One of the problems in estimating land-use in Bangladesh is that the area covered by water bodies is very dynamic. The monsoon rain and resulting overland flooding greatly increases the area in the monsoon season but will shrink to half the area in the dry (*rabi*) season. Seasonality has a strong impact on cultivation. In the relatively dry months (November to April) the cropping pattern and land use is very different from that in the wet months (May to October). In the dry season the main crops are *boro* rice, wheat, pulses,

oilseeds and vegetables. Towards the end of this period *aus* and *jali aman* (floating aman) are sown. In March the area under crops is more than at any other time of the year. At the onset of the rainy season the dry season crops are harvested, and the fields contain mainly *boro* and *aus* rice and Jute. By August these are harvested and *shail aman* (a variety of *aman* rice) is sown. In September land inundation generally reaches its peak and the area occupied by field crops is at its lowest. The land classification, *Seasonal Fallow* includes land that is inundated in the wet season and thereby forms some of the best inland fisheries. The year has five rice seasons. The three rainfed autumn (*aman*), two irrigated winter (*boro*), both of which have the potential for concurrent or alternate rice-fish production.

The spread of Green Revolution technology altered highly diversified agroecosystems which were fundamentally dependent on natural processes including important hydrological connectivity for transporting nutrients, energy and important fish propagules across the rural landscape. Programs of flood control, irrigation and drainage have drastically altered the physical agricultural landscape and at the same time have disrupted those valuable ecological processes that are responsible for wild fish production. The homogenization of Bangladesh farming systems reduced crop and animal diversity to a system dedicated to intensive rice production with severe consequences for rural food security and livelihoods (Barzman and Das, 2000). The rice production systems used in flood-prone (deepwater) areas in most parts of the South and Southeast Asia are often categorized as having little potential for large gain in rice productivity alone. The integration of fish culture with rice farming, however, can increase overall food production and works towards increasing economic gains from small holdings.

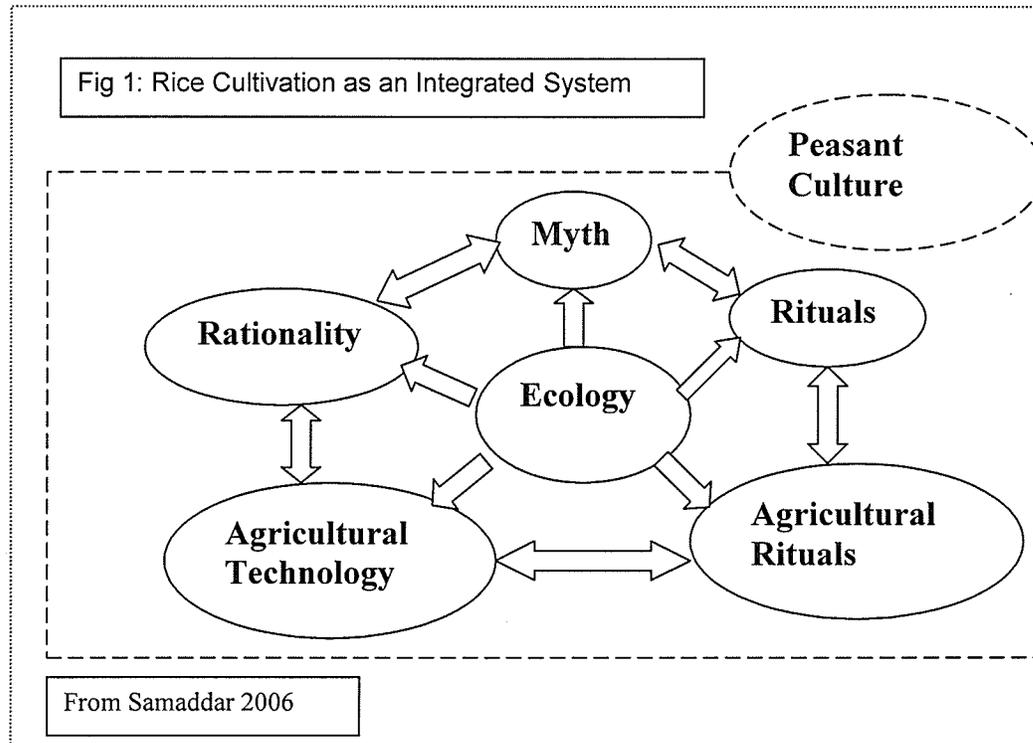
These diverse farming systems were simplified and intensified in the national rush for rice self-sufficiency. Even today, famine is never far away in Bangladesh, and provides an extremely powerful influence on agricultural policy. For most of Asia, famine is defined in terms of lack of access to rice.

In Bangladesh, rice fields account for some 10 million hectares of which over 4 million hectares are irrigated. Low land rice fields with irrigation facilities represent a potential resource where aquaculture could be practiced. In addition, there are another 2.8 million hectares of floodplain water resources that exist during the monsoon season. Over half of the country is comprised of floodplains and are intensively used for rice agriculture, fishing and other aquatic resource harvesting and are the foundation for resource based livelihoods for 800 people per km<sup>2</sup>. They provide fish for income or food for 70% of all rural households in Bangladesh. The aquatic biodiversity found in Bangladesh freshwaters is very high. There are about 284 freshwater species (including freshwater prawns) and 12 exotic species available in Bangladesh waters. Therefore, there is tremendous potential for the entire fisheries sector to make a significant contribution to the economy of Bangladesh. It is an area where the huge numbers of the rural poor are intimately involved and derive significant benefits.

Rice, the most important crop, is grown on 75% of the Bangladesh landmass and over the past 15 years two-thirds of this land has been put into modern varieties. This was made possible by the international donor support of state and local NGO sponsored privatization of subsurface water via "farmer-managed" networks of shallow tube wells.

As a result of failing returns from land and labour, today rice agriculture accounts for only 20% of household income. Rural Bangladesh is undergoing a rapid and desperate diversification of livelihood strategies within and outside the agriculture sector (Hossain, 2003). State-sponsored aquaculture development is one response to this need for diversification. The failure of GoB to acknowledge and integrate the importance of wild ricefield fisheries into resource management policy is troubling for those persons or agencies tasked with developing aquatic resource use management.

Any land that goes under water in Bangladesh is a potential fishery. The large stretches of agricultural land that are inundated become seasonal fisheries and can produce more protein per hectare than crops. This seasonal cycle of inundation of rice fields is used opportunistically by a wide range of aquatic organisms for different life history functions, and thus can provide sources of protein and income for rural people. In the classic study of ricefields, (Heckman, 1979), concluded that the fish and other aquatic organisms significantly contributed to the nutritional health of rural households in northeast Thailand and that these systems were undervalued and poorly understood. Heckman's call for more systemic research on ricefield ecology and the roles these systems play in rural livelihoods and nutrition is even more important today as marginalised rural communities throughout the world become more dependent on the wild production of aquatic fauna from ricefields and connected bodies of water. In Bangladesh, there is a social and ecological history of the interconnected institutions of rice agriculture and cattle grazing from paddy land. In a general schematic, Figure 1 illustrates the connected nature of rice cultivation indicating the importance of the relationship between the social, spiritual, ecological and technological spheres which contribute to the overall sense of place we find in rural areas. These relationships are the fundamental starting point for any study of how rice agriculture fits into the wider social-ecological context of connected aquatic systems.



Global aquatic systems including lakes, ponds, reservoirs, river floodplains and other wetlands comprise only 2% of global surface water area. Yet the inland waters of the tropical developing world produce 15% of global fish production and contain 40% of the world's fish species amounting to 34 MMT (Sugunan *et al.* 2006). The fish production from these water bodies is actually a lot higher as only 30-40% of the catch is actually officially recorded. These water bodies have an immense role to play in increasing the overall aquatic productivity of rural areas through their contribution to food production, livelihoods, environmental security and well-being for the poor of developing countries (Sugunan *et al.* 2006). The challenge is incorporate both the complex social and ecological contexts into a flexible management framework that sustains both aquatic productivity and supports broader development objectives. These broader development pathways must incorporate the diversity of cultures and livelihoods including the historical origins and contemporary patterns and processes which continue to foster and maintain the political linkages of rural Bangladesh.

The landscape is made up of a number of different types of water bodies. Many of these water bodies are interconnected through the seasonal flood periods, characteristic of tropical floodplain environments. This study focuses on seasonal river floodplain *beels* with rice cropping during the monsoon and dry seasons. The study site *beels* are saucer-shaped depressions in the floodplain which maintain some perennial water depth. They typically rapidly increase in area during the monsoon flood period and recede in area as the dry season

approaches. They are termed *open beels* as they maintain inflow and/or outflow connections to river or canal systems.

Floodplain fisheries are crucial in providing food, income and employment for millions of people in Bangladesh. Inland open waters total more than 4 million ha in area and are thought to be producing more than 500,000 MT annually. Typical yields from these flooded areas are between 150 – 350 kg /ha. However, pressures on these resources are increasing. These pressures include: the construction of flood control, drainage and irrigation projects; over fishing; the indiscriminate capture of brood fish and juveniles; the Government of Bangladesh (GoB) policies of revenue-based management; the removal of water from fish habitats for crop cultivation; the discharge of municipal and industrial wastes; the use of insecticides and chemical fertilizers; and the reduction in floodplain area due to siltation and encroachment (Gregory *et al.* 2007). Aquatic productivity must be maintained through the conservation of present-day water levels and critical ecosystem services including the provisioning of well-targeted environmental resource flows, and through improved management of the wild fishery. In addition to wild fish management, productivity may be increased through the wider adoption of community-based sustainable aquaculture and fish stocking systems.

Investment is needed for better governance and resource evaluation methods. Valuation methods must pay attention to the non-formal values especially those centered on the role small indigenous species (SIS) play in livelihood security and biodiversity conservation.

The politics of land acquisition, power and the cash economy pervade all aspects of life in Bangladesh. The politics of *who gets what, when and how* is a struggle for power, not requiring a *state* to facilitate, mediate or adjudicate this struggle. Power struggles are essentially centered on the acquisition of public goods and the forming of effective alliances in order to manipulate the power differentials found at different social and political levels in order to maintain control over access to these goods and services. There are both private and public forms of power depending on a person's goals. In an agrarian society like Bangladesh, these struggles are rooted primarily in the institutions of land tenure; which focus on the gain and loss of agricultural land at both the family and extended kin levels (Islam, 1974). Land ownership is separated from the labour that works it. It is a system based on sharecropping. The profits from the sharecropping system are used either to buy more land or luxury goods; very little is invested in increasing the productivity of the existing parcels. Increasing status and power comes from an increase in land holdings.

A basic issue in the discussion of rights-based approaches to resource management is whose interests are defended and developed; that is, what type of social-ecological environment do we want to create. The defense of interests is at the heart of resource allocation decisions. A rights regime is neutral only if transaction costs are zero for all *interested* actors. Neutrality is maintained if preferences and the distribution of costs, wealth and power

remain unchanged. In most resource systems, the accumulation of wealth and shifting preferences are the norm (Vatn, 2001).

Prior to the 18<sup>th</sup> century intrusion of British power into the region, the land cultivators enjoyed a relative security of tenure (not absolute ownership) on condition that their produce was shared with *zamindars* (overlords acting as intermediaries between Mogul authorities and the cultivators). The British East India Company wrongly assumed that the *zamindars* were land owners. They were in fact, appointed by Mogul authorities to collect land revenues. They had distinct interests from the actual farmers but were treated and co-opted to act as British landlords. This was institutionalized by the *Permanent Settlement of 1793*. This agreement with the zamindars ignored any previous customary tenure agreements with the farmers. The farmers were now "tenants", with zamindars given the right to fix their own tenancy rules and that cash payments to the British East India Company was fixed in perpetuity. The rents paid to the zamindars were not fixed and could increase with the crop success (Januzi and Peach, 1980). After 1793 the rights and privileges of the zamindars continued to grow, they became *de facto* land owners *in absentia* despite British attempts to reduce zamindar powers and to protect tenant rights.

As the Bengal delta was settled, people developed livelihoods based on agriculture, fishing and some livestock. Migrating Hindus and other ethnic groups developed riparian commons (RC) (Soefestad, 2000). Here the historical development of connections between villages (grams) and *khandas* developed through communication and subsistence activities via boats. This daily movement on water lead to the evolution of informal access and use rules for fishing and managing the RC. Through settlement processes of the floodplain areas, increased knowledge of fish species, habits and habitats would create customary preferences for fishing locations and gear management. As fish resources became scarcer due to increasing populations, property rights and fishing rules evolved between *grams*. A riparian commons would thus exist for entire grams involved in the development of local fishing rules, but these would be private property rights for people outside of the associated village clusters. Informal aquatic and terrestrial boundaries are drawn between grams. Due to extensive flooding a continuum of land-water areas existed during the monsoon. This flooding determined when fishing could take place.

Inter and intra-gram conflict resolution institutions developed due to the informal and dynamic evolutionary nature of the fishing rules. This would support rational methods of group decision making and local resource control. Adding to the complexity of RC model formation is that certain specialized gears would require specific fishing requirement of time and place; women and children, using small special gear would forage freely for subsistence catches. The evolved RC institutions were destroyed or incorporated by Moguls and British colonizers. The RC period is pre-British. The Moguls were developing and codifying even older and emerging

property rights (these may be considered the historical or the indigenous institutions). There was no land revenue collection prior to the 17<sup>th</sup> century, shifting cultivation was widely practiced; 16<sup>th</sup> century Afghan migrants were nomadic so therefore no revenue from fisheries was collected prior to the British colonization

The complex historical arrangements by which custom and law govern peoples' relationship to the land was not altered by the implementation of any government policy between 1948 and 1978. The landlordism of the past zamindari system is similar to what Januzi and Peach 1980 found in their study on the agrarian structure of Bangladesh. In contemporary Bangladesh, landlords continue to influence the rural political economy by controlling (state sanctioned) *patron* relationships of reciprocity. Control of who has access to land determines the local political power structure.

Rural Bangladesh is a *dynamic and negotiated mosaic* of groups connected by religion, caste, class, wealth and kin relationships which interact to control and distribute a resource base under immense pressure from a number of important drivers or change agents.

There is an urgent need to build equitable partnerships between fishers and other groups interested in aquatic resources management, especially those groups involved in the management and allocation of water for agriculture. A holistic approach to the understanding and management of the aquatic environment is needed. Creative actors must foster processes that link the institutional and group learning environments with the role aquatic resources can play in solving problems of food security and rural poverty in Bangladesh.

Bangladesh produced 538,000 t of inland fish in 2004; 50-60% of the national total this production is directly related to the strength, extent and duration of the flood pulse. In Bangladesh there are four M ha of open waters are among the richest and most complex in the world. They support over 260 species of fish and supply protein to 80% of the Bangladesh population. There are also approximately four M ha of irrigated rice fields which also represent a potential resource where aquaculture can be practiced profitably. (Mandal *et al.* 2004)

Fish production in an agrarian economy often serves to add nutrients and variety to the diet. The Bengali culture is heavily dependent on the consumption of both rice and fish. In Bangladesh, indigenous wild-caught fish is a major dietary protein supplement. The landless rural poor require access to these fish in the common property environments of the flooded fields during the rainy season. The current trend to enclose and privately manage these aquatic commons in the name of increased fish productivity and economic efficiency may result in destabilizing livelihoods coupled with a reduced nutritional status of local rural populations.

The capture and culture of fish from ricefields is an ancient practice, probably co-evolving with wetland rice agriculture. Integration of rice and fish culture is an ecologically sound way of increasing rice yields, providing a low-cost protein source, increasing cash incomes in small-scale farming systems and contributing to integrated pest management programs (Ruddle,

1982). Rural Bangladesh is essentially an interconnected aquatic-terrestrial landscape in which the proportions of terrestrial and aquatic environments change seasonally. In other areas of Asia, such as China, rice-fish farming has moved beyond the household economy and family consumption. Integrated rice-fish is part of a larger agro-ecosystem approach to land improvement, increased soil fertility and increased productivity of ricefields and is contributing to the expansion of economic surplus (Hongxi, 1995; Fernando, 1993a; Fernando *et al.* 2005). Today increased resource use resulting from factors such as population pressures and declining cereal yields requires the maximization of food and fibre output from any given land/water system. The directed intensification of rice production is discussed by (Frei and Blecker, 2005) and how this intensification can be directed along an alternative sustainable path through the integration of fish culture and thus optimize the use of irrigation water and land resources. Rice-fish optimizes the benefits of scarce resources and uses trophic relationships in rice pest and weed control (Frei and Blecker 2005). The spreading of cultivation into new areas or onto increasingly marginal lands are not ecologically feasible solutions. Faced with a rapidly growing pressure on freshwater resources, increased productivity is necessary from agricultural water use. The role of productivity from all available water resources is essential (Dugan *et al.* 2006). The integration of aquatic and terrestrial production systems can efficiently use both on-farm and external resources to increase farm-level productivity which can serve as a key mechanism for fostering sustainable livelihoods. Rice-fish integration is suitable for resource-limited farmers as it can serve as a focal point for reduction of farm-level risks, by the integration of two distinct crops and connection of pond to field reduces risks associated with stand-alone pond aquaculture (Prein, 2002; Fernando and Halwart, 2000). The cash generating pathways of small scale fisheries for the local economy is poorly understood and not fully appreciated by planners and decision makers.



Concurrent Rice-Fish, Rajshahi, Bangladesh

(R.Jones)

## 1.2: Theoretical background.

My research is situated in common property theory (Ostrom, 1990; 2006), political ecology (Watts, 1993; 1994) and governance (Kooiman, 2003; Folke et al. 2005), where governance is considered as *“arrangements in which public as well as private actors aim at solving societal problems or create societal opportunities, and aim at the care for the societal institutions within which these governing activities takes place”* (J. Kooiman, p. 139 in Pierre, 2000).

The origins of “development” are rooted in perceptions and ideas stemming from biological or physiological paradigms of growth, maturation and evolution (excluding death). The Enlightenment and Christian discourse of “providence is progress” underlies the techno-economic pursuit of global modernity in the post-World War 2 era. This development discourse relies primarily on western, northern, urban, primarily white-male knowledge and power to control the development agenda based on assumptions of “trickle-down economics” which ultimately leads to some sectors and individuals benefiting more than others. The development process itself is often now seen as the problem, reinforcing differential power spheres and poverty (Sachs, 1992 in Watts 1993). This neo-liberal development model has now been successfully co-opted by dominate power spheres in the South, including Bangladesh, and is used for the subordination of their own marginal classes.

Development research is now framed as the “sociology of non-existence”, claiming there is something missing in the lives of poor people, they are prevented from “developing”. What is then created by the neoliberal development narrative is the “sociology of desire” what is missing is projected as *desire*. The key factors lacking in development are touted as what “the people” desire. Development is thus based on the fulfillment of desire, which the market is very good at doing. A resulting consequence is the hyper-exaggeration of the importance of some institutions, agents and forces (Watts, 1993).

These floodplain ricefield fisheries are considered examples of linked social-ecological systems (Berkes *et al.* 2003), in that the social and ecological components are linked through dynamic processes of feedback from a diverse set of multi-scale institutional linkages (Berkes *et al.* 1998, Wilson *et al.* 2006). This feedback consists of information from ecological change as well as inputs from different knowledge sets (Jentoft, 2005; Powell, 2006) including local or traditional knowledge (Edwards *et al.* 1997; Sakia, 2004) and livelihoods (Glavovic *et al.* 2002, Marschke and Berkes, 2005). These systems are also examples of complex systems (Levin, 2005; Norgaard and Baer, 2005) with self-organization around key bio-physical processes such as flood pulse and overland monsoon flooding as well as the longitudinal and horizontal movements of fish and propagules within the floodplain system (Heckman, 1974; Welcomme, 1979; Naiman and Laterell, 2005).

### **The Nature of Change in Floodplain Beels**

*“Resilience absorbs the consequences of our ignorance”* [C.S. Holling] (Holling and Goldberg, 1971).

Floodplain rice fish systems are examples of complex adaptive systems (CAS). Complex adaptive systems evolve and are characterized by an interconnected association of diverse elements which, over time, have the capacity to change and adapt to new social or environmental circumstances (Levin, 1999, 2005). The control of a CAS is decentralized and dispersed with any coherent behavior arising out of cooperative and competitive behavior among the system agents. The organization of complex adaptive systems is a result of the myriad of small decisions made by the individual agents making up the system. They are characterized by non-linear relationships, they are energetically open systems; contain feedback loops of energy; nutrients or information; are often nested within other CAS; prior states may influence present states therefore CAS contain memory via historical pathways for adaptive processes; boundaries are often fuzzy and are perceived differently by different agents. Complex Adaptive Systems are characterized by system trajectories away from stability. There is dialectic between continuity and change and between tradition and innovation in linked social-ecological systems. Change and innovation are prominent features of adaptive

and resilient systems. Lock-in and system brittleness are results of attempts to stifle change, surprise and on-going innovation.

Resilience is an emergent property of linked social and ecological systems. Through diverse patterns, types and scales of interconnections, a system is buffered against severe and synergistic forces of change. It is the ability of a system to absorb perturbations while maintaining essential system characteristics. Resilience in social systems has the additional capacity of humans to anticipate and adapt for future conditions (Gunderson and Holling, 2002; Gunderson and Pritchard, 2002).

The emergence of resilience can be assisted by creating an environment for creativity, learning and innovation, safe-fail experiments and adaptive management. This begins with the recognition/respect of human rights, land tenure and enabling legislation. Creating and communicating a "vision" (Olsson and Folke, 2004; Walker *et al.* 2004) are part of the process of preparing an intransient natural resource system for change and reducing the negative resilience of the undesired state. Tipping points or thresholds are surpassed which can allow for breakdown and institutional re-organization. This can lead to shifts in governance to more inclusive and response forms (Folke *et al.* 2005). An adaptive management approach will set out experimental (learning) methods to implement and evaluate the possible "new" policy pathways. Finding ways to recognize these tipping points and thresholds are key to CAS management. The loss of system resilience can occur through inflexible and closed institutional arrangements which allow the system to be over managed and tightly coupled to prolonged periods of growth. This ignores feedback from system thresholds and pushes the system towards fundamental reorganization or collapse.

Complex social-ecological systems are dynamic with high uncertainty and are controlled by a small number of key social and ecological processes. These complex systems are self-organized around these key processes. Complex systems evolve due to internal and external pressures, and it is the understanding of this co-evolutionary nature of system components which is key to understanding system adaptive capacity and resilience. In CAS, biodiversity serves as an important regulator at the ecosystem level as energy, matter and genetic information flows through the ecosystem via processes of co-evolutionary change. In complex aquatic-terrestrial transition systems, there is a need to understand the links between biodiversity and ecosystem structure and function (Lundberg and Moberg, 2003). System resilience is also dependent on processes of reciprocity between social and these natural systems. The feedback from social and ecological change is a key element in tailoring reciprocal exchange between system components.

These floodplain systems are managed through a complex network of multi-scale linkages among key actors who both make decisions and have a stake in the production of fish from a specific water body. There is a changing species composition as the result of over fishing

during winter water draw down and in dry season areas. The results include the replacement of large slow growing species with smaller fast growing and reproducing species (deGraaf and Martin, 2003).

It is through inclusive and adaptive processes that the disruptive relationship between the two largest complex systems--the planet/ human culture and the natural world--are stabilized into sustainable patterns. Humanity cannot get to sustainable states of resource use and equitable allocation by mechanisms which rely upon support from institutions and beneficiaries which directly benefit from the status quo.

Through repeated failures in global fisheries management at all intensities, scales and environments, fisheries resource personnel are beginning to recognize that a *fishery* is an example of a complex social-ecological system and is not manageable through conventional science-based methods alone. It is crucial to understand both the social-economic and ecological sub-systems as examples of complex adaptive systems, and that multi-scale drivers influence patterns of behavioral interaction within and between sub-systems (Levin, 2006). This is especially true in artisanal or subsistence-based rural freshwater fisheries such as extensive or semi-intensive ricefield fisheries where the fish play multiple roles to the people who harvest them. These fisheries are a key component of a complex and historical agrarian social system. These fisheries not only supply critical food protein and products for sale or barter but are also an intricate part of the cultural contributions to system resilience. The production component cannot be divorced from the social-cultural aspect of rural life tied to floodplain fisheries

Unpredictability of the fish resource base (what is actually there and what is happening to it) is a major source of uncertainty in any fishery. The inherent ecological complexity, multiple levels of instability, exposure to external driving forces and difficulty of getting accurate data on dynamic aquatic systems contributes to the ubiquitous uncertainty in fisheries management (Mahon *et. al.* 2008). These factors are especially prevalent in dynamic systems such as floodplain ricefield fisheries. Box 1.1 lists the key characteristics of complex fisheries. Mahon derived these primarily from his work on small-scale artisanal marine fisheries but they are also applicable to the diverse types of freshwater fisheries found in lakes, rivers and floodplains throughout the developing world. These characteristics are especially important to consider when managers or development practitioners attempt to fit their management schemes into the local institutional context by integrating forms of science-based fisheries management with local fisher knowledge. The extent to which these system characteristics are incorporated into fisheries management will directly influence its legitimacy and ultimate success of any fisheries management program.

#### Box 1.1: Characteristics of Complex Fisheries

- Multi species harvests
- Wide spatial distribution
- Large number of fishers
- Fishing operations are local
- Diverse and dynamic marketing
- Poor fit between ecosystems and administration
- Inadequate technical, economic and legal support
- Low resource revenues

(Mahon *et al.* 2008)

How can deeper understanding of complexity contribute to the development of sustainable fisheries policies for floodplain rice field fisheries? There must be a profound move away from a reliance on control via simple, top-down, rule-based management systems. The governance of these systems will require an understanding of the key driving forces and how they interact and influence public and private decision-making processes. Understanding how driving forces create and hinder opportunities for joint public-private collective action to solve resource allocation and management problems will be a priority.

#### 1.3: Problem statement

For a state to assert control over complex natural resource systems, policy institutions and instruments are needed which simplify the intricate social-ecological views, understandings and processes that characterize their human-resource interactions. In the name of creating 'public goods', one method is to devise state-legitimized, top-down, science-based command and control types of resource problem definition and management. These processes of state sanctioned simplification more often require the "harmonization" or replacement of complex local systems of property rights and resource access institutions with various forms of "private property" narratives. In developing countries these "private property" initiatives often necessitate different forms of physical or institutional "commons enclosure" which will exclude the poor and marginal groups from customary access and use of open access resources.

In linking "poverty reduction with increased productivity", The GoB through collaboration with national agencies and international development partners, are trying to boost aquatic production from so-called unproductive or marginal floodplain water bodies by using different

forms of "commons enclosure" on the premise that private property management is the most efficient and effective. This approach, as it is implemented, fails to recognize or incorporate complex social and ecological institutions and is far from equitable. This "enclosure movement" to increase management and production efficiency through privatization leads to the unjust loss of resource access and social-environmental assets of the rural poor. Tubtim and Hirsch (2005) describe the enclosure of common property fishing area in a Lao PDR wetland in which certain powerful villages took over control of the common area but over time would come to develop quasi-equitable benefits sharing arrangements. Under heavy fishing pressure, the common property resource was taken over by a community-based management regime. This is a dominant approach; in order to conserve open, common or customary resources there is an almost automatic move towards developing more restrictive communal or private property models. It is important to realize that enclosure can be the response to local or state-imposed pressures.

The current approach to fisheries management in Bangladesh does not adequately focus on questions of ensuring long-term resource access for the poor or building adaptive resource management institutions but instead relies heavily on old, top-down techno-centric methods of fish production.

Forces of globalization including the spread of individualistic western thoughts and values are altering traditional, labour-intensive agricultural systems including ecologically sound systems such as integrated rice-fish farming.

The purpose of this research is to identify the specific social and ecological drivers which contribute to the current development management institutions of rice-fish resource systems in Bangladesh. These drivers are pushing and pulling concurrent, multi-purpose aquatic CPRs towards more enclosed, private and top-down managed systems.

Things have gotten worse politically, socially and economically for the majority of the people of Bangladesh. Despite the 3% to 6% economic growth during the 1980's, there are still unacceptable levels of child and rural poverty (Jansen, 1986).

In Bangladesh, a revenue-focused leasing system, controlled by the Ministry of Land (MoL) manages access to the publicly owned and state-run fishing resources. The high lease prices and conventional fisheries management interventions have effectively excluded poor fishermen from participating in these favored fisheries. Leases are *supposed* to be made available via a public bidding process to registered community-based organizations. Leases are for periods of three years thus giving no long term incentives for ecological management of leased water bodies. This allows lease owners to "mine" the fish stocks at unsustainable levels. There are more than 12,000 publicly owned water bodies in Bangladesh. In order to develop secure tenure for resource users it will be necessary to determine what are the key social and ecological drivers affecting the creation of institutions and the cross-scale linkages which

connect user groups to the management of the aquatic resource base. Development agencies must realize that the poorest 25% of the rural population do not depend on managed fisheries at all; they do not belong to "a community" and are out of reach of any "community-based" agenda. They lack access to any group, resources or democratic process. They are landless, illiterate, and with no asset except personal belongings. They glean resources from open areas. The CBFM model as promoted by the state and associated agencies is an idealized scheme for those with the resources, time, and influence to participate. The community of the CBFM, as it stands today, is a glossed-over version, trying to reduce heterogeneity in power and influence in order to make the project work.

Beyond this problem statement, as this research suggests, there are many diverse drivers impacting floodplains, and a scenario exercise can be used to elucidate local views and attitudes on trajectories of system change and development. Scenarios, essentially stories about the future, can be used as part of the overall resource planning process. They draw on data from the past and present and help plot possible futures, sketch out possible outcomes of interventions, assist planners in developing "plausible promises" for resource users (Douthwaite, 2004). Scenarios allow us to map alternative future development pathways by taking a systems point of view and accounting for critical uncertainties, such as rapid or significant technological changes or changing value systems. By creating maps of different futures, scenarios can help decision makers identify resource management policies and actions that will be sustainable across a range of potential outcomes, or that chart paths that promote desired outcomes such as ecosystem resilience (Shearer, 2005; Carpenter and Folke 2006). Scenarios are often used in the decision making context. These are iterative, social learning tools. Definitive outcomes are not as important as the building processes, which may include capacity building and community empowerment. Develop shared perceptions of different possible futures (if they want to talk about it). Explaining uncertainties and drivers of change is the focus of adaptive co-management scenarios. The scenarios describe important uncertainties created by drivers within the local social ecological context. These uncertainties may include unexpected events such as calamities. Stakeholder discussions and scenario building aim to integrate *slow* variables or trends with *rapid, unpredictable* uncertainties. Potential output is a partially shared, negotiated perception or a current working understanding of political alliances and conflicts; power differentials; channels to exchange important information on internal and external forces. Scenario processes build in allowance for the addition of new knowledge.

#### **1.4: Research Objectives**

The purpose of this project was to study key drivers, their relationship to management processes and the resulting impacts upon the organisation of rice-fish systems, people and institutions.

- 1) To examine drivers of change and institutional responses at selected rice-fish production sites.
- 2) To analyse the key cross-scale institutional linkages at the selected rice-fish sites in Bangladesh.
- 3) To build scenarios using the key social and ecological information used by rice-fish farmers to make decisions regarding the management rice-fish systems.

These objectives focused on the examining key drivers of social and ecological change; the resulting institutional responses, and how local stakeholders see future trends and developments in local ricefield fisheries.



