UNDERSTANDING LIVELIHOODS DEPENDENT ON INLAND FISHERIES IN BANGLADESH AND SOUTHEAST ASIA
(DFID/FMSP Project R8118)

BANGLADESH COUNTRY STATUS REPORT

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Abbreviations and Acronyms

ADB	:	Asian Development Bank
ADC	:	Additional Deputy Commissioner
Aratdar	;	Fish trader
BAU	:	Bangladesh Agricultural University
BBS	:	Bangladesh Bureau of Statistics
BCAS	:	Bangladesh Centre for Advanced Studies
Beel	:	A depression in the floodplain which retains water for all or part of the year
BFDC	:	Bangladesh Fisheries Development Corporation
BFRI	:	Bangladesh Fisheries Research Institute
BKB	:	Bangladesh Krishi Bank
BOD	:	Biological Oxygen Demand
BRAC	:	Bangladesh Rural Advancement Committee
BSKB	:	Barni Selimpur Kola Basudevpur (a *beel*)
BWDB	:	Bangladesh Water Development Board
CBFM	:	Community Based Fisheries Management
CB-NRM	:	Community-Based Natural Resources Management
CBO	:	Community Based Organization
Charland	:	Land which has recently emerged from the river due to deposition
CIDA	:	Canadian International Development Agency
CNRS	:	Centre for Natural Resources Studies
CPP	:	Compartmentalization Pilot Project
CPR	:	Common Pool Resource (e.g. open waters)
current jal	:	(illegal) fine mesh fishing net (Net made of monofilament synthetic fibre)
Dadondar	:	Money lender
D.C.	:	Deputy Commissioner
DFID	:	Department for International Development of the United Kingdom
DFO	:	District Fishery Officer
DOF	:	Department of Fisheries
DU	:	Dhaka University
ERR	:	Economic Rate of Return
FAO	:	Food and Agriculture Organization of the United Nations
FAP	:	Flood Action Plan
FCD/I	:	Flood Control and Drainage and Irrigation
FFP	:	Fourth Fisheries Project
GDP	:	Gross Domestic Product
GO	:	Government Organization
Haor	:	Big depression or low-lying area in north-east Bangladesh which is inundated during rainy season and become a vast sheet of water. In the *haors* a *beel* is a deeper area or pocket where water remains throughout the year or for a longer period.
HES	:	Household Expenditure Survey.
Hilsa	:	Indian shad (*Hilsa ilisha*). An anadromous fish of commercial importance
HYV	:	High Yielding Variety
ICLARM	:	International Centre for Living Aquatic Resources Management (now named WorldFish Centre)
IFAD	:	International Fund for Agriculture Development
IUCN	:	International Union for Conservation of Nature

Jalmohal	:	Section of river, individual or group of *beels* (depression), or individual pond owned by the government but leased out for fishing. They are also called *Jalkar*, or Fishery.
Khas	:	Land (and waterbodies) owned by Government, usually leased out
LGRD	:	Local Government and Rural Development
Mohajan	:	Money lender
MACH	:	Management of Aquatic Ecosystem through Community Husbandry
Mastan	**:**	***'Influentials' (powerful people)***
MFA	:	Marine Fisheries Academy
MOA	:	Ministry of Agriculture
MOEL	:	Ministry of Environment and Forestry
MOFL	:	Ministry of Fisheries & Livestock
MOF	:	Ministry of Finance
MOL	:	Ministry of Land
MOWR	:	Ministry of Water Resources
MOYS	:	Ministry of Youth & Sports
MPO	:	Master Plan Organization
NFMP	:	New Fisheries Management Policy
NFP	:	National Fisheries Policy
NGO	:	Non-Government Organization
NRM	:	Natural Resources Management
PC	:	Planning Commission
PAPD	:	Participatory Action Planning for Development
PIPs	:	Policies, Institutions and Processes (as in DFID's Sustainable Livelihoods Framework)
PRA	:	Participatory Rural Appraisal
RHD	:	Roads and Highways Department
RRA	:	Rapid Rural Appraisal
SPARSO	:	Space Research And Remote Sensing Organization.
Sundarbans	:	Large mangrove forest area in southwest Bangladesh
TV	:	Television
TFP	:	Third Fisheries Project
UFO	:	*Upazila* Fishery Officer
UNDP	:	United Nations Development Programme
UNO	:	*Upazila Nirbahi* Officer
Upazila	:	Sub-district
USAID	:	United States Agency for International Development
VCP	:	Video Cassette Player
WARPO	:	Water Resource Planning Organization
WB	:	World Bank
Zamindar	:	Landlord (who holds land)

Executive Summary

Background

The Country Status Report of Bangladesh is an output of the project "Understanding Livelihoods Dependent on Inland Fisheries of Bangladesh, Cambodia, Vietnam and Laos" financed by DFID and led by WorldFish Center. This report gives an overview of the livelihoods of those who depend on inland capture fisheries including threats to, and opportunities for improvement in, their livelihoods. The report also aims to identify information gaps in understanding livelihoods and resources.

The report has been prepared on the basis of:
(i) the existing literature on inland fisheries,
(ii) discussions with secondary stakeholders (government, NGOs, etc.), and
(iii) knowledge, experience and views of the authors.

The report includes sections describing the geographic context and country-level livelihood indicators, fisheries resources status and trends, legal institutions and policy issues for conservation and management of inland fisheries, livelihoods in the context of inland fisheries, and gaps in information required to understand livelihoods and fisheries resources.

Bangladesh, with a total population of about 130 million, is one of the most densely populated countries in the world (average of 876 person per sq. km). The economy, which has traditionally been agro-based, is becoming more diversified through development of the industrial sector. The agricultural sector, which includes fisheries contributes about 24% to GDP (down from 30% in 1991), of which the fisheries sector contributes 6% (BBS, 2001).

Industrial development has focused upon export oriented commodities, the promotion of small cottage industries, and employment generation to alleviate poverty. Major export oriented industries are the jute, shrimp, and garment industries. Major economic policy reform has included the adoption of a free market economy, the impact of which is mixed. Decentralization of power and authority to the local level and people's participation in policy formation and implementation are the policy strategy of the Government.

Poverty

About 44.3% of the population are regarded as 'poor' (energy intake less than 2122 k.cal) of which 20% are considered 'hard core poor' (energy intake less than 1805 k.cal). In recent decades, the proportion in poverty has declined, but due to the rate of population increase, the absolute number of those in poverty remains high.

Presently, the national literacy rate is 53% compared to 32% in 1991 and 18% in 1979. Literacy among women is also increasing but remains lower than among men. Between 1976 and 2000 life expectancy rose from 56.6 to 61 years due to decreases in infant mortality, in the crude birth rate, and in the mortality rate of children (currently 57 per 1000 live births).

People's access to clean drinking water, sanitation, electricity and communications has also improved. However, there has been a significant decline in per capita land availability and increase of landless as a result of population growth (World Bank, 2001).

About 70% households depend on some form of credit from institutional or private sector providers. Possessing collateral determines access to formal credit. NGOs are a major source of collateral-free supervised credit to poor rural people for income generating activities.

Fisheries trends

The fisheries sector (marine and inland fisheries) plays a vital role in the country's economy contributing 6% to export earnings and 63% of animal protein to people's diets. The sector provides full time employment for 1.2 million people. A further 11 million people are engaged in part-time fishing, fish trading, food processing, making fishing equipment, fish and shrimp farming and hatchery and nursery operation, and working as fishery labourers. In addition approximately 70% of the rural population fish for subsistence needs.

Bangladesh has 4.0 million ha of inland waters and about 0.38 million ha of ponds under aquaculture. Annual fish production for 2000-2001 was 1.78 million MT, of which 0.69 million m. tonnes (38.7%) came from inland capture fisheries, 0.71 million ton (40%) from aquaculture and 0.38 million tonnes (21.3%) from marine fisheries (DOF, 2002). Inland capture fisheries are classified as follows:

(i) Riverine fisheries in the major, secondary and tertiary rivers and canals, including estuary and Sundarban forest area.
(ii) *Beel/Haor* fisheries in depressions - perennial and seasonally isolated waterbodies, where fish accumulate when flood waters recede.
(iii) Floodplain fisheries in seasonally flooded areas which retain water for 3-5 months.
(iv) Reservoir fishery in Kaptai Lake built in 1991 for hydro-electric power generation in the southeast of the country.
(v) Ox-bow lake fisheries: culture based enhanced fishery in abandoned courses of rivers in the south central and southwest regions.

Inland fish production and total production declined from mid 1960s (when 90% of the catch was from inland capture fisheries) up to 1975-76. After 1976 overall fish production showed an upward trend as a result of production developments in aquaculture and marine fisheries. However, inland fish production continued to decline until 1990. After this (according to DOF) it has shown a slow upward trend, although other sources and estimates based on national fish consumption and expenditure and local studies indicate declining inland fish catches.

During the 1960s to 1980s, increasing rice production through cultivation of HYV rice particularly in the dry season, small scale irrigation and large scale flood control, drainage and irrigation projects dominated rural development. This increased food production and the country is now self-sufficient in food-grain. On the other hand these activities have had a negative impact on aquatic ecosystems and resources.

Due to over fishing, fish habitat loss or degradation, siltation of water bodies, water pollution, reduction of water flow in the major river system, inland fish stocks have declined significantly and fish biodiversity has been affected with changes in fish species composition. Some 54 species of fish are currently threatened in Bangladesh, of which 12 species are critically endangered (IUCN 1990). Between the mid 1960s, and the mid 1980s about 0.8 million ha of floodplain were lost due to FCD/FCDI projects, this trend has continued and is believed to have seriously affected small scale inland fisheries particularly more valuable species that make local migrations.

The combination of habitat loss and high population pressure is reducing access to fish for poor people – both subsistence fishers and professional fishers. Thompson et al. (2002) report substantial declines in frequency of fishing and catch per day for landless households in one area during the 1990s, these people now buy most of the fish they eat, but cannot afford as much fish as they once could catch for free. Government has focused on aquaculture and the poor are now more dependent on buying cultured fish (Silver Carp and Thai Sharputi for example). Other studies doubt that human activities have substantially affected inland fisheries to date and argue that these fisheries based on small species are very robust (Craig et al. in press).

The current development strategy for the fisheries sector is to: increase fish production through the protection, conservation and better management of inland open-water fisheries; develop marine fisheries through deep sea fishing by trawlers and mechanization of coastal and inshore fishing; and develop freshwater aquaculture through strengthening of extension services. The latter has received most emphasis.

Fishery policy changes

The East Bengal Tenancy Act 1950 abolished the landlord system and private ownership rights to land and waterbodies were transferred to the Government. All water bodies/fisheries (rivers, beels, oxbow lakes, canals, reservoirs, etc.), except flooded land, man-made ponds and shrimp farms, are state property controlled by Government and administered by the Ministry of Land (MOL) who leases out these waterbodies known as *jalmohals*. The Government's present lease policy is to give priority to registered fisher cooperative societies but if none makes a high enough bid to follow an open auction. Lease periods are for 3 years for closed waterbodies, since 1996 "open *jalmohals*" (rivers and canals) are no longer leased and have been open access. The minimum lease value for a fishery is fixed by adding 25% to the average of the last 3 lease term values and then an additional 10% increase every year. In 1984 all closed *jalmohals* of up to 20 acre (8 ha) were transferred to *Upazila Parishad* (Local Government) for management, and were transferred again in 1997 to Ministry of Youth and Sports.

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Although the intention of the leasing policy is to favour fishing communities, in most cases fishers have limited access because their poverty, poor organisation and the influence of powerful groups prevents them from bidding effectively for leases. Sometimes powerful people form a fake cooperative society to secure the lease of a *jalmohal,* or sometimes they pay the lease money on behalf of the society and control the fishery, with the fishers work either on contract/share basis or as labourers.

Institutions and agencies

MOFL is the lead agency responsible for formulating fishery policy, development and management strategies. Under MOFL the following agencies are involved in fisheries:

(i) Department of Fisheries (DOF), responsible for management, development, training, extension, enforcement of regulation,
(ii) Bangladesh Fisheries Development Cooperation (BFDC), responsible for marketing and creating marketing and landing facilities,
(iii) Bangladesh Fisheries Research Institute (BFRI), responsible for undertaking field needs-based research,

(iv) Marine Fisheries Academy (MFA) responsible for training of cadets for marine fishing vessels.

Among other agencies involved in the fisheries sector, the Ministry of Land (MOL) is the most important and is responsible for lease management of all water bodies (fisheries) above 20 acre (8 ha). Ministry of Youth and Sports (MOYS) is responsible for management of all closed waterbodies up to 20 acres, *Union Parishad* manages waterbodies up to 3 acres (1.2 ha) for use as common property resource for drinking water, bathing, fishing, jute retting etc. Other Government agencies with activities which impinge on fisheries (habitat, financing, socio-economic, etc.) include the Ministry of Water Resources, Bangladesh Water Development Board, Ministry of Environment and Forest, Ministry of Education, Ministry of Local Government, Rural Development and Cooperatives, Ministry of Finance. Additionally NGOs and CBOs are also involved in fisheries management and development activities. All Government agencies involved have developed their own policies, institutions and laws which lack coherence and sometimes adversely affect the fisheries resources and the fishers' interest.

The Protection and Conservation of Fish Act 1950 with amendments and rules is exclusively applicable to inland capture fisheries. The Marine Fisheries Ordinance 1983 and rules are partly applicable for estuarine areas. The main features of the Protection and Conservation of Fish Act 1950 are: prohibition on the size of fish at catch, on the use of certain gear and mesh size, on destructive fishing by explosive, gun etc. or by dewatering and placing barrier on the migration routes of fish.

The Government adopted a National Fisheries Policy in 1998 with the following objectives:

1. Development of fisheries resources and increase in fish production.
2. Poverty alleviation through creation of employment opportunities and improvement in the socio-economic condition of the fisher community.
3. Meet the demand for animal proteins and improve public health.
4. Increase foreign exchange earning and economic growth through the export of fish products.
5. Maintain environmental balance, protect of biodiversity..

The *Jalmohal* leasing management policy of the MOL provides the principles and norms for leasing *Jalmoha*l/fisheries. However, the lease management policy is mainly for the collection of revenue for the Government and is against the principles of biological management of fisheries resources and the rights and interests of the fishing community. To ensure biological management of fisheries resources and establish the right of fishers to *Jalmohals* a licensing system was tested under the New Fisheries Management Policy in 1986 in selected locations, but this had limited achievements and effectively ended in 1996 since when project based approaches involving communities have been adopted.

The Ministry of Water Resources' present policy gives due consideration to the fishery sector, though its past policy was against the interests of fishers. The Environment Policy of the Ministry of Environment and Forest, 1992 has provided sufficient coverage for ensuring congenial environment for fish and protection of biodiversity. The current Land use policy of the MOL (2001) is designed to ensure conservation of the usual fish production area and discourage conversion of water bodies to agriculture.

Fishers livelihoods threats and opportunities

The contribution of inland capture fisheries to the livelihoods of the rural poor of Bangladesh is historically very significant. Increased landlessness and poverty due to rapid population growth has caused serious fishing pressure leading to depletion of fish stocks, which in turn has adversely impacted on the livelihoods of those directly dependent on inland fisheries. The primary stakeholders who are directly dependent on inland fishers are (i) fishers, (ii) fish and shrimp fry collectors, (iii) fish traders, (iv) fish processors, (v) fishing equipment makers, (vi) fish hatchery and nursery operators, (vii) fishery workers and (viii) money lenders/ leaseholders.

Most fishers are poor, landless and disorganized, with low social status and exploited by the rich and powerful. Fishers' access to fishing sites is limited because of their poverty, lack of organization and capacity. They also do not have access to institutional credit due to inability to provide collateral and consequently they are dependent on private sources of credit at higher rates of interest - about 10 times the rate of institutional credit. In recent years they are getting financial and social support from NGOs. Government policies have provision for fishers access to resources and credit, but in reality they do not get these because of their poverty and lack of organized forum.

A major constraint in fishing communities is their lack of financial and social empowerment. In the public sector a major weaknesses are the lack of enforcement of fisheries resources' protection and conservation laws, the lack of implementation of biological management of fisheries and the poor coordination among different agencies involved in the fisheries sector. There has been a recent move towards community based fisheries management approaches aimed at social and financial empowerment of fishing communities with public sector's support and linked up with local initiatives to conserve fish stocks for sustainable exploitation. While this has shown some positive changes locally the long-term sustainability of such institutions and fishery management is not yet known.

Workshop outputs

The national workshop for the study identified from secondary stakeholders in government and non government sectors several opportunities and challenges for improving livelihoods dependent on aquatic resources.

1. Reform of the leasing system to ensure long term access for fishers at fair lease rates.
2. Regulatory systems for open access rivers.
3. Rivers are drying up.
4. Seasonal rice fields give an opportunity for aquaculture.
5. Non fish aquatic resources are more important than has been recognised.
6. Given the shrinking floodplain and growing urban area there is scope to diversify in the sector and for high value products e.g. fish.
7. Provide a comparative analysis of alternative scenarios for floodplain development, e.g. flood control and rice versus open water fisheries in monsoon to guide planning based on total value.

It also identified some possible priorities for research:

1. Adopt a holistic approach in research (livelihoods).
2. Legal and institutional gaps for CBFM.
3. Areas of fish and wetland resources, their status, access, security of use, and legal versus actual status.

4. Valuation of wetland use and of improved wetland management (benefit and costs of habitat restoration etc.,) and how much benefits go to poor people.
5. Security issues of resources and users – resource, access, musclemen, security etc. lack of incentives to invest.
6. Changing professions of traditional fishers.
7. Impacts of trans-boundary changes on livelihoods of poor fishery dependent people.
8. Indigenous knowledge and good practices in fishery management and conservation
9. How best to inform policy makers, and how to harmonise policies affecting wetlands/fisheries.
10. Research to determine which is the main factor in openwater fisheries decline – extraction or environmental changes?
11. Compare and assess alternative systems including: open access, leasing, CBFM, etc for their impacts on the resource, on poverty, etc. Which system gives more revenue, fair/equitable distribution benefits, maximum catch etc?