Harvesting wild fish from ricefields, Gheramari Beel, Mymensingh

(R. Jones)



Solimari Beel, Rajshahi, July 2006

(R. Jones)

## Chapter 2: Research Areas and Study Methods

### 2.1: Study sites and village context

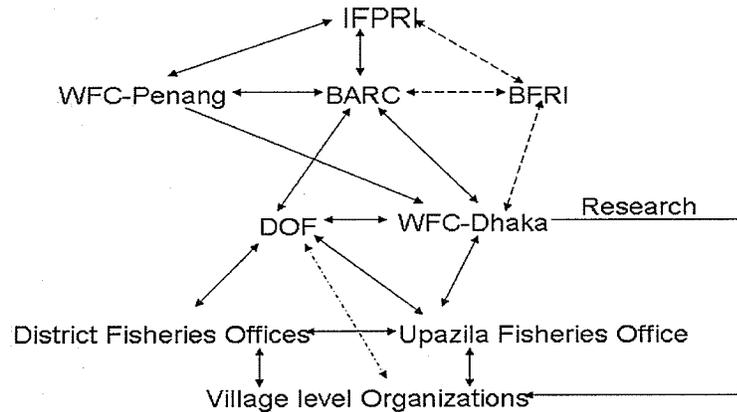
The focal ecosystems were floodplain ricefields with beel or perennial water bodies in them which would allow for the stocking of a fish crop. These ricefields, interconnected to the larger hydrologic systems, would also produce an extensive wild fish crop which would be harvested by a number of different stakeholders. These sites are hydrologically known as floodplain beel systems, they are seasonally inundated with monsoon rainfall and overland flooding, from dry to up to two to three meters deep. Bangladesh receives between 1110 (Western Bangladesh) to 5080 mm (NE-Sylhet) of rain per year. Our study year, 2006, was a dry year in Rajshahi and Mymensingh, with constant worries of insufficient water for stocking fish.

These water bodies will increase three to four times in depth and area in the wet season. T Aman rice is transplanted with the onset of monsoon rains and wild fish will enter the flooded ricefield to spawn or feed. In some beels there is a stocking or culture-based fishery managed by multiple and diverse institutional arrangements. Integrated rice-fish farming not only benefits the farmers in terms of more income, more food and less labour, but it is also environmentally and ecologically sound. Energy and nutrients are recycled more efficiently through the food chain, creating a stable and highly productive system. Fish feeding and swimming activities generally improve the fertility of the soil. Weed growth is frequently a problem in rice fields which farmers usually address through labour-intensive manual weeding or the application of expensive herbicides. When stocked in rice fields, grass carp, which feed exclusively on macrophytes, can effectively control weed growth, thereby reducing labour and costs. See references in Fernando *et al.* 2005 for a detailed overview of rice field ecology and rice-fish aquaculture.

My research was carried out in conjunction with the larger *Challenge Program on Water and Food*. CPWF is one of three *Challenge* programs developed by the CGIAR and launched in November 2002. The program is administered through the CGIAR *Future Harvest* Research Centers of IRRI, CIAT, WorldFish, IWMI and IFPRI. The program relies primarily on technical and scientific approaches to reduce poverty, address food security and environmental issues, and improve rural health through improved nutrition. The CGIAR Center IFPRI, in Washington, is included to provide guidance on policy development. This program also links with national level agricultural research and extension services, advanced research institutes and NGO/private sector partners. Figure 2.1 show the institutional linkages for CP-35.

Fig 2.1

### CGIAR Challenge Program Water For Food CP-35



-- Weak or non-detectable linkages

Bangladesh is included within one of the program target areas, the Indo-Gangetic Basin. The CPWF is partially implemented via the CP-35 project, *Community-based Fish Culture in Irrigation Systems and Seasonal Floodplains* with a focus on alleviating poverty by developing local capacities to increase productivity from underused or marginal water bodies such as seasonal floodplains (Dugan *et al.* 2006). CP-35 involves increasing the productivity from aquatic resources to "meet the needs of a growing population"<sup>1</sup>. The WFC project staff included a project coordinator along with two first-year Bangladesh PhD students. The CP-35 project was also linked to national partners, BARC, DoF, and BFRI. The primary ecosystems studied include our alternate rice-fish floodplain systems and perennial beels found throughout Bangladesh. The project also works in Cambodia, Viet Nam, two provinces in China and Mali.

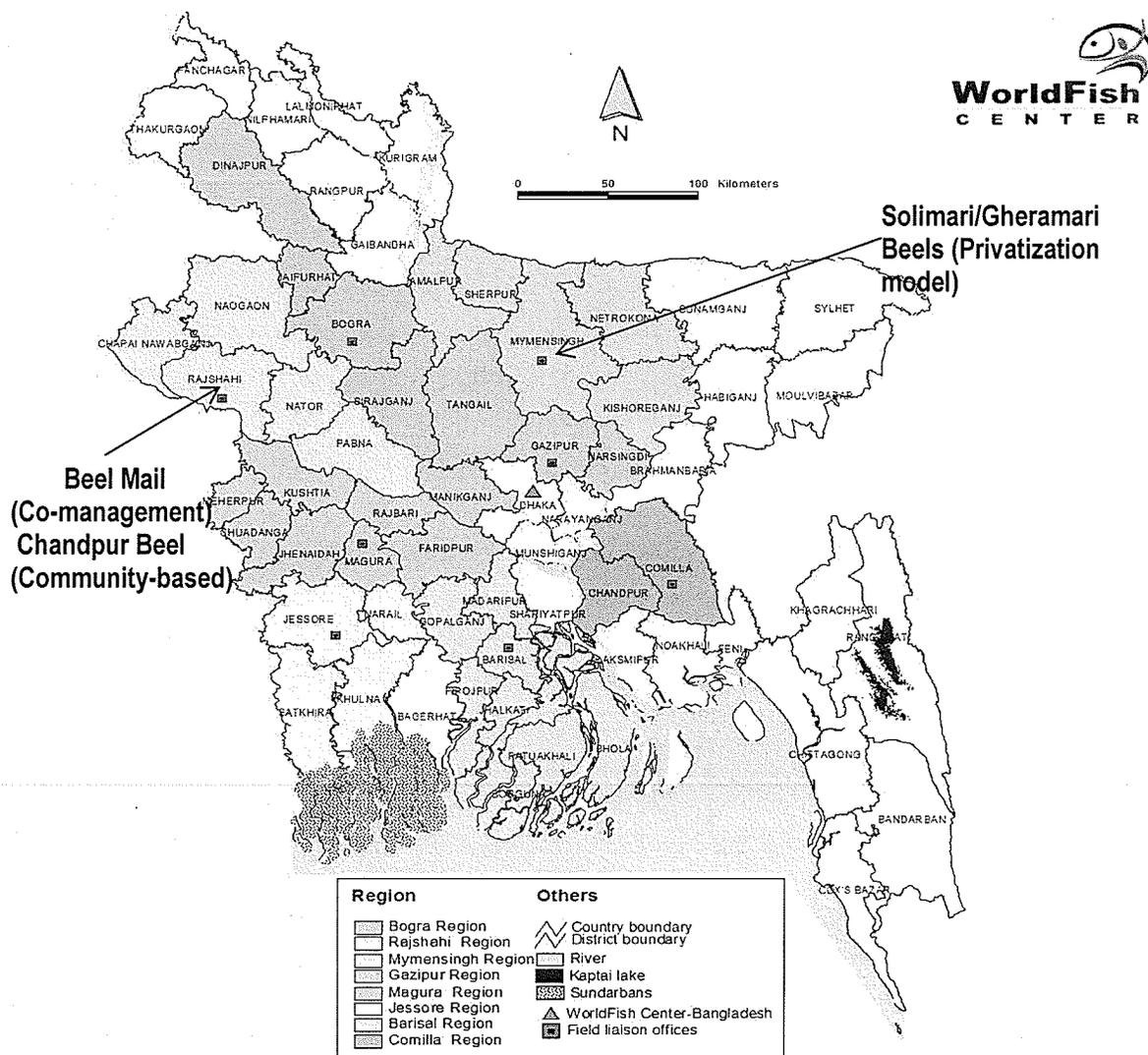
My three sites were part of the 2005-2006 season of CP-35 project. Site selection was done prior to my arrival and was based on top-down selection processes negotiated between WFC

<sup>1</sup> Project CP-35 is nested under CPWF Theme 3-*Aquatic Ecosystems and Fisheries*. "Theme 3 of CPWF fosters research and capacity building aimed at improving water productivity through sustainable use of aquatic ecosystems. We forge partnerships with ARI, NARES and NGO partners to ensure that aquatic ecosystem goods and services contribute to the enhanced livelihood, food and environmental security of millions of poor people in the developing world". [www.aquaticecosystems-cpwf.org/5.Theme%203%20projects.htm](http://www.aquaticecosystems-cpwf.org/5.Theme%203%20projects.htm)

and the national partners. Site selection was primarily based on the levels of co-operation (trust) with local officials, ease of access and aesthetics. The *personal relationships* between GoB officials and local administrators of the sites were seen as very important to help resolve future conflicts. Senior project staff, from past experience, knew who were cooperative local officials and chose those sites accordingly.

My research was conducted at Soliamari Beel, Mymensingh-Sardar Upazila, Mymensingh District; Beel Mail and Chandpur Beel, Mohanpur Upazila, Rajshahi District. Figure 2.2 shows the site locations on a map of Bangladesh. A complete description of site characteristics is provided in Table 2.1. This table lists demographic and physical secondary data. It provides a preliminary outline of the project interventions and governance structure found at each site.

**Fig. 2.2: Map of Bangladesh showing study areas, Chandpur Beel and Beel Mail in Rajshahi District and Solimari/Gheramari Beel, Mymensingh District**



**Table 2.1: Demography and Fisheries Resources**

Upazilla	Mohanpur	Mymensingh-Sadar
District	Rajshahi	Mymensingh
Area (km <sup>2</sup> )	67	81
Population	53,000	63020
Density (persons/ km <sup>2</sup> )	16	740
Villages	56	76
Union Parishads		3
Pradeshya Sabah (municipalities)		
Rivers		(Brahmaputra/ Sri Kali)
Ponds	170	
Private ponds	720	925 (850ha)
Khash ponds	50	20 (8.2ha)
Fishermen No.	N/A	360
Beels	2	0
Institutional ponds*	0	30 (60ha)
Canals	5	
Canal borrow-pits	8	
Rice cum flood plain	5	
Hatcheries	0	5 (priv) 2 (govt)
Nurseries	0	8 (priv)
Fish production 2005	N/A	500 mt
Fish demand 2005	N/A	978 mt

\*Institutional ponds (masjid, maktob, school, college etc)

Table 2.1 continued

District	Rajshahi		Mymensingh
Upazilla	Mohanpur		Mymensingh-Sadar
Beel	Beel Mail	Chandpur	Soliamari
Communities	(1) Melandi (2) Dangapara (3) Dewpur (4) Goalpara (5) Moheskundi	(1) Batupara (2) 4-5 additional villages	(1) Bhatibarerarepar (2) Dariakandi (3) Takevita
Total Population HH/Pop	(1) 200 /700 (2) (3) (4) (5)	(1) 400	(1) 600/ 3000 pers (2) 50 (3) 150 pers
Beel land owners HH	Total >150 (1) (2) (3) (4) (5)		Total 106 (1) 102 (2) 3 (3) 1
Absentee landowners	Yes (approx 15)		
Location of land owners	Rajshahi City	Rajshahi City	Houses in Mymensingh
Max beel (ha)	200	50ha	35.21 (87ac)
Khash Land (ha)	15.2	9ha (22acres)	
Perennial area (ha)	0.5ha	1ha	0.5ha
Religion No HH	1) Hindu 75, Muslim 25 (2) (3) (4) (5)	(1) Muslim 399, Hindu 1	(1) 100% Muslim (2)? (3)?
No of Gustis			1) 5 (2)? (3)?
Lease cost 2005 Tk	54,000 (lease auction)	Yes (6 members)	
Fry lease Cost 2006 Tk	54,000	20,000	NA – private
2ndry lease cost Tk	NA	45,000	NA - private
Lease capital	Internal credit	Sub-leased	NA
Benefit sharing	50% / 12.5% wild/ stocked fish (harvest remuneration) 12.5% of net profit		
Intervention	Culture-based CBFM Aman – alternate	Community- driven Aman - alternate	Culture-based CBFM Aman - alternate
Intervention characteristics	Screened sluices/ stocking	Fencing/ stocking	Screened sluices/ stocking
Intervention agency	DoF / Self	Self	DoF
Institutional arrangements	Self (2005 lease bid)	Self-mobilised	Top-down Mobilisation
Total beneficiaries HH	(1) 92	(1) 13 (6 on exec.)	Total 106HH (1) 102 (2) 3 (3) 1
Landless beneficiaries HH	2		
Fishermen beneficiaries HH	(1) 92 - 75 Hindu, 17 Muslims		
Commercial pond owners			(1) 40-60 (2) 3-4 (3) 30
Active NGOs	ASHA		
Distance from Division District Capital (km)	4	5	
Retail/ Wholesale Markets (km )	Rajshahi (34), Keshorehat (5), Sollaapara (2), Ekdiltola (6.5), S Champur (3)		

The sites were all floodplain ricefields with Aman season cropping patterns. Rice was transplanted in early monsoon (May/June). In areas with fish stocking, fish were stocked after transplanting as soon as water levels were high enough. The 2006 field season was dry. There was often concern about low water levels. Fish harvest starts in the post-monsoon season of October/November and continues as long as possible (January). A portion of each research area had perennial standing water (beel area) which served as a refuge for wild fish and a place for rearing stocked hatchery fish. The photo below shows Beel Mail in July with rising waters and transplanted rice.



## **2.2: Research methods**

I undertook secondary data collection and desktop research during the month of July 2006 at WFC-Dhaka and included literature reviews on Bangladesh fisheries and aquaculture. Individual WFC staff interviews were conducted (Miller and Dingwall, 1997; Morgan, 1988).

Field work consisted of participant observation, conducting group discussions, individual stakeholder and villager interviews. Interviews also included random meetings with fishers in the field. These interviews would attract more people and larger discussions and more interviews would ensue. My field research was carried out with a research assistant providing translation. Additional research was carried out as a member of the CP-35 project team. The discussion sessions consisted of 12-15 men assembled by the translator in conjunction with village leaders, a series of questions were asked and the responses were recorded in Bengali. They were later translated and responses compared, coalesced and tabulated (see appendix A). We also spoke informally with key people in and around the project including all levels of government personnel. We also conducted early morning interviews with fishers returning from night fishing. In my study, three plausible scenarios sessions were constructed, with my suggestions of possible drivers and impacts, and the resulting discussions with the assembled

participants (8-10 men) on the likely occurrence, impacts, mitigations and general feelings about the suggested drivers were then translated and grouped with my assistant (Table 5.1).

The results of all group discussions and individual interviews were assessed in terms of how the participants viewed the *seriousness and persistence of impacts* of drivers and, in scenarios sessions their visions of the future and possible constraints. The responses were compiled to form a narrative around peoples' perception of drivers of change and how external organizations (government, NGO or private) contributed or helped to mitigate these impacts. I wanted to get a sense of where the peoples' *powerlessness* resided and where they felt they had power and control in their own lives as related to drivers and institutions within the local social, political ecological, spiritual (Muslim/Hindu) context). This was attempted through the different interactive sessions I arranged.

On the key issue of the *privatization of the aquatic commons*, my thoughts were guided by the following questions.

- 1) What is the extent of this happening? As both a property rights issue and a research topic, where are we going with this?
- 2) Is privatization of the aquatics commons desirable and for whom?
- 3) Who are the winners and losers in the different governance schemes?
- 4) What are the drivers and mechanisms of power which maintain these pathways of privatization?

What are the available alternatives for governing in these floodplain systems? Under what conditions do different approaches work at promoting sustainable resource use?

What is the *trend* we see in the governance of aquatic resources, especially those used as *de facto* aquatic common property resources? Governance is a broader, more reflexive, value inclusive extension of resource management. Are the political questions of access and control answered via participatory democratic processes? Empirical research into who participates and why; and thus who benefits and who loses is critical. What are the impacts on the livelihoods of poor and landless? How has access to aquatic resources changed and what are the impacts? There are questions of sustainability over subsequent generations of rural poor. Power dynamics are often difficult to detect. They are often implicit, hidden and not discussed openly. What is the role of private capital as influence on land/water tenure regimes?

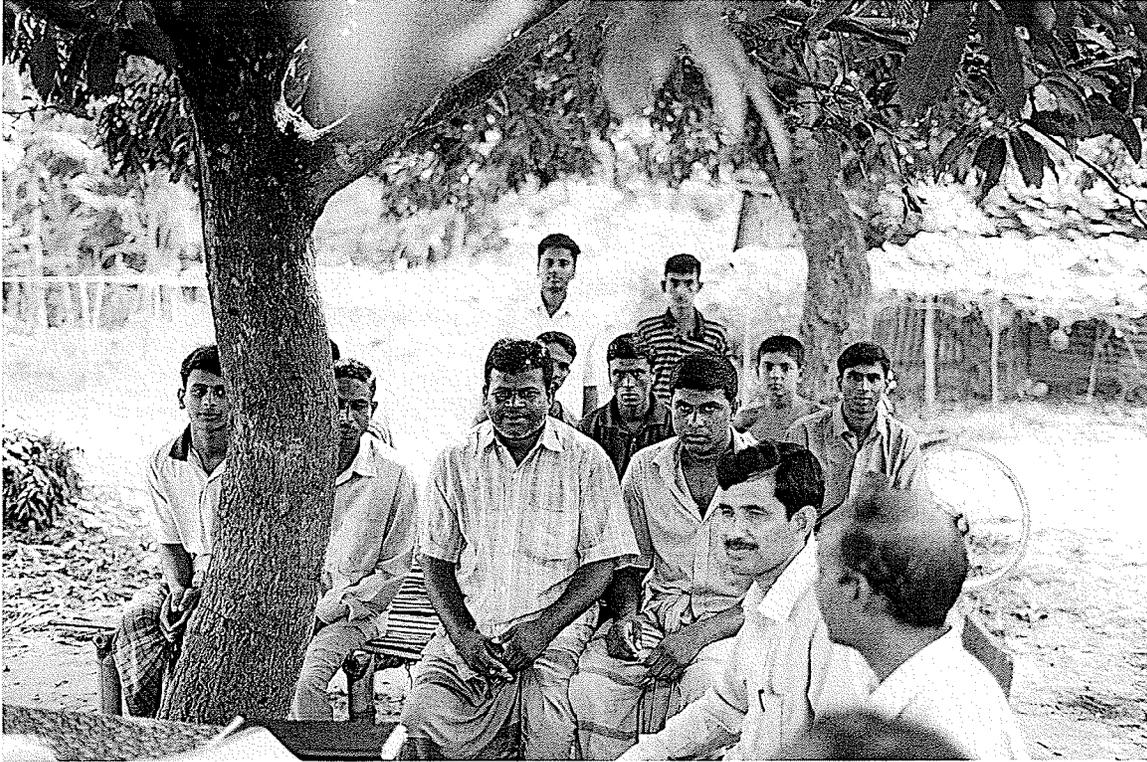
If we are concerned that present management is unsustainable, then an analysis of governance requires an in-depth examination of the relationships between the social, political

and technical factors or drivers influencing decision making. Scenarios can be used to establish the "long view" of how the stocks and flows of aquatic resources could change over the long term. What are potential solutions, options? How do we use the scenarios to learn about options such as PPPs, community-based fisheries co-management, and the changing power and flexibility of local institutions? The social sciences and humanities can have input in developing processes which begin to make value choices regarding our choice of management directions.

This research begins to outline "push and pull" drivers which dictate aquatic resource relationships and how these influence the state of the resource. Factors to be considered include land reform and employment policies. What are the key drivers of enclosure of the commons, forces which are driving the conversion of open fishing areas into private, exclusive aquaculture enterprises; and how do these forces alter benefits streams and participation and power centres in decision making (Runge and Defrancesco, 2006)?

Broader considerations include how do incomplete democracies or semi-failed states such as Bangladesh deal with decision making in natural resource sectors? Is *phronetic* (Jentoft, 2005) knowledge incorporated into aquatic natural resource decision making? Is there an over reliance on reductionist, natural science approaches by key state and non-state participants in the management of these aquatic systems? As we will see these are key concerns which will affect the nature and context of how the partnerships between GoB, WorldFish Centre, and national project partners affect the project design and implementation of CP-35 and the potential ramifications this has for governing the aquatic commons.

The management of the commons involves the trade off between who is included and excluded not only in access and benefits sharing but also in decision-making fora. This research involves looking at how the project partnerships interact with the local institutions and communities and how the project will manage to deal with problems of commons governance in the face of previous work by such authors as Sultana and Thompson, (2003).



Group Discussion Meeting, Chandpur Beel

## **Chapter 3:**

### **Key Drivers of Change in Floodplain Rice-Fish Systems**

#### **3.1: Introduction**

Today our collective inability to make intelligent decisions about how we manage or interact with ecosystems has left a legacy of ecological degradation and marginalized communities. Rationale and forms of ecosystem management have changed but the methods of decision making have not (Savory, 1999). Drivers of change and their potential impacts on ecosystems have not been significantly included in resource decision-making frameworks. Multiple drivers may come from any social, physical or ecological sphere. They will directly impact on how the primary resource users, the people who are ultimately responsible for managing the resources, formulate their livelihood and “quality of life” goals and the subsequent resource management decisions (Savory, 1999).

In this chapter we examine the prevalent drivers of change affecting our three alternate rice-fish floodplain sites. From the previously described study methods, the key drivers for both the present systems state and potential change trajectories were determined and described.

These drivers are not mutually exclusive they interact across temporal and spatial scales including the different levels of governance operating in rural Bangladesh. They will also vary in significance for different actors at the three case study sites.

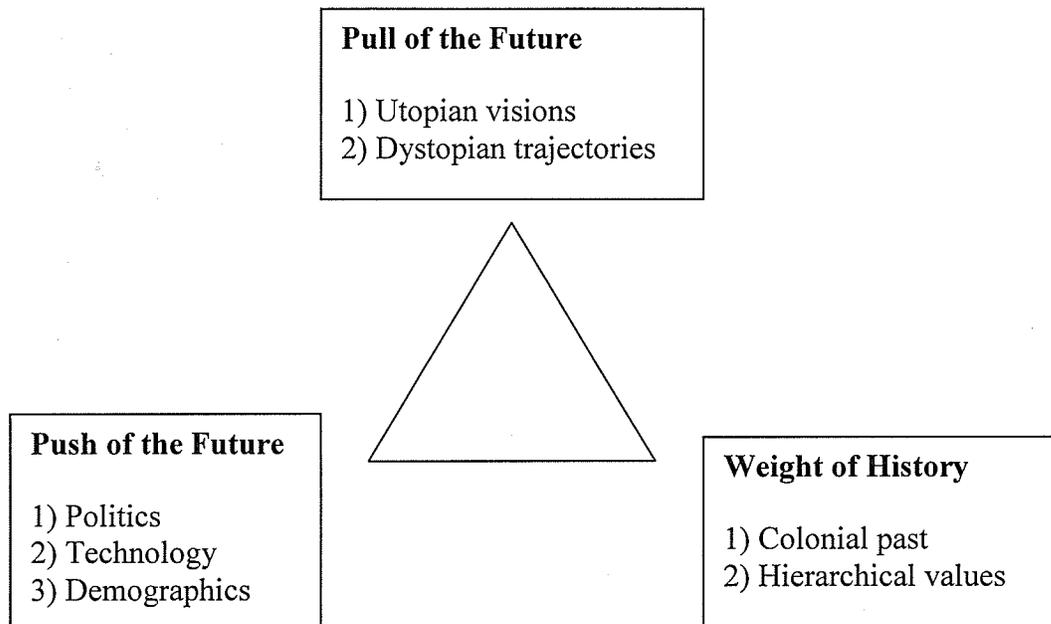
There are many definitions of *drivers* originating from different disciplines. We can use the definition of drivers as stated by the Millennium Ecosystem Assessment as

*“Any natural or human-induced factor that directly or indirectly causes a change in an ecosystem. A direct driver unequivocally influences ecosystem processes, and therefore can be identified and measured to differing degrees of accuracy. An indirect driver operates more diffusely, often by altering one or more of the direct drivers, and its influence is established by understanding its effects on direct drivers”* (MEA. 2005b:85).

We focus on drivers of both ecological and institutional change. This sets out in a clear, evidenced-based way the most influential forces which direct or shape the incentive structures for adapting to multi-scale change in rural social-ecological systems such as our rice-fish systems. This knowledge will be important for the future development of monitoring and evaluation approaches to assess any impacts of management interventions on ecosystem state and services.

Drivers can either “push”, directly forcing a systems change by altering key internal (endogenous) processes and structure usually through economic, political, demographic or technological factors, or they “pull” by altering external conditions, providing competing future visions and opportunities to attract the system to a new state. The pull of future options and the push towards modernity facilitates and accelerates change in dynamic social-ecological systems. In addition to the push-pull dynamics, another important factor affecting change is the *weight of history* on the pathways of development (Figure 3.1)

**Figure 3.1: Driver Typologies** (adapted from Runge and Defrancesco 2006)



The *historical context* is comprised of the technological innovation and adoption and the influences of class, caste, ethnicity, religion and epistemology which shape the social and cultural context. This context then ultimately influences how resource problems are perceived and the subsequent development of local resource tenure institutions. The evolutionary nature of culture shapes behavioral responses to the diverse nature of change thus simultaneously shaping and being shaped by both the social and ecological components of rural life. The long history of social stratification, gender relations, power and wealth accumulation and their impacts on land tenure institutions are some of the key drivers continuing to affect present day rural resource use in Bangladesh (Hartmann and Boyce, 1983; White, 1992)

The interaction of pre and post-colonial science, politics and educational legacies affect how rural resource systems in Bangladesh are managed in current context of environmental and sociological change (Jansen, 1986).

The typology of drivers continues (Box 3.1). *Direct* drivers influence ecosystems and are measurable. Direct drivers can condition future decision making processes. In our case examples include fish habitat fragmentation from irrigation and road building, conversion of paddy fields to fish ponds and localized impacts of environmental change.

*Indirect* drivers influence direct drivers and are seldom easily defined and can include policies on land use or demographics. Both direct and indirect drivers consist of *endogenous and exogenous* types. Endogenous drivers originate from within the SES, while exogenous forces impact the SES from external sources, generally at a larger scale or from levels of

governance beyond the control of smaller scale decision-makers. In addition to drivers, we must also be aware of externalities, the positive or negative repercussions beyond the immediate scope of decision, which can in turn influence other decisions.

Drivers can come in 3 general forms, as external shocks and disturbances, visions, hopes and fears of people for the future or a set of conceivable policies.

Box 3.1:

Examples of different types of drivers include

Indirect Endogenous: local decision making, new fishing technologies and patterns

Direct Endogenous: changes in local land use patterns and impacts of agricultural practices (crops/chemicals).

Indirect Exogenous: property rights, community-based groups, markets/price changes

Direct Exogenous: ecosystems characteristics, local impacts of regional climate change, exotic species

(Bennett *et al.* 2005)

Drivers can be clear and well defined such as local precipitation or the change in fish price but they are more apt to be a complex interaction of historical (contingent), institutional and cultural factors with the resulting institutional responses often being a combination of both self-organized emergent and intentional design processes (MEA, 2005a). This tangled complex of both emergent (evolutionary) and constructed institutional outcomes makes *a priori* understanding of the multi source and cross-scale nature of drivers critical for planning sustainable natural resource management.

Drivers of change can occur across all scales (village, local, regional, national, global). They occur over different time frames and importantly in often synergistic combinations. Their impacts will depend on their interactions with the multi-level institutional structure (Wilbanks, 2006). In our study, the seasonal increase in fisher populations through in-migration is an influential driver impacting at both the water body and village scales. This influx increases competition for fish resources and inter-personal conflicts.

The nested and interactive nature of drivers means regional *endogenous* drivers such as governance decisions, commodity prices, technology development or macroeconomic policy often become critical local *exogenous* drivers. These pressures for system change or re-organization can thus arise from multiple sources at different levels of organization or governance (Berkes, 2006). In our case, we can see how national-level resource policies promoting concepts of private sector replacement as important engines of innovation,

productivity and societal development come in direct conflict or do not fit with local level resource user goals and government capacities.

A study of drivers also develops an appreciation for how the interlocking nature of causes can make progressive change very difficult. Efforts of donors and NGO partners can contribute to this intransigence by insisting on static bureaucratic methods of implementation, monitoring and evaluation. Incorporating an explicit driver component into research allows the development of indicators of change. A focus on drivers can further our understanding of how adaptive institutions are developed based directly on local realities (Mahon *et al.*, 2008). It provides us grounded data to help understand the possible directions of medium/long-term change including how underlying forces shape critical incentive structures.

Decision-makers can influence the path and impact of endogenous drivers but must respond to external driving forces through adaptive responses. Understanding what controls these drivers may lead to better recognition of the role of adaptive responses play in projecting or shaping future development pathways.

Drivers of change alter both the ecology and the social structure and management strategies in these alternate rice-fish floodplain systems. This influences processes of developing social institutions in response to both social and ecological change. There is a close link between any technology introduced, its impact on the landscape and the resulting adaptive institutional and cultural response. One example of the synergistic impact of aforementioned drivers is the continual physical fragmentation of the Bangladesh landscape through altering hydrological flows and cycles through poorly designed and constructed irrigation, drainage and flood control works resulting in the disruption of critical migrations of fish across the land-water interface.

Current rates of in-country human migration and the attempts at redefining gender roles are two expressions of the impact of drivers of change on rural social structure brought about through the complex interactions of poverty and resource use in Bangladesh. Social movements and networks are formed or dissolved as they try to shape and work with government policy to generate public goods are forces of rural change, yet in our study we begin to see how the *proliferation of private property rights approaches* drives the continuing social and physical fragmentation of the rural sector.

As we expand the temporal and spatial scale of observation, the number of potential (endogenous) drivers also increases therefore we also increase the number of interactions and thus complexity. Depending on the scale choice, different decision-makers at a particular scale have influence over different drivers. Understanding the politics of scale choice and interactions allows a deeper recognition of possible entry points for intervention (Lebel, 2006). This study has shown driver impacts from the individual water body scale to the impacts of national resource policies and the local integration into the broader cash economy.

The characteristics of a changing and more interconnected world include shifting consumer preferences; increased private sector influences and competition; technological innovation and implementation; increased environmental constraints and a rapidly changing social institution context. The resulting institutions in turn shape how people come to know their social-ecological environments and how they assume to manage it. Understanding how drivers of change affect the processes of institution building is crucial in assisting Bangladeshi decision-makers and supportive partner organizations in the management of aquatic resources beyond the rhetoric of increased productivity and poverty alleviation.

### **3.2: Drivers of Change in Bangladesh Floodplains**

Who or what is determining the discourse on the issues facing aquatic resources management in Bangladesh and how are these forces affecting resource use decision making? There are 3 general interactive spheres of influence. First, donor-driven mandates based on western-science and management principles and the 'sustainable development' discourse. Second, the DoF/GOB view natural resources primarily as opportunities to control development trajectories and to generate revenues. They have little power and respect in local allocative processes of natural resources. The third sphere consists of local actors, primarily the economical and political elites who develop and control processes of building cross-scale linkages with the other spheres as well as a diverse sub-set of other stakeholders including in most cases NGOs. In this study there has been no development of linkages with local NGOs. Vertical linkages are primarily built between local spheres of influence and fisheries research centres such as WFC and BFRI, GoB agencies such BARC and other governance levels such as Fisheries Offices at the Upazila and District levels. These multiple level negotiated interactions between local spheres of power and higher governance levels define the specific scope of authority and boundaries of our floodplain resource regimes. This creates overlapping and competing jurisdictions and power struggles. The drivers outlined in this section both facilitate and hinder the development of possible institutional arrangements which can internalize these cross-scale conflicts into a merged local-regional negotiation forum (Young, 2006). This forum must clearly outline the roles for all actors across different levels of governance, commit to consensual decision-making and work towards formulating co-management arrangements to deal with the plethora of cross-scale conflicts resulting from the misfit of imposed central government views and regulatory institutions and local understandings across all levels of aquatic resources management.

In Bangladesh, the international influx of aid and development assistance is big business for the NGO sector. The influences of directed money, power and decision-making, gender and knowledge all impact the aid arena. These broad drivers force the need for mutual transparency, accountability thus requiring processes to develop commitment and trust

between donors and recipients as co-workers or research. There are expectations of donors to become *clients* to Bangladeshi NGOs and professionals. In this context both donors and partners must work together to find ways to move beyond *formal* clientalism and accurately describe and change institutional structures to support their present and future values-based partnerships (Eyben *et al.* 2007). This is primarily done outside of the local social context, because donors and recipients fear being drawn into the entrenched rural power spheres of elite capture, patronage politics and the mutual indifference, antipathy and blame created by class separation in Bangladesh.

Our study has shown how these interactions have direct consequences for the effectiveness of local research and development projects. The study found these organizations generally fall back on old methods, command and control methods of resource management. As Bangladesh reduces aid dependency, these dynamics are becoming more prevalent as competition for aid money intensifies and familiar, science-based, top-down approaches are promoted and relied on in lieu of more risky, community-based approaches. This disconnection is glaring as local bottom-up community-based approaches hit barriers of intransigence from aid dependent NGOs and capacity-poor government levels, fearful of losing future access to development funds. In Bangladesh, NGOs and governments see themselves as “goods and services provider” for donors-as-clients. There has been little commitment to mutual knowledge generation and application at the policy level with the consequences of increased conflicts and reduced local rural resource sustainability (Eyben *et al.* 2007). This approach does not facilitate the necessary linking of different knowledge sets for understanding the institutional, cultural and economic components of these complex resource systems (Powell, 2006).

This broad development environment influences how government, research and development organizations interact with local leaders and institutions. This problematic environment coupled with the following key drivers influences how problems and scales are defined, and the subsequent processes of decision-making. This includes the prevalent and unofficial national mandate to increase fish productivity by any means necessary.

Alternate rice-fish floodplain systems are examples of social-ecological systems that are under a diverse array of both internal and external pressures. These are examples of hybrid freshwater systems combining both fisheries and agriculture so are impacted by a wide range of physical and social drivers. Currently the floodplains of Bangladesh are administered to generate government and private revenues without effective concern for the poor resource users dependent on the high natural fish productivity of these ecosystems. There has been a systematic neglect of these important food systems in favour of policies promoting intensive agriculture with the associated irrigation, draining and flood control programs (Thompson, 2004a,b). Institutional development for the management of these fisheries remains poor. Farming interests tend to dominate other policy considerations including fisheries, water use

and the operational integration of wetland conservation into the National Water Policy (Habib, 1999 in Thompson, 2004a). From a case study in Gazipur District, (Thompson *et al.* 2005) uses the concept of drivers and shows their influence on the spread of pond aquaculture and the correlation to the development of government aquaculture extension programs.

The three case study sites are examples of an important local aquatic resource system under multiple stresses with rapidly declining productivity and an increasing user base. The cases outlined in this study show 3 different approaches to managing forces of change encountered in alternate rice-fish systems on Bangladesh floodplains. This project has identified a number of key drivers affecting the management of alternate rice-fish systems in floodplain systems (Table 3.1).

Table 3.1: Description of key drivers in rice-fish floodplain systems

Driver	Description of impact
Increasing fisher population	More people are fishing. Over fishing of some beels plus the increased use of legal gear and methods.
Fishers are more mobile	Conflicts result from encroachment of preferred local fishing areas.
Annual flood patterns	Key factors affecting the planting and harvesting of rice
Agricultural land use	Irrigation and HYV technologies; rice agriculture as a link to food security, loss of dry season fallow for cattle
Fragmentation of floodplain	Disrupts fish movement, reproduction and reduces wild fish yields; habitat destruction
Availability and the increasing price of fish	Price of wild fish in local market impacts subsistence fishing; price of cultured fish impacts aquaculture development and export production
Pressures to convert to cash economy	Unemployment and underemployment major national concerns; unofficial unemployment >%40 in Bangladesh; rural poor start micro-enterprises; "everything is about money" attitude
Use of short term leasing for short-term gains	Major policy mechanism for access control and resource use of water bodies; focus is on short term revenue generation
Government policy for CBFM	The theory and concepts of CBFM are endorsed but only rhetorically to direct National fisheries policy. In reality the government has very little capacity or willingness to implement CBFM on a large scale
Government policy for aquaculture development	Market forces and government inertia in promoting "scientific" pond aquaculture, agriculture land is converted to private ponds
Political influences on management decisions	Agendas of elected and appointed officials affects all aspects of fisheries management and project development at different political levels; circumvents CBFM, dissipation of resource rents through nepotism and corruption; transparency not always welcomed

Other drivers include decreasing farm plot size; developing fish products for export

For the rural poor, these drivers all affect their access and use of customary common property resources found in flooded ricefields. Through interviews and group discussions the relative influence of key drivers were determined and listed in Table 3.2.

Table 3.2: Driver Influence on Project Sites

Driver	Soliamari/Gheramari	Beel Mail	Chandpur Beel
Increasing fisher population	++	+	+
Fishers are more mobile	++	--	+
Annual flood patterns	+	+	++
Agricultural land use	+	+	++
Fragmentation of floodplain	++	+	+
Availability and the increasing price of fish	+	++	+
Pressures to convert to cash economy	+++	++	++
Use of short term leasing for short term gains	--	+	+
Government policy for CBFM	++	++	--
Government policy for aquaculture development	++	++	--
Political influences on management decisions	++	+++	+

**Legend:**

- - Not important driver at that site
- + Low importance or influence
- ++ High importance or influence
- +++ Critical driving or influential force

In terms of expanding scale, the key drivers found are *population and fisher mobility; floodplain and land use change; the cash economy, markets and fish prices and key governmental policies and management strategies for aquatic resources*. This is not to minimize the impacts of the others listed, as they all interact to some extent and shift importance depending on the specific local social-ecological context.

The general clustering of drivers (Table 3.1) around population mobility, land use change, markets and resource policies captures the social and ecological nature of the key drivers influencing our floodplain rice-fish sites. These general categories allow us to delve deeper into their specific and differential influence at each site, and rank them according to local perceptions per site as in (Table 3.2).

Drivers do not have identical impacts at each level: household, community, national and international. At different levels of organization, these drivers will have different impacts. It will be important, for policy considerations, to be aware of how these impacts are manifested at various levels of organization. Table 3.3 is one attempt identify these different impacts of the key drivers at various levels of organization.

### **3.2.1: Population and fisher mobility increase**

At the water body/ local scale, a key driver is the influx of mobile fishers from surrounding areas into the managed water body. They fish for cash, subsistence and in some cases recreation. There is now a question of communities trying to exclude these “outsiders” from their adjacent open access resource systems. These open access flooded areas are now being looked at as *de facto* common property of the villages that are beside them. There is a strong desire of the villagers to develop some form of cooperative management. This is especially prevalent in the villages surrounding the Solimari/Gheramari complex which see the possible expansion of private control of fishing combined with in-migration as degrading “their” fish resource base.

**Solimari Beel**, the focus of the ‘private enclosure’ project, is part of larger interconnected floodplain complex sustaining a large population of local landed, landless and outside mobile fishers. Fish yield, fish size and biodiversity were seen as severely declining by all participants. We found local resource users somewhat worried about the increased influx of outside fishers, excluded from the “privatized” project site, now fishing in the more important Gheramari Beel and other surrounding water bodies. Some fishers will walk up to 5 km to fish in Gheramari and surrounding water bodies. There is unanimous recognition of increased fishing pressure. This influx of mobile fishers is seen to contribute to over-fishing and the increase use of destructive and illegal fishing practices such as *dewatering* and digging resting fish from the mud. These were seen as very destructive and there was a strong voicing for the development of fishing rules and habitat conservation measures by the government or by some type of collaboration with WFC. Because of the declining state of the fishery, respondents saw the immediate development and enforcement of fishing rules to monitor the amount and types of outsider fishing as a more important issue than the enclosure of Solimari beel per se. The study also shows that in conjunction with increased mobility and migration, non-fishing livelihoods such as

**Table 3.3: Impacts of Drivers at Different Levels of Organization**

<b>Driver</b>	<b>Household</b>	<b>Community</b>	<b>National</b>	<b>International</b>
<b>Increasing fisher population</b>	Less protein and cash supply	Increased local fishing pressure	National declines in fish yields; reduced exports	Global over-fishing and loss of fishing communities
<b>Fishers are more mobile</b>	Greater travel distance from home	Increased local water body use	National employment issues	Decline of fishing communities
<b>Annual flood patterns</b>	Flood damage; livelihood loss	Infrastructure risk. Loss of important fish reproduction	National disasters; loss of beneficial floods	Climate change and increased vulnerability
<b>Agricultural land use</b>	Fragmentation, need to purchase land	Patron land accumulation/power politics	Conservation, development and land use planning	Global food and environmental security issues
<b>Fragmentation of floodplain</b>	Smaller plots to farm; declining crop and fish yields	Loss of local hydro connectivity and declining of fish yields	Rice agriculture/food security	Loss of wetlands; biodiversity loss; environmental refugees
<b>Availability and the increasing price of fish</b>	Influences family consumption of fish	Price up in local markets; more selling to Dhaka; local food security	Loss of wild fish; impact upon nutrition for the poor	Higher prices-more exploitation; all fish now becomes a commodity
<b>Pressures to convert to cash economy</b>	Alternate income opportunities and threats; loss of barter	Livelihoods for generating cash; money making for elites; money lending increases	Bangladesh integrates deeper into global market economies	Dominant paradigm of neo-liberal economic approaches to development
<b>Use of short term leasing for short term gains</b>	May be denied fishing access; costly membership	Power politics over control of local water bodies	Over-fishing; v. poor resource rent distribution	
<b>Government policy for CBFM</b>	Increased HH participation for wealthier	Increased government influence in local management	Community-based fisheries can lead to sustainable governance	International need for devolution of management to fishing communities
<b>Government policy for aquaculture development</b>	Opportunities for wealthy HH, loss of access to fishing areas	Local employment; Maybe some diversity into CB-aquaculture	Management for declining stocks; global export economics	"Blue Revolution"; aquaculture as intensive food production; panacea
<b>Political influences on decisions</b>	HH at mercy of party politics	Politicization of community institutions	Rent seeking agenda from leased water bodies	Unsustainable fishing regimes in many environments

rickshaw pullers, small business and day laborers are now including fishing or are increasing their fishing rate from these open access areas to supplement incomes or household food. Participants expressed resentment towards governments at all levels for their lack of enforcing existing fishing rules. Participants identified lack of capacity and political corruption as the chief reasons for lack of enforcement.

**In Beel Mail**, the poaching fish by outsiders is a problem resulting directly from increased fisher mobility and the enforcement of exclusionary property rights. Co-management has developed over the past 25 years with the relationships and lines of communication between stakeholders being very well developed across multiple levels of governance. The different stakeholder communities involved at Beel Mail are very concerned with local compliance and developing methods of monitoring, enforcement and sanctioning poaching which are agreeable to all. This requires complex negotiations between all parties involved with the floodplain project, including the informal groups of landless fishers. Over time, actions evolved from strong arm police/political tactics to the present day discussions. There is now goodwill and trust in these collaborative negotiations in which on going dialogues exist to solve these problems. Penalties for non-member poaching are/were graded and political. The police, members of Parliament, the courts and Upazila level fisheries personnel are all involved in fishing rules enforcement. At the time of this study, the enforcement was becoming more efficient with the parties coming to terms with actually enforcing the agreed co-management fishing rules. There seems to be good information flow among the key stakeholders involved, albeit facilitated and mediated by project research staff.

In Beel Mail, the incorporation of landless fishers into the co-management arrangement is stated by project partners and participants as a key objective and is recognized as a necessity for peaceful relations and sustainability. The inclusion of subsistence fishing in the co-management agreement must be seen in conjunction with the often clumsy negotiations and processes surrounding rule enforcement. The process for including poor fishers is daunting and on-going process involving all levels of government, WFC, money-lenders and the Melandi Fishermen's Cooperative. In August 2006, meetings were held by beneficiaries and project partners in order to begin to design institutions to incorporate landless and poor fishers into the Beel Mail arrangement. These negotiations centered primarily on traditional gear selectivity and the distribution of benefits from the "wild fish catch". Developing separate access and benefits arrangements for the local subsistence, wild catch and the commercial stocked fish is proving very difficult for the project partners and other stakeholders. Developing institutional processes for access and enforcing compliance of local fishing rules are directly related to increased fisher in-migration and poaching. The emphasis on stricter compliance to fishing rules is more of a concern to stakeholders than increases in population growth or mobility and is seen as the

most effective short term way to reduce impacts on Beel Mail. The project research staff (BARC/WFC) is working for longer term inclusion of landless and poor fishers through negotiations on access and benefits sharing.

In **Chandpur Beel**, the Chandpur Village Fisherman's Cooperative maintains a vigilant watch for outsider fishing. The fishing area is clearly fenced (see photo) and the cooperative is very strict against poachers. They confiscate gear/boats and threaten offenders. You must be a paid member in order to benefit from fish yields from Chandpur Beel. Interviewees did not seem concerned about poaching as surrounding villages were well aware of the penalties for getting caught.

### **3.2.2: Floodplain Land Use Changes**

Land use change occurs from the interaction of human knowledge, technology, institutions and resource allocation mechanisms. In Bangladesh, the agriculture sector dominates rural policy, technology R&D and resources allocation. Increasing irrigated rice production is still the dominate focus of agricultural policy and development. The rural elites which have come to dominate rural resource management and allocation have coalesced their power during the development and dissemination of Green Revolution technologies among the large land-owning class. Intensive agriculture production with its irrigation and flood control infrastructure alters the rural landscape and hydrology impacting directly on the fish productivity. As the scale expands out from the water body/village, we see the disruption of hydrological connectivity of nutrients and fish movement by the poor planning and construction of roads, dikes and sluice gates from agricultural expansion and flood control projects. Embankments and water control structures have blocked essential connections between river, beel and floodplain. A major project is the GoB funded Barendra Project involving the development of irrigation via deep tube wells (1 ell/120 acres), an underground piping service and surface canals. This is an important widespread and local project that in addition to developing HYV rice agriculture also promotes intensive aquaculture by providing commercial scale fish pond owners dry season access to water. This project has had major impacts on land use changes and is one of many projects disrupting natural fish production in rainfed rice/floodplain systems. Despite national policies to prevent the draining of wetlands, agriculture and water management policies have reduced the average depth and duration of monsoon flooding in the deeper, reducing fish productivity from these key floodplain habitats. The unilateral withdrawal of water for irrigation from seasonal floodplain depressions and destructive fishing practices such as *dewatering* are local factors which drastically reduce important self-recruiting species (SRS) from local livelihoods. The production and movement of propagules across the aquatic landscape is prevented due to improper drainage and irrigation construction. This influx is the key initial resource surge for rice field productivity of fisheries (Fernando, 1995). The balance between allowing the early flood waters to remain long enough on the field for fish production and the

prevention of rice-crop damage from early flooding and the draining of fields for sowing is the perennial challenge in Bangladesh floodplain agriculture. In discussions and interviews with the villagers of Takervita adjacent to the Solimari/Gheramari Beel, they fully recognize the importance of *fish sanctuaries* or habitat conservation and the importance of keeping water on the floodplains to fish productivity. They voiced a strong desire to develop cooperative conservation measures. Floodplains are altered to provide habitat (*katas*) to facilitate fish production, to develop a capture fishery from ricefield. This is primarily done by the land owners. In the Soliamri/Gheramari complex there is illegal construction of *katas* by elites on public land not only to capture common property fish but also to stake a future claim to this land.

The spread of high yielding varieties requires the use of chemical fertilizers and biocides. It was felt that pollution from biocides was not a critical concern in our study areas. A greater concern is pollution from tanneries and distilleries in areas with large river inlets such as the case with Beel Mail.

### **3.2.3: The Cash Economy, Markets and Fish Prices**

The alternate rice-fish floodplain systems in this study are examples of Integrated Irrigation and aquaculture systems (IIA), wetland economies dependent on a variety of aquatic products.

Through policies and process of *rural simplification* via the promotion of intensive agricultural production and direct marketing to urban centres, especially Dhaka, there is a general decline of fish species diversity in local rural and peri-urban markets. From personal observations, rural markets are being filled with a limited number of stocked or cultured species while the preferred indigenous wild species are rapidly declining and are sent directly to urban markets or if available locally, at a very high price. Wild species caught by the poor or landless fishers are generally sold for cash, while less valuable species are kept for household consumption. The overall national decline in the freshwater fish catch means increased fish prices across all regions and species. The lower cost of pond aquaculture species is still too high for the rural poor. In our study areas including the Solimari/Gheramari area of Mymensingh-Sadar, the majority of freshwater pond aquaculture rural development in Bangladesh is for the export markets for Asian catfish (*Pangassius sutchi*). There is potential for low cost integrated concurrent rice-fish production of tilapia, but these species are also being slated for intensive, export market driven production.

In Beel Mail, market concern focus typically on maximum production from the water body. The management narrative is to maximize production from the most efficient polyculture combination. Government and WFC research focuses on getting this polyculture right. Options for the management of Beel Mail consist of the on-going semi-intensive stocking program (status quo), conserving the wild fish supply and develop management strategies to enhance

the production of self-recruiting species (SRS) and the linking of a culture-based fishery with semi-intensive pond aquaculture. Presently there has been little effort to move Beel Mail away from the technology focus of a stocked, polyculture-based open water fishery.

Little research has been done to illuminate the driving forces which shape demand besides rural population increases and the anecdotal narrative of "a general rise incomes". We have seen in some areas, how local demand is also shaped by an active network of local fish farm labourers acting as middlemen for the farmers they are working for. In Beel Mail, this network has a range of approximately 20-25 km from the adjacent villages.

In Beel Mail, as the old guard in the Melandi Fisherman's Cooperative changes from the ways and ideas of the elder to a much younger group of small businessmen, ideas were discussed about setting up savings and credit strategies for members. They are interested but mistrustful of developing linkages with financial institutions or NGOs. Members see their role as moving the village out of a strict *jalmohal* model as the basis for resource management and development, towards a wider program encompassing different livelihoods centered on the diversity of local aquatic resources and other possible income generating activities.

In **Chandpur beel**, the formation of a village fisherman's *somitie* (society) was the direct result of 4 key village leaders wanting to develop proximate water resources to produce fish and to make money for its members. This was a business project, by which a little upazila-level training and trial and error was used to produce fish for sale. Village members see the water body as "theirs". The Chandpur members *would not tolerate* a lease holder trying to sub-lease to another party. The village manages the waterbody and surrounding ricefields without any assistance from NGOs or government departments. The village leaders were polite and helpful about working with WFC, not so enthusiastic about working with DoF or other governments and were generally only concerned with how they could improve yields. This was confusing as the CP-35 project sees Chandpur Beel as a "control site", a site with no formal interventions by project partners. Chandpur is interesting as an example of how this village is capturing benefits and moving management from harvesting an initial open access resource to developing a common property/community-based system. It was seen in scenario exercises that they have every intention to capture more benefits by developing a semi-intensive culture based fishery with local market access. The key stakeholders in the fishers society see this fishery as becoming their prime livelihood, other members see using some of economic benefits to purchase land in order to expand their agricultural-based livelihoods.

#### **3.2.4: Key governmental policies and management strategies for aquatic resources**

A major driver of change in floodplain fisheries has been the development and implementation strategies of natural resources and agricultural policies in rural Bangladesh. The policy development process has excluded participation of the rural poor and other

marginalized groups. The implementation of these policies has left a legacy of environmental degradation and inequitable access and distribution of resource benefits across the rural sector. The current predominance of agriculture policies in rural development and their implementation based on Green Revolution rice technologies and support infrastructure is a major driver of freshwater fish decline in rural Bangladesh (Mazid, 2002). Current technology includes the dissemination of a 100 day HYV of Boro rice to help farmers avoid early monsoon flooding (M. Rahman, CNRS, pers.comm.). The long term impact on fisheries of this technology is unknown. Fisheries and aquatic resources and their landscapes, it seems will always be an after thought in government policy emphasis on rice agriculture.

There has been a long history of the GoB/MOL managing national waterbodies for maximum revenue generation. This is indicative of the short-term lease strategies of the MOL approach to beel management. In our study, leases were either held by the a recognized fishermen's cooperative (Beel Mail) or through an informal/illegal sub-lease arrangement (Chandpur Beel) or the waterbodies had no lease so the DoF under the MOFL organized private landowners to participate in new policies of private property or enclosure management strategies (Solimari Beel).

In the national context of drastically reduced freshwater fish stocks, the DoF is under top-down pressure to "produce fish by any means or methods necessary" (personal communication, anonymous senior DoF staff) and they see involving private land owners (dry season farmers) in implementing fish production methods in alternate rice-fish seasonal floodplains. The project shows the landowners fish as an additional crop and incentive to continue in the project. Most of the landowners are farmers with previously little interest in the wet season and common property fish crop, but now see the additional income as significant. The power of these landowners is then exercised in order to derive direct benefits from the project. The DoF by partnering with the mandate of the CP-35 project tries to give both the DoF and CGIAR through WFC an air of credibility and legitimacy. The project mandate is essentially to reduce poverty by increasing aquatic productivity which fits well with DoF expertise and history. This unfortunately it is being exercised without the effective participation by the poor and landless fishers displaced by the different privatization strategies explicit in both the project and wider policy implementation. The possible exception to this is the history of negotiated processes of fisher participation at Beel Mail, although this researcher found the processes of inclusion still to be top-down conceived and disseminated, thus perhaps contributing to the conflicts surrounding the poor rural compliance to fishing rules at Beel Mail.

In order for privatization to contribute to the sustainable management of natural resources, a full integration of social and environmental considerations must accompany processes of building private partnerships within the context of environmental protection and conservation

(Lovei and Gentry, 2002). This is not the case with the ongoing promotion of private property rights as a management tool for the aquatic commons in Bangladesh.

A key related driver is the political or economic force resulting from processes which develop both vertical and horizontal linkages between different loci of power. In our study this was efficiently facilitated by the active participation of one or more interested, willing and influential person(s) involved in the management of the local fisheries. The political influence of local representatives starting from the UP chairman, members and the local elites all input into the management of open water fisheries and influence problem definition; roles, authority and jurisdictions as well as how project inputs and subsequent benefits are distributed. As was clearly shown at the Solimari/Gheramari site these power relationships can quickly derail any project which does not capitulate to local demands and protocols. These cross scale conflicts can exist within and between user groups and their committees.

There is a serious misfit between the imposed centralized governance institutions found as a result of GoB policies and the aquatic ecosystems they are supposed to govern. These *command and control* style policies, generated through the centralized hierarchical bureaucracy do not fit because they were generated without any consideration of the unique local economic or political characteristics. Beyond the collection of demographic statistics, the central government does not take into account specific village institutional attributes and their interactions with multiple forces of change when developing rural fisheries research and development programs.

The uncoordinated policies and management programs within and between national departments and lower governance levels contribute to the ineffective centralized control of rural resources in Bangladesh. This disjointed policy process in turn leads to ineffective attempts at the devolution of resources and authority to local levels. Without fully taking into consideration the key drivers impacting in rural resources, these flawed processes of devolution and public-private partnerships often end up replacing adaptive local management strategies or building new governance with the same outdated models of command and control resource management and private property rights. This study clearly indicates the need for all actors/stakeholder involved in the sustainable management of floodplain resources in Bangladesh to get together and develop an arena of social learning for multi-level policies which address the need for equitable access and benefits sharing agreements from these multi-use, multi-stakeholder resource systems. These negotiations must also include discussions on providing supplemental incomes or developing alternative income generating activities (AIGAs) in order to support poor fishers during periods of fishing bans/closed seasons.

These drivers are also associated with different forms of *disconnect*. There is disconnect with respect to wealth differences and socio-economic advantage; political power and access to

resources and information as resource development is focused away from the rural and into the peri-urban zones of Bangladesh.

### **3.3: Conclusions.**

This section has listed and described the key drivers which influence the 3 case study sites (Table 1). The drivers found to most influential in our 3 site case study are ranked in importance in Table 2. It is important to view any discussion on drivers in context of the role the local actor set (full/part time fishers, farmers, community leaders, local elites) play as they interact with these outside interests and influences in developing local governance institutions.

The key drivers include fisher population and mobility increase resulting from increased landlessness and the erosion of profitability of small land holders, the increased use of fish resources for income as more people try and enter the local and wider cash economies; local social capital relating political and economic influences in implementing national resource policies; the broader government policies of agricultural intensification( increased reliance in external inputs) and privatization of aquatic resources including the promotion intensive export oriented aquaculture and the resulting environmental impacts resulting from land use and flood control alterations for developing Boro season rice cropping. Sluice gate management favors early season flood prevention and rapid post-harvest floodplain water removal both strategies have severe negative consequences for wild fish production. Dry season ecological factors such as the vital presence of fish refugia are not fully accounted for in land use decisions which promote the intensification of rice production.

In order to develop sustainable co-management or PPP agreements, it is crucial for managers to incorporate the differential impacts of these drivers and how they limit the effective inclusion of real concerns and capacities of local resource users, NGOs and citizen groups into a needed multi-sectoral policy process. Key government officials in DoF (Upazila and District levels) and local political leaders (both parties) especially at the Union level must come together to develop the knowledge, trust and accountability and other skills in order to move beyond entrenched centralist thinking and familiar patterns of top-down, command and control management strategies in order to develop the necessary adaptive co-management agreements.

The current project strategy of not involving NGOs in project implementation should be re-assessed with respect to the project's effectiveness at actually contributing to its primary goal of poverty alleviation. The project, as presently implemented is overly focused on the technical production of fish, with little effective incorporation of the broader social context beyond the usual participatory development rhetoric. The incorporation of a legitimate NGO component could assist stakeholders to develop beyond fish production to develop equitable access and benefits sharing agreements working towards achieving broader social goals. The inclusion of

an NGO component may help foster the needed innovative governance approaches currently outside the scope of government capacities. The key task will be for all resources stakeholders to develop management institutions on the scale on which the key drivers operate. This will require a radical shift in governance to more decentralized, interconnected multi-level and multi sectoral institutional arrangements.

There is enthusiastic rhetoric by project partners on the need for more participatory action plan development (PAPD) and "community-based" approaches to aquatic resources management, but little is actually implemented. Donor appeasement is achieved through the use of the concepts and jargon of participatory development, but the current CP-35 project staff have very little capacity and real willingness to implement truly participatory aquatic resources management. Misfit between the proposed project research methodologies and local perceptions and preferences (knowledge) of resource system management occurred at all study sites. Through interviews, we found a severe scale misfit between project design and implementation and the local social and economic context as the project attempted the privatization of the aquatic common property resources at Solimari Beel.

The key drivers found in our study were observed at increasing scales from the increased mobility and in-migration of individual mobile fishers into a specific water bodies, expanding diversification into the cash economy, land use changes resulting from aquaculture expansion and the impacts of the promotion of national policies on Boro rice culture and the private management of floodplain fisheries.

There is no homogeneous collection of institutional responses to these drivers. There is a diverse collection of mechanisms implemented to control access and distribute benefits from our 3 sites.

#### *Privatization at Solimari Beel*

The intervention of organizing private landowners to manage fish by CP-35 was driven in part by a couple of macro level forces. First, DoF is under heavy top-down pressure to take action in the face of rapidly decline freshwater fish stocks. The DoF can only really respond with its capacity and technological approach to increase fish yields through the stocking of beels or the development and extension of pond or rice field aquaculture. In addition CP-35, through the experience of WFC is working with the stated national government policy commitment to models of CBFM. The "community" in this case was the 106 private landowners of Soliamari Beel, including those who operated *kuas*. These beneficiaries would hopefully prove cooperative and as there was no *khas* land involved there would be no need to deal with public sector stakeholders. After finally rejecting Gheramari Beel, there was immediate top-down pressure on all project staff, especially WFC to come up with an agreeable alternative site and group of beneficiaries quickly for the 2006 field season.

At the time of the study, those interviewed in the villages surrounding Soliamari were only mildly concerned with the privatization project as it was still limited to Solimari beel, an easily accessible but not a major fishing area. People were concerned about where some of the mobile fishers would go if they were not allowed in Soliamari. In later scenario exercises *older* participants were very concerned with the potential spread of this model by the government and WFC as it would reduce their access to the more important fishing areas. Previously open access fishing areas *could now be* closed to them under this private/landowner management model. They would have to travel further to find good fishing.

At Solimari/Gheramari the local riparian populace tried to manage fishing through public pressure of *ad hoc* or informal rules and education, informing and pressuring in-coming fishers about fish declines and the general state the local resource. They have no faith in the national government to help save the fishery. Respondents felt that the village could organize around a WFC project or develop a joint project between WFC and a natural resources NGO to develop a fish conservation program and enforce the current fishing rules. Research respondents indicated that over-fishing and the use of destructive fishing practices will destroy critical spawning habitat and thus the fishery in 10 years unless action is taken. The rapid degeneration of the floodplain fishery was recognized by all participants and all those interviewed had strong opinions on causes and what to do about it. There was little overall faith or trust that the DoF could effectively manage these fisheries and was perceived only as rent collectors for Ministry of Land or were ineffective due to political corruption.

The agendas and attitudes of the local fisheries officers were also a factor in the dynamics of Soliamari Beel. Both the DFO and SUFO come from a long history of intensive aquaculture production and technology extension. From the beginning the SUFO was very skeptical about the project success and therefore not very enthusiastic about being involved, although he did attend meetings and field trips and did not directly hinder the project, he was not a positive influence. The DFO was a very strong advocate of intensive pond-based aquaculture. He oversees Mymensingh, the most productive aquaculture district in the country. This was built on converting ricefields to ponds and a massive hatchery support infrastructure. The enclosure and stocking nature of the project appealed to him, as a ex-freedom fighter he had a strong social conscience so the DFO-Mymensingh was a strong supporter but without the knowledge or appreciation for the social goals and objectives of the project. The project developed as far as it did due to his support and interactions with WFC project staff. Through later interviews, it was told to me that the some of the conflicts at Gheramari Beel stemmed from disagreements with the DFO about from whose hatchery and the cost the stocked fish would be purchased. The DFO allegedly had his contacts where inexpensive fingerlings could be purchased. These sources were unacceptable to the local leaders, so DFO scuttled Gheramari as a project site.

In a follow up interview, these allegations were denied by the DFO as rumors spread by political rivals.

#### *Co-management at Beel Mail*

The fisheries management systems at Beel Mail have evolved over the past 25 years into a relatively successful example of a fishing co-management arrangement. The key driver at this site is to maximize aquatic productivity and to convert this productivity into marketable fish. This is a well organized enterprise with strong and weak horizontal and vertical linkages cutting across levels of government including the two political parties, wealth, power religious and caste ranks. Beel Mail management also involves the local police and judges in enforcement. The high number and diversity of both horizontal and vertical cross-scale linkages surrounding the management of this water body, developed over time is the key structural attribute contributing to the successful management of this rice-fish beel area. Today, the younger executive of Melandi Fisherman's Cooperative sees revenues from the fishing as a gateway into a wider economic sphere. They want to look at investing in alternative income generating activities and to begin to distribute benefits for broader community development projects. There is an interest in setting up banking and investment programs with commercial banks or NGOs, but there is still a degree of fear and uncertainty in dealing with outsiders as most of the Cooperative Executive are low caste Hindu fishers.