1. INTRODUCTION

1.1 Background to study

The Department for International Development (DFID) of the United Kingdom has identified fisheries as an entry point for its strategic policy of reducing by 50% the number in extreme poverty by 2015 – a challenge of the 21st century. The fisheries sector can have a significant impact on the number of those in poverty in those countries where there is significant inland aquatic resource base and a considerable number of poor people who are dependent on these resources, and who are disproportionately disadvantaged due to loss and degradation of habitat, lack of management or mismanagement of the resource, or inappropriate institutional and policy frameworks.

In particular DFID has identified inland fisheries as a valid entry point through which the livelihoods of poor people in the South and South East Asian countries of Bangladesh, Cambodia, Vietnam and Laos, where there are important inland fisheries resources and where a considerable portion of the population are dependent on these for their livelihoods, can be improved. Before taking any measure to improve the livelihoods of those who are dependent on inland fisheries, detailed information regarding resource status and management regimes, and an understanding of their livelihood status, needs, problems and constraints etc., are needed. In view of the above a research project entitled "Understanding Livelihoods Dependent on Inland Fisheries (capture) in Bangladesh, Cambodia, Vietnam and Laos", and financed by DFID, has been implemented by the WorldFish Centre (formerly ICLARM) in collaboration with Governments, NGOs, and Universities in the target countries. BCAS has been sub-contracted to implement the Bangladesh part of the project as local partner organization. The project period is from February 2002 to January 2003.

The purpose of the project is to characterise the poor, identify their dependence upon aquatic resources, the nature and status of those resources, and the poor's vulnerabilities in relation to loss or mismanagement of the resource. The project will prioritise constraints and identify possible research priorities through consultations with categories of poor people, other aquatic resource users and other organizations. It will match this information against a classification and synthesis of fisheries resources and research to identify critical areas and researchable problems requiring further study. It will evaluate the impact of relaxing key constraints for the poor and any further constraints.

In order to achieve the objectives the following activities have been envisaged under the project:

1) Preparation of a Country Status Report (the present report) on the basis of a:
   - (i) review of literature on aquatic resources , resource conservation and management including legal, institutional and policy issues;
   - (ii) identification of primary stakeholders in the inland fisheries sector and pattern of their dependence on aquatic resources;
   - (iii) discussion with secondary stakeholders in the fisheries sector; and
   - (iv) identification of gaps in information required to understand the resources and livelihoods of those who are dependent on inland fisheries.

2) PRAs with representatives of different primary stakeholder groups in order to assess livelihood status including analysis of their livelihood strategies, resource use and linkage, and the opportunities and constraints in their livelihoods.

3) Preparation of a national report on PRA.

4) Holding of a regional workshop for comparative analysis of reports and findings among collaborating countries.

5) Holding of National workshops to discuss and disseminate findings and the preparation of summary findings in national languages for dissemination through existing networks.

1.2 Methodology for Preparation of this Report

This report has been prepared on the basis of existing literature, discussions with secondary stakeholders and the experience of the authors. It focuses primarily on literature dealing with livelihoods dependent on inland fisheries.

Literature has been collected from different Government organizations (BBS, DOF, MOFL, MOL, MOWR, MOEF, MOA, PC) and international organizations (DFID, FAO, UNDP, WB, ADB), and from national and international NGOs, universities, and research organizations. A list of the secondary stakeholders discussed with is given in Annex-XI.

Literature on livelihoods has been reviewed with a focus on the following issues using DFID's Sustainable Livelihoods Framework as a guide:

(a) Livelihood options
(b) Vulnerability
(c) Capital Assets
(d) Policies, Institutions and Processes (PIPs) affecting livelihoods
(e) Problems and Constraints to livelihoods
(f) Information gaps.

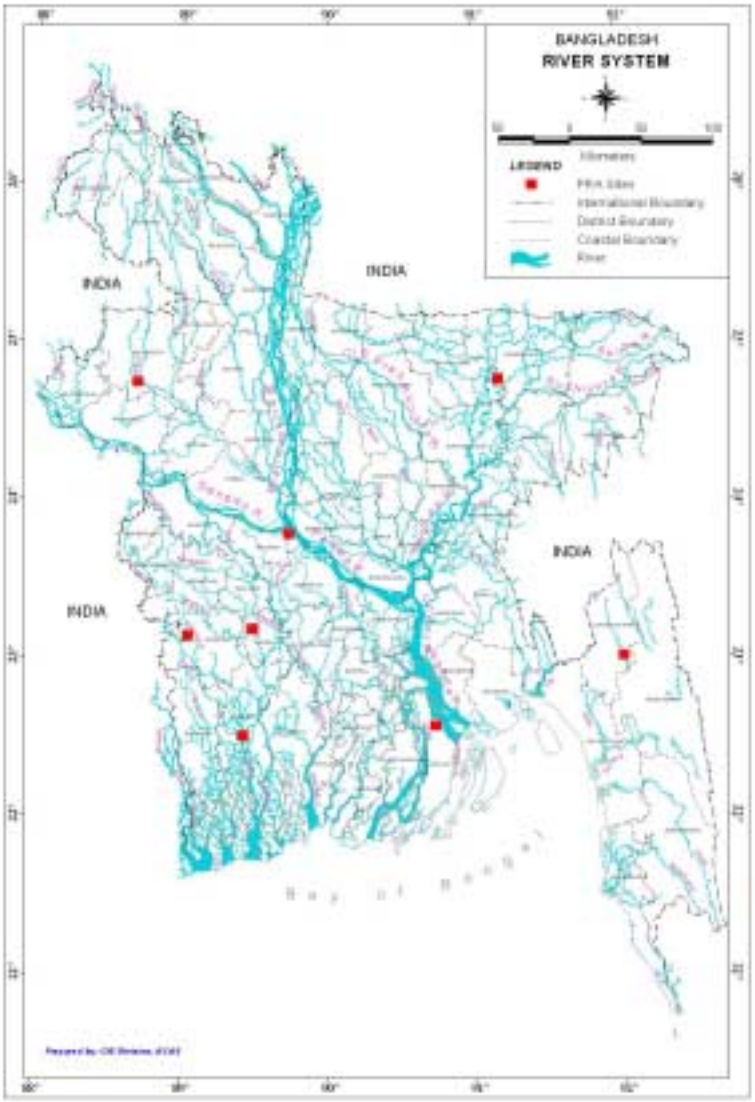
2. COUNTRY BACKGROUND

2.1 Physical environment

Bangladesh, having a total area of 1,47,570 sq. km is largely a deltaic plain with low ranges of hills on eastern and north-eastern margins. It is situated on the northern end of the Bay of Bengal between 88°0′ and 92°41′ E. longitude and 20°34′ and 26°38′ N latitude and is bounded by India (on west, north and east) and Myanmar (on east).

The country is criss-crossed by a network of rivers numbering about 230 with length 24,140 km. Most of the major rivers arise in neighbouring countries and flow into the Bay of Bengal. The major river systems of Bangladesh are the Ganges, the Brahmaputra and the Meghna. Fig. 1 shows the location of Bangladesh with major river basins, while Fig. 2 shows the river systems with tributaries and distributaries and the locations of PRAs (separate report). The country is influenced by the southwest monsoon, which causes heavy rainfall (up to 4,000 mm) between July and September, leading to inundation of more than one third of the country every year.

Figure-1. River Systems of Bangladesh



2.2 Poverty

Bangladesh is one of the most densely populated countries in the world, with an average 834 people per square km. Total population in the country is about 130 million with an annual growth rate of 1.48% (BBS 2002). The growth rate has decreased from 2.35% during the period 1974-81%. About 44.3% people are 'poor' (with an energy intake of less than 2122 K.cal per person/day) of which 20% are 'hard core poor' (with an energy intake of less than 1805 K.cal per person/day) (BBS 2000). Over 75% of the poor (some 43m) live in rural areas but are classed as functionally landless (owning less than 0.2 ha of land for cultivation).

Estimating the numbers of people in poverty is complex. The proportion in poverty has reduced recently: in 1985-86 about 55.7% people were poor and 27% people were hardcore poor, but absolute numbers in poverty still remain high. Rural poverty incidence in a BIDS survey fell from 64.8% in 1987/88 to 53.9% in 1999/2000 (Draft National Strategy for Economic Growth and Poverty Reduction). In 1979, about 75% people were below the national poverty line (per capita energy intake less than 1900 K.cal)[1]. Poverty levels calculated by Direct Calorie Intake (DCI) methods for different years are shown in Annexure-I and also in Figure-2.

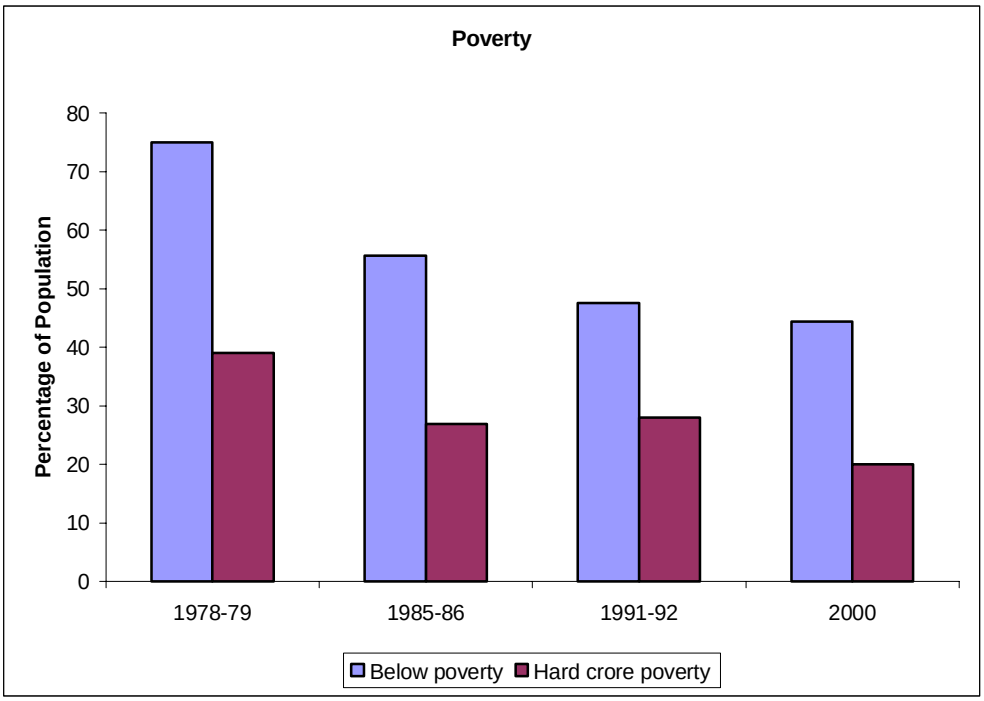


Figure-2: Percentage of Population Below Poverty Line

Some regions of the country are poorer than others. In particular the majority of the poor continue to live in rural areas, with the trend in poverty reduction being more pronounced in urban than in rural areas. In the rural areas greater concentrations of poor are to be found in the ecologically vulnerable low-lying areas of the *charlands* close to major rivers and in the deltaic region, and also in the north west of the country. Finally despite improvements in recent years, women and female-headed households (where 95% are in poverty) remain particularly disadvantaged (see Rahman, 1998; World Bank 1998, Ashley et al 2000).

[1] The World Bank gives slightly different figures to BBS due to differences in the definitions used.

The country's economy has historically been agro based. The contribution of the Agricultural sector (inclusive of fisheries) to national GDP is about 24% of which 6% comes from fisheries. Though the contribution of agriculture to the national economy has been declining, it is still very important in the livelihoods of the rural people. More than 50% of households in rural Bangladesh are dependant on agriculture. (The distribution of households by main occupation is shown in Annex-II.)

The incidence of poverty in households with agriculture, forestry, and fishing as major occupations is much higher than the overall national average (BBS 2000). About 40% of these households are below the poverty line (taking the lower poverty line) followed by those of service workers (36%), clerical, related workers and Government executives (33.1%), and production, transport and related workers (31.2%) against the national average of 33.7%. The highest percentage (49.5%) of households which are below the poverty line (using lower poverty line) is that of landless households. According to the 1995-96 HES (BBS 1997) 74.8% of landless agri-workers and 45.4% of fishers were below the lower poverty line as against the national rural average of 39.8%. In the same survey 49.3% of illiterate household heads were found to be below the lower poverty line against the national rural average of 39.8%.

There are gradations in livelihood strategies between the two poles of households that only farm and those that only fish - that is there is a very large number of households from landless through to medium farmer which depend on a mixed portfolio of strategies and which switch production from terrestrial to aquatic in response to seasonality. However, in terms of poverty dynamics there are essentially two types of rural household, those that have a successful accumulative strategy and those whose strategy is survivalist. The former households show nets gains of land or have a stable but relatively high landholding, survivalist households have a declining land base or have stabilised with negligible land holdings (Ullah 1996, Barr et al 2000a). It is the latter who make up the rural poor, whose main resource is their labour and who allocate a large proportion of their time to expenditure- saving strategies based on the exploitation of Common Pool Resources (CPRs) and ecological reserves (Rahman 1998).

2.3 Vulnerability

In the past (and indeed into the present) Bangladesh citizens, particularly the rural poor, have been vulnerable to natural disaster - including cyclone, flood and even drought. Due to flood control and drainage measures and the introduction of dry season irrigation and high-yielding varieties of rice, vulnerability to natural disaster and food insecurity has in general been reduced at the national level. However, some groups, and particularly the poor and landless, remain more vulnerable to seasonality and natural shocks since they often build their houses in low-lying areas (such as government *khars* land), or are forced to colonise very marginal areas including the transient islands (*chars*) which appear in rivers and river deltas. These low-lying areas are particularly prone to frequent climatic shocks (floods, drought and cyclones), as well as the potential resubmergence of land in subsequent years (Ashley et al 2000). By contrast, in drought years fishers have low catch and low income due to less flooding. Meanwhile all poor groups have few assets to fall back on times of need.

Flooding is still a threat to the life and property of the rural people and sometimes it becomes devastating. However some well protected areas within flood control works have a reduced risk (although the impacts of embankment failures can be even more devastating when they occur). Historically, there has been a 'disaster-narrative' around flooding which has driven infrastructure

development on the floodplains. In brief, government and donor concerns about food self-sufficiency have led to a focus on agricultural intensification through the introduction of HYV rice which is not flood tolerant, and consequent FCD/I infrastructure development (embankments and dry season irrigation) to accommodate it. On a measure of foodgrain self-sufficiency, GoB's policy has been successful (see Palmer-Jones 1999). However, this has been achieved at a price. Firstly, HYV species require High External Inputs (HEI) such as inorganic fertilisers and technical support, while their widespread uptake has led to a dramatic reduction in indigenous rice varieties. This has made Bangladesh more vulnerable to sudden shocks (such as the 1987, 1988 and 1998 floods), and input supply constraints. Short-stemmed HYV rice are particularly prone to damage from abnormal flooding, while the non-availability of fertiliser inputs at critical growing seasons can lead to dramatic falls in yields (see graphs in Palmer-Jones 1999). Meanwhile the development of dry season irrigated rice has been achieved through huge investment in Shallow (STW) and Deep Tube Wells (DTW). Additionally, the cultivation of HYVs and increase in cropping intensity through extending cultivation into the dry season, has been facilitated through huge investments in FCD/I measures. The environmental impact of these has caused concern to many observers. Lastly a focus on national food security has disguised the food security status of different population strata - there may be plenty of food but the poorest may have limited access to it.[2]

FCD/I measures have also been identified as a threat to inland fisheries and to the livelihoods of those dependent on them. NEMAP (1995) estimates flood control has reduced floodplain fisheries by about 70% in recent years (see also Khan et al.1994), whilst it is predicted that FCD/I will result in a loss of up to 151,300 tonnes of production from the floodplain fishery (Mirza and Ericksen 1996). Problem census exercises carried out by Barr *et al* (2000b) at two sites revealed concern among fulltime fishers about just such matters, while a scoping survey carried out by consultants at the Tangail Compartmentalization Pilot Project (CPP) noted that, unless mitigation measures were implemented, 'the predicted annual loss [of fish] will have a serious impact on the nutritional status of about 17,000 of the 29,000 households in the project area and on the living standards of 260 professional fishers as well' (CPP: 1996a) (see also CNRS 1996).

In particular, some professionals such as fishers have been adversely affected by FCD/I and their livelihoods have become more vulnerable than before. In addition, the livelihoods of the growing number of landless and the large number of other p/t fishers who rely seasonally for a part of their livelihood upon the fisheries - given the status of much of the inland fisheries as CPRs for subsistence use – are threatened.

Again, people living in the *charlands* are at risk of floods, but are also particularly at risk of land erosion as rivers change their course. Flood is an annual event which *charland* dwellers have learned to cope with so long as their land re-emerges after the flood. However, the braided rivers are constantly changing course and widening. These major rivers tend to periodically erode riverbanks, including what had once been thought stable mainland, at an alarming rate, and as the land disappears, so families who may previously have been climbing out of poverty are reduced to poverty. The nature of *charlands* – as newly emerged land from the river – does, however, mean that they are most frequently colonised by those who are most vulnerable, the landless poor who are seeking to get a foothold on the land-holding ladder (Ashley et al 2000).