The DoF for the past 5 years has supplied the fingerlings and collected harvest data. Through the analysis of harvest data they have suggested changes to the polyculture stocking density and ratios. The fishing committee has always followed their advice after all they were getting free or discounted fingerlings. The current CP-35 project is trying to bring a more research and development role for DoF. The WFC-Dhaka Project coordinator is seconded from DoF and one of the 2 PhDs (there is now a third non-DoF PhD added) is senior ranked DoF staff in Dhaka. There are verbal commitments to building PAPD capacity for these DoF staff through research interactions at the project sites. The presence of a senior DoF staff with the power to directly influence the management of Beel Mail, conducting PhD level participatory research in the surrounding villages for the CP-35 project is an interesting dynamic. There is a very strong power differential between the local fishers and management committee and Dhaka-base DoF staff. On paper, WFC-Dhaka/DoF are only to supply fingerlings, monitor harvest and provide technical advice; all management decisions are made by the FMC and Melandi Fisherman's Cooperative. Further long term research is needed to find out the actual range of power and influence DoF has at this site. Beel Mail is very interesting and perhaps a unique example in Bangladesh; it is probably close to being a sustainable co-managed fishery without having developed from heavy support or influence of an NGO. The DoF wants to

eventually wean the project off their inputs of fingerlings over the next year, as there is no NGO involvement at this site, there *maybe* a capacity gap but the enthusiasm and willingness of all the partners involved and the strong capital stocks available, should overcome any technical limitations imposed by a DoF pull out. It would make very interesting research to compare the sustainability of Beel Mail to other community-based sites from the recently completed CBFM-2 project which depended on high NGO involvement to develop sustainable governance institutions.

In addition to the driver of increased fish prices and market expansion, the single most important driver contributing to the success of Beel Mail as a co-management venture was the dedication of the DFO to the project and his willingness to mobilize his political connections for conflict resolution. This man acted as a bridging leader, seeming able to cut across political lines and bring together conflicting parties from different scales and levels. He was strongly supported vertically by the Director of Fisheries-Inland Waters, and was assisted locally by a well liked and respected UFO. These 3 persons wield enormous power and they used it to form energetic and effective governance at Beel Mail. Yet, there are a number of key problems to be solved driven by increased local populations and fisher in-migration (poaching); trying to operationalize wider government policy on community-based fisheries management within this local context including the necessity resulting from CP-35 to now foster and implement more equitable access and benefits sharing arrangement with the local landless and the rural poor. At the time of this research there were on-going multi-stakeholder meetings on the problems of rule enforcement to counter poaching and trying to develop more flexible benefits sharing arrangements at Beel Mail.

#### *Community-based Management at Chandpur Beel*

The farmer-fishers of Chandpur beel are first and foremost driven by the entrepreneurial spirit to grow and sell fish into the market economy. They are not overly concerned with the bio-physical drivers such as flooding or pesticides affecting the beel. They are more concerned with developing a business and using improved technology such as better net fencing and learning more about proper species choice and stocking. The key members of the village cooperative see the development of a wet season stocked rice field fishery as a very lucrative addition to their primary rice cropping and livestock based livelihoods. They have no desire to work with an NGO or GoB and are driven by a sense to be independent and away from the corruption of politics. They do not want to jeopardize what is obviously a very strong sense of village level ownership of this enterprise. They were more concerned and cautious about the tenuous local political and economic interactions which allowed them this form of autonomy. All cooperative members interviewed were helpful but were ambivalent about receiving any direct benefits from participating in the CP-35 project. There were key linkage overlaps and deals made between

the village level cooperative and the larger local Fishers Committee which allowed the overlapping members not only access to capital and the sub-lease but I suspect gave them respect and power to implement strict security around the beel area. They were very reluctant to talk about negotiations involved in the (illegal) sub-leasing process.

The people of rural Bangladesh have a legacy of high knowledge, public participation in rural governance and civil society actions. Through diverse and dynamic social capital networks rural people are acutely aware of the pressures on local resources and the deficiencies in local accountability. The increased complexity of their rural resource governance problems and the historically centralized and sectoral nature of resource management approaches in Bangladesh make it very difficult for current fisheries and project staff to couple these challenges to a learning process which incorporates our increased knowledge of complex floodplain systems to the necessary collective action to solve resource problems.

The *lack of time spent by project staff in the field* in order to fully understand the relationships between drivers, local impacts and the wider public perception prevented any trust building, not only with beneficiaries but also in the villages surrounding the project site. This was the single most important factor contributing to the significant failure of CP-35 at the Solimari Beel site. The project failed significantly to build upon the general good will and willingness of the majority of riparian villagers to participate in developing a possible PPP model which could provide benefits to wider group of stakeholders. They did not try and transfer or adapt what was being done at Beel Mail to Solimari, the time constraint to get the site up and running was too great. The current CP-35 project personnel do not have the capacity or the political latitude to foster these arrangements. There is still a reluctance to let go of the command-and-control approach. This is also coupled with a serious lack of information on how well these decentralized approaches 'fit' with drivers and trends in the dynamic social-political landscape of the project sites.

From personal observations and discussions it seems that the CGIAR coordinators in Washington and Penang along with key in-country project personnel are over extended with other projects. They do not presently have sufficient time to effectively operationalise the necessary local-level participatory approaches to meet the goals and objectives of CP-35.

In the next chapter we will take an in depth look at the 3 individual sites and begin to make the connections between the site specific drivers, the resulting institutional environment and the interactions between the CP-35 project and the current form of local aquatic resource management.



## Chapter 4: Three Models of Governance

### 4.1: Introduction

In this chapter we examine the three models of resource governance found at our study sites. We look at how the actors, and the institutions which guide their decision making, are linked across different scales and governance levels and how they interact to foster or in some cases prevent the development of pathways of sustainable resource governance systems and livelihoods. A study of the pathways and impacts of drivers of change on institutional and livelihood systems shows us directly where the key focal areas are and how local resource users respond. This driver-institution response can allow us to incorporate the diverse roles played by the actor set into the different resource management arrangement we find already in place or set out by design. This chapter will look at the three main CP-35 study sites with respect to the key players and their primary relationships to both state and non-state actors.

The story begins in the mid-late 1960's when the local people and researchers noticed the profound decline in fish catch. By the mid-1980's the Government of Bangladesh officially acknowledges these severe declines in the production of indigenous freshwater fish from natural water bodies, including rice fields, and begins to develop plans to implement conservation and enforcement plans. The decline is estimated at 9% per year from 1984-1989 and is speculated to be reduced to 60%-70% of the 1970 total wild catch (Mazid, 2002). This fish catch is a critical and undervalued input into the lives of the landless and rural poor. It serves as an important source of household protein, with 63% of the annual per capita protein intake of the rural poor for the coming from harvesting in public waters (Mazid, 2002). Open access fisheries also provide valuable additional income and its harvest is important cultural aspect of rural Bengal. The GoB recognizes these declines, acknowledges the importance of wild fish to the food security of the rural poor and wants to develop and implement strategies to counteract this. The widespread expansion of semi-intensive and intensive forms of aquaculture has been their main approach to making up for the decline in fish production. Aquaculture technology development and extension has been the predominant approach to mitigating the loss of natural fish production from inland waters since the late 1970's-early 1980's. The GoB through the Department of Fisheries has had a long and successful history of aquaculture development. The DoF aquaculture development and extension staff is extremely knowledgeable and efficient at producing fish from stocked beels, ponds and it limited areas through rice-fish aquaculture. This aquaculture is based on tested, technical and scientific methods to maximize production, and this technology is disseminated through a well-connected national network of fisheries and aquaculture extension programs. There is some extension of household-based pond technology in conjunction with WorldFish and other NGOs developing alternative income sources for women. But most of the aquaculture development is directed

towards the wealthier landowning class, with goals to sell in the domestic or export markets. More extensive aquaculture is undertaken in floodplain beels and is directed towards promoting hierarchical models of community-based fisheries management with their poorly defined goals of food security and poverty alleviation. There has been little thought given to how to implement such a sustainable strategy over such vast and diverse types of aquatic social-ecological systems found in rural Bangladesh. Outside of the conservation and development rhetoric, there has been no consideration given to the subsequent impact of widespread aquaculture development on aquatic genetic biodiversity, impact on livelihoods of the rural poor and overall ecosystem function. There has been no systematic development of a monitoring and evaluation program for the social and ecological impacts of aquaculture expansion.

In March 2007, after more than 10 years of field research, the longest and most extensive community-based fisheries research program ever undertaken was completed. The inconclusive success of DFID funded project CBFM-1 and its extended phase CBFM-2, prompted the GoB to write into policy CBFM as the underlying framework of its fisheries development and habitat rehabilitation programs. Unfortunately the DoF has very little capacity or willingness to alter its top-down, engineering and science-based approaches to producing fish and to provide staff with the necessary training to learn the more participatory, social science based methods that are needed to actually implement CBFM. Despite very small contributions to GNP from *jalmahals*, the Ministry of Land has little real incentive to change the leasing processes, as these revenues serve as important sources of wealth and leverage at the Upazila and Union levels so they become sources of influence used by the MoL to try and maintain the status quo; their control over land tenure. The widespread failure of the GoB to assure responsible fishing and equitable distribution of benefits under the current leasing system has prompted a re-evaluation of how it develops its partnerships and interactions with non-state actors. Their current methods of problem identification and institution building need to be replaced or re-tooled in order for government officials to develop broader systems awareness and the institutional and operational responses suitable for the diverse range of rural stakeholders involved in the aquatic commons (Ahmed *et al.* 1997). The GoB actively links with international projects to try and foster legitimacy. It espouses the use of participatory approaches but, at the same time, in our case, avoids or downplays developing linkages with NGOs in fear of increasing their influence in fisheries and rural resources management.

The types of common property floodplain rice field fisheries found at the Solimari/Gheramari and Chandpur Beel sites have in the past been viewed by the state as of little value, so not worthwhile, too costly or politically impossible to govern. These sites are now on the agenda for development in the pursuit of increasing national fish yields as part of the government's fight against rural poverty.

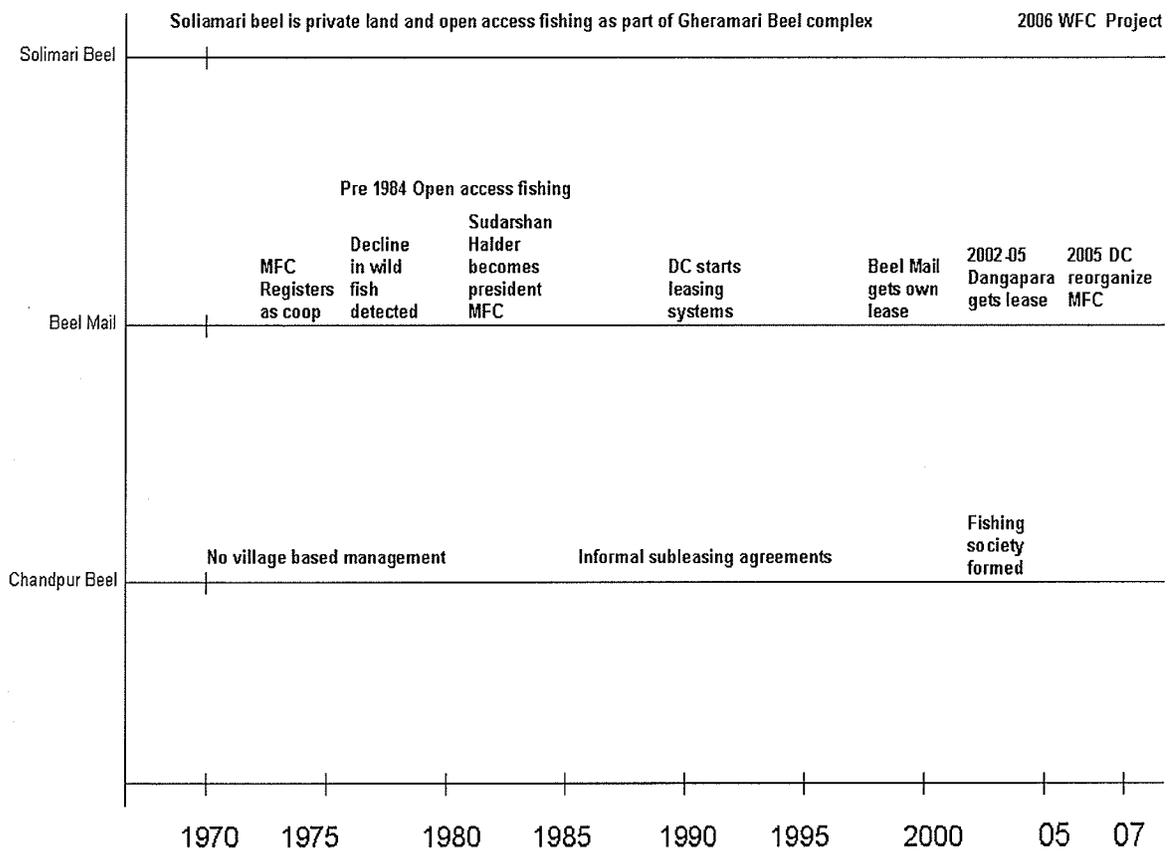
Beel Mail, evolving over 25 years, has developed a large co-management operation with

multiple vertical and horizontal institutional linkages. This site clearly shows that the combination of key leadership, diverse linkages among actors coupled with a tentative willingness to overcome resilient political barriers via inclusive problem-solving fora can lead to a successful co-managed fishery. Despite its current struggles, the stakeholders have overcome tremendous social and political obstacles to develop a vibrant rural enterprise.

The Chandpur site is a completely community-based commercial enterprise with high aspirations of making money. It vehemently defends its "rights" over the perennial water body surrounded by their floodplain rice fields. Here the community has, with only a little training in fish husbandry, developed their own institutions to stock and manage the ricefield fishery. Through somewhat questionable means they are proud of doing it on their own.

Looking at the three sites, we can see how adjacent communities in their similar yet specific social-ecological context, have developed different attitudes and approaches to managing their aquatic resources. Each site is impacted upon by the aforementioned drivers and their impacts mediated through the local social structure. The interactions between driver and the local communities will differentially influence current values and preferences, thus the local institutions we find for resource and social development. The result is three different management approaches with very different levels of success in trying to develop a sustainable fisheries management system. The timeline for the development of the three sites is indicated in figure 4.1, with Beel Mail clearly showing the longest period of stakeholder involvement.

Figure 4.1: Research Site Timelines



#### 4.2: Soliamari Beel: Private Property Model

On a humid late afternoon in July 2006 a meeting was held in the town square of Bhatibarerepar, under a large tree, across from the mosque, the new *madrassa* under construction, and a large household fish pond. This was to be my first involvement with ‘problem solving” and “community participation” according to WFC and the partners of the CP-35 project. The project coordinator from WFC Headquarters-Penang was also in attendance. The people gathered for the meeting, fishers, the landless and the curious all sat on the ground or on small benches while a row of plastic chairs was lined up on raised ground, shaded by trees, for officials. Included “on stage” were the DFO; the Director of Inland Fisheries; WFC project staff and the three students. We were all here to discuss and resolve outstanding conflicts which, according to project staff, threatened to derail the project. These political and

personality conflicts<sup>2</sup> had already caused the project to abandon the use of Gheramari Beel and now the project was going to get serious about tackling the dissent and the party politics which seemed to overflow from previous attempts at management interventions at Gheramari.

Both the DFO and Director delivered long and animated speeches referring to the benefits the people would receive from participating, how the GoB has made poverty alleviation its top priority and that DoF sees increased fish production from water bodies such as this beel complex as the quickest way to alleviate poverty, and that they are all very lucky to have been selected to participate. They also told the crowd of the consequences of *not* participating, how there would be no chance of future projects without their cooperation on this one and how the Member of Parliament (MP) would be brought in to “straighten things out” for them; that the MP fully backs the project, and he sees its benefits; it was, after all, an election year. There was a question and answer session after the speech, and the WFC staff began to describe some of the partnering methods, but the dissenters, cell phones in hand, quickly hijacked the session with questions about disbursements of resources.

The project staff had sat quietly for almost three hours as the DoF officials, in an aggressive top-down way, told the villagers what was going to happen. This style of communication methodology went against everything that the CP-35 project, of which I was a part, wanted to do. There was no collaboration or participation; this was not consultation but confrontation. WFC and project partners did contact the MP and over the next two days he used his influence over his political friends in the area to quiet the dissent.

As darkness fell, the meeting broke up and quickly disintegrated into loud pushing and shoving matches among groups. Through the dust clouds in the headlights, we were quickly ushered into the vehicles and away from a potentially dangerous situation. This night succinctly showed me the process of project communication. In Bangladesh the management and allocation of fisheries is a very political subject, but was this really only about fish? In any (fisheries) development project, in Bangladesh or elsewhere, there are very distinct winners and losers in the power game over control of project resources and how the benefits from the project are distributed. This is especially true in the Solimari/Mymensingh area. Upon further inquiry, the educated and politically connected insisted that a very direct and top-down approach is needed to make sure that the rural poor, the majority of whom are illiterate, will understand and cooperate with the project objectives.

I also learned very quickly that any “rural development” project can be captured and manipulated by local power centres for their own personal agendas, regardless of the nature of project. It just becomes a tool to wield and consolidate power among “their poor and illiterate”

---

<sup>2</sup> These conflicts originated with young, politically connected, community members who saw *any* development project as a chance to get resources and thus raise their own public persona among villagers. This is a common practice in the area. They were especially active at this time as there was an upcoming election in October.

constituents, whether they have an actual elected mandate or not.

This encounter set the tone and foreshadowed things to come as my research began to untangle the relationships and processes at the Soliamari site. The 106 private landowners, the main beneficiaries of the project intervention, saw the project as a financial opportunity to capture more benefits (with minimal investment), by combing their small plots to produce a private fish crop. I was told by DoF officials that private management was better than no management for these under-utilized floodplains, and that these private landowners had the resources to participate in cost-sharing for the project. Through interviews I was told by some landowners that they felt they also *owned* the fish that grew above their flooded plots, and that they should harvest them for profit. There was no history for this type of thinking. For years these fish were a common property, used by the poor and landless as supplemental food and income and as I found out to my surprise, also for recreation. The landowners now saw their land and participation in this GoB-run aquaculture project as leverage or opportunity to extend their private rights into this customary public resource for profit.

There was discussion by project staff and the FMC of eventually finding ways to include the poor and landless fishers but many of the interviewed landowners could not see any way this could be done. They did see benefits-sharing in the form of hiring excluded people as paid fish harvesters. In fact, I was told the FMC had made a commitment to hiring local fishers for year two of the project contingent on the success of the first year. Due to the capturing and selling of all the stocked fish in late November possibly by a few powerful members of the FMC without prior project knowledge, there would be no year two for CP-35 at Soliamari.

The local farmers and fishers want to actively participate in some management scheme in order to save "their" fishery. They realize that they have no official control over who has access to fish in these open water bodies and how the benefits from fishing are distributed (Box 4.1).

**Box 4.1: Community Views on Ricefield Fisheries**

Those interviewed in villages adjacent to Soliamari Beel want the poor and landless to have access to fishing in the flooded paddies. They realize that the poor need the food. But the locals want people to fish in a proper manner and they want destructive fishing practices to stop. The local people feel powerless because they are receiving no outside assistance to help manage these open fisheries. Each year catches are reduced; they see fish disappearing quickly before their eyes. Because they consider these resources as belonging to their adjacent communities, there is very good communication between local resource users. Local people are well informed on the state of the fish resources and thus they participate in very informal, *ad hoc* enforcement.

They realize this is not good enough so they are willing to collaborate with WFC or an outside NGO to establish a fish habitat conservation program in the Solimari/Gheramari area. Political and power alliances however make this difficult, so government and NGOs collaborate with the private landowners.

There is social capital there to begin developing co-management arrangements. Social pressure and communication allows this large and locally dispersed group of fisher/enforcers to balance exclusion and resource allocation. Through these actions they have developed a loose sense of shared values and understandings on the resource state, the problems facing it and what they feel should be done to conserve the fisheries. These recommendations do not include the proliferation of the private management model as implemented in Soliamari Beel. All respondents acknowledge the importance of fishing to their daily lives as well as the lack of concern by the GoB. To the local people, the rainy season fish belong to the poor, with the dry season landowners involved in helping with fish conservation programs for some amount of allowable catch. The local people can see the possibility of future government, private land owner and resident cooperation in developing conservation methods but this must be in conjunction with the development of alternate income activities to compensate for any closed season restrictions.

Soliamari was the most recent project site and thus was the main focus of the CP-35 during the early part of 2006 field season. Conflicts, real or imagined, with project objectives were quickly exploited by opposition forces for political reasons. These included the fear of losing access to common property fish. Some people saw the project as a way to promote the

development of pond aquaculture in the surrounding area. There are many new private ponds being built on land next to the beel, with little regard for the users of the larger beel complex. Farmers will turn their rice fields into fish ponds to capture the much greater profits in supplying the urban or international markets. These ponds can make from 100-500 times the profit of the same area of rice. This drives farmers with land to enter into the wider cash economy. These landscape changes are being promoted by DoF at the Mymensingh District level. This policy is contrary to the national policy of maintaining rice acreage and increasing overall rice productivity to ensure rice security.

There is general concern that the pond aquaculture development is reducing the presence of small indigenous species and that escaped tilapia may proliferate. To date, there has been no tilapia caught from the ricefields. A significant local fear is the potential loss of squatted *khas* land due to government involvement with this project. This land has been occupied for over 10 years. The DoF and project officials have told the local people that they have no intention of involving the MoL. These "*land grabbers*" are generally from one Ghosti. Although they are not rich or powerful they are well organized and vocal. They have more influence than the displaced fishers. There is a widespread mistrust of any government or any official presence, which will turn out to be a major force in the CP-35 project in Soliamari. Local people are also worried about the loss of field crops as a result of the higher and prolonged water levels due to the fish stocking. Research participants also expressed their concerns about the possible spreading of enclosures (Soliamari model) to other fishing areas. Soliamari beel, although not as deep and productive as Gheramari, is hydrologically upstream, so receives floodwaters earlier, which makes it a desirable early season fishing area.

In Bangladesh, CP-35 is implemented through collaboration between WFC-Dhaka, BARC, BFRI and DoF. This researcher saw no interaction with BFRI personnel during the research and was told that there were "disagreements and conflicts" with BFRI staff. No one wanted to elaborate on this to this researcher. The Soliamari section of the larger complex was quickly chosen as an alternate site after the local "political conflicts" around Gheramari proved insurmountable for project staff. There is however one Union member who is trying to make the project work despite vigorous opposition from his local political opponents. Through interviews, it was told to me that these opponents are just causing trouble and trying to make political gains by outlining and inflating the possible negative consequences. They organize the fishers with fear of losing fishing rights if they get involved. These "provocateurs" have done this in the past with other projects in the area<sup>3</sup>.

The Gheramari/Soliamari beel complex is an area surrounded by six villages interconnected with an extensive network of dike-roads crossing the ricefields. Each village has two to three

---

<sup>3</sup> *ibid* 2; previous involvement with these local political authorities included conflicts over misspent funds for project materials and lingering resentment with the DFO on disputes over which hatchery fingerlings for stocking should be purchased, all contributing to a general air of mistrust and conflict.

influential persons (*mathbors*) per village. The population is 99% Muslim. There are approximately 300 fishers (male household heads) using the complex. Subsistence fishers travel from all six villages and further to fish in the complex. There are 15 landless professional fishers who fish full time/all year and sell what they catch. Professional fisher associations exist in the Gheramari area but were not invited to participate in project discussions. There are 150 landless men who fish in the complex over a nine-month period. In the areas there are 75 landless households involved in non-fishing livelihoods such as day laborers, driving, carpentry, painting and other service shops (metalworking)

There are apparently no women involved with fishing on any level at the complex and they were discouraged from participating in this project. They hid in their homes when researchers came to the villages. It was only in the presence of a visiting female staff from IFPRI that any contact was made with female villagers. Over these two days women spoke freely about NGO collaborations in micro-credit for alternative income generation and participated in a resource mapping exercise. This hastily arranged mapping exercise was unfortunately made more suspect by the "supervised" assistance of the male village leader and secretary of the FMC. We were told he was making sure the women got it right. Throughout Bangladesh, women participate in fisheries management at many different levels, from no participation as was in our case to the full management of household fish ponds. The participation of women in these activities is the result of complex and personal negotiations of gender roles at household and community levels. This involves factors such as household and village level power and economic struggles, caste, religion and marital status. Unfortunately the women at our research sites had no involvement with fishing and were also not permitted to participate in individual surveys, group discussion meetings or the scenario exercises. Unfortunately a detailed exploration of gender relations and their impact on floodplain resources is outside the scope of my research, but see White, 1992 for a detailed exploration of gender relations in Bangladesh. The topic of gender inclusion, like community-based and participatory theory was acknowledged as important but during my stay the CP-35 project made no attempt to include women in the project<sup>4</sup>

The two beel areas are separated by a road-dike, the project found willing private land owners on the Soliamari side of the road. Research participants told me that Soliamari beel has a smaller, lowland section called *Amakuri* in which 15-20 people fish regularly. This separate area was never mentioned by the project as a different fishing area as they treated Solimari as one homogeneous water body.

---

<sup>4</sup> I was told, that the WFC Project coordinator had extensive experience with gender issues in Bangladesh, and that it made up a considerable component of his postgraduate work; but during my stay no women were involved in the CP-35 project including the baseline data collection. It was not until Rowena Santos of IFPRI came for a field visit did the project have any contact with women, and this was on the insistence of Ms Santos that women partake in the mapping exercise.

In June 2006, under directions from WFC Headquarters the project quickly and simply moved over to Soliamari and began to appoint the necessary management committees. The FMC included some of the 106 private landowners, DoF staff from the Upazila and District levels and the DoF supported PhD student. The WFC provided coordination and technical support.

There was a rush to have fish stocked as soon as possible. In the end it was recognized that the project went too quickly in establishing the FMC; they simply included the relevant landowners and government officials. There was no attempt to be inclusive of any other stakeholders using the Soliamari Beel which included the local rural poor, landless and mobile fishers.

On November 24, project staff along with FMC and other stakeholders met in Bhatibarerepar to discuss the very low water levels and to decide on the fishing date. This date had been postponed previously a number of times as it could not be coordinated with MP's schedule<sup>5</sup>. The disturbing lack of fish activity was evident from a subsequent walk around the beel which promptly caused the secretary of the FMC to speculate about the possible theft of fish.

On November 28, after numerous delays in assembling all the necessary dignitaries and key stakeholders, harvesting was to take place. A large *kua* was seined and only two small stocked fish were caught. All fish, including wild fish had been harvested from the beel prior to this day. To this researcher, the lack of surprise and the generally pleasant and jovial nature of the assembled FMC and others on the dike were in complete contrast to the complete failure of this experiment. In later discussions, the project staff at the time felt that some members of the FMC had "harvested" and sold the fish. The possibility of escapes or local poaching could not account for the wholesale disappearance of *all* stocked and wild fish from the enclosed beel. The DFO was very angry and blamed the local leaders for stealing the fish. He quickly removed the bamboo fencing as he was sure it would be stolen and sold. He was also angry for having had to pay for its removal, cleaning and transport to storage. To him, this indicated no willingness on the part of the community to participate in the broader goals of the project.

In the end, the project staff along with senior DoF officials closed the project at Soliamari Beel and after a meeting in Dhaka, spent the about one week traveling to different districts in Bangladesh looking for new sites. Another Mymensingh site, Fulbaria replaced Soliamari.

On December 14, 2006, just prior to leaving, I had my "end of project" meeting with WFC project staff, BARC and DOF officials. This meeting was set up for me to give a brief preliminary summary of my findings. With respect to Soliamari Beel, I told them that not enough time was spent in developing trust between beneficiaries and project staff. WFC staff spent very

---

<sup>5</sup> By this point, it had become extremely frustrating for this researcher to continually learn of stocking and harvesting postponements due to the unavailability of the local Member of Parliament. Fish stockings were regularly delayed until the MP could attend for the photo op.

little time in field conducting the necessary participatory activities for developing trust between project partners. Stakeholders were simply given *free* fish and then told what to do. The beneficiaries and other participants were never made to really feel a part of a larger or long term project. The stakeholders were not included in the initial experimental design or research protocols. Their lack of involvement and mistrust probably led to acting in the short term by selling the experimental fish.

The earlier conflicts which carried over from Gheramari were never solved by the MP. The conflicts were suppressed only to resurface in mistrust and the eventual selling off of the fish. I was told in confidence that, some Soliamari stakeholders felt that due to ongoing conflicts the project would end and to recover funds, and "their" fish would be sold by the project, so they took the fish before this could happen. This is the direct result of ineffective top-down conflict resolution.

The failure at Soliamari may be just one of the many examples in Bangladesh of politically motivated top-down projects implemented to *create the illusion* of a project addressing rural poverty. This provides the GoB, especially DoF, the appearance of legitimacy by having them frame the declining fishery problem as a *national* rural poverty issue. They then situate this within the larger CGIAR international project to capture resources and linkages which add to this air of legitimacy. The complex nature of floodplain systems and the resulting management problems contributing to the declining fisheries occur at multiple scales, levels of governance and over different time frames which DoF cannot or will not acknowledge and undertake proactive research on. But this part of the CP-35 project failed on a couple of empirical levels. In having stakeholders selling the fish before the project finished, there was no first year fish catch data for the aquatic productivity research component for one of the PhD students. In its rush to establish the committee hierarchy, it failed to develop the processes necessary for building community-project cohesion and project buy-in. This resulted in the ineffective or non-existent will for negotiating broader benefits for the excluded landless by the better-off landed beneficiaries. At Soliamari, the project failed fundamentally to design and implement any mechanisms of poverty alleviation through wider negotiations of access and benefits sharing for the people living around Soliamari/Gheramari. The primary objective of CP-35 is poverty alleviation through redistribution of the benefits of increased aquatic production.

Looking back, in June 2006, there was too much pressure from senior project staff to get fish stocked and to get some results from this field season. It had been speculated among in-country project staff that, there was never any serious expectations of the project succeeding in the risky peri-urban environment in Mymensingh-Sadar. This might have been partially a result of cynical support at the Upazila level, but there were no persistent on-going attempts made by the project to develop a conflict resolution process. Through interviews, government officials voiced the opinion that the elite capture of resources was so high in the area that it would be

impossible to develop a truly participatory project that devolved decision-making and shared benefits to the poor and landless. Under donor pressure, the project tried to make all aspects *very transparent*, with budget and accounting clearly open for all to see. These requirements coupled with very little information flow about the project goals and methods created a lot of friction as FMC leaders began to realize their usual avenues of extracting funds from projects, such as overbilling for materials, were now closed. Because of the rigorous accounting, it was alleged that a few powerful members of the FMC harvested the beel to at least capture some benefits prior to their perception of the project being terminated.

Pre-project workshops were not held to make participants at all levels aware of the "limits" and rules of financing. These organizational workshops were limited to senior project and partner organization staff. The main CP-35 (Bangladesh) organizational meeting in May was not even attended by the present in-country DoF and WFC implementation and research staff!

The rapid formation of a FMC consisting of elite landholders and local vested interests coupled with command-and-control management approaches and strict accountability standards imposed on these village level leaders doomed the project at this site from the start.

#### **4.3 Beel Mail: Co-management Model**

Rajshahi District, specifically in the Beel Mail area (Ghasigram Union; Mohanpur Upazila) people are much more dependent on the harvest and selling of fish and other aquatic produce than in the more livelihood diverse peri-urban area of Mymensingh. Prior to 1984 the fishers of Melandi and Beel Mail were only catching wild fish; after 1984, the government begins stocking as part of a response to stock decline.

In Rajshahi, there is a much larger and more diverse group of "recognized" stakeholders involved in the use of aquatic systems as compared to the limited number of stakeholder groups involved in the private property approach at Soliamari. These include:

**Fishermen:** project beneficiaries and outsiders

**Rice Farmers:** small land, large land, sharecroppers

**Landowners:** present and absentee

**Local nursery business:** supply fingerlings

**Harvesters,** both professional and subsistence

**Middlemen** as fish distributors or retailers

**Labourers** for guarding, transport, repairs

**Moneylenders:** investors of lease money for Melandi Fisherman's Cooperative (MFC)

Rules for the running of the cooperative and formal fishing rules are developed in conjunction with the Upazila Fisheries Office, which provides literature and "writing assistance". The executive committee (5-6/55 members) meets once a month all year to discuss any rule changes or disputes. Executive members were frustrated by the six month process to

institutionalize the fishing and savings rules, and the repeated payment of “administrative fees” at the Upazila level for a total of Tk 40,000. The Co-operatives Office is still involved. They audit and renew the MFC registration every year and the executive pays a Tk 200 fee plus a “gift” of Tk 400-500 to expedite the process.