[2] On food deficits among poorer strata see Rahman and Hossain 1995). For a reprise of the arguments concerning the differential impacts of FCD/I infrastructure on livelihoods and on the redistribution of wealth between different stakeholder groups see Dixon (2000 Chapt.3)

Finally, coastal people are sometimes severely affected by cyclones and tidal surges. In general rural people are more vulnerable than urban people. The Government is the main agency which renders all possible help (food, shelter, health care) during vulnerable periods to poor people. NGOs and voluntary organizations, international organizations, and foreign missions also come forward to assist the affected people.

2.4 Capital Assets: National Overview

Human capital: The large and growing population in Bangladesh is a problem rather than a blessing because of deficiencies in respect of literacy, skill and sound health and also because of the limitation of other resources - particularly natural resources - to support the population. However, at the national level, human resource quality is gradually improving. The overall literacy rate has increased to 53% in 2001 as against 32.4% in 1991 and 18% in 1979 (see Fig.-3). However, the literacy rate in female population has lagged that for men (BBS 2002), see Annex-III.

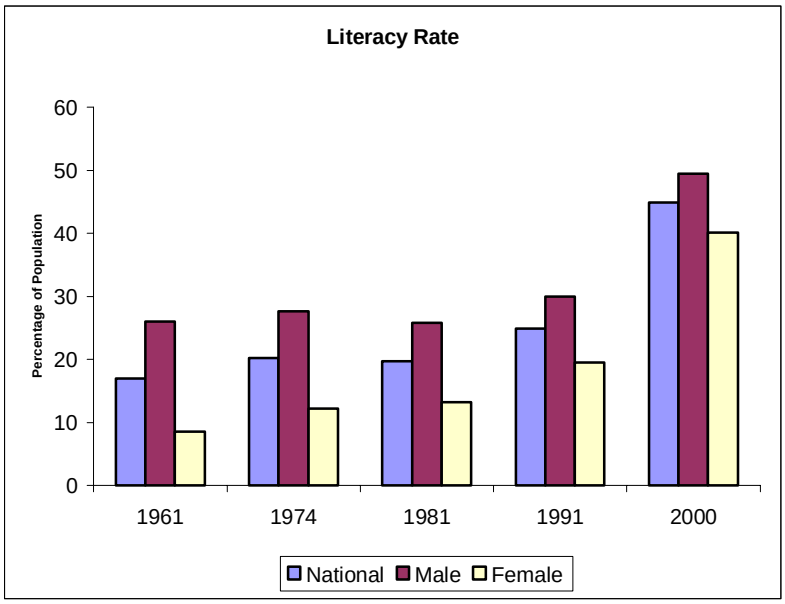


Figure-3: Percentage of Population who can Read and Write

The mortality rate has reduced significantly resulting in an increase in life expectancy - possibly due to reduced crude mortality. The crude mortality rate was 3.7%o in 2000 against 11.2%o in 1991 and 15%o in 1970. While Crude birth rate was 17.9% in 2000 against 30% in 1973 (MOF 2000). Child mortality decreased to 96 per 1,000 in 1998 from 211 per 1,000 in 1973 (World Bank 2001). The life expectancy increased from 56.6 years in 1997 to 61.0 years in 2001.

Awareness among the population about health and hygiene and improved life style has increased during the last few decades. Access to clean drinking water, sanitary latrine, electricity, improved communication etc. has improved over last decades. According to household income and expenditure survey (BBS 2001), 6.79% people drink tap water, 89.91% people drink tube-well water, which according to 1991 census were 4.3% and 75.3% respectively (see Figure-4 and Annexure-IV).

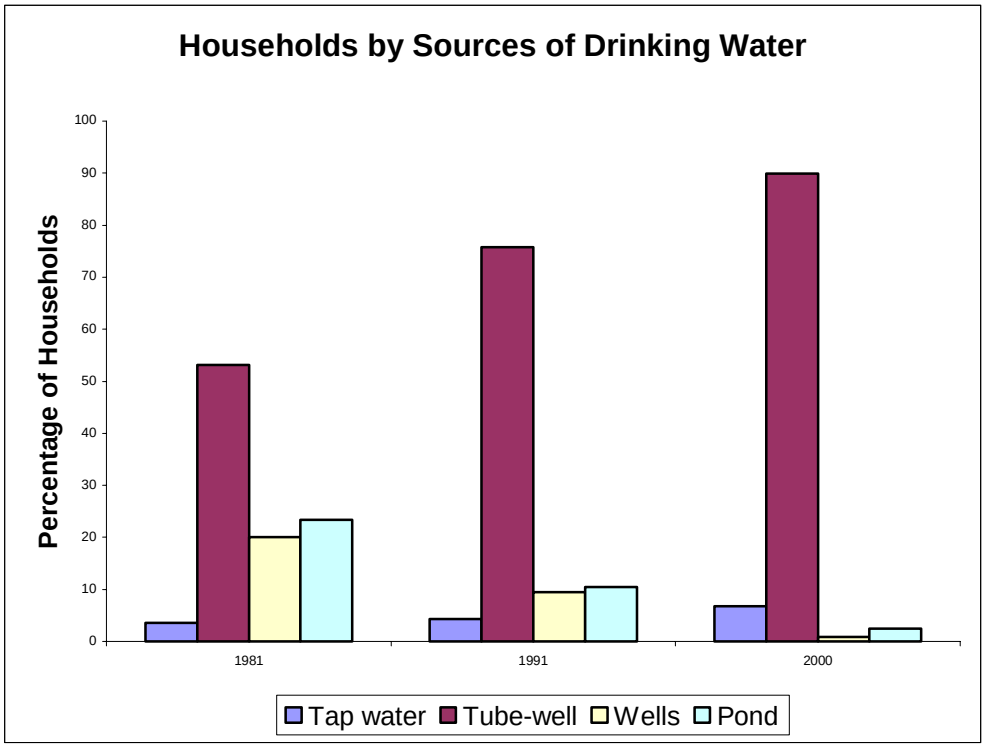


Figure-4: Percentage of Households by Source of Drinking Water

The use of sanitary latrine is also gradually increasing in the rural areas (Fig. 5). However, the bulk of the rural population still use open space. According to BBS household survey (2001), 14.2% households have access to sanitary toilet, 66% have access to other type of (pacca and kancha) toilet, and 19.26% households use open space against 12.46% households using sanitary toilet, 53.4% other type and 34.20% open space in 1991 (see Annexure-V).

Figure-5: Percentage of Households having Access to Toilet

Physical Capital: Access to electricity is gradually increasing because of taking up special rural electrification programme by the Government (Fig.6). According to BBS (2001) about 18.7% household have access to electricity against 14.57% households enjoying electricity facility in 1991 (Annexure-VI).

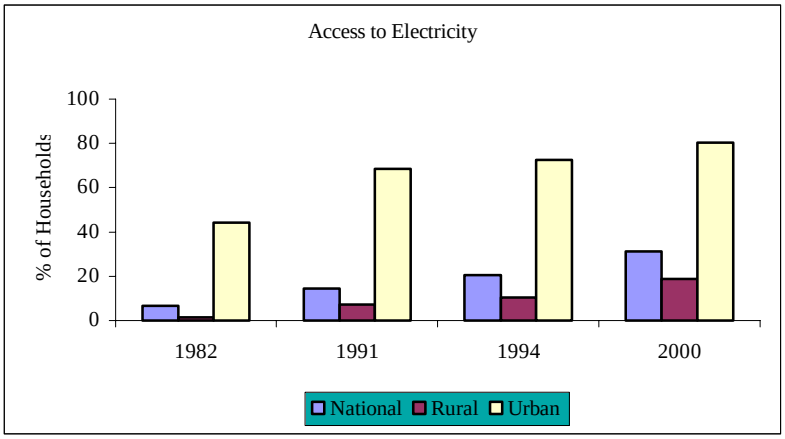


Figure-6: Percentage of Households having Access to Electricity

Access to improved communications (roads and mass media) has increased significantly. Access to mass communication media and recreational facility like T.V., Radio, VCP, VCR, etc. has increased even in the rural area as part of life style. Now about 17.68% household possess radio and 3.84% household have access to T.V. About 11.86% people possess bicycles, 1.7% people have automobiles (car and motorcycles) (1991 census). Road communication network has also developed significantly during last 2 decades.

Natural Capital: Land. Because of the rapid increase in human population, the per capita availability of land has dropped to 0.06 ha (1995-1997 figure) as against 0.10 ha in 1979-1981 (World Development indicators 2000 - World Bank). Indeed about 8.7% of households have no land, 19.6% of households only have homestead land, 28.2% of households only have homestead land with cultivable land up to 0.5 acre, while 12.3% of households own cultivable land measuring 0.5 to 1.00 acre (MOF 2002).

Reduction in the size of landholdings and increasing landlessness means that poorer households are unable to meet their food security needs from their own or share-cropped land and have to diversify out of agriculture. While members of poor rural households may pursue a variety of livelihood strategies, including agricultural and migrant labouring, transportation, and petty trading, a very significant number turn to fishing as a part or even full-time occupation because of the low entry costs involved. This occupational trend, plus the trend in increased subsistence fishing (due to population increase) is increasing pressure on the fisheries and leading to conflict between groups (which may or may not be linked to religious differences) (see Barr et al. 2000b; Dixon 2000 Chapter 3).

Natural Capital: Inland Fisheries: The role of CPRs, and particularly open-access fisheries, feature prominently as expenditure-saving strategies in the livelihood portfolios of the poor. It is estimated that 73% of all HH are involved in floodplain fisheries (DOF, 1990), though this masks the diversity of who fishes, when, for how long, with what intensity, with what gear, and how these factors relate to households' other livelihood strategies.

There are three types of participant in fishing: subsistence, seasonal and professional (FAP 17, 1994). Subsistence fishers are opportunistic, and catch mainly for the pot using small gears. They include labourers, small farmers, women and children, but do not class themselves as 'fishers' (*jele*). Seasonal fishers are a group which has expanded recently in response to crises and shortage of agricultural land. They are primarily landless and marginal farmers, and fishing has become an important component of their livelihoods. Professional fishers were traditionally Hindus. This group has declined due to competition and out-migration, and Muslim agriculturalists have increasingly entered this part of the fishery. Professional fishers (who make up a small proportion of the total population) define themselves as full-time fishers, and their occupation is primarily fishing. However, they may also have other livelihood strategies and if they are able to save income may invest it in agriculture (either owning or share-cropping land) as a dry season activity (see Barr et al. 2000b; Dixon 2000 Chapter 3).

Financial Capital: About 70% of rural households are dependent on some sort of credit, either institutional or private (BBS 1998). Collateral is the determining factor for access to institutional credit. The poor and those who have no resource for collateral are heavily dependent on private sources of credit (moneylender, *Dadondar, Mohajan*) with a high rate of interest (8 % to 15 % per month). Fishers, who are poor and virtually landless, in particular have to depend on private loans from *Dadondar* and *Mohajan* and *Aratdar* (fish trader) - sometimes on condition of selling the catch to the *Aratdar/Mohajan* at low price or at price fixed at the time of taking loan. Government introduced a system of collateral free loan to poor fishers but Banks do not take much interest to disburse these because of the uncertainty of loan recovery. However the Agricultural Bank of Bangladesh (BKB) and other nationalized banks introduced collateral free credit system up to Tk.50,000 for aquaculture and fisheries (Khan M Amin 1998). Under the NFMP, Government (through BKB) introduced collateral free credit up to Tk. 6,000 per licensed fisherman for purchasing boats, nets, etc.; but in reality this is not accessible to fishers.

NGOs also provide credit to their beneficiaries for different types of income generating activities including fishing and fish culture. Borrowing from friends and relatives without any interest is also found but it is far from expectation for poor community like fishers.

Social Capital: Irrespective of caste, creed, sex, financial or social status, in State Law every one has equal right and access to education, health service, public utility (water, electricity), communication facility, justice, land tenancy, job opportunity, etc. However, in practice there are special privileges/advantages for some sections of people (such as women and freedom fighters from the 1971 liberation war), where there is a special quota in job opportunity - particularly in Government /semi Government organizations in addition to normal/general merit basis. For example, women have tuition fee free facilities in education up to H.S.C. level particularly in Government educational institutions. Social capital specific to fishing communities can be strong in the sense that traditional Hindu fisher communities are cohesive and cooperation among fishers can be high, but is limited externally since as a minority and low status class in rural society they lack good connections and networks with local influentials and national organizations and policy makers. The poor who catch fish as a subsistence strategy may have some safety net through regular work for their patrons, and likewise some full time fishers work catching fish for leaseholders and pond owners or have credit through moneylenders as noted above. This provides some security in times of need but on disadvantageous terms.

2.5 National Development Strategies, Reforms and Achievement

The major reform undertaken by the government in the past was the East Bengal Tenancy Act 1950 by which the landlord (*Zamindar*) system was abolished and the right to private ownership to land was transferred to the government in order to relieve the people from the oppression of the *zamindar*. Subsequent reform for the benefit of the poor marginal farmers was the waving of the land tax on up to 3 hectares of cultivable land in 1973.

In 1984 all closed type of *jalmohals* (water bodies for fishing) measuring up to 20 acre were transferred to the *Upazila Parishad* for leasing to the poor and landless people for fish culture. In 1986 a pro-poor policy approach, the New Fisheries Management Policy (NFMP), was taken to establish the rights of fishers in the *Jalmohals* by abolishing the leasing system for selected *jalmohals* in favour of licensing fishers (but maintaining the same revenue collection. In 1995 the Government abolished the leasing system for flowing rivers and since that time fishing in rivers has been open to all free of cost. This was done in favour of the poor fishers who under the lease system were exploited and over taxed by the leaseholder. However, by lowering the costs of entry to the sector, these measures – together with the trend of increasing landlessness – have increased pressures on the resource, depending on the location ex-leaseholders may still control the rivers in practice, or richer landowners may now invest in brushpiles (fish aggregating devices) to control parts of the resource and increase exploitation of fish in the dry season.

Other major development strategies have been the green revolution to grow more food through agriculture development, flood control, drainage, and irrigation activities (FCD/I) and the introduction of high yielding varieties of rice and crop diversification. Although the country is now more or less self sufficient in food grain, FCD/I activities have negatively impacted on the ecology and natural resources, like fish, wildlife etc.[3] This and the indiscriminate use of pesticides and chemical fertilizers for HYV rice has had an adverse effect on environment and on aquatic resources.

After liberation from British rule in 1947, industrial development was a thrust area. The country being the foremost jute growing area in the world, the jute industry contributed significantly to the national economy and to employment generation and livelihoods. However, with the introduction and increasing use of synthetic fiber throughout the world, demand for jute and jute goods declined.

Since the mid-1970's with the increasing demand for shrimp in foreign market, shrimp aquaculture has emerged as an export-oriented industry. Although it has brought much needed foreign exchange, shrimp farming in the coastal area has had an adverse impact on the environment and on the livelihoods of agricultural-labourers and share-croppers who used to work the agriculture land now being used for shrimp farming. However, some of those landless poor and labours have been subsequently engaged in shrimp fry collection for supply to shrimp farmers. However, while collecting shrimp fry, other aquatic organisms including fish and other shrimp are destroyed, resulting in adverse impacts on the stock and biodiversity of these aquatic fauna. Taking into consideration these adverse impacts and the availability of shrimp fry from hatcheries, which have recently been developed, government has banned the collection of wild shrimp fry. Following the concern expressed from different corners including donors and fry collectors to the effect that thousands of poor people (often women and children) who are now dependent fry collection for their livelihood would be affected, the implementation of this ban

[3] For a discussion as to whether Bangladesh will or will not be able to ensure the food security of its population in the future see Rogaly et al (1999).

has been suspended for the time being and it is being further reviewed by an International Consultant appointed under the Fourth Fisheries project.

Since the 1980s a highly labour-intensive export-oriented garment industry has emerged in Bangladesh. This is the highest foreign exchange earning industry and provides employment for many thousands of poor young men and women. Presently 0.8 m people are engaged in this industry.

A major economic policy reform has been the adoption of a free market economy. The impact of this and of globalisation has been mixed. Decentralization of power and authority to local level, together with peoples' participation at all levels are stated policy strategies of the Government. Reform of local government at sub-district (*Upazila/thana*) level, through election and delegating power/authority to it, is a major policy reform that has been debated for long but has not been fully implemented, so that in practice devolution of decision making is very limited. Below the *Upazila* level there is the *Union Parishad* (UP), the lowest tier of local government and the only elected councils below the national parliament, the UPs are responsible for rural development and assisting all sorts of public activities at the local level.

The country has experienced turmoil and many political changes during the last few decades – such as independence from British rule in 1947 as a part (East Pakistan) of Pakistan and then emergence as a sovereign state following a war of liberation from Pakistan in 1971. Then through political turmoil between democracy and autocracy/dictatorship of Government, democratic form of Government has been established since 1991.

2.6 Government Policy and Strategies for Poverty Elimination and Sustainable Livelihoods

The Government's policy strategy, as reflected in its periodic development plans (five year and two year plans), very specifically focuses on poverty alleviation and livelihood improvement. The policy objectives in different 5-year/2-year plans have been as follows:

After liberation in 1971, the main policy strategies of government during 1973-1980 (1st five year and 2 year plans) amongst others were the rehabilitation and reconstruction of the war ravaged economy, poverty alleviation, and acceleration of economic growth.

During the second and third five year plans (1980-1990) the primary policy objective was alleviation of poverty along with addressing unemployment, rapid population growth, malnutrition and illiteracy. The general approach to poverty alleviation was to provide productive employment through efficient use of primary resources (land, water and manpower), through improving productivity by technological and manpower development, and increasing productivity in agriculture and fisheries and employment generation.

The main objectives and strategies of the Government today as regards poverty alleviation and sustainable livelihoods, are accelerated economic growth by raising levels of income and adequate supply of basic needs, generation of sufficient employment opportunities, attainment of sufficient food production beyond self sufficiency level, human resource development through compulsory primary education and vocational training, achievement of lower population growth, protection and preservation of natural resources, closing the gender gap by giving priority to women's education and employment, establishing better social justice through more equitable distribution of income, resources, opportunity and creating effective safety nets for socially and economically disadvantaged sections of the population (fourth and fifth five year plans of GOB).

3. THE INLAND FISHERIES

3.1 Importance of Fisheries Sector

The fisheries sector of Bangladesh plays a vital role in the national economy, in employment generation and in the supply of animal protein in the diet of people. The inland capture fishery in the rivers, canals, depressions (*beels* and *haors*), oxbow lakes, reservoir, flooded land, etc. is one of the richest in the world after China and India. In the past the major source of fish production of the country was the inland capture fisheries. Even during 1960's more than 90% of country's fish production came from inland capture fisheries and the rest from aquaculture and marine fisheries. However, during the last 3-4 decades the contribution of inland capture fisheries to total national production has declined, partly due to increased production from marine fisheries and more so from freshwater aquaculture, but also due to over-exploitation, other human impacts and natural processes affecting the floodplain resources and wetland environment (such as FCD/I).

The fisheries sector as a whole contributes 5.9% to the national GDP (BBS, 2001) and 6% to the country's export earnings. Inland capture and enhanced fishery presently (2000-2001) contribute 38.7% of the country's fish production. This sector provides employment to full time and part time fishers, fish farmers, fish traders and others involved in fisheries-related and auxiliary activities. About 10% of the population have some dependence on the fisheries sector for their livelihood. According to DOF some 0.77 million full time fishers are directly dependant on inland capture fisheries for their livelihood. In addition it provides opportunities for about 70% of rural population in subsistence fishing for their own consumption. Quite a significant number of people are engaged in other related activities such as fish fry production, aquaculture and enhanced fisheries, fish trading, processing (indigenous), net/ trap and boat making, fisheries labour, etc.

Fish contribute 4.53% to daily food intake, 14.15% to total protein intake, and 63% to the animal protein intake in the diet of the people of the country **(source)**, and 84% of animal protein from fish in rural Bangladesh (Ahmad and Hassan 1983). However, the normal Bangladeshi diet provides sufficient protein, other nutrients are more critical. Fish also play a very important role in supplying nutrient such as calcium, phosphorous, iron, and vitamin A. Fish is the major source of calcium providing about 44% of total calcium intake in the diet of the people. It also provides 8.48% vitamin C, 5.2% Iron, 2.08% Ribo-Flavin, 2.94% Niacin and 0.27% vitamin A **(source**), however some species are very rich in vitamin A – 17 g of mola/day would meet the full recommended daily allowance of vitamin A for children (Thompson et al. 2002).

3.2 State of Fisheries Resources

3.2.1 Physical Resource

Dynamics:

Bangladesh is one of the richest countries in the world in fisheries resources, particularly in inland open water fisheries. Being situated in the deltaic plain of three river systems, namely (i) the Ganges (ii) the Brahmaputra and (iii) the Meghna, Bangladesh has vast inland open waters in the forms of rivers, canals, depressions (beels/haors), floodplains (seasonal flood lands) and

closed water ox-bow lakes (abandoned course of rivers), reservoirs, etc. and innumerable smaller artificial closed water bodies (ponds and impoundments). In addition to inland waters the country has along its 710 km. coastline extensive marine waters extending up to 200 nautical miles in the Economic Exclusion Zone (EEZ) in the Bay of Bengal. The 1 million ha of perennial inland water-bodies (15% of Bangladesh's territorial area) and the over 3 million ha of floodplains provide an extensive opportunity for inland fisheries. The water bodies are classified in different categories based on the fish production regime and ecological consideration (Table 1).

However, during the last 50 years there has been a considerable loss and degradation of inland water bodies due to man made and natural causes like siltation, water pollution, FCD/1 projects, unplanned construction of embankment, dams and roads, and diversion of waterflow in the major river in the neighbouring country.

Due to FCD/I projects for increased agriculture production, some 0.814 million ha of floodplain water area had already been lost up to 1985, and by 2005 a total of 2.00 million ha of flooded area is expected to be lost (MPO 1988) with potential adverse consequence for fisheries. Again the water bodies in (floodplain, beels, haor and river) are gradually being silted up due to increased land erosion by intensification of aquiculture activities and deforestation both in the country and outside of the country. According to Millman and Heade (1983), some 2.0 to 2.4 billion metric tons of sediment are carried out by the three major rivers with their tributaries and distributaries every year. About 5% of this is deposited in the riverbed, floodplain and beels, and the rest is discharged into the Bay of Bengal (Hossain 1992).

Land erosion due to agricultural intensification and deforestation is pronounced in the hills in the northeast region of Bangladesh, with huge amounts of sediment being deposited every year in the *beels, haors* and other low lying areas gradually reducing their water holding capacity. These perennial water bodies are rapidly being converted into seasonal ones or the water area is gradually reduced. According to MACH (2000) about 7.6 cm/yr of sediments has been deposited in Hail Haor with maximum of 15 cm/yr during last 12 years.

FAP-6 (1994) reported that the piedment rivers rising in the Indian catchment area carry large quantity of sediment, most of which are deposited in the *beels*, floodplains and river *duars* (scourholes known to be favoured dry season refuges for fish) and as a result these water bodies are gradually silted up and many of the perennial water bodies are converted into seasonal water bodies. Reduction of dry season surface area and depth of water bodies are negatively impacting the fish production.

ISPAN (1992) further reported a reduction of about 70% water area in a *beel* (Jugnidaha beel) in the district of Tangail in 15 years (1977 to 1992) as measured by satellite imageries.

Pollution

The water quality in the inland water has been degraded due to water pollution caused by discharge of untreated industrial effluents, domestic organic waste and agro-chemicals (Ali 1997).

ISPAN (1992) reported that pollution due to use of chemical fertilizers and pesticides / insecticides in agriculture for production of HYV rice and other crops has affected fish and its production. Residual concentrations of DDT and Dieldrin (non degradable), were detected in the

issue of *Puntius* species in CPP area (Tangail district) at levels within carcinogenic risk range for humans.

BCAS and NCM (1994) reported that the commonly-used fertilizer, urea, which is soluble in water is washed into water bodies under irrigated condition and during flood and causes luxuriant growth of hydrophytes which after death and decomposition give rise to anoxis conditions resulting in fish mortality.

Ali (1994) reported the occurrence of pesticides in the *khals* (canals) and ponds within Meghna-Dhonagoda Irrigation Project area and resultant mortality of fish there.

The World Resource Institute (WRI 1990) reported that the direct contamination of aquatic ecosystems by different industries of tannery, urea, newsprint, paper and pulp, jute mills is wide-spread in Bangladesh. These industries release untreated effluents containing mercury, lead, chromium, arsenic, and iron, which are harmful to aquatic organisms. The high Biological Oxygen Demand (BOD) created by sewage effluent from cities such as Dhaka, Chittagong, and Khulna is affecting the water quality and the fish in adjacent rivers and other water bodies. Incidences of fish mortality in the Sitalakhya, Buriganga, Karnafuli, Kushiara, Bhairab rivers have been reported due to industrial and domestic pollution (Ali 1997).

3.2.2 Biological Resources

Inland waters of Bangladesh are inhabitant by 260 native species and 13 exotic species of fish and 20 species of prawn (Rahman 1989). (The marine waters are inhibited by 475 species. of fish and 56 species of shrimp (**reference**) Additionally there are other aquatic resources like crab, turtle and tortoise, both fresh water and marine mussels and snails (molluscs), amphibians and reptiles (frogs, crocodiles, etc.), and others such as dolphin and seaweeds etc. with commercial, environmental and nutritional values. A short account of those resources is given below:

Dolphin:
Only one species the Gangetic Dolphin, *Platinesta gangetia*, locally known as Sishu/ shusuk, is found in the rivers of Bangladesh. This endangered species (IUCN 2000a) has important populations in Bangladesh and is not commercially exploited. They are occasionally caught in fishers' nets. Its oil is extracted by some people as it is thought to be beneficial for rheumatism. Earlier DOF used to extract oil from Dolphins jaw bone for use as a lubricant for watches and other precision machinery.

Turtle and Tortoise (Chelonia):
According to IUCN (2000b) there are 22 species of freshwater turtle and tortoise in Bangladesh all but two are nationally regarded as threatened while eight are listed as globally threatened, and a further 5 species of marine turtle occur (all globally threatened). Five species, namely *Kachuga tentoria*, *Lissemys punctata*, *Trionyx hurum*, *Trionyx gangaticus* and *Chitra indica*, are or were of commercial importance and are/have been harvested for export and local consumption. Turtles and tortoise are exported mainly to Singapore, Hong Kong, Thailand and Japan. Prior to 1965 turtle and tortoise were exported to Calcutta. Export of turtle started during mid-1970s. Turtle and tortoise worth Tk.22.5 million and Tk.72.2 million were exported in 1982 and 1997 respectively. In 1998 export of turtle and tortoise was been banned by the Government because of declines in their populations due to over exploitation.

Crocodile:

The saltwater crocodile, *Crocodilus porosus*, is also declining, while the Gharial *Gavialis gangeticus* is virtually extinct in Bangladesh.

Amphibian:
There are about 19 species of frog and two species of toad in Bangladesh (IUCN 2000b). Of these, 3 species, namely *Rana (Hoplobatrachus) tigerina*, *Rana (Euphlyctis) hexadactyle* and *Rana (Limnonectes) limnocharis*, are edible and are of commercial importance. Frog meat is not eaten in Bangladesh except by some ethnic minority groups. Frogs legs, mainly of *Rana tigrina* collected from the wild, were extensively exported from the mid 1970s to 1990 when their collection and export was banned due to an apprehended decline in their population. About 327,400 kg of frog leg worth Tk.633 million, 1,281 kg worth Tk.152 million and 324 kg worth Tk.83 million were exported during 1981-1982, 1989-1990 and 1990-1991 respectively (EPB-1999)(Not in bibliography). Thousands of poor rural people were engaged in frog collection and trading during the period, while at its height, the strategy made a small but significant contribution to rural livelihoods (particularly those of women and the landless). A decade already passed after the ban but frog population has not re-established. The reasons are still unknown.

Mollusc (Freshwater mussels):
Freshwater bivalve mussels (Mollusc) are an important aquatic resource in Bangladesh. They produce the valuable pink pearl. According to a survey conducted by the Small Cottage Industries Cooperation about 160 kg of pink pearls worth Tk.1.4 million was produced annually during 1960. There are about 18 species of fresh water bivalve mussels. According to that survey about 2000 tribal people are engaged in collecting fresh water mussels. They collect and open the mussels for pearls. The flesh is used for duck feed and the shells are used for making buttons, toys, flower vessels and decoratives. In 1978 and 1979 mussels worth Tk. 0.7 million and Tk.0.40 million were exported respectively (Ali 1985).

Snails
Different varieties of snails are available in the inland and marine waters of Bangladesh. Inland snails are mainly used as duck-feed. Recently snail's meat has been extensively used as feed in shrimp farms particularly freshwater prawn farms in the southwest of Bangladesh. Snails are collected by poor people in the rural areas to supply to the shrimp farms. This has become a good source of income of the poor. However, there are concerns that the extensive collection of snails may lead to extinction of the resource as expressed in PRAs and local consultations (Sultana et al. 2002).

Fish Production

Total fish production of the country in 2000-2001 was 1.78 million m. ton of which inland open waters contributed 0.69 million metric ton (38.7%), aquaculture 0.713 m. metric tons (40%) and marine waters 0.380 million metric ton (21.3%) (See Table 3.1).

Table 3.1 Water Area and Fish Production of Bangladesh in 2000-2001.

	Type of water	Area (ha)	Fish Production (M. ton)	% of Fish Production
A.	**Inland waters**			
(a)	**Inland open waters**			
	(i) Rivers, canals and estuaries	1,031,563	162,163	9.1
	(ii) Depression (beel and haors)	114,161	74,527	4.2
	(iii) Reservoir (Kaptai Lake)	68,800	7,051	0.4
	(iv) Flood lands	2,832,792	445,178	25.0
	Inland Openwater Total	4,047,316	688,920	38.7

(b)	**Inland Closed Water**			
	(i) Ponds	241,500	615,825	34.6
	(ii) Ox-bow lakes	5,488	3,801	0.2
	(iii) Coastal Shrimp ponds	141,353	93,014	5.2
	Inland Closed Water Total	388,341	712,640	40.0
	Inland Total	44,24,157	1,401,560	78.7
B.	**Marine water (up to 200 nautical miles in the EEZ)**	**16,607,000**	**379,497**	**21.3**
	Country Total		**1,781,057**	**100.0**

Source: DOF Fishery Statistical Year Book of Bangladesh. 2000-2001.

3.3 Trend in Fisheries Sector

Species group-wise catch in inland fisheries by sectors, 2000-2001 is shown in Annex VII. Major sources-wise (inland capture, culture and marine) fish production for several years are shown in Annex VIII. It appears from the annex that overall production increased at an average rate of 7% during last 16 years, but the production in inland open water gradually declined at a very low rate with a slow upward trend since 1991-1992 (Fig. 7). The reason for which has been attributed by the Government (DOF) to public sector intervention like floodplain stocking with carp fingerlings, and the strengthening of conservation measures.

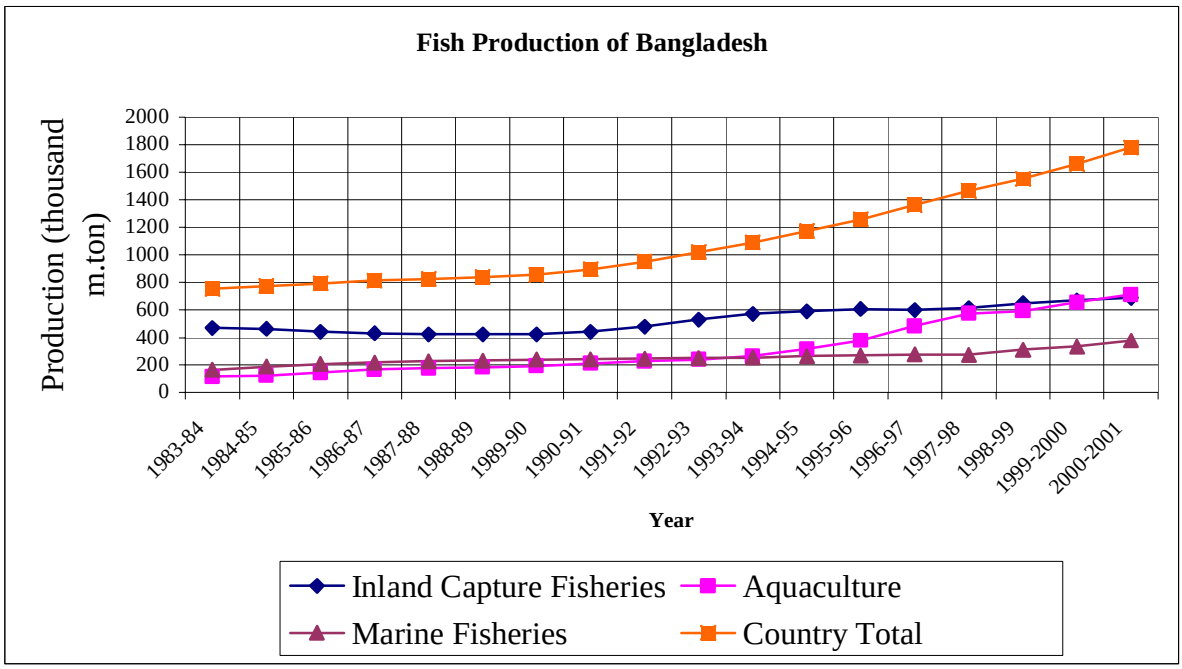


Figure-7: Fish Production of Bangladesh by Sources for Several Years

Historically, the major source of fish production was from the inland open waters (rivers, canals depressions and flood plain). But due to natural and man-made causes, like over fishing, implementation of FCD/FCDI project construction of embankment, dams, roads etc, indiscriminate use of pesticide in paddy fields, water pollution, siltation of river beds and other open waters, the fish population in inland open waters is widely believed by fishers and experts

to have declined significantly, resulting in an actual decrease of fish production of the country that is not borne out in the statistics. The livelihoods of the fishing community have been adversely affected (secondary stakeholder discussion).

During the last fifty years there has been considerable loss and degradation of fish habitat due to man made and natural causes, which coupled with over-fishing due to rapid population growth, has caused depletion of inland fisheries resources and loss of biodiversity. This has potential consequences for sustainable livelihoods of those who depend on inland fisheries.

Over recent decades there have been significant changes and shifts in local fish communities. Some important species like major carps, so called “live fish” (a few small to medium sized fish species that can survive for some time out of water and are highly valued), large catfish, etc. have declined (secondary stakeholders discussion). This is not clear from DOF’s catch data, which shows different pictures. This needs to be resolved through further study. Species composition of inland catch for 16 years (1985-2000) is shown in Annexure-IX.
According to IUCN (2000c) some 54 species of fish are endangered and 12 species of them are critically endangered or extinct.

Overall national fish production decreased after 1960 mainly due to decline of catch in inland capture fisheries which continued to decline until 1990. However, there has been an overall increase of fish production since 1975-76 due to increase of fish production from the aquaculture and marine sectors as a result of technological advances. Since 1990 the overall rate of growth of this sector has varied between 6% and 8%. The value of catch when compared with other commodities like rice, meat etc. is found to increase at a higher rate (BBS, 1992). However, with increase of human population, fishing pressure also increased with more people, particularly the poor group, engaging in fishing and related activities (Secondary stakeholder discussion). Again with developments in aquaculture, including coastal shrimp culture, and marine fisheries since the mid 1970s, employment opportunities have been increasing in this sector. Fish production trend by sources was shown in Fig,-8.