The Beel Mail FMC has representatives of these groups including mobile fishers but as yet to develop effective representation to negotiate access and benefits sharing institutions for the landless who depend on fish resources from this Beel. There is concern over poaching; how the policing of the beel is being conducted beyond the ceremonial burning of a couple of confiscated *current jal*. The process at the moment is the DFO speaks to the police chief who speaks to the local police head, who then links up with SUFO in order to coordinate on the ground policing and to prosecute those caught. In one incident 40-50 “illegal” fishers from a village five km away were caught in a daytime confrontation with the lone security guard on duty, the guard's life was threatened and the project began to mobilize stakeholders to address this potentially dangerous situation. The prosecution process takes so long and is wrought with political influence that it is hardly a deterrent to illegal fishing in the short to medium term.

The project must also deal with the widespread perception that any government-stocked fish are also *our* fish to take. This is a common perception with many government activities in Bangladesh, if the government is doing it, we (the people) can take the immediate benefits as we see fit. The project tries to look at this illegal fishing from a wider contextual point of view. *Who are these poachers and is there a history of these people fishing here? What are the overall social and economic implications?* The project coordinator sees these “worries” over poaching as part of the research process and that the stakeholders, with support from the project, will work them out. But as the majority of meetings attended by project personnel in response to these and other problems were with moneylenders, government officials and power people, it was hard for this researcher to gauge how serious the project is beyond the rhetoric about entering into participatory access and benefits sharing negotiations with the more marginal stakeholder groups. There does seem to be high levels of goodwill to “attempt” this more inclusive, participatory planning, but how far the project and its supporters move from the status quo of top-down command methods at Beel Mail will remain to be seen. The status quo is working for many people. Early negotiations include who will be “contracted” to harvest the beel and what proportion of cash and fish will they receive. The negotiation process for benefits sharing is inclusive and ongoing with better arrangements as the results. As with all projects the enforcement and the post-project sustainability of these institutions is a concern. But there are reasons to be optimistic as there are elaborate and inclusive mechanisms in place for conflict resolution and allocation negotiations.

Beel Mail described in Table 2.1 is a well developed and productive fishing site. In the adjacent village of Melandi, the centre of fishing activity for Beel Mail, The Melandi Fisherman's

Cooperative (Cooperative:1974) has been actively involved in the development and management of Beel Mail for over 20 years. There has been a long process of developing relationships with the multiple interests in order to manage the Beel Mail fishery and to develop and implement the rules for outsiders wanting to fish in adjacent and connected water bodies.

Upon the *request* of the DFO to re-organize the MFC, the founding president of MFC has been recently replaced with the next generation of leaders. The executive of the MFC have very well articulated business and development ideas that they would like to see them work towards. The new president owns the tea shop and store in the village square and would like to see MFC work towards broader development objectives beyond Bell Mail fishing. Other members include a furniture maker who fishes for four to five months as part of a seine (*Bher jal*) net team. They fish at midnight with catch values ranging from Tk 500-Tk 10,000 per night. The *size* of the fish determines what percentage of the sales they will take home. If the catch is comprised of large fish, they may get only 5% of the sales, small fish they may take home 50% of the sales. This is a form of the Bengali saying that "*The big fish eat big fish*". The extra value of large fish is not passed down to the fishers but captured by the middlemen. Some fishers are part of a larger 10-12 member fishing team (*Cocal Jal*), in which each pay Tk 2000 to cover the costs of the boat, gear and ropes. There are many residents of Melandi that fish individually with hook and line. Conflict resolution in Melandi is a hierarchical process from the village level *Gram Sakar*, UP Chairman, Upazila (Thana) then to the national court system.

In Melandi (75% Hindu), 6% of the population are permanent fishers while another 2% are seasonal. There are a number of NGOs working with micro-credit programs. The Delta Life Insurance Company out of Tanore Union is active in the village. There is also a village owned "traditional" duck hatchery (no electricity) that produces 2000 hatchling per week. There are also 20 private fish ponds in the area. Some of these ponds (four to five) are owned by one man who has them connected to Dubi Beel, which in turn is directly connected to Beel Mail via a sluice. Here he manages both pond system and beel. He lists his primary occupation as fish pond owner but he is also an "open water manager". There are about 50 people who work outside the village in service industry jobs including local government, NGOs, banks, or teaching.

For the men of Melandi, there is a strong attachment to the beel, its fish and its potential role in the future development of their village. They all have strong opinions on its status and future management. They have specific concerns over the marketing of small indigenous fish, the conservation of the wild fish, and the positive and negative aspects of aquaculture development. The Hindu women interviewed had really no use for the beel as it was too far way from the household and there was nothing there for them. The men bring them the fish to cook. According to a senior government official, women are more empowered as they must interact more with the cash economy. Their husbands are pushed to work more in the cash

economy so they also have this opportunity. The children and young women continue to graze the prized Bengali black goats in the harvested paddy fields. In the surrounding villages other than Melandi, a number of men interviewed said they were once fishers but since the beel is now leased and they cannot afford the membership fee, they are now rickshaw pullers or day laborers. They were sad as their fathers and grandfathers were fishers in the beel.

There is strong local social capital in Beel Mail. The management system is characterized by a large and diverse set of cross-scale vertical and horizontal linkages to government and related service industries including net making and boat building and repair. Fifteen years ago all relations were at the village, Union or Thana level, there was no NGO or district interactions. For example now, the DFO-Rajshahi has strong links with MoL (The Assistant Commissioner for Land is on the FMC), therefore they can "engineer" the leasing process at Beel Mail. This DFO deliberately makes sure that the process is transparent, that all people know who is involved in the bidding. He is partially responsible for determining "valid" fishers with claims to benefits as members of the cooperative. There is an ongoing problem where the number of claimants is greater than the accepted list of members. There is constant "negotiations" on revising of the membership list.

The DFO has established vertical linkages below and above the District level as well as strong horizontal connections with user groups and many other stakeholders in the ongoing benefits sharing and poaching negotiations. This is the classic example of a knowledgeable, politically well connected and somewhat powerful individual taking an active role in the management of this beel. For the past 10 years he has acted as a bridging agent between different levels of governance and between stakeholder groups. The seriousness of the current deliberations on access and benefits sharing means he feels a lot of pressure to work with all parties concerned along with his own desire to come to equitable agreements. His active involvement is a key reason that this beel is so well organized and productive. He is very enthusiastic and supportive of the CP-35 project. It is a major concern if he is replaced or leaves on account of the recent political turmoil in Bangladesh. One group of key stakeholders is the 24 moneylenders, including four very influential political persons from neighbouring Tanore Upazila who loan money to pay the lease cost. These people have bridged, with the help of the DFO, political party differences and have come together to invest in the beel. Through co-management arrangements this investors group see Beel Mail as a very good investment. Most are rice-farmers or absentee landowners with little interest in the fishing except for making profits. They put up the lease money (Tk 154,000) for MFC, from which they receive 80-90% of the profits, they exert political pressure to reduce any "bidding up" of the lease price by outside interests as well they "motivate" the police and judiciary to control poaching. Current negotiations are for 80-20 split of gross revenues between beneficiaries and fishermen including 20% of net profits. The SIS catch is split 50/50 among beneficiaries and

fishers. There will need to be a lot of goodwill and trust as the stakeholders begin to actively resolve the conflicts of access and benefits sharing among the so called "illegal" fishers and resolve conflicts between some landowners who want to fish for personal consumption.

The MFC is a "registered priority fishing group" and therefore the only valid leaseholder but they need the outside money to hold their lease. There is an amicable relationship between the investors and MFC at the moment; it is the intention of the recently formed MFC to eventually get the lease from the DC without external "assistance". This will be a challenge as the Tanore Group (did) have strong connections with MoL in Dhaka. However, it will be interesting to see if the demise of the Bangladesh government in October 2006 opens up any political space for developing new management arrangements for Beel Mail and Bangladesh fisheries.

The active involvement of DoF over the past five years shows their interest in Beel Mail as a successful example of culture-based fisheries. They are very interested in the fact that this beel management has been achieved without any NGO participation. It is not clear however if DoF is fully aware of the time and capacity needed to develop the management linkages which can allow Beel Mail to operate over the long term and be adaptable to new ecological or political environments. There is a general feeling by DoF that this model or technology can be replicated and extended by them to other areas of Bangladesh. There is an overemphasis on production technology and its dissemination to other areas of the country.

From a meeting on December 16, 2006 at Mohanpur Upazila the current concerns for Beel Mail were determined to be:

- 1) Bighead and Common Carp grow very well, but the Indian Major Carps (45% of stocking weight) do not.
- 2) Need more biological assessment of beel productivity including phytoplankton and zooplankton studies. The polyculture has to reflect the current productivity
- 3) Develop strategies to empower fisher's community in order to be sustainable post-project. The DoF want to withdrawal support after 2 years. There are concerns over leadership at the cooperative level.

From the above results we still find a strong pre-occupation of DoF on the biological and productivity aspects of the beel even in the light of their planned withdrawal of support in only two years' time. How Beel Mail resolves the present conflicts to ensure an effective transition to a more independent community-based co-management arrangement requires further observations. The current project staff and government supporters should focus less on aquatic productivity aspects and concentrate on working with the widest group of local stakeholders to develop appropriate institutional solutions to poaching and equitable access and benefits sharing. The institutional structure has been put in place for these negotiations. It will be combining the current goodwill, political enthusiasm, and local social capital into deliberative

processes which will produce the necessary adaptive resource management strategies for Beel Mail.

#### **4.4 Chandpur Beel: Community-based model**

The Chandpur Beel study site consists of a relatively small and homogeneous settlement of Muslim farmer-grazers around the town of Batupara. Some of these farmers see a very good opportunity to diversify their livelihoods. The physical and demographic characteristics of the Chandpur Beel area are described in Table 2.1

Since 1980 in Rajshahi, the DoF have attributed the declines in fish catch to drought. This area has the lowest rainfall (300-500 mm), but with high humidity it experiences the greatest temperature range in the country. This produces very unpredictable fish yields. According to national policy, this area thus becomes the focus of DoF research to improve yields using culture-based fisheries in different water bodies including seasonally flooded rice fields.

This site was developed and is currently managed by the Batupara Fisherman's Cooperative which is registered and is permitted to hold a jalmahal lease. This cooperative is run on a paid membership format. You pay a fee and contribute labour in order to derive benefits. The executive committee is comprised of six prominent villagers. Four of these were the original 2004 founding members. The executive keeps strict records on member labour contributions including the *cash-in-lieu of labour* arrangements which many people end up using. This is somewhat frustrating as the same group of people end up doing the work, this system is under review.

The Chandpur site is a community-based enterprise. Its members have lots of ideas and enthusiasm for growing and selling fish. At present, it has no interaction with DoF or any NGO on fisheries management although there is the ubiquitous BRAC micro-credit working with village women. In 2004, cooperative members received some training from SUFO and experts from Jessore in culture-based fisheries and polyculture. The members then came up with the idea of surrounding the deeper area with nets after poor returns from stocking fry between 1998 and 2004. They also changed to stocking larger fingerlings, purchased from the local government hatchery (photos-Beel nets)

It is a small, perennial beel surrounded by rice culture. According to members, flooding and presently drought is a constant worry but there is not much they can do about it, they irrigate their rice and they feel there is little impact from the limited pesticide use on the fish. Wild fish provide minimal contribution to the overall catch as they clean out the wild fish and the nets prevent entry from river sources. They now want to purchase better quality nets to reduce repair time. The fishing season runs from September/October until January depending on the amount of standing water. In the Aman season ricefields are flooded for concurrent rice-fish production in some of the paddy plots. The fish harvest is split as a fresh crop or percentage of

gross sales. Currently, there are thirteen members. Everyone contributes and benefits equally. They harvest with the net or otherwise hire the village-based professional fishermen. Women help in feeding and fertilizing household ponds. There are seven or eight women employed outside the community as teachers or government service workers. Seven people from Batapura started another larger splinter committee, the Kotibari Fisherman's Co-operative whose main purpose is manage "external relations" which is primarily to negotiate leases and fingerling prices in the area. There are more than 50 members, with only 13 actual fishers. The seven members have investments at Chandpur village as well. As could be determined, this somewhat shady group serves as a lease middleman by securing leases and then sub-leasing to local groups such as Chandpur. They do some marketing and secure fingerlings but very little actual fishing. This is all technically illegal under National Jalmahal lease regulations.

A two-tier community-based organization has developed without the assistance of GoB or any NGO. The community-based fisheries management structure consists of the Chandpur village group, with four of its leaders also as members of the larger local "fishing" committee. Through coercion they have developed the horizontal linkages necessary to guarantee entitlement and to raise funds for a sub-lease but they aspire to full lease holder in the future. This organization has militant tendencies and I was told they are not afraid of using violence to control poaching or to secure their sub-lease.

With respect to the wider allocation of benefits at the village level, if the Imam asks for help, some benefits (fish or money) are given to the village mosque. With respect to fishing only members share the benefits. This is very restrictive as there are over 400 households in the village and very few can afford the time or fees to become members. The co-operative leaders see this expanding as other villagers learn of their success and want to share in the benefits.

Table 4.1 summarizes the characteristics of the three research sites.

**Table 4.1: Research Site Synopsis**

<b>Characteristic</b>	<b>Soliamari Beel</b>	<b>Beel Mail</b>	<b>Chandpur Beel</b>
<b>Governance Model</b>	Private property model	Co-management framework	Community-based
<b>Fishing</b>	All culture-based	Both culture-based and wild	Mainly culture-based, some wild
<b>Benefit-Sharing</b>	Committee members	Cooperative members and local fishers	Village members only
<b>Institutional Arrangements</b>	Private landowners as committee members	Melandi Fishermen's Cooperative holds lease	Local <i>informal</i> lease and sub-lease
<b>External Interventions</b>	DoF/WorldFish Center	DoF at District and Upazila levels	None; village self-organized
<b>Key Strengths</b>	Willing fishers to assist conservation	Long term management ; diverse representation	Strong community activism and cohesion



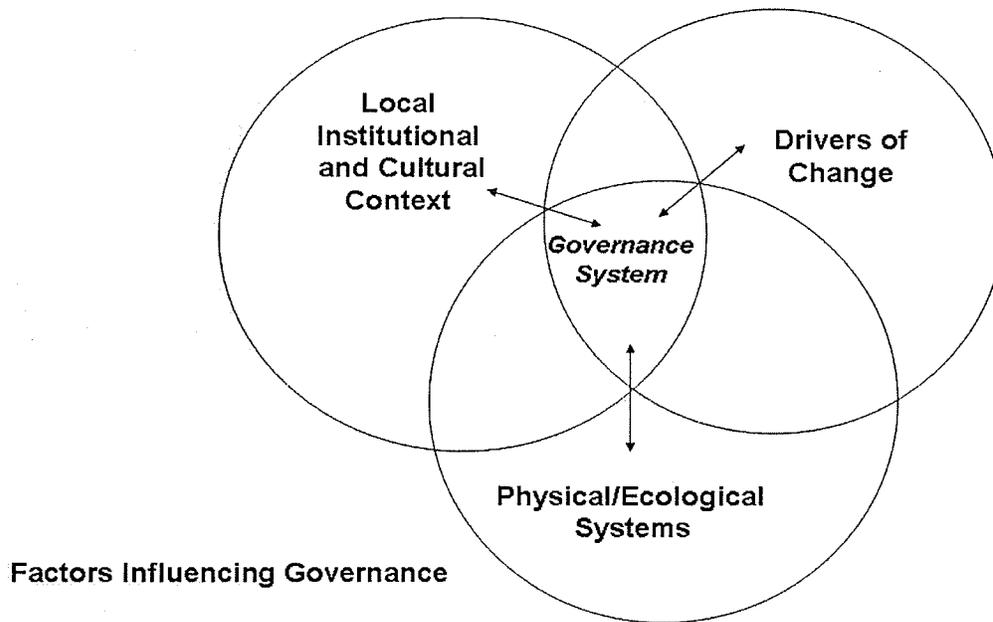
Fence Mending, Chandpur Beel

(R. Jones)

#### **4.5: Conclusions**

The three sites which are located in similar floodplain conditions, dominated by rice agriculture and livestock grazing show us three different approaches to governing a local integrated agricultural-aquaculture system. The governance structures and processes we find at any one site consist of the institutional responses to the different drivers of change and the feedback from the physical alteration of the local aquatic landscape. This feedback loop between ongoing alterations in the physical aquatic environment, changes in the institutional (management) context and interactions with multi-scale social and economic drivers is the main pathway of change at our sites. Figure 4.2 shows that the governance system we find in a local context is the outcome of interaction and feedback from the physical, institutional and cultural spheres.

Fig: 4.2: Governance Interactions



There is a local narrative of people wanting to exercise control over “their” adjacent resources, they are mistrustful of the government and feel with adequate legal and financial support they could manage the aquatic resources in partnership with some group. The local people believe the government is to *serve* them, but they don’t see this happening. All they see are government personnel doing things which make themselves money. They don’t see DoF working to conserve fishes, but serving the leaseholders and wealthy landowners, the old story in Bangladesh.

The multi-purpose nature of these water bodies serve different interest and power groups. In this project and perhaps in other projects such as CBFM-2 or Winrock International’s MACH (Management of Aquatic Ecosystems through Community Husbandry) project, it is now less automatic that the powerful and political vested interests can just commandeer these resources and control their allocation. The wealthy and connected do wield influence within any project in Bangladesh and need to be included from the outset in project design and implementation. Their exclusion can result in project obstacles or termination. The presence of WFC in this project is a mediating influence and gives a platform for the increased inclusion of broader stakeholder representation. But without a real commitment to inclusive and representative stakeholder participation, one runs the risk of losing the project to elite capture as was the case

in Soliamari Beel. The self-organization of Chandpur comes about through semi-powerful and ambitious individuals coming together to grow fish and make money. Although membership is open to everyone in the village, only those with financial resources can join and participate.

The degradation of aquatic resource systems through intensive agricultural landscape changes, the lack of effective community-based institutional responses and the widespread promotion of commercial aquaculture by the GoB are all outcomes from cross-scale interactions with drivers of change operating within the historical and contemporary context of rural Bangladesh. These forces are widespread and persistent and include the erosion of profitability and returns to small holders and agricultural production. The emergence of new employment opportunities from increased local and national mobility in the non-farm sector; environmental degradation due to misguided agricultural policies; decreasing plot size due to *sharia* inheritance customs and the cultural and social change resulting from increased connectivity to globalizing forces of commerce and western modernity are key drivers impacting upon the post-independence Bangladeshi state.

At the site level we found that certain factors contributed to a positive approach to developing some form of collective action. This was in response to either the declining local ricefield fishery or seeing potential community level opportunities. These factors include a concerned citizenry, horizontal networks linking services, key leadership and power spheres and opportunities for developing decentralized self-organized community-driven institutions. At all three sites, these local level challenges and opportunities are linked through networks of fishers, markets or fishing supply chains. This social capital is also used to forge links with higher governance levels as seen with the active participation of DoF, BARC, MPs and WFC as was the case of Solimari and Beel Mail. The local is linking to high levels of governance and power is primarily to secure resources or forms of property rights. In Chandpur Beel, the community-based model fully uses their social capital networks to secure leases, resources, and to coordinate labour. More research is needed to unpack the exact nature and extent of their interaction with higher levels of governance. They are a registered cooperative, the lease process is run by the District Commissioner for Land and some fingerlings, and training was acquired from DoF. They are quite secretive about their relationships to the local power structure around leasing and not enthusiastic about interacting with the "corrupt" government. Still, within the pervasive Bangladesh state model of hierarchical governance, the need for ongoing conflict and tension resolution around natural resources probably forces the Chandpur community to develop informal cross-scale linkages and local channels of communication with officials and local power brokers. A longer, more in-depth ethnographic study is needed here to uncover the informal rules at work in Chandpur

In Bangladesh there has been a reduction in communal waterbodies available for CPR management as they are continually converted to flood-controlled and irrigated ricefields, and

eventually into semi-intensive aquaculture ponds (Mazumder and Lorenzen, 1999). Through these landscape changes and the privatization of communal fisheries, the rural poor lose access to the valuable nutrition found in the dozen small indigenous species of ricefields and temporary water bodies. Their reduced availability and the resulting high price in the market put them increasingly out of reach for the poor. The high price of local fish coupled with the reduced overall per capita consumption of fish in Bangladesh threatens to have negative effects on household nutrition through the reduction in dietary diversity. Despite the rhetoric, the prospect for developing sustainable aquaculture technology and economics for these species is currently not promising.

Floodplain fisheries are examples of complex adaptive systems. They are also social-ecological systems with the dual function of providing aquatic public goods, while at the same time, maintaining ecosystem capacity (resilience) to adapt to future environmental change. In floodplains with high dependent populations, these functions focus on developing management to enhance aquatic productivity in order to sustain fish catches for the widest public good. In our study this was attempted via different institutional mechanisms such as private property management, co-management or the development of community-based management. In Soliamari we see the typical state/hierarchy response to these challenges and opportunities by trying to implement a top-down single technology package, although qualitatively different than their poor farmer directed pond aquaculture package, it is the same logic of trying to reduce poverty by boosting productivity through private, technology-based methods. The state overrelies on simplistic, intuitively rational technologies. Instead of developing flexible participatory integrated agri-aquaculture approaches to rural poverty, food security and nutrition (Prein and Ahmed, 2000; Prein, 2002), DoF with WFC continue to promote these market oriented, donor friendly resource management strategies.

It is the continual re-organization of the ineffective Bangladesh state, the failure of its authority structures and rule compliance and its questionable motives for developing "legitimacy" in the natural resources sector which breeds mistrust and ambivalence in rural communities.

This research project describes examples of the social and ecological dynamics and connectivity in rice-fish systems. The importance of both rice and fish to the Bengali livelihood and culture has been emphasized elsewhere. The larger floodplain alternate ricefield fisheries can be used as a platform to develop more participatory community-based models of aquatic resources management leading to more holistic approaches to social-ecological system management.

In the final chapter I bring together the discussion on drivers, their interactions and the resulting institutional arrangements found at three research sites. The synthesis will build upon the preliminary "past/present/future" scenario exercises I conducted. I then conclude by

showing how the research outcomes can feed into the political ecology of developing interactive governance theory and natural resource policy experiments. These interactive policy processes must first and foremost acknowledge the diverse preferences and worldviews of ricefield resource users and make a genuine effort to integrate these people and their views into ongoing processes which foster resilient management strategies.



Fish Harvest, Beel Mail, Rajshahi.

(R.Jones)

## Chapter 5:

### Scenarios and Synthesis: Implications for Future Policy

#### 5.1: Introduction

Today, there is an urgent need to re-evaluate our key goals and assumptions which underlie not only our management of freshwater fish stocks (Allan *et al.* 2005) but how we perceive our relationship to the natural resource systems we ultimately depend upon. Our interventions must not degrade the adaptive capacity of aquatic ecosystems to continue to provide their dependents the necessary ecological goods and services which support their livelihoods (Folke *et al.* 2003; Berkes *et al.* 2003).

Researchers, management practitioners, resource users and concerned citizens must take a hard look at how we learn and interact in developing co-operative platforms to not only solve critical contemporary resource dilemmas but to renovate or reconstruct our governance

mechanisms. More inclusive governance is needed in order to develop long term planning, problem anticipation, conflict resolution and the development of sustainable resource use strategies (Diamond, 2005). How we design or foster aquatic resource management and development policy and institutions will have a direct effect on the ecosystems and the people who depend upon its resources. The consequences of our policy implementation will feedback from the social-ecological system which, if included into a learning process, can be used to quickly scrap or adapt the policy to the new and changing environmental and social context. It is through developing deliberative processes in which diverse world views, knowledge sets and other dispersed data are interwoven into fora where problems are collaboratively defined and debated and multiple alternatives for adaptive resource policies are developed. The incorporation of scenarios into this process can assist in developing possible pathways towards charting out future policy and management directions.

## **5.2: Scenarios**

In natural resources management scenarios include different claims of “property rights” and responsibilities within the resource system. In our floodplain cases, there is a high level of ecological and social-economic interdependency by a diverse set of stakeholders and therefore different viewpoints on resource problems, their root causes are and what type of management should prevail. There are *de facto* rights and responsibilities for the fisheries expressed by villagers living around the waterbodies.

As global stocks of freshwater fish rapidly degrade, there is now an urgent need to develop strategic and comprehensive approaches to freshwater fisheries resource management that work to influence future events rather reactively dealing with management outcomes or crises. These strategies will require an in-depth understanding of historical influences and decisions and how these can influence possible future resource management trajectories. The inclusion of scenarios can be part of a proactive approach to dealing with potential conflicts when including fragile fisheries in wider plans for rural resources management (Biggs *et al.* 2007).

The scenarios were designed and carried out to try and get local participants to speculate about the future (Stout, 1998). The exercises got the villagers to discuss what they saw as possible outcomes or futures for the management of “their” aquatic resources and what they now saw as the main problems or constraints to this management. The participants were also asked to discuss how the state of the resource had changed. The discussion often centered about the existing social-political problems of Bangladesh. There was a strong connection to how the rural people saw the state of the fishing and the problems of a corrupt and uncaring government. People see a profound lack of genuine concern for the rural poor by the government which sees them as a major impediment to their attempts to manage fisheries

resources. They have the feeling that they are "invisible" to the political powers until these powers want land or their votes. The people see themselves as poor and powerless but not without local knowledge and the willingness to bring about the necessary changes. The scenarios showed how the participants were enthusiastic and saw value in developing coalitions or groups to overcome the powerlessness of the individual. Landless participants were especially concerned about being excluded or having to pay money to fish in the ricefields. At the time they were not overly worried as they said there were still many places to fish.

Relating back to our objectives, the three main scenarios were compiled from discussion groups held in the villages of Batupara/Chandpur Beel and the villages of Darikandi and Takevita adjacent to the Solimari-Gheramari Beel complex. These three broad scenarios were compiled from six smaller categories and are outlined in table 5.1 with respect to their interaction with key drivers. The table shows a synopsis of perceptions the local people had when asked how they thought these drivers are affecting the future of the main fishing beels. Included are their general attitudes or feelings about how they see the future of *their* beels within the changing rural landscape. The exercises also began to unpack how their perceptions of the future are tied to their understanding of local history, their own memory and those of village old people and their worries about the identities of their children. The discussions easily went beyond material or food security into deep concerns about what natural resource legacies will be left for their children. Many participants were sad. They see making money to provide a good education for their children so they can leave the village as their only real hope for helping their children.

Table 5.1: Comparison of Floodplain Scenarios.

**SCENARIOS**

Driver	<i>The Status Quo</i>	<i>The Future Cooperation</i>	<i>A "Fortress" type</i>
Increased Fisher Population	Continues, with destructive fishing practices and increased violence	Cooperative relationships are developed	We protect our own beel and use force to limit fishing; more conflicts with local police
Fishers are more mobile	More fishers move in to fish waterbodies	Agreements are made which can control entry; other livelihood options are created	Protect against outside fishers, but more conflicts
Agricultural land use	Monoculture, HYV rice, export oriented	Diversified cropping systems, AIGA possibilities	Family land used more for cash crops
Fragmentation of floodplain	HYV agriculture, irrigation and drainage engineering (adapt)	Transforming rules, measures to prevent fish kills, allowing fish to move; dry season concerns	Private plots and ponds dominate the landscape
Availability and the increasing price of fish	Declining yields, Sell larger fish, small fish for HH	Develop cooperative innovative benefits sharing, markets	Sell most fish for cash, minor occupation
Pressures to convert to cash economy	Fishing is reduced, other work sought	Fishing/aquaculture just one livelihood option	Fishing is eventually replaced by other labour
Government policy for CBFM	CBFM model is government policy	Moving beyond <i>CBFM</i> & <i>jalmahal</i> models; diverse livelihoods	Access to fishing for private landowners only,
Government policy for aquaculture development	Continual loss of access to ricefield CPRs, culture-based privatization continues	Forms of integrated agri-aquaculture; promotion of small-scale systems	Private enterprise for the wealthier HH
Political influences on management decisions	Dhaka and local elites control and use resources as private; rural poor ignored in decisions	Diverse users involved; key leaders & NGOs identified and supported; co-management	No political solutions, each HH must survive on their own; \$ is focus

1) *The Status Quo* was not realistic as they know things would not stay the same; things are rapidly getting worse, fisheries are being lost through the increased use of illegal gear and destructive fishing practices. They know the fishing yields and average size of favored species have declined. They blame the government for not enforcing the fishing rules.

2) *The Future Cooperation*, here they saw the possibility of an NGO or an organization like WFC to set up community-based management of ricefield fisheries. They see cooperation developing in setting up sanctuaries, developing fishing rules, finding persecuting "cheater people" and working towards developing alternate income sources. Younger people see private enclosures and aquaculture as opportunity for employment. Through this cooperation they see increased political linkages with UP chairman.

3) A "*Fortress*" type scenario. In this one people see the local poor not considered at all and resources taken by those who make decisions based only on money. Livelihoods are altered by the presence of "far away" money people changing the land (building more fish ponds in the ricefields). They see no political solutions. The people who run Bangladesh do not see them. They are invisible to the politicians who just want to make money. People are now forced to start many small businesses in order to make money instead of earning money from fishing. They are now forced to engage in many activities to make money outside of their usual fishing/agriculture livelihoods. This desperation leaves no time for them to participate in any CBFM program and with no access, they will continue to watch the aquatic resource degrade.

What can we realistically plan policy for? The local people living adjacent to the waterbodies can be incorporated more fully into any resource management initiative. The people are wary of any government or business venture, but they are willing to listen and to participate if they feel there is something directly beneficial and that it is a fair process. There was an overall sense by many to want to be included in the process to conserve the fish. When asked, no one explicitly said they did not have time to participate. Of course in our case all participants were men. An additional study/survey for women should be done as their domestic work responsibilities will definitely affect their participation

What can scenarios tell us about the rural poor's approach to risk aversion or management? These exercises show us the possible paths that farmer-fishers can take to diversify livelihoods and create connections with different power groups or governance levels to assist in risk management. By framing uncertainty in a social-ecological context, scenario exercises show us how local fishers-farmers and the landless recognize important times of uncertainty and their response to it. There is a pluralistic response to unexpected events which confront stakeholders with potential impacts or surprises. The strong interpersonal relationships which exist across kin, cast and neighbours in rural Bangladesh interact with the aforementioned

drivers to develop the actual pathway of livelihood response (Wollenberg *et al.* 2000). To this researcher, the high concern and willingness to work to conserve fish and the diversity of coping skills and mechanisms were not taken into consideration in the design of Bangladesh component of CP-35.

Scenarios create a framework to discover pathways and actions that connect the visions stakeholders *prefer* to the kinds of drivers that they will have to adapt to in order to realize these visions. The "before and after" input from scenarios into the policy could help guide development trajectories. Resilient policies can help foster the ability of any community to recognize and respond to disturbances and provide the means to offset those disturbances. Resilience is a function of policy architecture (Holling and Goldberg, 1971).

In our scenarios, younger participants had a more positive outlook. They could see opportunities for employment either security guards or laborers for project beneficiaries (Table 4.1). They could see the forming of *fishing teams* of mobile pond harvesters and marketers. They could see new employment as a result of pond aquaculture. The pond aquaculture business could provide employment in secondary industries such as fish nursery, fish feeds, vet service, labour pools etc. Older respondents were worried about being excluded from favorite fishing areas and having to travel much further distances to fish. Older participants were more pessimistic about the future. There was a palpable air of disappointment especially from those that were a part of Bangladesh Independence in 1971.

#### *What has changed over the years and why?*

Thirty-five years ago, there was no irrigated rice (HYVs) only the local varieties, there was good fishing, and only drought and floods were the continuous threats. In the early 1980's very good catches continued as irrigated rice was introduced but local water sources were insufficient, so the development of deep tube wells began along with HYV technology of increased use of pesticides and fertilizers, multiple rice crops and as a result of rice intensification there was reduced use of cattle grazing as a livelihood. Rising commodity prices lead to increased reliance on fishing and introduced unsustainable fishing practices including "dewatering" and the use of small mesh monofilament nets or "current jal" which allegedly catches all fish, this however, is strongly contested. The current jal would later become the political focus of fish conservation with mass confiscations and ceremonial net burnings. In early-mid 1980s, the Meghna-Dhanagoda Project (MDIP) along with other internationally funded flood control, drainage and irrigation (FCDI) projects would drastically alter the eco-hydrology of the Bangladesh floodplains, reducing fish production (de Graaf and Martin, 2003). The 1990s saw the introduction and spread of Ulcerative Disease in Snakeheads (*Channa* sp.), *Puntius*, *Anabas*, *Mystius* and other preferred species. The increased intensity of land use following ill planned irrigation development is a major factor in fish declines. Today, the GoB is under

immense social-political pressure to make up for this loss of fishing. Many international and domestic research studies have clearly shown the negative impact of FCDI projects on fish productivity. People told us that the last good fish yields were in the early 1980s.

Included in the scenario exercise is a brief discussion of benefits sharing. This is a paraphrase of discussions between project staff and beneficiaries at Beel Mail.

*There is an agreement by project staff that the landless should not be removed from the process of determining benefits and that they should receive some portion of the net profit. It was suggested, by FMC members to give the landless/poor 10% of profit, but it was then suggested that it should be much higher (closer to 50%) since the project is currently paying for the inputs; if we are to address poverty the profits should be split evenly until FMC can take over the project.*

*Participants felt that some form some sort of list (people here are very fond of making lists) of "qualified" landless/poor would be useful in knowing who deserves benefits, despite that fact there is an unknown and dynamic number (least couple hundred) "qualified" poor/landless fishers who traditionally fished from the beel area. The project has difficulty keeping the list of qualified project beneficiaries from continually growing around harvest time! It would be extremely difficult to keep track of all the landless. The DFO is constantly having to "revise" the list of qualified beneficiaries.*

This project must work to develop fora where beneficiaries and other key stakeholders deliberate in order to come to a working agreement on access and benefits sharing or else this project becomes just another example of enclosing the commons for the benefit of local power investors.

At Chandpur Beel, we included in our scenarios the proposed 20 year lease; there was a boisterous discussion on how they would change the entire beel into a commercial aquaculture operation, with new fencing, more stocking and the eradication of wild fish. The committee members all knew what they wanted to do, but were less sure or reluctant on developing wider methods of benefits sharing. There was a strong commitment to a membership mechanism for distributing benefits.

Most participants want to engage the CP-35 project to assist the local committee to develop alternate livelihoods because economic problems are their main concerns. People are poor, they need credit and the project could help them to develop links with other organizations to develop education, credit and alternate income sources. This concept was very important in ushering in a new Fishermen's Committee in Melandi, Beel Mail. The new committee saw ways of expanding its role out from just fishing into other activities that would require developing external linkages to establish a savings or credit plan. There are three new savings groups established in the village of Melandi. These have 10, 20 and 25 members respectively and a membership is a Tk. 100. It has been going for 18 months, will continue for 5 years and will invest money in different business ventures. These savings groups were established by the new village committee. There five-six members of the fishing committee are savings group

members. There is problem with starting a fishermen's savings group as I was told, "Many men, many minds". There is poor organization at the moment.

With respect to conflict resolution, traditional institutions of conflict resolution are still being used in the Beel Mail and Solimari areas. These include *Gram Sakar* (village level dispute resolution body of elders), *Gram Salish-Union-Upazila-Court*. There are political rivalries ex. The village is Awami, UP is BNP, so disputes often go right to court. The main cases concern land disputes, marital problems, groups fighting over access or fishing areas in the beel. Other conflict resolution mechanisms include mosque-based meetings. In the Solimari/Ghermari case, members of Parliament were brought in to quell conflicts.

In Beel Mail, establishing fishing rules involves the Cooperative Officer, who assists and provides literature on what fishing rules are needed. Villagers went to Mohanpur many times. It took 5-6 months and 40,000 tk. Officers collect money during the set up process. Renewal is 200 tk but must pay officer a 400-500 tk "service" fee. This renewal/audit (on yields and activities) takes place annually. In Beel Mail FMC, 6/55 people make rules. These 6 are chosen by voting. This "executive" makes rules or fishing times, gears and can grant permission to outsiders for fishing. The village fishing committee meets 1/month all year round. The scenarios brought out a general concern about the Hindu fishers not being treated fairly by Muslim officials. This was thought by the participants to contribute to the difficulty in setting up credit and savings plans.

To this researcher the variety of skills and the local desire to be involved is obviously much more acknowledged and incorporated into the fisheries management at Beel Mail as opposed to the other 2 sites. In this co-management set up, many voices are included. The new, younger FMC wants to expand its operations into new income streams, The age old problems of vested interests, free-riding, poaching and other complaint still exist, but there seems to be recognized and accepted *fora* for discussion. The CP-35 project staff has really no choice but to work with this local, long time arrangement. A longer, more in-depth critical, social science study of Beel Mail would be beneficial because here is a 20+ year "successful" co-management operation that did not apparently come out of one of the many specifically designed CBFM-based projects to be implemented in Bangladesh over the years.

Genuine policy reforms require the willingness and leadership from officials at multiple levels of governance, this unfortunately is in short supply in Bangladesh. It is however, not absent. It is present at Beel Mail. There seems to a rhetorical commitment to a Participatory Action Plan Development model (Sultana and Abeyasekera, 2008), but higher officials still default back to familiar "target group" approaches. Aquatic resource management policy analysis and reform would benefit from additional research and input of information on our key drivers of change, the enthusiasm and willingness of local people to participate in a fair and equitable project and the diversity of coping and livelihoods skills that local resource users can bring to the policy

table. Policy reform in Bangladesh is stifled from the politics of vested interests (the status quo) combined with a strong overarching faith that top-down, science-based fishery management and extension models can be "loosened" to accommodate the diversity of social-ecological interactions in the ricefield fishery. The policy reform and implementation is still at the "rhetoric of participatory development" stage. The Senior staff need to devote more time to working in the field with stakeholders.

### **5.3: Policy for Resilient Floodplain Resource Management**

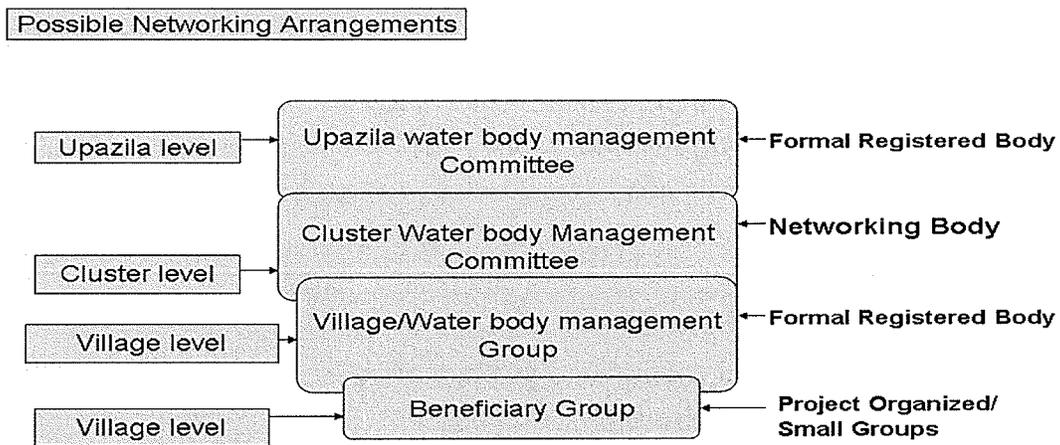
Implementing appropriate methods for fostering aquatic resources management institutions is a critical task for those involved in developing broader sustainable rural resource use policies for developing countries. Institutions are most effective when they elicit voluntary compliance and participation or consist of an equitable incentive/sanctions structure. They are undermined by costly and inefficient economic mechanisms and social norms (Krishna, 2003). A flexible policy environment is needed which combines legitimizing processes for indigenous management institutions while creating the opportunities for communities to assemble to innovate and develop new adaptive resource management strategies.

A priority area for the CPWF-35 project is the "development of alternative policies and methodologies for enhancing fisheries management as a means to improve water productivity" (CPWF Concept Note [www.iwmi.cgiar.org/challenge-program/concept\\_note.htm](http://www.iwmi.cgiar.org/challenge-program/concept_note.htm).) My project began to look at different models of aquatic resource management including private property/enclosure; a co-management model and a community-based/culture-based fisheries type with the intent to have research results contribute to having fisheries policy contribute to poverty alleviation. First, does the project really have mechanisms to understand the drivers of poverty in the study area? A key question remains does the GoB not only have the capacity to develop innovative resource policies, but is it willing to be inclusive of the diverse types of stakeholders that need to be included in the policy process for floodplain fisheries? The general answer to the above two questions would be no. There is still a lack of innovative thinking in order to address the complex questions CP-35 needs to answer. One policy implication is that cross-scale subsidization by DoF at Beel Mail should end when self-organization becomes apparent, because subsidization can increase the vulnerability of the system as a whole by favouring different sectors. The focus should be upon conserving or investing in the elements of the system critical for maintaining institutional innovation. If the current system is not viable, it is necessary to invest in forms of capital that will enable fundamental change. It will also be necessary to stop investing in those institutions and coalitions which serve to reinforce the unviable regime. The political difficulty of doing this is why resource systems in Bangladesh (and elsewhere) so often remain maladapted to current

conditions and opportunities and eventually reach the point of collapse. These are political decisions which require leadership and risk.

The idea of managing individual floodplain waterbodies through unique management regimes is difficult and haphazard. Waterbodies are often connected both hydrologically and socially. These interconnected waterbodies could be managed through the clustering of communities around specific issues and developing networking strategies among CBOs, linking the diverse resource management systems found per specific waterbody in a network format. Fig 5.1 shows possible linkages in a model of clusters as proposed by the NGO Centre for Natural Resources Studies (CNRS-Dhaka). These cross-scale linked institutions are touted as more realistically reflecting management issues.

Fig: 5.1: Possible Networking Arrangements



From CNRS/Bangladesh

A number of traditional livelihood opportunities are lost as areas come under semi-intensive floodplain aquaculture. NGOs can play a useful role in aligning their pro-poor and pro women development programmes to the significant service provision opportunities that can result from properly implemented sustainable aquaculture.

The capacity of the our floodplain ecosystems to provide goods and services across a diverse actor set is shaped by the actions of their resource users, their governance institutions (or lack of) and will ultimately provide the resource base on which social and economic development is built (Folke *et al.* 2007).

Floodplain aquaculture cannot really be said to be considered to be enhancing natural floodplain fisheries production or biodiversity except in the cases where selected species are

deliberately targeted for protection and propagation. There is a basic incompatibility between floodplain rice-fish aquaculture and the more conventional community based fisheries management (culture-based) approaches used in Bangladesh and future conflicts between traditional fishing communities and farmers wishing to establish floodplain aquaculture seem likely. To counter this it is suggested that resource organizations come together with local resource users and knowledge holders to carry out a comprehensive zoning exercise to identify priority aquaculture and fisheries areas on the floodplain. This requires more thought than to simply target all large waterbodies as potential single-use aquaculture projects.

A significant number of knowledge gaps exist generally for ricefield fisheries and for this project in particular which prevent a more complete understanding of floodplain aquaculture development. They include the extent and severity of lost livelihood opportunities; the social, economic & organisational aspects of projects; and the design, effectiveness & contribution of dry season refuges to wet season floodplain fish production. Until these and other research issues are better understood, it is recommended that Government adopt a precautionary approach to the development of floodplain aquaculture (Gregory *et al.* 2007).

In the long term, what are the implications for projects like CP-35 which do include a privatization approach to managing aquatic resources? In the Solimari case, the local farmers, fishers, landless were not involved either in project development or its implementation. The project holds the assumption of greater efficiency and productivity from a private property model. In addition, the government sees dealing with private landowners to be easier. There is only one stakeholder/beneficiary group to deal with. The stakeholders and beneficiaries are the same. Unfortunately, this is not true, as the government found out when scoping potential new sites in Fulpur, Mymensingh that are traditionally used by well organized, semi-militant groups of "floating fishers" who prevent land leases from being claimed and worked. The fishers exerted their rights of inclusion into the project. I do not think that the project officials were surprised by this. They were somewhat reluctant to accept that any project would not work in this area with out their full inclusion.

Developing governance is a messy and negotiated undertaking and the policy process must be inclusive enough to facilitate both self-organizing local networks and to develop the fora necessary to include these cross-scale concerns in a process aimed at formulating resilient resource policies. Legitimacy of participatory governance requires stakeholder participation in decision-making which ideally transforms both the participant and the process. The nature and substance of communication (connectivity) between players is very important.

In Beel Mail, some of the local customs allow outsider fishers to fish in community managed areas. The Melandi Fishermen's Cooperative *may* charge individual/family members to fish or grant them 2 days free fishing. Commercial fishers are charged based on a maximum length of

stay up 4 days. Depending on where commercial fishers are from they may be excluded from fishing. Here the local customs are used to generate income and to control fishing pressures. There is also some status seeking by the Melandi FMC, who will exclude people from certain nearby areas, possibly based on a bad history.

A key result from this study, according to senior project staff, is that the community has to be willing to participate and cooperate with project staff. The PIC/FMC members must know and accept their responsibilities and carry them out. The community has to see that DoF/BARC/WFC staff are doing a project for their benefit. Here trust is needed by the community to see future benefits. These interview results clearly show the mentality of *command and control* which dominates Bangladesh Fisheries management, even within the rhetoric of CBFM. Solimari Beel, Mymensingh is a peri-urban environment where people have had experience to *use the system* of projects to get resources or tasks done. There is a long history of elite capture in this area which makes cooperative projects very difficult. Here, culturally dependent goal structures maybe of greater importance in determining resource productivity than land tenure agreements of which the majority are small private lots.

This study shows the GoB to be very enthusiastic about being involved with the CP-35 project, a CGIAR undertaking with global scope. There are benefits to the GoB to be seen involved in these international projects. The GoB wants to avoid being excluded from the growing trend in Bangladesh and international development in general, in which international organizations develop multi-level governance systems directly with sub-national units. The active involvement of the state in these projects serves to help keep control over rural resource users and more importantly to give an air of "green" respectability in order for it to leverage additional international funding streams (Sneddon, 2007).

The prevalent "state failure" with respect to resources management in Bangladesh has fostered the plethora of INGO-NGO partnerships which are the backbone of Bangladesh development. In the CP-35 project, the in-country project coordinator was working for WFC-Dhaka as seconded from DoF. There are deliberate, and one could argue disturbingly close linkages between WFC-Dhaka and current or ex-employees of DoF. The state is very cautious about being sidestepped with respect to the development and management of rural resources. The Bangladesh state has had a long history of exerting control and building party-based political influence in the rural areas through the programs of de-concentrated line agencies such MoL and DoF (Crook and Manor, 1998).

What are the incentives for natural resource managers in Bangladesh to be motivated to try and create optimal management institutions in such an ecologically complex and politically unstable environment? In Bangladesh, corruption and patronage politics create the incentives for officials to keep the status quo on behalf of the powerful landed elite. It is the study of influential drivers and their institutional responses which illuminates how experiences of the

partial connections between people, place and misguided policies and programs cause the degradation of these important freshwater floodplain fisheries. This disconnect thus permits state simplification of complex resource systems and promotes its discourse of command and control institutions of management. It is through learning from these partially connected local experiences of resource degradation and rural social upheaval that can give community-based organizations and reform movements the resilience and adaptability to resist state and private interest processes of resource system simplification and co-optation via the "globalization" narrative (Johnson, 2001).

*"Extension and application of new aquaculture technologies in common property wetlands, formerly considered of little or no value, have increased their productive potential and consequently, have caused their value to rise. As a result of increasingly private investment and transformation of wetlands to more economically profitable land uses, the poor and the landless are denied access to these resources and deprived of their benefits. This has contributed to a widening gap between the better-off and the worse-off in rural communities and, in some cases, competition for the resource has spawned violence and abuse of human rights." (Ahmed, 1993)*

*"Village residents noted that the availability of small native species (SNS) had declined drastically due to habitat loss related to agricultural intensification and due to the restriction of access to the remaining habitats in the course of aquaculture development. Their perception was that poor people had gained from the intensification of agriculture in terms of rice consumption but had lost in terms of reduced access to fish and other animal products" (Mazumder and Lorenzen, 1999).*

The impacts of technocratic approaches and short-sighted views on wetlands and their relationship to the rural poor are captured in the above quotes. Bangladesh needs a policy for the distribution of state owned water bodies similar to the national policy on distributing public land (*khas*) to the landless. It is recommended by the CBFM-2 project to expand from 260 CBFM water bodies to the over 12,000 in Bangladesh; implement pro-poor management strategies though longer-term, conservation oriented leasing policies (tax exempt policies) (CBFM Policy Brief 4. [www.cbfm-bd.org/policy/The%20Right%20Option.pdf](http://www.cbfm-bd.org/policy/The%20Right%20Option.pdf)). It should be noted that the results from both the CBFM and CBFM-2 studies are highly variable in terms of benefits sharing and community empowerment and thus a thorough analysis of the actual benefits to the rural poor of the CBFM approach should be undertaken before widespread 'extension' of this model is promoted

There is the challenge to meet both the income and food components of domestic fish production (Muir, 2005). There needs to be increased focus on managing fisheries to meet the needs of the poorest sectors of rural communities. Here the discussion focuses on the forces driving aquaculture expansion for domestic urban and international markets. There are additional forces and perceptions driving national policies for food security and employment. Links between the politically dominate urban centre (Dhaka) and rural economies are important

drivers of pond aquaculture or enclosure models. The political motives for driving these private models and their linkages to the rural poor are not adequately brought out in the mandate and project description of CP-35.

The development of integrated agri-aquaculture (IAA) systems provides a platform to develop aquaculture systems which can provide greater food security, income diversity and local household benefits (Ahmed *et al.* 2007). These systems can also provide greater connection and relevance for the rural poor. In connecting agriculture with the aquatic environment through interconnected resource flows they contribute to the overall resilience of rural food systems. As in agriculture, an evaluation of local access to resources, labor skills, markets and risk assessment is needed before implementation. (Muir, 2005). The relative economic performance of different aquaculture systems within the national regulatory framework, shaped by consumer preference and incomes, will ultimately determine their uptake and expansion. The promotion of aquaculture on public and private land for increased domestic consumption and export is occurring throughout rural Bangladesh. Aquaculture development is one of the major forces of landscape change, driving paddy conversion and reduced grazing.

The common flooded season fishing areas are being captured by the private landowners as they now see the benefits of "private" fish culture in areas that were informally shared with the landless community for gleaning fish (Minkin and Boyce, 1994). They claim it is their land, therefore it is their "flooded water" so they can do what they want with it. There is now restricted access to aquatic resources based only on the ownership of dry land. There is a need to establish clear institutions of access and use rights over resources before these common property or open resources are seen as (become) valuable in the eyes of the landed elites looking to monopolize local resources for more profit. (Li, 1996). Whenever the GoB is involved with a project or development scheme, or the devolution of power, there is an automatic tendency for different groups to exploit it. The political and economic elites capture resources through the manipulation of project decision-making and accounting processes (Li, 1996). The very poor see research and development projects as part of the *de facto* welfare state with its resources there to serve them. They will not hesitate to take what they think is theirs. For this reason, they need to be brought directly into the project through some form of legitimate representation.

Including the poor and other stakeholders in benefits sharing probably requires the *negotiation* of private property management for these alternate rice-fish floodplains to set aside CPRs (areas, times, certain gear) so that landless and extreme poor can have access to some resources. The government or international projects, such as CP-35 could leverage the access to resources, funds, legal/administrative advice etc, for beneficiaries to develop the capacity to fully participate. In interviews with a representative from BELA (Bangladesh Environmental Lawyers Association), they see it is as crucial for community-based resource groups to have

access to legal representation. In order to fight wealthy landed interests, especially over leasing arrangements, BELA sees the empowerment of the poor partially arising from successful court challenges.

Over the past 20 years repeated financial crises have forced an ideological and cultural shift from developing collective action solutions to mechanisms based on individual or private enterprise. The market is seen as the most efficient system for resource allocation. The state's ability to control its external environment, assuring the delivery of public goods and services or defending the rights of the marginalized is eroded through ill conceived restructuring and devolution. The decreased legitimacy and capacity for collective actions weakened along with the tax base. Is it the decline of the state or its transformation to a more diffused and flexible tool of governance which allows for developing questionable PPPs or its outright co-optation by financial interests? The state is reconfigured through neo-liberal reforms, with the loss of accountability and traditional command-and-control centres and sources of power and influence through devolution. There are shifts in power at different levels as the center is marginalized and decision-making power flows to the periphery. These dynamics feedback and enforce more power and authority for external agencies, which are becoming more critical for state functioning. In the CP-35 project we saw a vigorous and direct partnership between the state (DoF) and its associated agencies (BARC, BFRI), an International NGO (WFC) and private, commercial interests. At Solimari there was no effective inclusion of a wider stakeholder base. This was a PPP, with the only key "public" as private land holders. At Beel Mail, the project saw this opportunity to become involved, gather data and advance its knowledge on culture-based fisheries management of larger waterbodies. The historical use rights of this beel by a diverse rural community could not be ignored so efforts were made to include them in discussions and negotiations. The WFC project leader in conjunction with DFO Rajshahi were the two key people trying to bridge the communities of fishers, moneylenders and the landless. In our project we saw how senior project members were actively scouting new, "agreeable" areas and UFOs in order to implement the project. One criteria is a strong local compliance with the UFO. The project assumed its eventual success on the UFO's ability to control dissent at the local level. There had to be a strong working relationship between the UFO and DFO. Senior project staff were well aware of who these people were and where they were located. They were often located in their home or familiar districts!

The relationships of inter-dependency in society are growing and changing. The boundaries between the public and private sectors are blurring, there are frequently shared interests. There is the shifting role of government in managing PPP. In order to understand the changing nature of governance especially the lines between the social and the political it will be necessary to deal with issues of dynamics, complexity and diversity. This requires a systems approach (Kooiman, 2000). There is a need to explore the agendas underlying PPP processes,

especially where they serve only to legitimize semi-failed states. The use of consultative and participatory approaches in community-driven development can assist in the transition from quick-results, top-down development or emergency interventions to a more evolutionary, bottom-up development of institutional reforms. This can enhance the local sense of project ownership which should contribute to developing more sustainable resource management regimes and may provide the fora for experimentation and development of broader governance programs. These participatory approaches may help citizens and officials change their worldviews and narratives about governance, state-society interactions and the management of critical natural resources and development. Spheres of power and their relationship to daily community function must be explicit from the start of any project.

The local level is seen as a key focal point for the capacity for constructive action, this involves the inclusion of local level authorities in processes of dialogue and action with higher level officials. Local preferences should be allowed to influence the development trajectories through a demand driven process, this is especially important in states with weak institutional capacity and facing complex governance challenges (Manor, 2007). There is a temptation to rely on top-down autocratic approaches, especially by states with post-colonial educational legacies, but bottom-up innovation should be encouraged through the inclusion of local knowledge in local resource management processes. The key project task is to link intact local management processes and social actors simultaneously and effectively with key institutions and players at higher levels of organization.

## Chapter 6: Discussion and Conclusions

### 6.1: Introduction

The lack of political will, clientelist politics, and the dominance of centralized bureaucratic institutions create prominent stumbling blocks for the development of decentralized resource governance in Bangladesh. The failure of state-led development and resource conservation programs has led to opportunities for commons resource privatization and created the space for NGO/INGO to take over the delivery of rural public goods and services (Sarkar, 2003).

There has been an increase in the distance that mobile subsistence fishers must travel to access water bodies. As fish become more of a cash resource, more traveling to markets is necessary. To pay for education and other household goods, more fish is sold so more labour (time) is spent on fishing for declining catches which may contribute increased household food insecurity. As commodification and market integration of previous subsistence activities, such as fishing increase; there is heightened local awareness of potential loss of fish in local food security. This commodification of fish products increases rural socio-economic stratification and in many cases reduced household level resilience through the restriction of access to common fishing areas or simply from place-specific over-fishing. Fishing as a multi-purpose livelihood is simplified by increasing the reliance of the household on fish for cash.

Regarding the objectives about drivers of change, the key social drivers and institutional responses, were: increase in rural population numbers and mobility; increased integration of floodplain fisheries into the cash economies of aquaculture production and fish markets; GoB-WFC project interventions and the linkages between project staff and representatives of key government policies and management strategies of poverty alleviation via maximizing fish production from flood plain water bodies. The success of the co-management site at Beel Mail was a direct result of developing diverse vertical and horizontal linkages over more than 20 years. The aquatic resources governance at this site involved participants from different levels of government, financial elites and resource user groups, with a flexible and progressive involvement by key state officials.

The WFC-DoF project at Solimari site, a top-down approach did not invest the time in the field to develop the trust and key linkages necessary to develop a "private" floodplain culture-based fishery with wider access and benefits for the local poor and landless. Therefore, project resources were (not surprisingly) appropriated by the local project leadership as they saw fit.

The third site, Chandpur Beel, was being driven by local village leaders to make money, to enter the cash economy via selling culture-based fish. Leaders in this community-based project want to increase membership and manage the aquatic resources for maximum cash profit. Short term leasing for profit of public water bodies; a blanket government promotion of untested CBFM governance mechanisms and the political influence of all levels of well-connected private

and powerful government officials in the management of aquatic resources are the main social/political drivers.

In addition to the social drivers discussed above, the main ecological driver was the alteration of land use patterns due to land fragmentation and disruption of floodplain hydrological connectivity from poor irrigation and field drainage in the expansion of rice agriculture. This included the dewatering (by pumping) of dry season fish refuges. The decreased fish yields, in turn, increased the overall price of fish, but especially for the favored local species. Thus the government saw this as an opportunity to continue to push culture-based fishery development elsewhere. There are concerns about fish loss due pesticide and organic enrichment but these are minor in my study areas.

Scenario exercises showed unanimously how people living adjacent to the waterbodies saw the demise of the fishing resources from increased entry of a greater number of mobile fishers and the lack of enforcement of state rules. With this came more illegal fishing practices and the start of exclusion of landless fishers from some waterbodies. Participants acknowledged that more vigilance and local enforcement of customary rules would be necessary to reduce fish declines. They have no faith in the central government to protect fish, but did welcome joint projects for fish habitat conservation and the younger participants could see positive benefits in working for culture-based fishery operations as proposed in Solimari Beel.

We can conclude with answers to our guiding questions on efforts to privatize the floodplain commons (pg. 25). The social and ecological drivers are tightly bound to policies of private property mechanisms which seek to extract the highest yields from these common property resources. The privatization of the aquatic commons is widespread with different forms being implemented in different waterbodies either through questionable leasing arrangements with the rural elite or through GoB management of floodplains with private land owners. As a rights issue in Bangladesh, the private landowner has ultimate control over what he does with his land. A group of private landowners can control access and benefits from those collected parcels of land. Lip service is paid to a wider distribution of benefits, as attempted at Soliamari Beel. On the surface, privatization is desirable for private land owners, but as we see at Beel Mail (co-management case), over time and with effort of diverse stakeholders, lease holders, private landowners and a wider group of beneficiaries can all benefit. Strict privatization is desirable for the GoB as it provides it with a simpler management paradigm based on private property and entrepreneurship. The MoL can just deal with land owners and lease holders and not worry about incorporating wider beneficiary groups. The winners in these schemes are the landowners who can, with assistance from the state, convert their land into culture-based fisheries or pond aquaculture thus generating higher returns. They do however run the risk of contempt and possible theft from the excluded locals.

Alternative governance includes commitment to developing adaptive co-management regimes along the lines of Beel Mail. They seem to work best when there is a local history of collaboration, diverse participation, conflict resolution fora and the patience and commitment by officials and elites to make the system work. There is a need to look at hybrid governance regimes which combine a number of different governance and management mechanisms. These probably involve some *mélange* of formal, legal state-sanctioned mechanisms in conjunction with the many local, informal common-property mechanisms found in the rural areas.

In the context of the CP-35 approach, there was no commitment to developing hybrid "participatory democratic" approaches to aquatic resource governance. Current politics promote state directed command and control mechanisms. Aquatic resources are still seen by the state as a source of rent, although they contribute very little to national revenue. But these rents are very important sources of leverage and control at Upazila and Union levels of political organization. The rural poor continue to be marginalized, shut out from management decision-making, they watch the fish resources decline while private aquaculture expands (floodplains converted to ricefields now converted to fish ponds). The power dynamics that facilitate such development are often difficult to detect by researchers or outsiders. They are often implicit, hidden and not discussed openly.

This case study also explores how a International NGO, in this case a CGIAR Center, partners with government agencies to try and implement a "community-based" fisheries *research* project, with a small inexperienced staff. The context of the study consists of complex relationships and conflicts that the project staff and partner organizations are either unable or more seriously are unwilling to disentangle the complex interactions and institutions which make up informal governance of these water bodies. There are very pronounced difficulties with the application of the assumption and models found in the CP-35 project. It is also possible that the project, as outlined by the Challenge Program, hides a management agenda based on green or participatory neo-liberal economics, by which different models of resource privatization or enclosure is the key rights-based governance model. The project tends to disregard the material and structural constraints of "hybridized" forms of rural capitalism placed on the local poor. There are other examples which show that the neo-liberalism is not the only successful approach, although at larger scales, there seems to be a strong push by "community groups" or their leaders to develop some form of market-based commercial enterprise from "their" water bodies. There is a predominate focus on livelihoods, with some emphasis on developing alternative income sources, but the main focus is on boosting fisheries yields through the application of fisheries and aquaculture technology and management. Most of the senior project staff had applied aquaculture training and experience.

There was an effort by the project to try and homogenize or “flatten out” the difficulties or differences in local conditions in order to apply fisheries/aquaculture science and marketing approaches. Each site had very different histories, audiences and concerns yet the “PRA/PAPD participatory” approach was being implemented as policy at two of the three sites, clearly failing at Soliamari Beel, due to a serious lack of attention. There is very little real recognition by the project of “community-based” cultural goals. These relationships and structures are important as they re-forge ties to create buffers against global impacts. There is a need to foster/recognize the loose local relationships; diverse social relationships/structures which create boundaries (institutions) which mediate the outcomes of external drivers; these have to be acknowledged by any rural resource project, and not automatically replaced by externally generated concepts of participation and management. These externalities are important top-down drivers of change and may be contextually inappropriate when superimposed on local institutional contexts.

Leadership at different levels is crucial, all sites had key individuals, at different levels; the project often gravitated to just working with these people. There is a need to recognize & encourage key leaders, promote inter-generational learning to ensure sustainability of sites such as Beel Mail; local people are knowledgeable, enthusiastic and willing to participate in exercises where there is direct benefit to them.

In this study there is a need to be critical about how the Bangladesh state develops public-private partnerships for managing important resource commons in conjunction with partners with little experience or influence to effectively contribute to their management. There is a pronounced lack of willingness of state agencies to truly involve the poor rural resource user. In many cases where the Government of Bangladesh has influence, the use of PRA/PAPD is rhetoric to create an air of legitimacy, to satisfy donors while still implementing the familiar top-down resource management strategies. International research organizations such as WorldFish via the Dhaka Office enter into agreements with the government through line agencies such as Department of Fisheries to either replace or supplement fisheries research and management for the retreating state. Their involvement then gives legitimacy to GoB initiatives which they perhaps do not agree with, but are a mandatory discourse to secure donor funding for the linked state and INGO.