With demand of fish and shrimp in the foreign markets export of fish and fish product including shrimps has increased rapidly during the last two decades. Presently the export of fish and fish products contributes about 6% of the total export earning of the country. In the year 2000-2001 a total weight of 38,988 metric tones of fish and fish products were exported and Tk. 20,327.5 million was earned. Figs. 8 and 9 respectively show the quantity of fish and fish product exported and their value during the last 10 years.

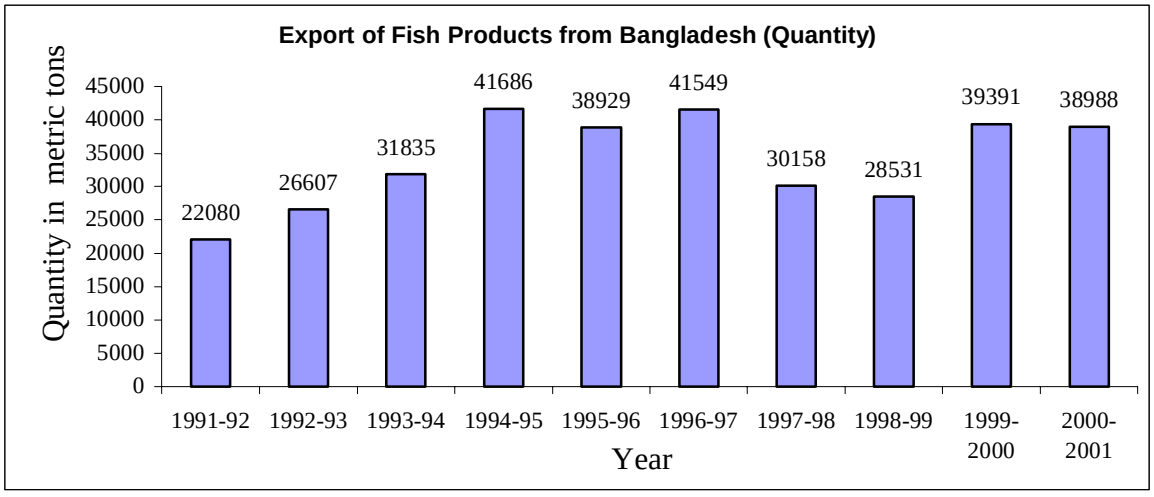
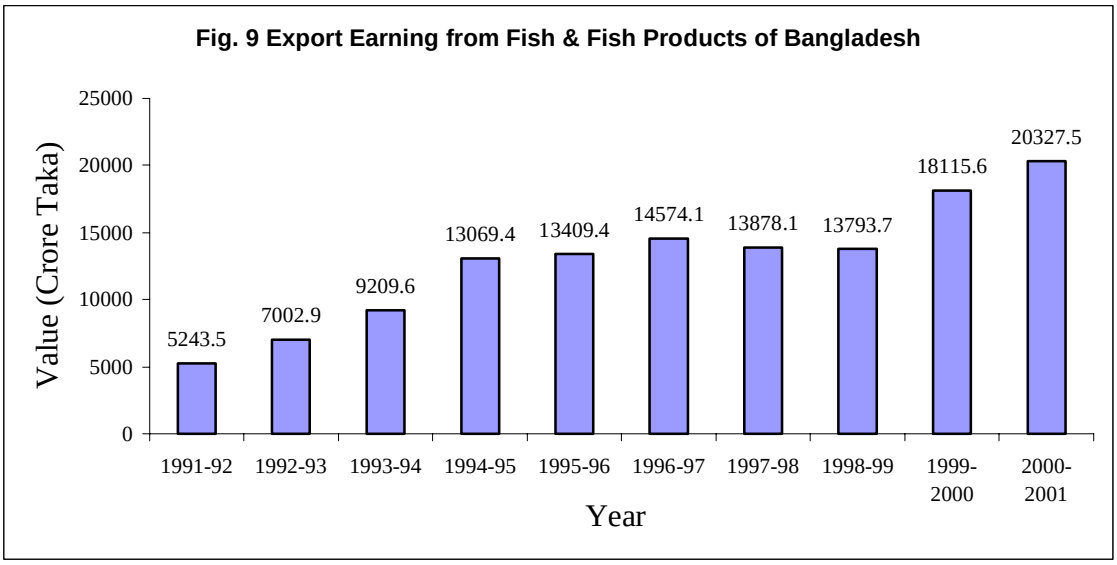


Fig. 8: Export of Fish & Fish Products from Bangladesh



3.4 Distribution of Resources in Different Regions of the Country

Inland fisheries are important more or less throughout the country, but with ecological changes due to man made and natural causes their importance and future prospects have declined markedly in some regions - particularly in the upper riparian zone within the country. Capture fisheries remain important along the major perennial rivers, in the northeast region (depression) and in the lower riparian (estuarine) region of the country. Unfortunately there are no statistics as to what proportion of people are dependent on fisheries by region. Distribution of fisheries in terms of water area and catch by former greater districts are shown in Annexures-X & XI respectively.

3.5 Inland Fisheries Resources Characterization

3.5.1 Ownership of Inland Fisheries Resources

All water bodies, except flooded private land and man made ponds and shrimp farms are owned by the Government and are controlled by the Ministry of Land, which is responsible for administration of the water bodies as a means of collecting revenue through leasing fishing rights to water bodies. For convenience of management, rivers and canals are divided into several sections based on the boundary of small administrative units or villages. Each such section is called a fishery *(Jalmohal*). An individual *beel,* ox-bow lake, or pond (when owned by Government) is also called a fishery. There are about 10,119 such fisheries in Bangladesh (Table 3.2). Their distribution is as follows:

Table 3.2 Distribution of Fisheries/Jalmohals by Category in Bangladesh

Category of Fishery	Number of Jalmohals
Rivers	2,013
Canals	1,924
Beels (depression)	3,528
Ox-Bow Lakes	162
Ponds	1,632
Others (Unclassified)	860
Total	10,119

Source: Annual report of DOF activities 1985.

3.5.2 Categorization of Fisheries Resources

Inland fisheries of Bangladesh can be categorized as described below :

(i) **Riverine fishery**: The major, secondary and tertiary rivers including estuary and Sundarban forest area form the riverine fisheries. The estuarine area within the land mass is so linked with river fishery that it cannot be considered separately. Bangladesh has a network of about 230 rivers with a total length of 24,140 km and an area of 1,031,563 ha. The Ganges and Brahmaputra, two of the largest rivers in the world, and the Meghna are the major river systems in Bangladesh. Most of the rivers originate in the neighbouring country (i.e. India), and are very much influenced by uses in the upper riparian country. The rivers are a major source of inland fish production in Bangladesh. Riverine fisheries presently contribute 20% of inland catch.

At present there are about 2,013 *Jalmohals* in the riverine system. Riverine fisheries have declined due to over fishing and habitat degradation – shoaling of river beds due to siltation, and diversion of water flow of Ganges at Farakka in India. The major commercially important riverine fish – the anadromas Hilsa (*Tenualosa ilisha*) which ascend the major river system for breeding has almost been eliminated in the upper

reaches of the river and been shifted to lower reaches of rivers, estuaries and the sea. However, the total catch of Hilsa has not declined. Hilsa alone contributes 50% of the riverine catch and 11% of the inland open water catch (DOF-2001). Another commercially important group of fish – the major carp (Rui, catla and mrigal) - has also significantly declined in the rivers, and once important riverine carp spawn fisheries have been decimated. Riverine catch composition for several years is furnished in Annexure XII.

In 1995, in the interest of poor fishers, Government Ended leasing of riverine jalmohals and declared fishing in flowing rivers open to anybody free of cost. Due to this open access without any control, fishing pressure has increased significantly and the fish stock is being affected. Additionally, poor fishers are harassed by powerful people and miscreants (secondary stakeholder discussion).

(ii) **The *beel/haor* fishery**: The *beels* (deeper areas in the floodplain) are the perennial and seasonal standing water bodies, these may be within larger natural depressions or low-lying areas, which in the north-east are called *haors*. During the rainy season a *haor* becomes a large sheet of water, like a small sea and offer a good fishery. With the receding of flood waters, fish accumulate in the deeper areas or *beels* for shelter and are harvested during the dry season. According to DOF/SPRRSO (1984) total area of *beels* is 114,161 ha. Most of the *beels* and *haors* are located in the north-eastern region of the country. According to MOL there are 3,528 government owned *beels* in the country butt there are private beels also.

The *Beel/haor* fishery is also declining due to over fishing, including harvesting by dewatering (draining and pumping out all water in the dry season) and other destructive fishing, loss and degradation of habitats, obstacles in the migration route of fish to and from floodplain, river etc. The decline of the *beel* fishery has occurred during the last 3-4 decades both quantitatively and qualitatively. In order to improve the *beel* fisheries the Government has in a few locations taken up programmes such as improvement of habitat through excavation of canals linking river with *beels* and floodplain, construction of fish pass, establishment of fish sanctuary, stocking of fish fry, improving fishers' access right to fishery etc. The projects that undertook such initiatives are reviewed in the following sections, there are some positive findings but these are local.

(iii) **Flood plain fishery:** The low lying area of the country, mainly paddy field, is flooded every year during the rainy season from July to October. The seasonally flooded area is highly productive for growth of fish and other aquatic animals. Many of the freshwater fish and shrimp migrate from the rivers and *beels* to the flooded land for breeding and grazing and are harvested by the rural people for their own consumption, and also commercially by professional fishers. Flood plains offer an opportunity of fishing for more than of 70% of the rural population and constitute the largest inland capture fishery in the country contributing about 62% of inland fisheries catch.

Average annual flooded area in Bangladesh is 5.2 million hectare (BBS-2001), of which 2.8 million hectare is considered to be productive for fisheries which retain water for 3 to 5 months in a year. However, some productive flooded area has been lost due to flood control irrigation and drainage project undertaken for augmenting agriculture production. Up to 1985 some 0.8 million ha of floodplain was converted to drained and flood protected agriculture by FCD/FCDI projects, while it has been estimated that by 2005 some 2.5 million ha would be lost due to such action (MPO 1988). Migration routes to

and from rivers and *beels* have been disrupted due to flood control embankments, dams and roads. In addition water quality has deteriorated due to indiscriminate use of insecticide, pesticides and chemical fertilizer in agriculture fields.

As a result of those activities the flood plain fishery has declined during the 1960s to 1980s and this has affected rural people's livelihoods. After 1990 a slow upwards trend in floodplain catch has been shown in official statistics (DOF 2002) which has been attributed to floodplain stocking by Government under different projects and the enforcement of fisheries regulations, but the sustainability of this trend and even its accuracy is unknown given the widespread testimony of fishers that their catches are falling, although opposite views are given by Craig et al (in press). The present fish production from flooded land is 445,178 metric ton, about 62% of the inland catch (DOF 2002).

(iv) **Reservoir fishery:** The only reservoir of the country is the Karnafuli reservoir (Kaptai Lake) - a man-made lake created as a result of construction of a dam in 1961 for hydro-electricity generation on the river Karnafuli at Kaptai in the Chittagong Hill-tract area. The average water area of the lake is 68,000 ha (SPARRSO- 1984). The lake fishery is based on natural and enhanced stock.

Fishing rights to the lake are leased to the BFDC, a semi Government autonomous organization under the Ministry of Fisheries and Livestock, for a low fee. BFDC licenses about 500 fishers in the lake, but many more fish without a license.

There are about 66 local indigenous species and 6 species of exotic fishes. There were 4 carp spawning grounds in the lake but due to natural and manmade causes the spawning of carp has been affected. Since construction carp fries have been stocked in the lake along side the natural recruitment.

Species composition has changed overtime. Some important species like major carp have declined, most of the catch is now of small fishes (mostly less valued species). Total annual recorded landing of fish varies between 4,000 and 7,000 metric tons. About 50% more is marketed illegally without any record.

(v) **Ox-bow lake (*baor*) fishery:** This is culture based enhanced fishery in the abandoned course of rivers (Ox-bow) located in the south-central and south-western region in the greater districts of Jessore, Kusthia and Faridpur. At present there are about 162 ox-bow lakes with dry season area of 5,488 ha. Almost all active *baors* are associated with traditional fisher communities living on the banks of rivers or nearby and dependent on the lake fishery for their livelihood. Over time natural stocks of carps gradually declined and disappeared due to siltation and loss of connections, vegetative growth, and increasing fishing pressure and in consequence the fishers became poorer.

During 1960s Government initiated some development activities in the ox-bow lakes through clearing aquatic vegetation, mainly water hyacinth and stocking *baors* with carp fingerlings for increased production and socio-economic improvement of the poor fishers living on the lake site. The stocking programme was not well planned but there was a positive impact on the production and income of fishers employed by lessees on a share basis. MOL leased these ox-bow lakes to people capable of paying the lease, who employed fishers to catch naturally occurring fish and who occasionally stocked some fish or benefited from government action.

During the early 1980s the Government (DOF) took up a development project with financial and technical assistance of World Bank. Under this project, through rehabilitation of the lake and improved stocking technique, fish production of six baors increased to 500 kg/ha/year against reported pre project production of 100 kg/ha/year, this has continued with yields of 360 kg/ha/years in the 1990s (Middendorp and Balarin 1999). The lakes are managed by the DOF and harvested by the local fishers on a share basis, 40% of the catch going to the fishers and 60% to the Government. In privately managed *baors* fishers' share of the fish was only 15-20%

As a follow up this project, the Ox-bow Lake Small Scale Fishermen Project (the second Ox-bow lake project), financed by IFAD and Danida, was taken up by the Government (DOF) in 22 *baors* which were rehabilitated under the project. Fishers living in and around the lakes were organized and trained and financially supported by an NGO (BRAC) engaged under the project and were involved in managing the lake by themselves with long term tenural right (50 years renewable every 10 years) under the government's New Fisheries Management Policy. With improved management techniques (stocking, guarding, harvesting and marketing fish), production from stocked fish could be increased to 700 kg/ha/year on average with maximum of 2000 kg/ha/year in addition to the indigenous catch which they used to have before. Fisher's income increased from stocked carp (excluding other sources and types of fishing) increased to the range of Tk.5,000-10,000/year in the mid 1990s (Middendorp et al. 1999) In these 22 ox-bow lakes some 5,000 fishers have been benefited by the project.

As a follow up of the second Ox-bow lake project, a third project of almost similar nature, with IFAD financing, is currently under implementation by DOF in another 15 Ox-bow lakes covering an area of 750 ha. Overall situation of *baor* fishery has improved over last two decades due to enhancement activities.

Enhancement fishery programme in flood plains and seasonal *beels* was taken up by DOF as normal activities as well as under different development projects in larger scale. As a result, enhancement fishery is now being practiced at private level too by lessees (fishers' cooperatives and others). This has a tendency to increase the level of exclusion of fishers – professionals are hired on a share or contract basis, while those leasing and stocking beels or areas of private floodplain prevent poor people from fishing after they stock fish.

3.5.3 Inland Fisheries and Fisheries-based Livelihoods Development Programmeme

In addition to the normal programme and activities for protection, conservation and management of inland fisheries, Government development projects with donor support have been undertaken during the last two decades for production purpose and more recently for development of fishers' livelihoods. - in most cases in collaboration with NGOs. In the mid-late 1990s there was a switch to a greater focus on institutions and local participation in the form of community-based fisheries management (CBFM) of inland fisheries through awareness- and capacity-building of the communities. Such communities have then established fish sanctuaries, stocked with fish fingerlings, established closing fishing seasons, rehabilitated wetland habitat, and taken up income generating activities with the help of training and credit to improve their incomes. Some important projects already implemented or under implementation include:

(i) Third Fisheries Project (TFP) (1991-96).

(ii) Second Aquaculture Project. (1989-96)
(iii) Fourth Fisheries Project (FFP) (1998-2005)
(iv) Community Based Fisheries Management (CBFM) Project Phase 1 & 2 (1995-2006).
(v) Management of Aquatic Ecosystem through Community Husbandry (MACH 1998-2003).
(vi) Oxbow Lake Small Scale Fisheries Project Phase I & II (1989-1996)
(vii) Fishers resource development and management under New Fisheries Management Policy (1999-2003).
(viii) Empowerment of Coastal Fisherfolk in Conservation and Management of Coastal Fisheries Resource for Food Security (2000-2004) (Coastal Fisheries).

The objectives, activities and achievement of the above projects are described below:

(i) Third Fisheries Project (1991-96).

The main objective of the Third Fisheries Project was to increase fish production and income of the poor fishers through stocking seasonal flood plain with carp and by involving the beneficiary fishers organized, trained and assisted by NGOs engaged under the project. Starting with 3000 ha flood plain in 1991, a total 43,500 ha in 23 flood plains were stocked in the final year - 1996. The idea behind the project was to increase fish production by using the underutilised ecological niches of the floodplain and gradually hand over the financial and technical aspects of management to the fishers by the end of the project. However, due to delay in deploying the NGOs (only engaged in the final year of the project), the fishers were not properly organized to take up the programme by themselves, and after the project stocking was discontinued. However, incremental production was on an average 214 kg/ ha with a maximum of 400 kg/ha, and the programme was considered to be economically viable. The Economic Rate of Return (ERR) varied from 28% to 122% with average of 38%, and production increased 2 to 6 times. Though the programme was not sustainable, the project was a guide for this type of programme in respect of technical issues (stocking densities, species composition, habitat suitability), social aspects, timely handing over of the water body to the beneficiaries on long term basis, properly organizing the group through NGOs etc. (Islam 1999).

(ii) Second Aquaculture Project (2nd ADP) (1989-96)

The major activities of 2nd ADP were floodplain stocking in the *haor* basin of northeast region of the country and aquaculture development and extension in ponds for increasing fish production of the country.

Unlike the Third Fisheries Project, the Second Aquaculture Project stocked hatchery-produced 4-5 days old carp spawn/fry in low submersible dyke nurseries in perennial *beels* where they grew to fingerling size (5-12 cm) before being automatically dispersed in the floodplain when the nursery was flooded. This system involved less cost compared to TFP where fingerlings were purchased through contractors, but the *beel* nursery system was not environmentally sound as preparation of beel nurseries required all fish/aquatic organisms of the *beel* to be killed with piscicides (Rotenone). Besides, sometimes the nurseries were damaged by flash flood. Starting with 200 ha *beel* nursery in 1991, about 1,000 ha beel nursery were stocked in the terminal year of the project (1996) and a total of 2,498 kg of hatchlings (861 million) were stocked and an estimated 324 million fingerlings (5-10) were produced and finally released in the *haors* during flood. As there was no systematic monitoring system under the project, the environmental and livelihood impact could not be assessed. However there had been an enhancement of fish production and of fishers' income in the area. Fingerlings procured through contractors were also stocked under the project in Hail *Haor* (13,000 ha) in Moulvibazar district, where the impact of stocking was visible from increased catch of stocked fish (carp) and thereby the lease value of *jalmohals* in Hail *Haor* increased significantly. Though the project was to increase fish

production and the income of the fishing community, there was no direct involvement of fishing community in project implementation (Ahmed 1999).

(iii) Fourth Fisheries Project (1998-2005)

On the basis of the experience of TFP, the FFP has been taken up by the Government with flood plain stocking as one of the major components of the project, but where the beneficiaries have been involved in the stocking programme with financial, and technical support from the very beginning of the project. The other components of the project are establishment of fish sanctuaries, construction of fish passes, and linking canals with floodplain and river, and involvement of beneficiaries in project planning and implementation for sustainability of the programme.

(iv) Community Based Fisheries Management Project phases 1 and 2 (1995-1999; 2001-2006)

The approach of the project is to focus on community organization among fishers, and to establish enabling co-management based on local organizations supported by Government and NGOs, and with technical support and research on these pilot activities by WorldFish Center (formerly ICLARM). The aims have been to empower fishers and to achieve more sustainable and equitable management of fisheries to improve the livelihoods of the fishing community, and through this experience to inform and influence fisheries policy. Under the phase-1 project supported by the Ford Foundation, 19 water bodies (closed *beel/baor*, open *beel* and rivers) were included. In the closed beels the fisher groups, waterbodies and fishing rights were well defined and , the fisher groups organized and trained by NGOs stocked fish with NGO credit, in open beels and floodplains the communities took up conservation measures (fish sanctuary and closed season). In both cases there is some evidence of benefits in terms of participatory decision making, participant satisfaction, improved assets and incomes, and higher fish catches (Sultana and Thompson 2000; Thompson et al 1999). In the flowing rivers, the management approach is through local committee consisting of NGO-organized fishers, other fishers and local leaders. The open access policy in rivers limited the achievement in the first phase. However, the NGO-organized fishers have been benefited to some extent. Sustainability has been achieved to some extent in some *beels* where the community is more organized and users' rights in the *beel* have been ensured. The second phase of the CBFM project is under implementation (2001-2006) with financial assistance of DFID and technical assistance from WorldFish Center in 125 water bodies including 15 from Phase-I.

(v) Management of Aquatic Ecosystem Through Community Husbandry (MACH) Project (1998-2003)

MACH is a USAID financed project for community participatory management of aquatic resources. The major objective of the project is to demonstrate to the community, local Government and policy makers, the viability of community approach to sustainable natural resource management and habitat restoration and conservation over an entire ecosystem for sustainable and improved livelihood and food security of the poor, and landless. The project activities include awareness building, organizing and training of the community by NGOs involved under the project; habitat restoration and conservation of aquatic resources, and providing income generating activities for landless poor and destitute women. The project is being implemented in three locations namely – Hail *Haor* in Moulvibazar district, Turag-Bangshi basin in Gazipur district and Kangsha-Malajhee basin in Sherpur district since 1999. The management is being carried out by community level resource management committees comprising representatives from fishers, farmers and local elite and through involvement of local Government. (the Union Parishad, Upazila and Government departments) for sustainability of

the activities. Users' rights have been transferred to the committees for management of the fisheries in specific water bodies. As a result of management intervention like habitat restoration, resource conservation (closure of fishing during breeding season, establishment of sanctuaries, implementation of fish act) the fish production increased in the project area (MACH 2002).

(vi) Oxbow Lake Small Scale Fisheries Project Phase-I & II (1989-1996)

The management of oxbow lakes through stocking of carps either by government itself or by fisher group organized with NGO assistance under government supervision in the southwest of the country has been summarized in Section 3.5.2 (v).

(vii) Fisheries Resource Development and Management Under New Fisheries Management Policy (1999-2003).

This GOB financed project aimed to assist and empower the fishing community to manage fisheries under the principles of the new fisheries management policy by working with the national fishers association, but it has made very slow progress.

(viii) Empowerment of Coastal Fisherfolk in Conservation and Management of Coastal Fisheries Resource for Food Security (2000-2004)

This FAO/ UNDP financed project is being implemented in Cox's Bazar district as a pilot programme to empower the fishers through awareness building, training and other support for management of coastal fisheries on sustainable basis for food security of the fishers. (The present report only details projects relating to inland capture and enhancement fisheries, so no further details about this project will be given here.)

3.5.4 Enhancement Fisheries

The above summaries of project experiences have included a number where fisheries were enhanced through deliberate stocking of carps. This has to be done on an annual basis where native carp are unable to breed naturally or be recruited into a fishery, if carp are to be grown there. Experience in the floodplains indicates that this is technically feasible, but environmentally problematic practices should be avoided, and organization of communities to sustainably operate such practices in terms of collecting funds for stocking and maintaining equitable organizations is very difficult and not yet demonstrated. Recent experience of habitat restoration, local sanctuaries and restoration of naturally breeding / recruiting fish into such systems is more encouraging as a robust means of reversing past trends with lower annual costs. Smaller beels with few outlets that can be controlled by an individual or by fisher groups are rapidly moving towards culture based systems of annual carp stocking, given that this trend is strong, it seems better for fishers to benefit through community based approaches linked up with DOF than for the benefits to go to leaseholders and a few leaders of cooperatives.

3.5.5 Fisheries Data Base

DOF has maintained records of fish production of inland and marine water since 1960, estimated on the basis of per capita fish consumption obtained through national nutritional surveys conducted in 1962-64, 1975-76 and 1980-81 in conjunction with DOF field experience, until 1983-84 when a fishery statistical system was developed under the FAO/UNDP financed Fisheries Resources Survey System Project.

From the review of existing literature and secondary stakeholders discussion, it would seem that the inland fisheries (capture) are declining, though according to DoF's estimates they are increasing since 1990. The reasons for this contradiction are unclear. However it may be that total catch is increasing due to increased fishing effort although the catch per unit effort or per fisher is decreasing, or it may be that the recorded increase in catch is due to weak and old data base and a faulty data collection system. This is a weak area in inland fisheries management which needs to be addressed properly. The present fisheries data base and data collection system and the reliability of the data has been questioned by different agencies and the need for a strong fisheries data base and statistically sound data collection system have been suggested.

4. LEGAL, INSTITUTIONAL AND POLICY FRAMEWORK IN RELATION TO THE INLAND FISHERIES

4.1 Historical Background of Fisheries Policy and Institutions

Policies regarding inland fisheries in rivers, canals, depressions (beel and haors), lakes, estuaries and flooded land in pre-British and even during the British period (1757 to 1947 AD) were to harvest fish without considering conservation and management needs of the fish resource, and to collect revenues from those who caught fish for a livelihood or from those managing the water bodies for fishing. During pre-British period the customary right of the fishers to catch fish in non-navigable rivers, canals, depression (*beels, haors*) was through tolls, with part of the catch going to the estate-holders or agents. Sometimes the state agent would take fish free from the fishers (Ali 1997). Fishing in navigable rivers was free. This system in navigable rivers, canals etc was gradually replaced a leasing system or contractual system of leasing of the water body or part of it, mostly to non-fishers.

During the period of British rule; the rights of private ownership of land including waterbodies/ *jalkar /jalmohal* (*jal* means water and *kar* means tax – *jalkar* means water bodies taxed for fishing), except navigable rivers, were vested to the *Zamindar* (one who holds lands) under general legislative form in Regulation XXVII of 1793 Permanent Settlement. Rights of the navigable rivers was retained by the Public sector through the state which owned navigable rivers, tidal estuaries and rivers running through certain forests (reserved forests).

In 1859 the Government introduced a leasing system for navigable rivers, or parts of them demarcated by the state for leasing, to increase Government revenue. A portion of a river demarcated for leasing, an individual or group of *beels* (depressions), individual ox-bow lake (*baor*), and government owned man-made ponds are all known as *jalmohal/jalkar* or fishery.

However, after liberation from British rule (1947) the landlord (*Zamindar*) system was abolished under the State Acquisition Act 1950 (during Pakistan period) and all *Zamindar* Estates including public water bodies (fisheries/*jalmohal*) were transferred to Government. All the *Jalmohals* were placed under the administrative control of Department of Revenue, subsequently designated as Ministry of Land Administration and Land Reform (presently the Ministry of Land), mainly for the purpose of collecting revenue by leasing the *Jalmohals* for fishing and fish production. The responsibility for biological management and development of fisheries was vested in the Department of Fisheries. From 1908 when the Department of Fisheries in Bangladesh (Former Bangla/Bengal State of India) was established to 1947 the activity of the DOF was very limited. After which the activities of DOF expanded gradually, focusing on management, protection and conservation of fisheries resources, aquaculture development and extension.

A summary of major policy and legal issues related to aquatic environment and resources adopted so far is furnished in Table 4.1.

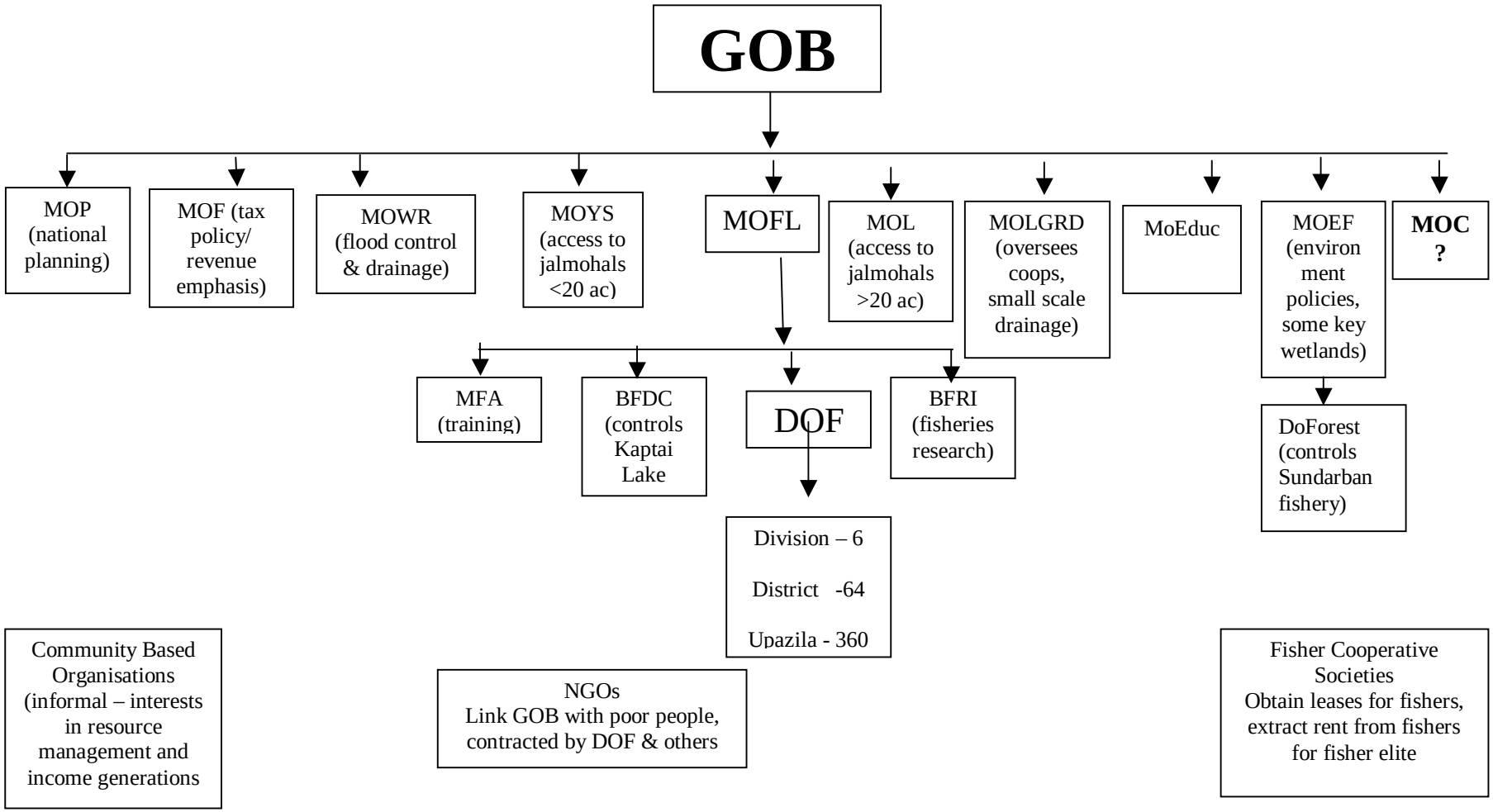
Table 4.1 Summary of Major Policy and Legal Issues Related to Aquatic Environment and Aquatic Resources.

Policy/ Regulation/Policy Decision Adopted		Year of Adoption
A.	Fisheries/Policy/Regulation/Laws	
1.	Fish Protection and Conservation Act. 1887, India	1987
2.	The Tank Improvement Act 1939.	1939
3.	The East Bengal Protection and Conservation of Fish Act 1950.	1950
4.	Abolition of *Zamindar* System under State Acquisition Act 1950	1950
5.	Water body / *Jalmohal* Management Policy of MOL	1950
6.	Leasing Priority to Fishers Cooperative Society	1965
7.	Transfer of *Jalmohal* to MOFL from MOL	1980
8.	*Jalmohal* Returned to MOL from MOFL	1983
9.	Marine Fisheries Ordinance and Rules.	1983
10.	Fish and Fish Product (Fish Inspection and Quality Control Ordinance 1983.	1983
11.	*Jalmohal* up to 20 acre transferred to Upazila Parishad	1984
12.	New Fisheries Management Policy	1987
13.	Declaration of open access to flowing river fishery	1995
14.	*Jalmohal* (closed) up to 20 acre withdrawn from Upazila Parishad and placed with MOYS	1997
15.	National Fisheries Policy	1998
16.	Ban on Shrimp Fry Collection from natural water	2000
B.	Water Policy	1990
C.	Environment Policy	1992
D.	Land use Policy	2001

4.2 Fisheries Organizations and Institutions

Several organizations and institutions are involved in fisheries development and management in Bangladesh today (See Organogram in Fig. 10). Ministry of Fisheries and Livestock (MOFL), Government of Bangladesh is the main and lead administrative agency responsible for formulating fisheries policy and development strategies. Under MOFL there are four agencies namely (i) Department of Fisheries (DOF), (ii) Bangladesh Fisheries Research Institute (BFRI), (iii) Bangladesh Fisheries Development Corporation (BFDC) and (iv) Marine Fisheries Academy, each with specific functions and responsibilities for development and management of the fisheries sector.

Fig. 10 Government and Non-Government agency roles in Inland Fisheries in Bangladesh



The Department of Fisheries (DOF) is the largest of the four state fisheries organizations and is responsible for management and conservation of fisheries resources, enforcement of fisheries rules and regulations, extension of aquaculture technology and fisheries management technology through training, demonstration and motivation, execution of development projects, quality control of fish and fish products for home consumption and export. BFRI is responsible for undertaking basic and field needs-based research for technology development in the field of aquaculture, fisheries management, and post-harvest technology for transfer to the private sector through DOF. BFDC is presently responsible for marketing of fish including creating marketing and fish landing facilities, while Marine Fisheries Academy is responsible for training of cadets for marine fishing vessels.

However, in practice, policy and its application in inland fisheries is determined more by the Ministry of Land and finance requirements from fisheries than from MOFL and Department of Fisheries. The fisheries sector has focused on production and more recently on sustainability and access for fishers and the poor, while the central government focus in fisheries is still to collect revenue and exert patronage over fisheries irrespective of the income level of the fishers who actually depend on the fisheries.

Amongst other agencies involved in the Fisheries Sector, Ministry of Land (MOL) is very much related to fisheries management as it controls all the public water bodies in rivers, *beels*, ox-bow lakes, Government owned ponds etc. In the private sector fisher cooperative societies and NGOs are also involved in fisheries sector. Other organizations and institutions involved in fisheries are listed below:

1. Ministry of Land
2. Ministry of Water Resources
3. Ministry of Local Government, Rural Development and Cooperatives
4. Ministry of Industry
5. Ministry of Commerce
6. Ministry of Shipping'
7. Ministry of Education
8. Ministry of Finance
9. Ministry of Forest and Environment
10. Planning Commission
11. Banks
12. Fishers Cooperative Society / Fisher Organizations
13. NGOs
14. Community Based Organisations

The key features are:

a) the division of interests in fisheries (e.g. between land administration, Department of Fisheries and Forest Department),
b) overlaps in policy between land, water (two different ministries and agencies build water control structures), environment and fisheries which are yet to be harmonised; and
c) overall dominance by short term revenue interests and leasing systems supported by the Ministry of Finance and Ministry of Land which are at odds with sustainable harvesting (and sustainable tax revenue) and with poverty reduction.