There is a *mismatch* between the nature of “collectivist” rural Bangladesh communities and the groups mandated by overly simplistic “participatory approaches”. There is poor recognition by project design and staff of the highly personalized nature of power manipulation and social cohesiveness. It will be a challenge in Bangladesh to get project staff to overcome *educational bias and class (and in some cases) caste separation*; to see the immense value of face-face discussions as crucial field work; moving away from patterned, time consuming, top-down survey-based approaches for data collection to go beyond automatically focusing on collecting

data for sake of collecting data! There is no/very little actual use of local knowledge beyond rhetorical acceptance of its presence and potential management value.

From this study the following gaps were highlighted. A fundamental lack of understanding or appreciation for social/economic/political drivers of poverty in fishing villages by DoF staff; no real commitment to develop effective mechanisms to address resource concerns of fishers; a mismatch between the fishers perceptions of need and the actual services or research directives undertaken by the DoF in addressing key concerns affecting floodplain livelihoods. There is a deep lack of trust between government DoF and fishers resulting in truly ineffective policy and legislation to manage the politics of power in the aquatic commons. The result is ineffective coordination between actors concerning aquatic resource governance in Bangladesh floodplain rice-fish systems

The future is not static. As outlined in this study, floodplain alternate rice-fish systems are an excellent example of a social-ecological system undergoing differential changes by the diverse set of simultaneous acting social and ecological drivers. We found these to be arenas of enthusiasm and potential positive change. We tried to develop future scenarios as a description of the tension between the push and pull forces of the future moderated by the weight of historical contingency. It would have been beneficial for the project to try and understand past events and decisions in the context of contemporary change to better frame their objectives. There was little discussion of the past and all emphasis was on future fish productivity. Community-based resource management strategies begin with the premise that stakeholders have the innate capacity to improve resource condition and societal welfare. This requires a broader investigation and analysis of the devolution of governance powers (Murshed and Abdullah, 2000). Unfortunately this was not done in CP-35. There was little actual negotiation with stakeholders at any site other than those already involved in the management of Beel Mail.

There is need by projects like CP-35 to develop the capacity and willingness to recognize the importance of local mediations and ecological processes at a time when local communities all over the world are being transformed by the global development agenda. There is a fundamental need to understand how local resource use strategies are influenced by the drivers of capital flow, market demands and the dynamics of centralization and marginalization as the focus of commerce shifts from local to global. The scales of problem perception and institutional interaction; the partial connections and view points of ecological and governance systems are seen as a form of complexity, as clusters of institutions are developed around issues, scale and proportion (Strathern, 1991). The understanding of how these partial connections directly influence the coalescing of power and influence and the results on resource flow is crucial for beginning to foster sustainable resource management institutions.

The state-centric model, so prevalent in aquatic resources management in Bangladesh, is called into question by the growing power of linked networks; here sub-national authorities are defining themselves as international based on the quantity and quality of linkages; transnational systems of institutions and an ideological shift from state-provided public goods and collective action towards the market and free enterprise (Pierre, 2000). This is related to the normative theory of institutions (March and Olsen, 1989) which relates institutional structures to prevalent norms, values and beliefs. The diverse arrangements and linkages found in the “new” state are indicative of adaptation to external drivers and not a collapse. Moving past formulaic approaches to complex resource management problems requires new training and capacity to do this. These flexible approaches are currently lacking in national resource management policy in Bangladesh. The changing role of the state in governance moves beyond the traditional and historical patterns of exchange between state and society. There is now arbitration between social and commercial interests and the regulatory frameworks for markets. The role of the state is contingent on the path it takes as it interacts with society and the economy. This study shows that Bangladesh state is increasingly embracing neo-liberal economics and seeks its legitimacy and capital through visible PPPs to attract fluid global capital.

## **6.2: Post-Managerial Power Relations and Rural Resource Governance**

There needs more emphasis and inclusion of power relations, processes of negotiation and conflict description and resolution and dynamics of cross-scale relations. An integrated analysis, lacking from CP-35, is needed to account for the increased uncertainty, surprise and complexity in natural resource governance problems in order to (perhaps) contest the inconsistent and destructive command-and-control bureaucratic approaches stemming from the political status quo and the closed elite processes of policy-making.

The key drivers of changing agro-ecological context and conditions, demographic and migration (mobility) changes, increased emphasis on decentralization, the privatization of provisioning and forces of globalization are challenging and redefining the meaning and methods of participation in Bangladesh civil society. The citizen is no longer just a user or chooser of services but can also be an active participant in the development and shaper of public policy and the methods of delivery. Adopting a managerial approach, often underestimates the extent to which current laws, policies, state and traditional institutions (or lack of) and advocacy are already implicated in rural resource problems. All forms of power and understanding, formal or customary influence the processes through which rural resource allocation occurs. Rural landscapes and livelihoods are products of complex interactions of power.

In a post-managerialist view, institutions are viewed as outcomes of social and political processes. They are linked with culture, beliefs and world views. They acknowledge complexity and uncertainty. Institutions are seen as providing dynamic sites for negotiation and the interaction of different power spheres. They go beyond the "design principles" of resource governance and must acknowledge the flows of the "hub and spoke" model of centralized governance with channels flowing in and out of Dhaka to the periphery. There is strong state interest in linking rural and peri-urban production centers to service urban markets. How does the state see the decentralized actors, those groups located outside of the hub? What is their actual role in hub decision-making and policy processes? Currently the Bangladesh state sees these highly productive zones as servicing the center and subordinate to it. They supply agricultural goods to Dhaka.

Institutional analysis shows us how differential institutional arrangements are the outcomes of the associations of different networks of local/non-local; state/non-state actors. This leads to the different ecological and resource management institutions (Scoones, 1999). The processes of developing aquatic resource-based Public-Private Partnerships, as indicated in this study, are still relying on state-directed models of hierarchical command and control development.

In many areas of the world, there has been a shift to considering co-management approaches in fisheries and other natural resources. Unfortunately in many cases, this has not been accompanied by protocols on data collection and its use in decisions making. There has been little work done to specifically design methods of data collection and analysis for co-managed fisheries (Halls *et al.* 2005). This is evident from preliminary work at Beel Mail, where there is still a pronounced emphasis on collecting fish yield data, out of context of the institutional framework and the divisions of labour which produce them.

The failure of adaptive management, as outlined in Walters (2007), consists of 1) the failure of decision makers to fully understand why they are needed; 2) the lack of leadership to implement the complex processes for adaptive management; 3) inadequate funding for increased ecological and economic monitoring needed to compare alternative policies. These three conditions are evident in the CP-35 mandate but could be over come by paying deeper attention to local community context and the existing co-management arrangements.

The social-ecosystem approach, with emphasis on modeling forces us to confront the uncertainty in developing experiment polices and implementing management actions with diverse monitoring systems. These concerns are all at play in the mismanagement of Bangladesh floodplain fisheries. In our case study, positive/broad-thinking people in positions of political or financial power should be encouraged and supported to expand their linkages with other stakeholders and concerned people at different levels and scales in order to begin to develop innovative management approaches.

Any new approach to governance must accept the intrinsic uncertainty and unpredictable characteristics of complex resource systems and see these systems as inherently dynamic. The new approach can focus on developing holistic management approaches which can anticipate and respond to this uncertainty. These are by definition adaptive and include the creation of group learning opportunities. There should be a two-way dynamic of learning between the social and natural science realms. Local knowledge is generated in a crucible with additional seemingly chaotic cultural influences shaping both institutional and behavioral responses to the human-in-nature context. Interactive governance requires the promotion of joint principles and values, equitable stakeholder inclusiveness and transparency and methods to building learning capacity (Bavinck *et al.* 2005). The problems facing fisheries are often exogenous to the organizational styles of research and management (Hanna, 1995). Research and management tend to focus on the social 'roles' of the fishery such as employment or the social welfare, cultural and historical significance, and not on the conditions or drivers which mediate how social and the biological processes interact determining critical social-ecological complexity found at the local level.

So how can a project like CP-35 help foster local initiatives for food security, local autonomy and empowerment (via sustainable food systems)? It is through developing many diverse forms of horizontal and vertical linkages around both food security and resilient livelihood constraints and not always pushing a single (state sanctioned) model of top-down resource management.

### **6.3: Complex Adaptive Systems and Social Policy**

An over reliance on mathematical modeling in the state sanctioned model is a serious problem. The reductionist approach to problem identification and problem solving in a complex adaptive system such as floodplains fisheries does not work. Development of any kind is to create, evaluate and maintain opportunities; sustainability is the ability to create, evaluate and maintain adaptive capacity (Holling, 2001). Results from this research there does not seem to be the political or managerial space in a CP-35-type project to actively engage a wide enough diversity of stakeholders to create what Holling, 2001 refers to as adaptive capacity. The CP-35 project in Bangladesh, as implemented during my study period, remains too hierarchical, top-down and fishery-science oriented to be effective in addressing the factors driving poverty in floodplain fisheries. There is urgent need to truly look at the root causes of power differentials and how to implement forms of relevant adaptive management for these types of floodplain ricefield fisheries. This requires developing "policies as experiments" (*sensu* Walters, 1986). These policies have to be developed within the real time dynamics of these complex adaptive systems. They need to be broadly inclusive and "safe-fail" for those poor who are able to participate

*"For all its talk of 'modeling emergence' and simulating hierarchical feedback, however, those currently leading CAS research are still sunk in methodological individualism and a reactive conception of agency, human or otherwise. No matter how many emergent levels CAS modeling efforts have been able to simulate or spontaneously generate, this perspective has yet to effectively produce a systemic model in which a whole/part interaction based upon either negative feedback or positive feedback (or preferably both) can generate a holistic conception of a self-regulating or far-from equilibrium system capable of saltational possibilities."* (Harvey, D., 2001)

Following the typology of Cilliers (2000), our complex system of social policy could be characterized by consisting of a large number of elements which in themselves can be simple but which interact dynamically by exchanging energy or information. The effects of these interactions are propagated throughout the system. Our system would have many direct and indirect feedback loops. It would be characterised in terms of open systems where there is an exchange of energy or information with their environment and operate at conditions far from equilibrium'. Its flexible serve as dispersed 'memory, not located at a specific place, but distributed throughout the system' and thus system is a contingent entity; it has a history. Our fishery has emergent properties, that is, the system behaviour is determined by the nature of the interactions, not by what is contained within the components. Since the interactions are rich, dynamic, fed back, and above all, non-linear, the behaviour of the system as a whole cannot be predicted from an inspection of its components. The role of opinionated individuals in promoting collective action must be recognized and built upon.

Our floodplain ricefield fishery, a complex social-ecological system, is adaptive in so far as it can (re)organize its internal structure without the intervention of an external agent but it is also an example of a self-organizing complex system consisting of agency and actors (Medd, 2001). Key inputs of organization and management (enabling inputs) are required to allow the system to self-organize (Mahon *et al.* 2008) These dynamics of self-organization interacting with diverse styles or forms of directed management is characteristic of small-scale subsistence fisheries.

The impacts of floodplain over fishing have been severely underestimated by Bangladesh management authorities and their conservation measures do not including reducing fishing effort (deGraaf and Marttin, 2003). In small scale tropical fisheries the state faces enormous management, implementation and enforcement pressures. In Bangladesh, any attempt at community-based management of fisheries resources creates substantial conflicts between the new community-based organization and the former resource users, usually the local wealthy and politically connected elites. There seems to be an inability to form a CBO from the local users and elites which is not conflict ridden or top-heavy with the local elites. These methods or attempts seem to this researcher, as a kinder and gentler development mode cloaked in rhetoric of participation and community-based approaches (*sensu* Rocheleau, 1994).

Participation is a specific response to community-based interventions and is contingent on the historical social-economic conditions. The trends and legacies of past participatory experiences (success or failures) influence present-day willingness to participate (Walters, *et al.* 1999). These dynamics are not considered in CP-35, where the most agreeable and cooperative are selected as participants.

Our current understanding of the how to incorporate the complex inter-relationships between governance institutions and the ecological structure and function underlying tropical integrated agri-aquaculture systems is poor. Resource managers need to incorporate the potential impacts of key system drivers which will influence the development of multi-level management institutions. The governance of large integrated systems such as alternate rice-fish will require the detailed knowledge of local propensity for collective action in the community-based management of aquatic natural resources. Patterns of consumption and resource management are guided by social norms made robust by historical common practice. In Bangladesh, many social and ecological drivers are influencing these norms and strategies operating within the changing rice field landscape. Current research results from community-based management analysis are still inadequate to provide comprehensive guidance for aquatic resource planners faced with diverse power spheres.

If we look at China, in the period of decollectivization, rural business development grew at a rate of 30% per year. This is a direct result a system of "hybrid" property rights which combines collective ownership with forms of market mechanisms. Enterprises exist at different levels of organization such as village or township. There are complex institutional interactions and relationships of local government control and local spheres of power which exert control over the circulation and investment of profit at different levels in rural society (Watts, 1994). It will be crucial to understand the causes and outcomes of drivers which influence how these hybrid institutions and their associated cross-sector and multiple scale linkages are developed.

One must move beyond the dynamics of land concentration per se and focus on the diversity of produce the farms are selling (outcomes of rural social and economic changes via market integration), farm debt loads, labour markets and patterns of labour migration and the economy of subsistence. How does rural class structure and power difference influence the state's participation in resource management? In cases of state rent-seeking (ex. jalmohals lease auctions), how can it successfully maintain the social and economic conditions which allow it to continue over time? There is no state without politics, asset accumulation or rent-seeking agendas. These issues are not covered in the current version of CP-35 which tends to continually rely on the accepted, state mandated technocratic solutions.

The state is characterized in part by sectoral competition and a bureaucratic desire to control and plan complex natural resources systems. The state's application of technology and regulation as it attempts to simplify and control complex agricultural landscapes such as

floodplain ricefield fisheries is a key driver. In doing so, its primary focus is not rural resource rent per se, but to consolidate power and control access to rural resources, all masked by "efficient privatization schemes" or "green development" in order to access wider spheres of global capital and market integration (Sneddon 2007). Intra-state conflicts arise when agencies within the heterogeneous state do not share the same common vision for natural resource control. We see this to some extent with competing visions between CP-35 staff, but always recapitulating to the mandate from WFC-Penang.

With a focus on power and political economy, culture and the ecology of knowledge, interdisciplinary research into the social-ecological dynamics of floodplains systems must be grounded in a theory of social change and the creation of democratic processes. This contextual approach sees local institutions, economics and social aspects of farming practices nested within and affected by higher level governance structures and processes. The social, cultural and ecological are intertwined. The impact of trans-local processes on local farming/fishing practices and resulting institutional environment needs to be determined. Participation by stakeholders should manage to be doubly transformative, on the governance system as well as the personal perspectives of the stakeholder. All resource projects in Bangladesh should be aware of the possibility of state and NGO co-optation of so-called participatory processes to maintain their political and economic agendas.

Differential risk coping strategies are rooted in customary networks of social relations and reciprocity, but also of power, culture and inequality. The markets, land pricing, used as part of rural risk aversion, are still theatres of power, culture and contested meanings. They are components of the economics of rural organization, with informal or customary processes, exist outside neoclassical economics and the exceptions of perfect information and complete markets. There is no Pareto effect, agendas are not clear, markets may be non-existent or uncompetitive (Watts, 1994). So in Bangladesh, what is the relation between (multiple level) political fractions, rural coalitions and rural landscape change? Why do huge numbers of Bangladeshi farmers and peasants have no political voice? Wider research into the political, economic and institutional maintenance of a quasi-feudal state by the landed elite in post-colonial Bangladesh is required here.

To develop the necessary pluralistic approaches the state and its coalitions and partners must become more flexible to alternative resource governance approaches. In Bangladesh, resource policies are spread too thin, trying to satisfy too many vested interests therefore it is the resource and the poor who depend on it that suffers.

#### **6.4: A Role for the CGIAR and WorldFish**

In order to develop a more social science oriented approach to aquatic resources management, the WorldFish centre must increase its social science staff to meet its claims that social science is as important as fisheries biology and technology research; it must make up for the shortage of social science among its senior scientists. WFC must increase social and anthropological orientation of its Integrated Agri-Aquaculture Program (IAA) and WFC must hire staff members who are qualified to conduct the necessary social and economic research into the factors which promote sustainable IAA in developing countries (Kassam, 2006). There are two directions that the WFC mandate could take; one will be to continue to discover facts and predict outcomes through reductionist science. The other will be to go out and discover what is actually going on among different fishing people at different times and draw some conclusions about the constraints, hopes, causes and possibilities revealing the practicalities of their daily lives and livelihoods.

The "recovery of the commons", means regaining community involvement by a firm commitment to acknowledging the diverse roles rural peoples play in managing the natural resources they depend on. A revitalized sense of citizenship based on mutual understandings and negotiated relationships on how on food, water, soil and energy are used. This is place-based politics, where people's daily lives and livelihoods are organized on the basis of changes in the availability of resources and the social organization that determines access (Maida, 2007). As suggested by Sultana and Abeyasekera (2008), any commitment to participatory planning and development (PAPD) by agencies in Bangladesh must move from "target group" approaches and adopt broader more inclusive multi-stakeholder approaches.

A key question behind projects such as CP-35 is how do they get marginalized communities involved in the wider discussion of how resource management agendas are framed? Science and technology used with an engaged citizenry in a bottom up, participatory process with social, cultural and institutional inputs (Leach and Scoones, 2006). Who benefits from these interventions? And who loses and how is this determined? There needs to be a development process which is based upon inclusive fora for community involvement in innovation at the problem definition, policy setting and implementation stages. Innovative critical feedback or evaluation methods must also be developed with direct links to the communities involved. There must be inclusive discussions on the access to and control of so called "pro-poor" technology. The theory and methods of developing adaptive co-management as outlined and debated in Armitage *et al.* (2007) is an excellent starting place. We all need to care more about hearing the voices of the poor.

Chambers (2006) suggests six areas which can serve as focal points for developing and disseminating new methods of social science into development frameworks. He refers to them

as HYM (high yielding methodologies), and he targets their use for improving research and communication by the CGIAR.

1) *Bottom up demand*. The poor, voiceless and vulnerable provide the focus in 'demand driven' research. Their livelihood diversity provides the context to identify research needs and to foster local and relevant innovation.

2) *Social Innovations*. Researchers must find opportunities to learn about good social institutions or to innovate with existing local ones.

3) *Attitudes, Power, Behaviour and Relationships*. Little attention has been paid to how these influence development especially in the formation of partnerships and learning alliances.

4) *Reflection and Learning*. Many local innovations go unnoticed by researchers. They are not seen as significant by researchers with no time for reflection writing and communication. All professionals need time and space for reflection, learning and sharing results. In building learning communities there is opportunity to adapt, adopt, invent, practice and evolve practices and methodologies. Researchers must learn to be self-critical.

5) *Learning about learning, innovation, adapting and creativity*. Includes learning about processes of innovation and social change through self-reflexivity and deliberative engagement with diverse actor and knowledge sets. An understanding a depiction of local histories of social and technological innovation is needed.

6) *Spread and Influence*. This includes processes of scaling up and out, diffusion, dissemination, adaptation and impact. There is a lack of practical theory on the impact and spread of technology. Research already done under the CGIAR can be used to learn how beneficial methodologies spread faster and more effectively. We can develop ways to make these methodologies self-spreading and improving through deliberative processes of innovation.

With any discursive approach to rural development, one must have some idea of the historical record of how institutions, social processes and paths of economic relationships were developed. From this emerges the line to contemporary spheres of power and resource relations. This will help to illuminate the attempts by the state or vested interests at the "technicalization", "de-politicization" and political scaling of social and political problems and the proposed accompanying "green" neo-liberal solutions.

The poor tend to look inwards to family and spirituality. In many developing countries, corrupt and incapacitated state regimes forge alliances (PPP) which determine dominate "public culture' via by powerful, *laissez-faire* free-market forces. Organizations like the CGIAR and their state-private associations must commit *a priori* to acknowledging local norms of reciprocity and rights to basic levels of subsistence benefits before attempting any development interventions. There needs to be a thorough understanding of the dynamics of exchange

between peasants and elites and how this impacts on food and livelihoods security (Scott, 1976).

The continual reliance upon "magic bullet" solutions" to complex resource management problems, which seek to remove the diversity and complexity of agricultural systems, with disregard of biotic history, and the prime motive of control leads to an over-simplified understanding and erroneous assumptions about natural resource and food production system dynamics in developing countries. These approaches lead to the loss of social and ecological resilience in food and natural resource systems. Production agriculture, based on monoculture thinking is left unprepared for the external drivers which will at some point force the systems into crisis and the broader view. Homogenization reduces the number of potential entry points for growth and opportunity in linked social-ecological system (Scott, 1998). With monoculture resource management eventually results in the loss of human ecological diversity (human roles and functions). This reduces the diversity of good and services available to any community or neighborhood to develop social or economic opportunities (Jacobs, 1961 in Scott 1998).

Social science in agriculture and natural resources management must develop research which asks questions that other disciplines ignore or refuse to ask. It must ask questions that directly related to the lives of the poor, voiceless and marginalized. These are questions which are human, institutional and political; they concern the process of collective action, forces influencing social cohesion and developing a sense of place. The key question that social science researchers must ask is who wins and who loses from the impacts of their research and technology. Therefore, how can the poor gain more and lose less? This rapidly leads to the realities of bureaucracies, power politics, vested interests, corruption and violence. The complex system of rural resources and the nature of chaos and resilience cannot be ignored and requires deep willingness and special skills to explore. The broader mandate of "poverty reduction" or "environmental sustainability" will not be achieved by organizations such as the CGIAR until the fundamental question of who wins and who loses from their research is addressed from the beginning within the social and ecological context of the messy problems of the human, social and political realities (Chambers, 2006).

## 6.5: Epilogue

The CP-35 project is still on-going. Between the 13-16 of December, 2006 key project personnel, including WorldFish, DoF and BARC representatives and myself traveled to different floodplain locations in the Districts of Mymensingh, Rajshahi and several in the Northeast in order to scout out new sites. One will replace the *failed* site at Soliamari Beel. In the views of the project staff, this site *failed* because project stakeholder/beneficiaries allegedly took all the fish and sold them before the growth/yield or any institutional data could be collected. The FMC at Soliamari or one or two powerful people decided to sell the fish before the project reclaimed them or the profits. The Floodplain Management Committee saw the fish as "theirs" and through subsequent interviews the key local people never really felt part of an experiment or research project. Little actual trust was built between the project and the beneficiaries. On the surface there seemed to be a lot of meetings, but it was shown that these were focused top-down directions for implementation, disbursement of resources and methods of strict accountability. The CP-35, especially WorldFish wanted to be very accountable to the CGIAR and the Challenge Program. Senior WFC staff (Penang) put pressure on the WorldFish Dhaka staff for project accountability in lieu of the very poor reputation for accountability in Bangladesh. There was heavy pressure on the project staff to make this project work, quickly, and if it required moving to a new site and staring over; they were prepared to look at any place in Bangladesh.

The scouting of new floodplain sites by the project involved hierarchical meetings between the Director of Fisheries, DoF; project Staff and the pre-selected District and Upazila Fisheries Officers. These meetings were very formal and focused on the limnological nature of the waterbody and the extent of cooperative relationships between the DFO/UFO and local fishers. Two additional sites, Fulbaria in Mymensingh and Pirgonj, Rangpur District, were eventually selected along with Beel Mail. There is talk of DoF pulling out of Beel Mail after one or two more years of yield data collection.

There were incidents in this project where I questioned the general WorldFish project-centered approach. The "new" mandate for WFC-Dhaka is to generate funds and diversity over a number of different projects. WFC-Dhaka is to move out from the sole emphasis on community-based fisheries models which have come to dominate their thinking over the past 12 years. There is a push to generate more funds. These additional tasks (finding new projects) occupied a large amount of the WFC CP-35 project co-coordinator's time. Through interviews, I felt it occupied his time which could of been spent in areas such as Soliamari Beel in order to develop a stronger sense of community-participation in this part of the project. He was often there to only to resolve conflicts.

Secondly, for this researcher, there is a disconcerting loyalty to DoF by the seconded staff. The DoF is under a lot of political pressure to produce fish by "any means necessary" (pers.

comm., senior DoF staff). It appears to this researcher that DoF has strategically engaged WFC-Dhaka to promote "community-based" or private culture-based fisheries within the rhetoric of participatory approaches. The WFC-Dhaka is now hiring a lot of DoF personnel for its post-CBFM-2 staff. It must be said that all WFC staff have very good fishery science/aquaculture credentials. But have little experience or training in social science necessary to conduct the required research to move the project away from reductionist fishery science approaches and instead implement a community-relevant version of CP-35. The development of adaptive co-management regimes requires the recognition that time is necessary for repeated learning-by-doing something that the CP-35 was not practicing at the time of this work.

For example, the Beel Mail site has many of the characteristics of a successful adaptive co-management regime (Armitage *et al.* 2007). The experience with this site shows that the investment of time is necessary for learning. Similarly, the CP-35 project still has ample opportunity to further study and to develop the type of horizontal and vertical linkages at play at Beel Mail, and to apply this experience to other project sites. The self-organization of villagers at Chandpur Beel (the "control") is another opportunity to see how community-based management develops organically.

A commitment of time, resources and personnel is needed to fully explore the complex local patterns and processes of interactive governance; to understand the key drivers of change; and to fully appreciate how the local people feel about opportunities and constraints on their future. Without that commitment, we know these large multi-donor, multi-country projects fall back into conventional, simplistic, command and control paradigms of so-called rural development and the alleviation of poverty. This was clearly shown in the project, despite collaboration and input from distinguished researchers from International Food Policy Research Institute.

We need to recognize that the fundamental, underlying problem in managing natural resources within the paradigm of a moral economy is not the lack of science or financial resources. It stems from the injustice of inequitable distribution of benefits. Regardless of geography, the institutions of class, caste, tribe, language, ethnicity or religion are used to justify greed. Greed in this case involves the accumulation of power for domination over others to secure assets above a level needed for a sustainable livelihood. The social-ecological systems we encounter are a direct result of greed-based, extractive (capitalist) approaches. The origin of this greed comes primarily from people living with different types of fear. These are manifested in the way many humans develop patterns and responses, interacting with their environment and dominating others out of fear. Individual actors acting in their own self-interest, often with high future discount rates are acting out of a pre-occupation and fear for the future.

The typology of this self-centered fear comes from losing something you already have or not receiving something you may feel you need to survive. The fear ultimately stems from the many

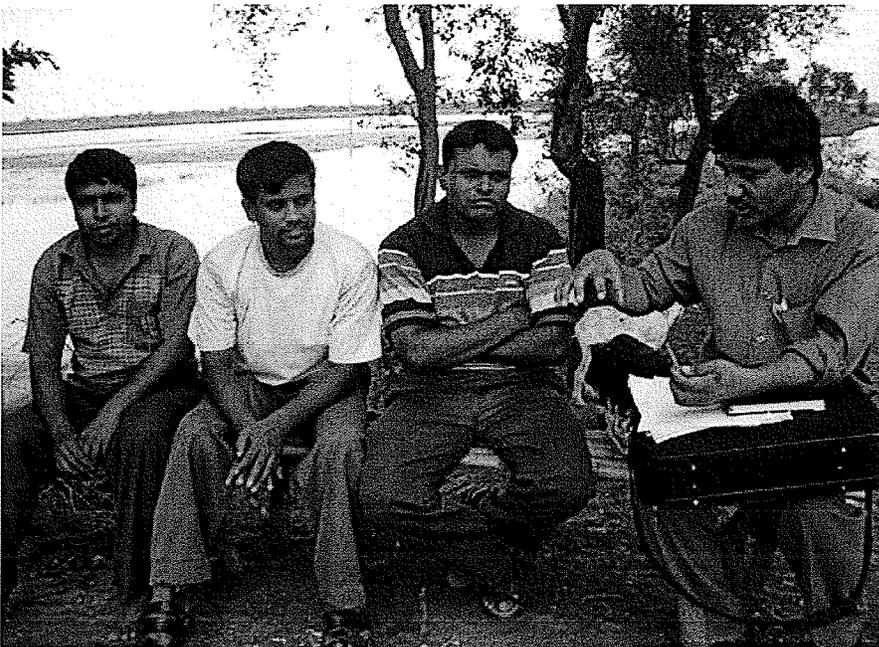
unhealthy modern (Western) attitudes and relationships with our own mortality. We think we can prolong life by over-consuming, by producing more, faster and better. This approach by the global few is actually reducing the long term quality of life for the majority of world's people. This unsustainable behavior will continue unabated until the many smaller scale collapse-reorganization cycles of both personal and ecological change are finally linked (synchronized) leading to either a global loss of resilience and collapse or a profound alteration of our relationship to the planet and each other. In the end it is ultimately our choice.

Resource problems are essentially human problems of misguided will in the exercise of rights and responsibilities. We need to develop mechanisms by which our collective and individual will is used to develop trust and cooperation. As humanity we need to reconnect to healthy attitudes towards life, death and our sense of community and place. We all need to strive towards developing what Kearney and Berkes (2007, p. 192) call *communities of interdependence*; "a vision of autonomous free persons living in communities of belonging and caring, sharing and solidarity, reflection and service".



Interviewing fishers around Soliamari/Gheramari Beel, Mymensingh

(R. Jones)



Benoy Barman WFC, with landed farmers who supply financial support to the Melandi FMC, Beel Mail, Rajshahi.

(R. Jones)

## References Cited

- Ahmed, N., Wahab, M.A. and S.H. Thilsted.** 2007. IAA Systems in Bangladesh: Potential for sustainable livelihoods and nutritional security of the rural poor. *Aquaculture Asia* 12 (1): 14-22.
- Ahmed, M.** 1993. Rights, Benefits and Social Justice: Keeping Common Property Freshwater Wetland Ecosystems of Bangladesh Common. Presented at "Common Property in Ecosystems Under Stress," the fourth annual conference of the International Association for the Study of Common Property, Manila, Philippines, June 16-19, 1993.
- Allen, C.R., Gunderson, L. and A.R. Johnson.** 2005. The use of discontinuities and functional groups to assess relative resilience in complex systems. *Ecosystems* 8 (8): 958-966.
- Armitage, D., Berkes, F. and N. Doubleday (eds.).** 2007. *Adaptive Co-Management: Collaboration, Learning and Multi-Level Governance*. Vancouver: UBC Press.
- Barzman, M. and L. Das.** 2000. Ecologising in rice-based systems in Bangladesh. *ILEIA Newsletter* Decemeber 2000: 16-17.
- Bavnick, M. and others.** 2005. Interactive Fisheries Governance: a guide to better practice. Amsterdam: MARE. 72 p.
- Bene, C.** 2003. When Fishery Rhymes with Poverty: A First Step Beyond the Old Paradigm on Poverty in Small-Scale Fisheries. *World Development* 31 (6): 949-975.
- Bennett, E.M., Cumming, G.S. and G.D. Peterson.** 2005. A systems model approach to determining resilience surrogates for case studies. *Ecosystems* 8 (8): 945-957.
- Bennett, E. and many authors.** 2005. Drivers of Change in Ecosystem Conditions and Services, pp 173-222 in *Ecosystems and Human Well Being Volume 2*. Millennium Ecosystem Assessment.
- Berkes, F.** 2006. The *problematique* of community-based conservation in a multi-level world. Presented at "Survival of the Commons: Mounting Challenges and New Realities," the Eleventh Conference of the International Association for the Study of Common Property, Bali, Indonesia, June 19-23, 2006.
- Berkes, F., Colding, J. and C. Folke (eds).** 2003. Navigating Social and Ecological Systems: Building resilience for complexity and change. Cambridge UK.: Cambridge University Press 388p.
- Berkes, F., Folke, C. and J. Colding.** 1998. *Linking Social and Ecological Systems: Management practices and social mechanisms for building resilience*. Cambridge UK: Cambridge University Press. 459 p.

- Biggs, R. and many others.** 2007. Linking Futures across Scales: a Dialogue on Multiscale Scenarios. *Ecology and Society* **12**(1): 17: Online
- Carpenter S.R, and C. Folke** (2006). Ecology for transformation. *Trends in Ecology and Evolution* **21**:309–315
- Chambers, R.** 2006. Social Research and Researchers in CGIAR: an Underused Potential, pp. 361-372 in *Researching the Culture in Agri-Culture: Social Research for International Development*. M.M. Cernea and A.H. Kassam (eds.) CABI Publishing.
- Cilliers, P.** 2000. What Can We Learn From a Theory of Complexity? *Emergence* **2** (1): 23-33
- Crook, R. C. and J. Manor.** 1998. *Democracy and Decentralization in South Asia and West Africa: Participation, Accountability and Performance*. Cambridge University Press. 335 p.
- Diamond, J.** 2005. *Collapse: How Societies Choose to Fail or Succeed*. Viking Press.
- Dillinger, W. and M. Fay.** 1999. From Centralized to Decentralized Government *Finance and Development* **36** (4).
- Douthwaite, B., Ekboir, J.M., Twomlow, S. and J.D.H. Keatinge.** 2004. The Concept of Integrated Natural Resource Management (INRM) and its Implications for Developing Evaluation Methods, pp 321-340 in *Natural Resource Management in Agriculture: Methods for assessing economic and environmental impacts*. B. Shiferaw, H.A. Freeman and S.M. Swinton (eds). CAB International.
- Dugan, P., Dey, M.M. and V.V. Sugunan.** 2004. Fisheries and water productivity in tropical river basins: Enhancing food security and livelihoods by managing water for fish. in *New Directions for a Diverse Planet*. Proceedings of the 4<sup>th</sup> International Crop Science Congress. 26 Sep.-1 Oct. 2004, Brisbane, Australia [www.cropscience.org](http://www.cropscience.org)
- Dugan, P., Dey, M.M. and V.V. Sugunan.** 2006. Fisheries and water productivity in tropical river basins: Enhancing food security and livelihoods by managing water for fish. *Agricultural Water Management* **80**: 262-275.
- Edwards, P., Hiep, D.D., Anh, P.M.. and G. Mair.** 2000. Traditional culture of indigenous common carp in rice fields of northern Vietnam. *World Aquaculture* **31**(4): 34-37, 39-40
- Eyben, R., Leon, R. and N. Hossain.** 2007. Participatory action research into donor-recipient relations. *Development in Practice* **17**(2): 167-178.
- Fernando, C.H.** 1993. Rice field ecology and fish culture-an overview. *Hydrobiologia* **259**:91-113.

- Fernando, C.H.** 1995. Ricefields are aquatic, semi aquatic, terrestrial and agricultural: A complex and questionable limnology, pp 121-148 in. *Tropical Limnology Vol 1. Present Status and Challenges*. K. Timotius and F. Goltenboth (eds.) Satya Wacana Christian University, Salatiga, Indonesia.
- Fernando, C.H. and M. Halwart.** 2000. Possibilities for the integration of fish farming into irrigation systems. *Fisheries Management and Ecology* **7**: 45-54.
- Fernando, C.H., Goltenboth, F., and J. Margraf (eds.).** 2005. *Aquatic Ecology of Ricefields: A Global Perspective*. Kitchener: Volumes Publishing.
- Fernando, J.L.** 2003. The Power of Unsustainable Development: What is to be done? *Annals AAPPS* **590**: 6-34.
- Folke, C.** 2007. Social-Ecological Systems and Adaptive Governance of the Commons. *Ecological Research* **22**: 14-15
- Folke, C., Colding J. and F. Berkes.** 2003. Synthesis building resilience and adaptive capacity in social-ecological systems, pp 352-387 in. *Navigating Social-Ecological Systems: Building resilience for complexity and change*. F. Berkes, J. Colding and C. Folke (eds.) Cambridge University Press. 388 p.
- Folke, C., Hahn, T., Olsson, P. and J. Norberg.** 2005. Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources* **30**: 441-473.
- Frei, M. and K. Becker.** 2005. Integrated rice-fish culture: Coupled production saves resources. *Natural Resources Forum* **29**: 135-143.
- Glavovic, B., Scheyvens, R. and J. Overton.** 2002. Waves of Adversity, Layers of Resilience: Exploring the sustainable livelihoods approach. Online. [http://www.devnet.org.nz/conf2002/papers/Glavovic\\_Overton\\_Scheyvens.pdf](http://www.devnet.org.nz/conf2002/papers/Glavovic_Overton_Scheyvens.pdf)  
Powerpoint at <http://www.caenz.com/info/2005Conf/pres/Glavovic.pdf>.
- de\_Graaf, G. and F. Marttin.** 2003. Mechanisms behind changes in fish biodiversity in the floodplains of Bangladesh. *Wetlands Ecology and Management* **11** (5): 273-280.
- Gregory, R.** 1997. The Ricefield Fisheries Handbook. Cambodia-IIRI-Australia Project, Phnom Penh, Cambodia. 41 p.
- Gregory, R. and H. Guttman.** 1996. Capture or Culture? Management of ricefield fisheries in South East Asia. *ILEIA Newsletter* **12** (2): 20-25.
- Gregory, R., Toufique, K. and Md. Nuruzzaman.** 2007. Common Interests, Private Gains: A study of co-operative floodplain aquaculture, paper presented at *International Conference on Community-based Approaches to Fisheries Management*. Dhaka, Bangladesh. March 7-8, 2007.

- Gunderson, L.H. and L. Pritchard Jr.** 2002. *Resilience and the Behavior of Large-Scale Systems*. Island Press. 269 p.
- Gunderson, L.H. and C.S. Holling** (eds.). 2002. *Panarchy: Understanding transformations in human and natural systems*. Island Press. 507 p.
- Habib, E.** 1999. Legal and regulatory issues in inland fisheries in Bangladesh. Papers presented at the national workshop on CBFM and future strategies for inland fisheries in Bangladesh. Pages 77-84. Dhaka, Bangladesh: DoF.
- Halls, A., Arthur, R., Bartley, D., Felsing, M., Grainger, R., Hartmann, W., Lamberts, D., Purvis, J., Sultana, P., Thompson, P. and S. Walmsley.** 2005. Guidelines for designing data collection and sharing systems for co-managed fisheries. Part 2 Technical Guidelines. *FAO Fisheries Technical Paper 494/2*. Rome: FAO.
- Hanna, S.S.** 1995. User participation and fishery management performance within the Pacific Fishery Management Council. *Ocean and Coastal Management 28*: 23-44.
- Hartmann, B. and J.K. Boyce.** 1983. *A Quiet Violence: View from a Bangladesh Village*. London: Zed Press and Dhaka: The University Press: 285 p.
- Harvey, D.** 2001. Response: Chaos and Complexity: Their Bearing on Social Policy Research. *Social Issues 1* (2) October 2001.  
[www.whb.co.uk/socialissues/indexvol1two.htm](http://www.whb.co.uk/socialissues/indexvol1two.htm)
- Hawken, P.** 2007. *Blessed Unrest*. New York: Viking.
- Heckman, C.W.** 1974. The seasonal succession of species in a rice paddy in Vientiane Laos. *Int. Rev. ges. Hydrobiol.* **59**: 489-507.
- Heckman, C.W.** 1979. *Rice field Ecology in Northeastern Thailand*. The Hague: Junk. 228 p.
- Holling, C.S.** 1986. The resilience of terrestrial ecosystems: Local surprise and global change. In *Sustainable Development of the Biosphere*, W.C. Clark and R.E. Munn (eds.). Cambridge University Press, Cambridge, UK.
- Holling, C.S.** 2001. Understanding the Complexity of Economic, Ecological and Social Systems. *Ecosystems 4* (5): 390-405
- Holling, C. S. and M.A. Goldberg.** (1971). Ecology and Planning. *American Institute of Planners Journal.* **37**: 221-230.
- Hongxi, W.** 1995. Introduction in *Rice-Fish Culture in China*. K.T. Mackay (ed.) Ottawa: International Development Research Centre. 264 p.
- Hossain, M.** 2003. Development through democratization and decentralization: The case of Bangladesh. *South Asia: Journal of South Asian Studies 26* (3):297-308.
- Islam Aminul, A.K.M.** 1974. *A Bangladesh Village: Conflict and cohesion*. Cambridge Mass. Schenkman Publishing Company.

- Jacobs, J.** 1961. *The Death and Life of Great American Cities*. New York: Random House.
- Jansen, E.G.** 1986. *Rural Bangladesh: Competition for Scarce Resources*. Norwegian University Press: Oslo. 351p.
- Januzi, F. T. and J. T. Peach.** 1980. *Rural Bangladesh: Competition for Scarce Resources*. Boulder: Westview Press.
- Jentoft, S.** 2005. Beyond Fisheries Management: The *Phronetic* dimension. *Marine Policy* **30**: 671-680.
- Johnson, D.** 2001. Fishy Comparisons or Valid Comparisons? Reflections on a Comparative Approach to the Current Global Fisheries Malaise, With Reference to Indian and Canadian Cases. *MAST* **1** (1):103-121
- Kassam, A.H.** 2006. Agricultural Institutions and Receptivity to Social Research: The case of the CGIAR, pp. 32-50 in *Researching the Culture in Agri-Culture: Social Research for International Development*. M.M. Cernea and A.H. Kassam (eds.) CABI Publishing.
- Kearney, J. and F. Berkes.** 2007. Communities of Interdependence for Adaptive Co-Management, pp. 191-207 in *Adaptive Co-Management: Collaboration, Learning and Multi-Level Governance*. D. Armitage, F. Berkes and N. Doubleday (eds.) Vancouver: UBC Press.
- Kooiman, J.** 2000. Societal governance: Levels, models and orders of social-political interaction, pp 138-164 in *Debating Governance*. J. Pierre (ed.). Oxford University Press: NY. 251 p.
- Kooiman, J.** 2003. *Governing and Governance*. London: Sage Publications. 249 p.
- Krishna, A.** 2003. Partnerships Between Local Governments and Community-based Organizations: Exploring the scope for synergy. *Public Administration and Development* **23** (4): 361-371.
- Leach, M. and I. Scoones.** 2006. *The Slow Race: making technology work for the poor*. London: Demos
- Lebel, L.** 2006. The Politics of Scale in Environmental Assessments, pp 37-57 in *Bridging Scales and Knowledge Systems: Concepts and Applications in Ecosystem Assessment*. W.V. Reid, F. Berkes, T. Wilbanks and D. Capistrano (eds.) World Resources Institute Staff, Millennium Ecosystem Assessment.
- Levin, S.A.** 1999. *Fragile Dominion: Complexity and the Commons*. Reading, Mass.: Perseus Books.
- Levin, S.A.** 2005. Self-organization and the emergence of complexity in ecological systems. *BioScience* **55** (12): 1075-1079.
- Levin, S.A.** 2006. Learning to Live in a Global Commons: Socioeconomic Challenges for a Sustainable Environment. *Ecological Research* **21** (3): 328-333.

- Li, T.M.** 1996. Images of Community: Discourse and Strategy in Property Relations. *Development and Change* **27** (3): 501-527
- Lovei, M. and B.S. Gentry.** 2002. *The Environmental Implications of Privatization: Lessons for developing countries.* World Bank Discussion Paper No. 426. World Bank: Washington D.C. 85 p.
- Lunberg, L. and F. Moberg.** 2003. Mobile link organisms and ecosystem functioning: Implications for ecosystem resilience and management. *Ecosystems* **6**: 87-98.
- Mahon, R., McConney, P. and R.N. Roy** 2008. Governing fisheries as complex adaptive systems. *Marine Policy* **32** (1):104-112.
- Maida, C.A.** (ed.) 2007. Sustainability and Communities of Place. *Studies in Environmental Anthropology and Ethnobiology.* Volume 5. Berghan Books.
- Mandal, M.A.S. and others** 2004. DSAP Mid term Review. July 15. 2004. WorldFish Center, Dhaka
- Manor, J.** 2007. Successful Governance Reforms in Two Indian States: Karnataka and Andra Pradesh. *Commonwealth and Comparative Politics* **45** (4): 425-451.
- March, J.G. and J.P. Olsen, 1989.** *Rediscovering Institutions.* New York: Free Press
- Marschke, M. and F. Berkes.** 2006. Exploring strategies that build livelihood resilience: a case from Cambodia. *Ecology and Society* **11** (1): 42.
- Mazid, M.A.** (2002). *Development of Fisheries in Bangladesh: Plans and Strategies for Income Generation and Poverty Alleviation.* Dhaka: Nasima Mazid. 176 p.
- Mazumder, D. and K. Lorenzen.** 1991. Developing aquaculture of small native species (SNS) in Bangladesh: village level agro-ecological changes and the availability of SNS. *Naga, the ICLARM Quarterly* **22** (3) 20-23.
- MEA.** 2005a. Ch. 7. Drivers of Change in Ecosystem Conditions and Services in Ecosystems and Human Well-being: Scenarios. Vol 2.
- MEA.** 2005b. Ch. 4. Drivers of Ecosystem Change pp 85-106 *in.* Ecosystems and Human Well Being: A framework for assessment.
- Medd, W.** 2001. What is Complexity Science? Toward and ecology of ignorance. *Emergence* **3** (1): 43-60
- Miller, G. and R. Dingwall.** (eds). 1997. *Context and Method in Qualitative Research.* Sage Publications.
- Minkin, S.F. and J.K. Boyce.** 1994. Net losses: Development drains fisheries of Bangladesh. *The Amicus Journal* Fall 1994: 36-40.
- Morgan, D.L.** 1988. *Focus Groups as Qualitative Research.* Qualitative Research Methods Volume 16. Sage Publications
- Muir, J.** 2005. Managing to Harvest? Perspectives on the Potential of Aquaculture. *Philosophical Transactions of the Royal Society B* **360** 191-218.

- Murshed e-Jahan, K. and N.M.R. Abdullah.** 2000. Welfare Impacts of Fisheries Co-Management at Oxbow Lakes in Bangladesh. Paper presented at IIFET 2000. Oregon State University.
- Naiman, R.J. and J.J. Latterell.** 2005. Principles for linking fish habitat to fisheries management and conservation. *Journal of Fish Biology* **67** (Supplement B), 166-185.
- Narayan, D. and P. Petesch** (eds.) 2002. *Voices of the Poor from Many Lands*, The World Bank. Washington, DC.
- Nguyen Khoa, S., Lorenzen, K., Garaway, C., Chamsingh, B., Siebert, D.J. and M. Randone.** 2005. Impacts of irrigation on fisheries in rain-fed rice farming landscapes *Journal of Applied Ecology* **42**: 892-900.
- Norgaard, R. B. and P. Baer.** 2005. Collectively seeing complex systems: The nature of the problem. *BioScience* **55** (11): 953-960.
- Olsson, P., Folke, C. and F. Berkes.** 2004. Adaptive Comanagement for Building Resilience in Social-Ecological Systems. *Environmental Management* **34**:75-90.
- Ostrom, E.** 1990. *Governing the Commons: The evolution of institutions for collective action*. Cambridge: Cambridge University Press.
- Ostrom, E.** 2006. Not Just One Best System: The Diversity of Institutions for Coping with the Commons, pp 329-360 in *Researching the Culture in Agri-Culture: Social Research for International Development*. M.M. Cernea and A.H. Kassam (eds.) CABI Publishing.
- Peterson, G.D., Cumming, G.S. and S.R. Carpenter.** 2003. Scenario planning: A tool for conservation in an uncertain future. *Conservation Biology* **17**: 358-366.
- Pierre, J.** (ed) 2000. *Debating Governance*. Oxford University Press: NY. 251 p.
- Powell, M.** 2006. Which knowledge? Whose reality? An overview of knowledge used in the development sector. *Development in Practice* **16**(6): 518-532.
- Prebble, J.** 1969. *The Highland Clearances*. Harmondsworth: Penguin.
- Prein, M.** 2002. Integration of aquaculture into crop-animal systems in Asia. *Agricultural Systems* **71**: 127-146.
- Prein, M. and M. Ahmed.** 2000. Integration of aquaculture into smallholder farming systems for improved food security and household nutrition. *Food and Nutrition Bulletin* **21**(4): 466-470.
- Prein, M. and M. Dey.** 2003. Community-based integrated aquaculture-agriculture systems in Bangladesh. Paper presented at the *CGIAR Challenge Program on Water and Food Consultation on Research Priorities in Aquatic Ecosystems and Fisheries in the Indo-Gangetic Basin*. BARC and WorldFish Center, 21-22 December 2003, Dhaka Bangladesh

- Rocheleau, D.** 1994. Participatory research and the race to save the planet: Questions, critique, and lessons from the field *Agriculture and Human Values* **11** (2/3): 4-25
- Ruddle, K.** 1982. Traditional integrated farming systems and rural development: The example of ricefield fisheries in Southeast Asia. *Agricultural Administration* **10**: 1-11.
- Runge, C.F. and E. Defrancesco.** 2006. Exclusion, Inclusion, and Enclosure: Historical Commons and Modern Intellectual Property. *World Development* **34** (10): 1713-1727
- Ruitenbeek, J. and C. Cartier.** 2001. The Invisible Wand: Adaptive Co-management as an emergent strategy in complex bio-economic systems. CIFOR Occasional Paper No. 34. Bogor, Indonesia.
- Sakia, A.** 2004. Indigenous control and sustainability of common resources in the hills of North East India. Paper presented at IASCP, Oaxaca. Mexico 2004.
- Samaddar, A.** 2006. Traditional and Post-traditional: A Study of Agricultural Rituals in Relation to Technological Complexity among Rice Producers in Two Zones of West Bengal, India. *Culture & Agriculture* **28**(2):108-121.
- Sarkar, A.E.** 2003. The Illusion of Decentralization: Evidence from Bangladesh. *International Journal of Public Sector Management* **16** (7): 523-548.
- Savory, A.** 1999. *Holistic Management: A New Framework for Decision Making*. Island Press
- Scoones, I.** 1999. New Ecology and the Social Sciences: What prospects for a fruitful engagement? *Annual Review of Anthropology* **28**: 479-507
- Scott, J.C.** 1976. *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia*. Yale University Press: New Haven.
- Scott, J.C.** 1998. *Seeing Like a State. How Certain Schemes to Improve the Human Condition Have Failed*. Yale University Press: New Haven.
- Shearer, A.W.** 2005. Approaching scenario-based studies: three perceptions about the future and considerations for landscape planning. *Environment and Planning B: Planning and Design* **32**(1): 67- 87
- Shivji, I.** 2002. Village governance and common pool resources in Tanzania. *Common Pool Resource Policy Paper 3*. Cambridge: Department of Geography, Cambridge University.
- Sneddon, C.** 2007. Nature's Materiality and the Circuitous Paths of Accumulation: Dispossession of Freshwater Fisheries in Cambodia. *Antipode* **39** (1): 167-193.

- Soefftestad, L.T.** 2000. Riparian Right and Colonial Might in the Haors Area in Northeast Bangladesh. Presented at "Constituting the Commons: Crafting Sustainable Commons in the New Millennium," the Eighth Conference of the International Association for the Study of Common Property, Bloomington, Indiana, USA, May 31-June 4, 2000.
- Strathern, M.** 1991. *Partial Connections*. Association for Social Anthropology in Oceania. Special Publications No. 3. Savage, M.D: Rowman and Littlefield.
- Stout, D.** 1998. The Use and Abuse of Scenarios. *Business Strategy Review* 9 (2): 27-36
- Sugunan V.V., Prein M, and M.M. Dey** (2006) Integrating Agriculture, Fisheries, and Ecosystem Conservation: Win-Win Solutions. *International Journal of Ecology and Environmental Sciences*, 32 (1), 3 - 14
- Sultana P. and P.M. Thompson.** 2003. *Methods of consensus building for community based fisheries management in Bangladesh and the Mekong delta*. CAPRI Working Paper 30. Washington DC: IFPRI. (also available at <http://www.capri.cgiar.org/pdf/capriwp30.pdf> )
- Sultana, P. and S. Abeyasekera.** 2008. Effectiveness of Participatory Planning for Community Management of Fisheries in Bangladesh. *Journal of Environmental Management* 86: 201-213.
- Thompson, P. M.** 2004a. *Lessons from Community Based Fisheries Management in Bangladesh*. Briefing Paper. CBFM and The WorldFish Center. March 2004. 22p.
- Thompson, P. M.** 2004b. *Impacts of the Community-based Fisheries Management Project Phase 1*. CBFM-2 Working Paper 11. Dhaka: The WorldFish Center.
- Thompson, P.M., P. Sultana and A.K.M. Firoz Khan.** 2005. *Aquaculture Extension Impacts in Bangladesh: A Case Study from Kapasia, Gazipur*. The WorldFish Center Technical Report 63, 75 p.
- Tubtim, N. and P. Hirsch.** 2005. Common property as enclosure: A case study of a backswamp in Southern Laos. *Society and Natural Resources* 18: 41-60.
- Tyler, S.R.** 2006. Comanagement of Natural Resources: Local Learning for Poverty Reduction. IDRC: Ottawa.
- Vatn, A.** 2001. Environmental resources, property rights, and efficiency. *Environment and Planning C: Government and Policy* 19: 665-680.
- Walker, B., C.S. Holling, S. R. Carpenter, and A. Kinzig.** 2004. Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society* 9 (2): 5. [online] URL: <http://www.ecologyandsociety.org/vol9/iss2/art5/>
- Walters, B.B., Cadelina, A., Cardano, A. and E. Visitacion.** 1999. Community History and Rural Development: Why some farmers participate more readily than others. *Agricultural Systems* 59 (2): 193-214.

- Walters, C. J.** 2007. Is adaptive management helping to solve fisheries problems? *Ambio* **36** (4): 304-307
- Walters, C. J.** 1986. *Adaptive Management of Renewable Resources*, New York. McGraw Hill
- Watts, M.J.** 1993. Development 1: power, knowledge and discursive practice. *Progress in Human Geography* **17**(2): 257-272.
- Watts, M.J.** 1994. Development 2: the privatization of everything? *Progress in Human Geography* **18** (3): 371-384
- Welcomme, R.L.** 1979. *Fisheries Ecology of Floodplain Rivers* London and New York: Longman.
- Wenger, E., McDermott, R. and W.M. Snyder** (eds.) 2002. *Cultivating Communities of Practice*. Boston, Mass: Harvard Business School Press.
- White, S.C.** 1992. *Arguing with the Crocodile: Gender and Class in Bangladesh*. London: Zed Books Ltd. 186 p.
- Wilbanks, T.J.** 2006. How Scale Matters: Some Concepts and Findings, pp 21-35 in *Bridging Scales and Knowledge Systems: Concepts and Applications in Ecosystem Assessment*. W.V. Reid, F. Berkes, T. Wilbanks and D. Capistrano (eds.). Millennium Ecosystem Assessment. Island Press.
- Wilson, D.C., Ahmed, M., Siar, S.V. and U. Kanagaratnam.** 2006. Cross-scale linkages and adaptive management: Fisheries co-management in Asia. *Marine Policy* **30**: 523-533.
- Wollenberg, E., Edmunds, D. and L. Buck.** 2000. Using scenarios to make decisions about the future: anticipatory learning for the adaptive co-management of community forests. *Landscape and Urban Planning* **47**: 67-77.
- Young, O.R.** 2006. Vertical Interplay among Scale-dependent Environmental and Resource Regimes. *Ecology and Society* **11** (1): 27

**Appendix A: Open Ended Questions (fishing)**

<b>Personal Survey Questions</b>	<b>Response</b>
<b>How long have you been fishing in Soliamari/Gheramari Beel?</b>	Average is 18 years; One man has fished for 20 yrs but only commercially for 2-3 years
<b>How often do you fish here? Ex. daily, weekly, only when fish are needed?</b>	People fish here daily, whenever they can find time or when they need money for emergencies
<b>How far do you travel to get here?</b>	Very local 0.5-2 <sup>km</sup> travel distance; 5 <sup>km</sup> is the longest
<b>Do you fish in any other beels? Which ones? How far away are they?</b>	Fishers use all surrounding water bodies, which is comprised of 5 other main fishing beels. There is a preference for those beels close household. Older fishers stay at a close or preferred site
<b>How important is fishing to your livelihood? Does it supply food and/or cash? How much of each? (% of total income)</b>	Fish is very important as daily food and/or income from fish; Money for children's education, up to %80 of income from fishing (1)
<b>How have you seen the fishing change over the years? (catch/fish size declines, species loss....). What are the reasons for this change?</b>	Many more people are fishing; Fishing was a lot better 7-10 yrs ago (1/7-1/10); Extirpated fish species, reduction in size and numbers caught; many favourite species lost, destruction of breeding habitat through dewatering and digging every fish from the mud;
<b>Do other members of your family fish here also? Do you ever fish with other Ghosti members as a fishing team?</b>	They generally fish alone or with sons; only rarely (2 respondents) fish with a Ghosti team; or fish with a professional pond-fishing team (1)
<b>In your own words, describe the significance of Soliamari/Gheramari Beels to you.</b>	Free access is important; There are other more productive beels so the loss of Sholiamri is not so crucial. Gheramari Beel is much more important to the local fishers.
<b>How does the stocking of this beel affect your livelihood? Do you see possible positive results?</b>	The understand they cannot fish in the fenced area, they are losing fishing area, the younger respondents are more positive in that they may be able to work for the project as harvesters or imitate the project in their own areas to make money; older people are worried that fencing may happen in all beels in the area.

n=25, ages varied between 18-70.

The respondents included both landless fishers or farmers/part-time fishers

## **Appendix B: Open Ended Questions (Actors/Issues/Informants)**

### **The Stakeholder Analysis**

1) Who are the principle stakeholders in seasonal floodplain aquaculture?

*(These may include; large and small farmers, landless (male/female), professional and subsistence fishers; landowners-elites, fish sellers/marketers.; external agents of change (community organizers., champions)*

2) Which groups have been excluded?

*(The rural elites are excluded from any formal discussions, they should be considered and included from the beginning. The very poor (ie. do not belong to any group, may not fish).*

1. What is the process for identifying stakeholders?
2. Under what and whose selection criteria will they be considered stakeholders?
3. What are the critical discriminating features that allow us to differentiate the groups of stakeholders?

*This may be influenced by waterbody shape/use, human settlement pattern (villages on the periphery of the beel, nest to roads etc.) and the extent of fish mobility (impeded by infrastructure or sluice gate policies and operation?*

4. What are the factors that stakeholders perceive as being within and outside of their control (exogenous and endogenous)

*(These are factors or drivers are a key aspects of building the scenarios.)*

5. What are the barriers and constraints to communication and collaboration between the different stakeholder groups?

*(Are there common objectives for establishing co-management? Find this out via focus group discussions)*

6. What are the main resource coalitions?
7. What goals/interests do these coalitions share?
8. What are the conflicts of interest, which organizations are in conflict and why?
9. Which stakeholders are excluded from these coalitions and what are the consequences of this?
10. How did the roles of key organizations and/or outsiders ( traditional authority, researchers, NGOs) change over project duration?

## **Issue Analysis**

What are the critical issues?

*As they relate to the management of the aquatic resources (sector focus, ie. going beyond the focus of increasing floodplain productivity) of the seasonal floodplains.; especially those which influence the effective formation of CBOs and key horizontal and vertical linkages (political self interest, greed, clientelism/patronage). Are there moral issues between resource users and the perceived state or treatment of the resource of overall aquatic environment?*

11. How do they relate to one another?
12. At what spatial and temporal scale do they occur?
13. For which stakeholder groups are these issues critical? What about adjacent floodplain communities?
14. How does the resolution of these issues come together in a vision for the future?

*Conflict resolution should be a part of the co-management arrangement and reflect the different interests of the different stakeholder groups. ex. How do they overcome conflicts associated with different types of institutional enclosures.*

*Once key stakeholders and corresponding issues are defined, researchers describe the relevant policies and governance structures that constrain or facilitate local capacity to cope with such issues.*

What are the key policies affecting the capacity of local stakeholders to sustainably manage their natural resources?

*Policies regarding land ownership/water resources as exclusively state owned (very reluctant to give up revenue source. These sources are more important at the local scale. Fisheries lease revenues contribute little to national accounts. Policies on access and control*

15. At what level are these policies formulated and implemented? National, District
16. How do informal and formal governance structures affect local capacity to adapt to and deal with stresses?
17. At what level are these governance structures formulated and implemented?

## **POTENTIAL FIELD QUESTIONS:**

### **Key Informants**

What changes (agriculture/fisheries/policy/ government) are the most important?

What groups were most influential? and now?

What groups or organizations in your field work best together?

### **Individual Respondents**

In your words what has changed in the local fisheries and agriculture here in the last 5- 10 years?

What aspects of your life have improved over the past 5 years? What aspects have gotten worst? Why do you think these changes have happened?

(Indicators of well-being, for ex. land holdings increase or decrease)

*What are some of the problems you faced in the seasonal floodplains before the project and now since being a part of it? Have the behavior of your friends and family changed since the project started?*

Why do you think being part of this project is important?

What how could the government agencies do more to help floodplain fishers?

Where or how do you receive information about new aquaculture ideas?  
Do you visit with other farmers/fishers at their farm/home?

What social or community groups or memberships do you belong to?

What do think the future holds for your farm and village? Do you see your involvement in floodplain aquaculture farming increasing? (open about the future)  
What would you like to do next?

What would you like to see your village plan to do next?

What are the different perceptions of project stakeholders on the possible project costs/benefits?

Are their any risks in participating or not with this project?

**Officials:**

What is your title and main responsibilities related to this project?

What are your general impressions of the objectives of the project?

What are you professional opinions about these type of aquaculture systems? What are some of the positive and negative aspects of implementing this type of aquaculture ?

What aspects of the project would you like to see improved? How would you do it?

What future role would you like to have?

Co-management is a partnership with shared responsibilities and rights between government, fishermen and other stakeholders. What do you find useful from these types of partnerships?  
What needs to done to establish successful partnerships here?

*(Linking land use change with other sectors and livelihood pluralism; Livelihood diversity; range of different actors and conflict of interests; multi-scale social forces results in complex land-use linkages.)*

What is the role of political and financial power in constructing access rules to beel/ricefield fisheries resources for the rural poor?

How do local policy, legislation and institutions affect floodplain/ricefield resource management?

What social-ecological factors influence or impact the three key aspects of adoption, sustainability and equity (WorldFish guidelines)?

*For example: kin/gusti relationships; ability to form coalitions or leasing groups to get leases for jahlmohals; The sub-lease market; hierarchical relationships with DoF and other resource authority figures; on going poverty/ land use pressure; caste/religion*

What are the potential social implications of the project interventions on the different poor or landless stakeholders?

How are patterns of access to resources by different stakeholders influenced by project interventions?

Are informal institutions creating any opportunities to build upon? What are the most effective institutions and key linkages, fostering opportunity and innovation?

### **Fishers**

\*name, gender, age, primary occupation, Ghosti

- 1) How long have you been fishing in Soliamari/Gheramari Beel?
- 2) How often do you fish here? Ex. daily, weekly, only when fish are needed?
- 3) How far do you travel to get here?
- 4) Do you fish in any other beels? Which ones? How far away are they?
- 5) How important is fishing to your livelihood? Does it supply food and/or cash? How much of each? (% of total income)
- 6) How have you seen the fishing change over the years? (catch /fish size declines, species loss). What do you think are the reasons for this change?
- 7) Do other members of your family fish here also? Do you ever fish with other Ghosti members as a fishing team?
- 8) In your own words, describe the significance of Soliamari/Gheramari Beels to you.
- 9) How does the stocking of this beel affect your livelihood? Do you see possible positive results?