Fish production and harvesting systems are almost entirely in the hand of the private sector, with the exception of some production-oriented activities required for demonstration and field testing of technology and training and extension undertaken by the DOF. Exploratory/ experimental fishing required for stock or impact assessment of any management intervention is carried out by the Govt. Agencies. BFDC of course undertakes commercial fishing in the Bay of Bengal by trawlers.

4.3 Policy Concept For Fish, Fishery and Fishers

The general concepts for management of a renewable aquatic living resource like fish, which has a life cycle, is that:

Firstly, fish should be given a chance to reproduce at least once in life. In other words- this concept implies that (i) an appropriate number of spawners are necessary to sustain the population (ii) young fish should be protected to grow to maturity and the spawner be protected during breeding season.

Secondly, the fish be given suitable habitat with sufficient productivity and ecological requirements including facilities for spawning, migration etc. and free from any contamination of water and soil.

Thirdly, users rights to the resource should be ensured equitably and the socio-economic condition of the poor users group be improved.

4.4 Fisheries Regulations and Laws

Based on the policy concepts of resource conservation, the Fish Protection and Conservation Act was for the first time adopted in the then British India in 1887 as applicable throughout the whole of India except Burma (Myanmar), and different states were asked to implement it. However, not much is known about the implementation status. However, in 1950 the East Bengal Fish Protection and Conservation Act was enacted in Bangladesh (the then East Pakistan). This has been amended from time to time and rules framed for enforcement of the policy. The main feature of the Act 1950 are (i) restrictions on size at catch of some species of fish at specific periods of year, (ii) restrictions on catch of any particular species at certain season/time (during spawning) (iii) restrictions on the placing of fixed engine (any fishing devises fixed to the ground) which may hamper movement of fish, (iv) closure of fishing in any water body at any time, (v) restrictions on fishing by dewatering and any other destructive methods, and (vi) restrictions on the use of particular kinds of gear and on mesh size of net.

4.5 Policy Commitment for Fish Habitat (Fishery)

Based on the above mentioned concept of fish habitat the policy commitments have been adopted by different Government organizations like MOEL, MOWR, MOL, MOFL. The key features of those policy issues are as follows:

4.5.1 Environment policy adopted by the Ministry of Environment & Forestry

(i) Environment congenial for fish should be ensured.
   1) Discharge of industrial & domestic untreated effluent/waste into water be controlled.
   2) Use of harmful insecticides and pesticides in agriculture, which may be washed into water bodies and may pollute water and harm aquatic organisms be prohibited.
   3) Water bodies cannot be dewatered for harvesting fish.

(ii) Arrangements will be made to halt reduction of area of water bodies and for their development/reclamation as source of fish production.

1) Water holding capacity of rivers, beels etc. can be increased by excavation/ dredging.
2) Water bodies like *haor, baor, beel* etc. be reclaimed/developed and declared as national protected area for fish production. Area of such water bodies can not be reduced.

(iii) FCD/I projects and other development activities which have already had harmful effect on fish resources be evaluated and their environment be improved for fish production.

1) Appropriate plan and arrangement be made so that flow and current of natural water bodies are not affected by development activities like FCD/I projects, roads, embankments etc.

(iv) Ensure that fisheries development works do not create any effect on mangrove forest and other ecosystem.

4.5.2 Water Policy for Fish Habitat

Water resource sector policy in the pre-liberation period paid full attention to the augmentation of agricultural production through implementation of FCD/I projects and did not take account of other sectors like fisheries, navigation, environment etc. As a result of the activities of water resource management for agriculture, there was significant loss and degradation of fish habitats including obstacles to the migration routes of fish which affected the fisheries badly. This was of major concern to the fisheries sector, and in the post liberation period (post-Pakistan) the issue was taken into consideration and a Master Plan Organization (MPO) was established during early 1980s to assess the impact of FCD/I projects and other water management activities on fisheries, navigation, the environment etc.. This organization developed a policy strategy and action plan for the water sector which gave due consideration to fisheries and other users of water resources. Subsequently in 1990 a national water resource policy was formulated and adopted by the Government.

Major/key issues of water policy relating to fisheries are as follows:-

1) Fisheries and wildlife will receive due emphasis in water resource planning in areas where their social impact is high.
2) Measures will be taken to minimize disruption to the natural aquatic habitat and water channels.
3) Drainage schemes, to the extent possible, will avoid state-owned swamps and marshes that have primary value for waterfowl or other wildlife.
4) Water bodies *(baors, haors, beels*, roadside borrow pits etc.) will, as far as possible, be reserved for fish production and development. Perennial links of the water bodies to the rivers will also be properly maintained.
5) Water development plans will not interrupt fish movement and will make adequate provision in control structures to allow fish migration and breeding.
6) Brackish water aquaculture will be confined to specific zones designated by the Government for this purpose.

4.5.3 Land Use Policy for Fish Habitat

1. The usual area for fish production such as ponds, rivers, canals and marsh lands should not come across adverse situation.
2. Conversion of water land to agriculture land be discouraged.

4.6 Waterbody (jalmohal/fishery) Management Policy

4.6.1 Jalmohal Management Policy of Ministry of Land

After abolishing the *Zaminderi* system in 1950, the ownership and management of water bodies (*Sairat mohal/jalmohal*/fishery) was vested with Government who took the policy decision to manage *Jalmohals* to earn revenue through exploitation of fisheries resources. The responsibility for management of *jalmohals* was given to the Ministry of Land.

The lease system put *jalmohals* on open auction where the highest bidder was granted lease. The method of fixing minimum revenue prior to auction was to average the last three terms' lease value then to increase it by 10%. In fixing the minimum lease value, the productivity of the water body was not considered. High lease values sometimes encouraged the lessees to over-fish – following destructive practices to earn maximum profit in the short term. This system continued up until 1965. Then, in order to help the poor fishers communities, the Government decided to give preference to fishers cooperative societies registered with the department of cooperatives in leasing out the *jalmohals,* provided the society agreed to pay the highest bid money. Then, after independence the new Government decided to restrict the leasing of *jalmohals* to registered fisher cooperative societies through negotiation for 1-year lease for river and canal and 3-year leases for the closed/semi closed type of waters (fishery) like *beel, baor* and ponds. If such a fisher association was not available or the terms and condition of lease were not acceptable to the Government then the *Jalmohals* would be put up for open auction where anybody including non-fisher could bid. The terms and conditions of leases were as follows:

1. In case of leasing the *Jalmohal* to a fishers cooperative society through negotiation, lease value would be fixed at 10% above the average of the last three years or the highest of the last three years revenue received due to increase fish price or increase in fish production.

2. The lessee must abide by regulations under the Fish Protection and Conservation Act 1950.

3. The lessee must not do such activity that would hinder/affect navigation, agriculture, public health, environment or cause the water of the *jalmohal* to be polluted.

4. The lessee is bound to provide any information regarding the *jalmohal* and fish and fish production to authorized fishery officers of the DOF.

5. The *jalmohal* cannot be subleased to any other person.

In 1984 leasing to the fishers cooperative societies through negotiation was replaced by open auction system but limited among fishers cooperative societies. Open auction system of leasing *Jalmohals* was subsequently changed to bidding by sealed tender system, all other conditions and norms remaining unchanged.

However, despite the fact that the policy of leasing *jalmohals* was made in favour of fishers, in most cases their access to the *jalmohals* was limited due to their poverty and inability to raise the lease monies, and to the influence of powerful people.. Again because of the short-term nature of the lease period, and sometime high lease value and other administrative complexity, the lessees tended to extract as much fish as they could from the water body to make maximum profit. Meanwhile MOL was more interested in revenue collection than in the sustainable management of the fishery.

Since the sustainable management of the fisheries was not given due consideration by MOL and as MOFL was responsible for overall management and development of the fisheries resources of the country, the *jalmohal* were transferred to MOFL in 1980. However, due to shortage of manpower, MOFL/DOF had difficulty in managing them and the *jalmohals* were transferred back to MOL in 1983.

In 1984 all closed *Jalmohals* up to 20 acres were transferred to the *Upazila/Thana Parishad.* In 1986-90 some 257 *Jalmohals* (above 20 acres) were managed under New Fisheries Management Policy by MOFL. In 1987 *Jalmohals* measuring up to 3 acres and where annual lease value was not more than Tk. 5,000 were declared as common resources for use by local people for drinking, bathing, fishing, retting jute etc., and were placed under the *Union Parishad* which would pay lease value of Tk. 5 per acre per year to MoL. In 1997 all closed water bodies (pond and closed type) of under 20 acres were withdrawn from *Upazila Parishad* and transferred to the Ministry of Youth and Sports to create self-employment for the young people. Besides selected *Jalmohals* (over 400 by 2003) have periodically been transferred to the MOFL for management under different development projects. Water bodies falling within reserved forest of Sundarban are currently managed by the Department of Forest.

4.6.2 New Fisheries Management Policy (NFMP)

In order to augment fish production through sustainable management and establish the fishing right of genuine fishers in the fishery by providing licenses, a management system of *Jalmohal*, namely New Fishery Management Policy (NFMP) was introduced in 1986. Along with MOFL/DOF, a fisher association namely *Jatio Matshajibi Shamiti* volunteered in the planning and implementation process of NFMP. Under the NFMP provision for collateral free credit up to Tk.6,000 was made to help poor fishers procure boats and nets. Initially 10 *Jalmohals* were brought under the NFMP and were managed jointly by MOFL & MOL and all *Jalmohals* were planned to gradually fall under theNFMP.

The feasibility of the NFMP was initially researched by the Bangladesh Centre for Advanced Studies. Then the impact of NFMP was evaluated by a committee formed with high level Government officials. From the studies it was confirmed that through the NFMP the rights of the fishers to fishery were established and exploitation by the middlemen lease holders was to some extent reduced. The fishers paid a lesser fee (license fee) under NPMP than they had to pay under leasing system. Some conservation measures like establishing sanctuaries in some parts of the *Jalmohals* were taken by the fishers. Some fishers got collateral free credit from bank. But because of the cumbersome, time consuming and lengthy process of getting bank credit as introduced under NFMP, most fishers did not take up bank loans. Some fishers remainded dependent on informal private credit from moneylender and *Mohajan*. In some *Jalmohals* production was found to increase. Subsequently another 290 *Jalmohals* were selected for management under NFMP.

In all 257 Jalmohals were placed under the NFMP by 1994. The fishers association (*Jatio Matshagibi Shamiti*) was responsible for identifying genuine fishers, organizing, and motivating the fishing community. But the Association itself was not organized and capable enough to organize the fishing community. Additionally the policy was implemented jointly by the MOFL and MOL, and this created a major problem in implementation. To implement the policy, management committees at *upazila,* district and national level were formed. The committees at *upazila* and district level were headed by Ministry of Land's representatives (UNO and DC) who had very little time to give attention to the policy's implementation and consequently DOF officials faced problems in proper implementation of the NFMP.

In 1995 the leasing system for flowing rivers was abolished and fishing was declared open to all free of cost except to those who catch fish by using mechanized boat. These have to pay

fees to the Government. The policy was established for the benefit of the poor fishers but as there was no control, fishing pressure increased disproportionate to the resource availability in the rivers, thus threatening the fish stock. Additionally influential persons and *mastans* (musclemen*)* have been reported as controlling the rights to river *jalmohals* in some areas and to have harassed and exploited fishers. (The secondary stakeholders (*Jatio Matshyajibi Samiti* and *Khudra Matshayajibi Samiti*), expressed this view.)

Following the abolition of the leasing of flowing rivers, NFMP became inactive and finally was closed. However, in 1998 the NFMP was revived with the initiative of the *Jatiya Matshyajibi Samity* and DOF. Now some 31 *Jalmohals* are being managed under NFMP.

4.6.3 National Fisheries Policy of Bangladesh (NFP)

In 1998 the NFP was adopted by the Government with the following goals and objectives.

1) Development of fisheries resources and increase of fish production.

2) Poverty alleviation through creation of employment opportunities and improvement of socio-economic condition of fisher community.

3) Meet the national demand for animal protein.

4) Increase foreign exchange earnings and economic growth through export of fish products.

5) Maintain environmental balance, protect biodiversity, and improve public health.

The implementation strategies for the NFP have not yet been formulated. However, some strategies already existed earlier and are being followed.

The present system of fixing the minimum lease value is to add 25% to the last three terms' average lease value and then increase the lease value by 10% every year, and bidding for leases continues.

However, the present policy of MOL regarding projects under the MOFL system of to fixing the minimum lease value for the first year of the project by adding 25% above the last three year average lease value and then to increase the lease value by 10% every year. Although in 2002 a meeting between the two ministries agreed to not make 10% per year increases in revenue for such "handed over" *jalmohals*, and to review the lease rate after 5 years, this was only notified by MOL to the district administrations in 2003.

4.6.4 Responsibilities for Fisheries Management at Different Levels

At macro level, fisheries (*jalmohals*) above 20 acres in area are managed by MOL for the collection of revenue through leasing. MOL is responsible for policy, planning and monitoring. Lease management, including fixing of the lease rate and collection of revenue is practically administered at meso-level (district) by the respective Deputy Commissioner assisted by the ADC (Revenue). At district level the *Jalmohals* are leased through a committee (*Jalmohal* Committee) with ADC (Revenue) as Chairman. At micro level the *Jalmohals* are managed by lessees (Fishers Cooperative Society/ other who get the lease).

Jalmohals up to 20 acre are managed by MOYS through the Department of Youth. The *Jalmohals* are leased to the registered cooperative societies of the youths (men and women) through the tender system by a *Upazila*-level Committee with *Upazila Nirbahi* Officer (UNO) as Chairman, *Upazila* Youth Development Officer as Member-Secretary. *Jalmohals* falling

within Metropolitan areas are leased through the tender system by a Committee headed by ADC (Revenue) and District Youth Development Officer as Member-Secretary.

Under the NFMP management is carried out at National, District and *Upazila* levels through three committees viz.

(i) Central *Jalmohal* Management Coordination Committee headed by the Secretary, MOL and Joint Secretary, MOFL as Member Secretary.
(ii) District *Jalmohal* Management Coordination Committee with D.C. as Chairman and DFO as Member Secretary.
(iii) *Upazila Jalmohal* Management Coordination Committee headed by UNO and UFO as Member Secretary.

At micro level *Jalmohal* Management Committee formed with the team leader of different fishers groups and a representative from *Jatio Matshyajibi Samiti* is responsible for planning and implementing management programme, including assisting selection of genuine fishers and fixing license fees, organizing the fishers, ensuring implementation of fish protection and conservation laws etc.

The fisheries within the Sundarban reserved forest are managed by Forest Department through local level staff of the Forest Department by issuing fishing permit to the fishing boat/fishers willing to undertake fishing in the forest area. The fees for permit for each entry is determined based on the type and size of boat, fishing gear and duration of stay in the forest area. Also royalty on the catch estimated while leaving the forest area is collected by the Forest Department. Fish protection and conservation acts are to be enforced by forest staff. DOF staff are not involved in the enforcement of the Fish Act or any management measures within the reserved forest area.

Environmental laws regulating industrial pollution which affect the fish resources in open water are enforced by the department of Environment. But the rules are not enforced effectively because of the institutional weaknesses of the enforcing agency and the influence of the industrialists.

Overall development and management of the fisheries sector is the responsibility of the MOFL/DOF. For inland capture fisheries the major responsibilities of DOF are:

1) enforcement of fish protection and conservation Act 1950, its subsequent amendment and rules framed under the act.
2) undertake different management strategies like establishing fish sanctuary
3) stocking open waters/flood plain with fish fingerlings
4) developing fish habitat through
5) creating awareness among the people including fishers about fisheries management and conservation need and of their laws.

The responsibilities of the DOF are performed at national, district and *upazila* level, while some NGOs and CBOs are involved in assisting the community in managing fisheries through organizing them, and capacity building.

The current distribution of responsibilities of the different organizations and agencies directly in fisheries resource management and habitat management at different levels is shown in Table 4.2.

Table 4.2 : Fisheries Management Responsibilities at Different Levels.

Levels		Actors	Responsibilities
Macro	National	MOFL	Formulate
			Policy and Planning for fisheries management, resource conservation and development
		DOF	Assist MOFL in policy formulation and planning in technical aspects, plan for execution of the activities, guide supervise monitor and evaluation.
		MOL	Policy and planning lease management of Jalmohal above 20 acres.
		MOYS	Policy and planning for management of closed type of *Jalmohals* below 20 acres.
		MOEF	Policy and planning for forest resources management and conservation; and protection and conservation of environment management
Meso	Division	Divisional Dy. Director	Supervision, Monitoring, Advising enforcement of law
	District	District Fishery Officer	Supervision, Monitoring, Advising enforcement of law
		Deputy Commissioner	
			Leasing *jalmohal* and collection
		Divisional Forest Officer	Supervise and monitor management of fisheries resources in the sundarbon forest
Micro	Upazila	Upazila Fishery Officer Assist Fishery Officer	Enforce Fish Act and Laws and extension activities
		Chairman/UNO, Upazila Parishad	Coordinating lease of small *Jalmahols* placed under the Ministry of youth and Jalmohal manage under NFMP
		Forest Ranger	Issue permits for fishing in Subdarban forest area and collect revenue.
	Local	Fishers organizations NGO	Motivate and organize the fisher for capacity building to establishing fishers right, and bargain for the interest of fishers community
		Chairman, Union Parishad	Management of *Khas* water body upto 3 acres as common property resource.

4.6.5 Problem and Constraints in Enforcement of Laws

Formulation and enactment of policy and laws are rather easier than implementation. The DOF, who is responsible for enforcement of laws/regulation relating to fisheries management, does not have sufficient manpower, authority for conducting mobile court or logistic support for efficiently enforcing the laws. Besides there is local and political influence that also hampers enforcement.

The poor fishers understand the implication of regulation and are always afraid of violating the regulations, but in practice they violate it on the grounds that they would have to starve if they are to obey law. Sometimes the fishers become hostile and aggressive to the law-enforcing body at field level. The relation between the local level DOF staff responsible for implementing Fish Acts and the fisher is in general good as they at heart realize that what they are doing is illegal and against the interest of the resource. There are of course reverse situations where the fishers are exploited /oppressed by local body, DOF personnel, and law enforcement agencies (police). But in general they (fishers) obtain legal support from DOF and other law enforcement agencies against any illegal acts by local elites.

4.6.6 Impact of Policies on Fisheries Resources and Stakeholders

Though the DOF is responsible for overall development and management fisheries resources and improvement of the socio-economic condition of fishing community, the DOF has limited authority and resources to perform its mandate. The Department of Cooperatives is responsible for organizing fishers cooperatives, while financial institutions are responsible for providing credit to fishers. However, fishers' access to those facilities is not duly accorded.

Lack of overall coordination among different organizations and agencies is a major constraint to proper management and development of fisheries resources and leads to negative affects on the resources and those who are dependant on them.

The revenue-oriented management of fisheries, i.e. leasing of *Jalmohals* for collection of revenue by MOL is against the principles of biological management of the aquatic resource and encourages over-exploitation. The short tem lease period, increasing revenue every year by 10% and fixing the lease value at the beginning at 25% higher than the previous term's lease value, with no control over fishing intensity etc. encourages the lease holders to extract as much as they can to maximize their profit. They do this through all sorts of illegal fishing, leaving very little for future propagation and thereby fish stocks of many species have declined alarmingly. Some species of fishes have become extinct and many are endangered.

The water management activities of the BWDB of the Ministry of Water Resource have caused a significant loss of fish habitat, created obstacles in migration route of fish to and from their grazing and spawning ground in flood plains. Construction of road networks by the RHD and LGED has also hampered normal water flow affecting the migration of fish. With the introduction of HYV rice/paddy, use of chemical fertilizer and pesticides has increased extensively and when washed away into the water bodies, the chemicals pollute the water causing harm to the aquatic resources.

The water management activities of FCD/I projects undertaken during and after the 1960s under the Green Revolution to grow more food (cereals) has impacted negatively on fisheries, environment and other sector.

Much importance has been attached to protection and conservation of environment in the last decade and for that the Ministry of Environment and Forestry with the Department of Environment has been established, which has formulated policy and regulations for conservation and management of environment including aquatic habitat and biodiversity.

4.6.7 Role of Stakeholders in Policy Formulation

Participatory approach is the major policy of the government in all development activities. Participation of people (with particular emphasis on women) at all levels in the process of planning, policy formulation and implementation with major objective of poverty alleviation and food security is one of the major policy strategy of the government and is effected through informal ways and processes such as inclusion of the representative organization of the poor who depend on inland fisheries, in meeting, workshop and committee for policy formulation in fisheries sector. Some time the individuals are also invited to participate in the workshop/seminar on policy formulation, where they can give their input to articulate their needs in the policy making and implementation. In addition to their own organizations (Fisher cooperative society, Bangladesh *Jatio Matshyajibi Samiti, Khudra Matshyajibi Samiti,* etc.), some NGOs working with fisher community for development of fisheries and poverty alleviation, the donors, etc. have scope to influence policy making, so that the rights and interest of the poor are properly reflected in policy. Thus the National Fisheries Policy 1998 was formulated through involvement of different stakeholders including fisher's representatives, NGOs, donors, etc.

4.6.8 Role of National and International Organizations in Policy Formulation

International organizations like FAO/UNDP, WB, ADB, DFID, IFAD, USAID, national research organizations, universities (BAU & DU, etc.), and NGOs all play a role in policy making through providing inputs to policy formulation forums (workshop, seminar, committee). Research/study findings are used as the basis for formulating policies and laws in fisheries sector. The international organizations, donors and NGOs have supported moves to ensure access for the users/fishers to the inland aquatic resources/fisheries in the interest of sustainable biological management of the fisheries resources, elimination of middlemen's exploitation of fishers and alleviating poverty and socio-economic uplift of fishers. Government policy specifically focuses on women's participation and interest in all sectors including fisheries sector particularly in aquaculture, fish processing, and making fishing equipment.

4.6.9 Government Overall Policy Trend

Overall policy trend of the government is decentralization of power and authority to local level with *Upazila Parishad*, *Union* Council and even villages, for greater participation of different stakeholders as far as possible to ensure better performance, quick decision and easy access to public facility and support.

5. THE INLAND FISHERIES IN THE CONTEXT OF LIVELIHOODS

5.1 Characterisation of Fisheries Stakeholders

The contribution of inland fisheries (capture fisheries) of Bangladesh to the livelihoods of the people - particularly of the rural poor - is historically known to be significantly important - in the traditional saying “Machee Bhatee Bangalee” (fish and rice make a Bangali). In various ways the people are involved in inland fisheries for their livelihoods, such as fishing, fish trading, fish processing, fish transportation, making fishing equipment, working as fishery labourer etc. Again those who are involved in fishing may be full time professional, part time seasonal and subsistence. With the introduction of enhancement fisheries (in Ox-bow lake, reservoir (Kaptai lake) and flood plain *beels* fish), hatchery and nursery operators, fry traders etc. are becoming associated with and dependant on inland fisheries. According to DOF estimate, fisheries sector provides employment of about 1.2 million full time fishers of which 0.77 million are engaged in inland (capture) fisheries. However, about 70% of rural households undertake some sort of fishing for their own consumption (DOF 2001, CIDA-FAP-6, 1994). Besides a large number of people are engaged in part time (professional) fishing, fish farming, trading, processing, working as labourer, marketing, transportation etc. for their livelihoods.

However, for heuristic purposes, the primary stakeholders in inland fisheries sector (capture and enhancement) may be broadly categorized as (i) Fishers (full time, part time and subsistence), (ii) Fish and Shrimp fry collectors, (iii) Fish traders, (iv) Fish processors, (v) Fishing equipment makers, (vi) Fish hatchery and nursery operators, (vii) Fishery workers. Details of their livelihoods are given below:

5.1.1 Fishers

In Bangladesh fishers are broadly classified into the following three categories:

(a) **Full time fisher/professional fishers**: They are usually from the poorest group of people. They undertake fishing almost throughout the year and are almost fully dependant on fishing for their livelihood there are about 0.77 million full time fishers in inland fisheries in Bangladesh.

(b) **Part time fisher/seasonal professional fishers**: They undertake fishing seasonally for part of the year, in most cases as secondary occupation.

(c) **Subsistence /non-professional fishers** : Where there is scope for fishing, people of almost all social strata catch fish for their own consumption. According to DOF (2002) about 70% of rural population undertake some sort of fishing for their own consumption.

Women rarely catch fish as a source of income in Bangladesh. Poor women and children do make use of aquatic resources, including in some areas catching fish for household consumption, even among Muslim households. Traditional Hindu fishers are not women, but elsewhere as they have somewhat greater freedom to move some Hindu women do openly fish (Sultana et al. 2002). In addition women have an important role in the fisheries sector in processing fish (although income is a household level one when the dried or fermented fish are sold and so women’s income is limited) and in making and repairing nets.

Full-time fishers

These were traditionally low caste Hindus, of low status and were looked down upon by others. However, driven by poverty and increasing landlessness due to rapid population growth, and the low entry costs to what are a common pool resource (CPR), poor Muslims have increasingly adopted fishing as their profession for survival. Now the majority of the fishing community is constituted of Muslims. For example, Karim Rezaul (1994) reported that in riverine area the fishers were 54% Hindus and 46% Muslims. Thompson (1999) found that there were 64% Muslim fishers and 36% Hindu fishers in a sample of different waterbodies.

However the socio-economic condition of full-time fishers has always been deplorable. They are usually poor, illiterate, unorganised and neglected. The majority live below the poverty line. They are exploited by the middleman/moneylender. Their access to the resources is frequently limited. Many do not have fishing equipment (gear and boat) of their own. Most are landless, and many of them do not even have homestead land, but build their houses on riverbanks (Government *khas* land) subject to flooding. They rarely have access to bank credit because of a lack of collateral. Consequently they have to depend on private moneylenders who usually charge a very high rate of interest. Most of them undertake fishing on a share basis with the boat-gear owner or moneylender, or as daily labourer or on a monthly salary basis.

The traditional fishing community rarely has other means of livelihood. Pressure on the resource is gradually increasing due to overall population increase and to more poor Muslims moving into the fisheries, while the resource is under threat of depletion due to degradation of fish habitat by human intervention and natural causes.

Given this trend the full-time fishers' livelihoods are under threat, while their vulnerability will increase as the resource declines even with higher prices for the product consequent upon the reduced catch landed. What the effect of such a scenario on individual and collective fishing effort, on incentives to others to enter or leave the fisheries, and the like is uncertain.

There is also some uncertainty as regards the impact of a declining resource base on fishers' vulnerability context. There is some evidence that full-time fisher households are not the poorest of the poor, do diversify into other activities (such as share-cropping) when circumstances allow, and are not as seasonally vulnerable as those poor with agriculturally-based livelihoods (for example PRA seasonal calendars indicate that, unlike poor agriculturalists they do not have a 'lean period' during the year – usually August-October for agriculturists -) (see Seasonal diagramming exercises in Barr et al 2001, Vol 4). On the one hand, if fish prices rise due to resource scarcity, fishers might not suffer any greater vulnerability and indeed might become more secure. On the other hand reduced returns to effort might lead them to focus more on agricultural strategies and become more vulnerable to the latter's 'lean period'.

The worst case scenario would be a collapse of the resource base and a necessary shift of all fishers to agricultural strategies where – as most do not own land – they would join the ranks of landless labourers and share-croppers. Given the development of aquaculture on the floodplains (enhancement fishery), its growing contribution to inland fisheries production, and the opportunities for fulltime and part-time fishers in this sector, such a scenario does not seem likely, but it would make these fishers dependent on landowners who invest in aquaculture for their wages or shares.

Of greater concern to the livelihoods of the poor in general is the likely impact of aquaculture on their nutritional status. Those involved in aquaculture are primarily concerned with farming valuable fish to meet market demand. There are issues around the expansion of aquaculture on the floodplains. The floodplains are primarily a CPR during the wet season,

and the poorest rely on harvesting the aquatic resources they contain (particularly small indigenous fishes often thought of by aquaculturists as 'trash' species) as a subsistence expenditure-saving strategy when alternative opportunities are at a premium. There must be concerns that aquaculture expansion on the floodplains will erode poor people's rights and their access to the CPR, despite government wishes for more community-based NRM.

Part-time fisher/ seasonal professional fishers

They undertake fishing seasonally for part of the year in most cases as a secondary occupation. They are usually small and marginal farmers/ sharecroppers or labourers with few assets. Degradation of fisheries resources would limit their opportunities for local seasonal livelihood diversification. In order to make up the short-fall in household needs, these (male) stakeholders would either have to seek employment in petty trade or off-farm employment, or to join the large number of seasonally migrant agricultural labourers. For this latter group, degradation of fisheries resources would also remove a seasonal safety-net upon which their households are dependant during migrant husband's absence. These households' vulnerability is also likely to increase, since any 'shock' which removed their wage-earner (such as death or abandonment) would leave them with no safety-net at all.

Subsistence/non professional fishers

Where there is scope of fishing, people of almost all categories catch fish for their own consumption. According to DOF (2002) about 70% of rural population undertake some sort of fishing for own competition. Sometimes someone sells part of his catch (estimate in 1983 by DOF). This large and occupationally diverse group derives a substantial part of the fish they consume from their own catches (and the rest from markets). There is limited evidence (Thompson et al. 2002) that loss of wetland habitat and catches of small fish (which can be bought in small quantities or caught when no other work is available) is not compensated among **landless households** through expansion of aquaculture – although aquaculture can keep the prices of cultured fish down, the poor cannot afford as much as they once could catch and they derive less micro-nutrients from the species cultured.

5.1.2 Fish and Shrimp Fry Collectors

Freshwater aquaculture used to be almost entirely dependant on fish fry collected from the wild (i.e. natural water in rivers). Many people (including fishers) were dependant on seasonal fry collection activities. However, with the development of induced spawning technology for major carp, dependence on wild sources has been greatly reduced. This has reduced pressure on the wild fry stocks, but has also reduced income-earning opportunities for fish fry collectors. Additionally, fish stock particularly the major carp has declined alarmingly due to man made causes like over fishing and habitat loss and degradation (but see Craig et al (in press). This has greatly reduced the availability of carp fry in natural waters and again has adversely affected fry collectors income and livelihood opportunity. An indication of impact is that in 1985 an estimated 8,407 people were engaged in fish fry collection from different rivers and 19,362 kg of fry (3-4 days old) were collected (1 kg = about 400,000 fry). In 2000, the number of fry collectors had come down to 1,441 who caught 1,872 kg of fry (DOF 2001).

With increasing demand for shrimp in foreign markets, production of shrimp through aquaculture in the coastal region of Bangladesh has expanded very rapidly during the last 2 decades. At present about 141,000 ha of coastal lands are under shrimp farming, this industry was until the last couple of years almost entirely dependant on wild shrimp fry collected from natural waters in the estuarine rivers and canals. Thousands of people - men, women and children - have been engaged in shrimp fry collection for the last one and half decades. DOF (2000) estimated that about 0.44 million men, women and children were

engaged in shrimp fry collection. Most fry collectors are poor and landless, most of them have been displaced from agriculture after introduction of shrimp farming in agriculture land.

Unfortunately, in collecting the target species of shrimp (*Bagda* and *Galda* Shrimp), perhaps a hundred species of fish and shrimp larvae/fry and other aquatic organisms are destroyed and this destruction has been considered a threat to the fish and shrimp stocks in coastal and marine water of the country. As a consequence, shrimp hatcheries have been established in the country and can now meet demand for fry to a great extent. In this situation the Government banned shrimp fry collection from natural waters in 2001, though this ban has yet to be implemented. If the ban is implemented then the livelihoods of poor wild shrimp fry collectors will be affected. While biodiversity may be being secured, concerns have been expressed by different agencies (donors, NGOs, affected fry fishers etc.) that the livelihoods of thousands of poor men, women and children will be adversely affected. The issue is under review of the Government.

5.1.3 Fish Traders

Traditionally people from the Hindu fishing community were involved in fish marketing and trading. One distinct community of Muslims known as *Nikari* or *Moumal* were also involved in fish marketing and trading. With time there has been a change, now people of all religions are involved in fish marketing and trading. Four types of fish trader can be distinguished.

(a) Types-1 : Those who buy fish from fishers from the fishing grounds and sell at landing centres through *Aratdars* (*Arat* means spaces for holding/storing any commodity and *Aratdar* means someone who possesses the *Arat* or space) or at wholesale market through auction.

(b) Type II : Those who buy fish from fishers or others from primary landing centre through auction and either (i) send to distant places where the fish are distributed to retailers through local *Aratdar*/ agents or (ii) sell to the retailers locally.

(c) Type III : *Aratdars* those who sell the fish through auction/ negotiation and collect fees at a certain rate of sale value or quantity of fish from the seller.

(e) Type IV : The retailer those who buys fish from wholesale market / fisher from landing centre / *Arat* or sometimes from the fishers at fishing ground and sell fish to the consumers. Small-scale fishers sell their catch directly to the consumer at retail markets mainly in rural area.

All would be affected if less of the resource were available for trading, although the likely increase in value of the remaining fish might compensate for the loss of volume of the product. Aratdars and larger traders obviously are better able to withstand seasonality, shocks and trends than small retailers.

5.1.4 Fish Processors

Fish processors are those who engage themselves in sun drying fish, salting *hilsa*, smoking shrimp, fermenting small fishes such as *Puntius* species (when fermented the latter is called *Shidhal*). Fish processing is done both on a small scale by poor people - mainly women - as a secondary occupation, and on a larger scale by richer people as a major profession (men employing women and men). In sun drying the women are involved mainly during the winter months when there is bulk of catch in *beels* and *haors*. Smoking of shrimp is mainly practiced in the coastal region of Khulna. Fermentation of *Puntius* species is done in Sylhet and Mymensingh haor areas in the winter months when fishes are abundant. Many people in the riverine districts of Chandpur, Laskmipur, Barisal, Patuakhali, Barguna and Bhola, where

hilsa is abundantly caught, are engaged in salting *hilsa*. These processing activities are seasonal with availability of sufficient fishes. Export-oriented fish and shrimp processing industries are owned by rich people, but many poor people work in the processing plants.

5.1.5 Fishing Equipment Makers

Many people, both men and women are engaged in making fishing nets of small size (cast net, push net, lift nets) and traps as source of supplementary income. In fishing families women are engaged in making net/traps and mending net. Building of fishing boats also offers a means of livelihoods for many people.

5.1.6 Fish Hatchery and Nursery Operators

Fish hatchery and nursery were previously mainly related to aquaculture. But with the introduction of enhancement fisheries in ox-bow lakes, *beels* and floodplain, the hatchery and nursery activities have become part of the activities of open water inland fisheries. As such hatchery and nursery operators including fry traders, have to some extent become dependant on the inland fisheries. However, with the development of enhanced flood-plain fisheries and their growing importance to production from the inland fisheries, opportunities for this group of stakeholders should expand.

5.1.7 Fishery Workers

Many poor and landless people (unknown numbers of men and women in the case of processing factories) work as labourers in fish landing centres, at wholesale markets for carrying, handling, icing, packaging fish, and also in large scale indigenous fish processing and export-oriented fish processing plants, fish hatcheries and nurseries.

5.1.8 Leaseholder/ Mohajan/ Money Lenders

The leaseholder/Money lender/ *Mohajan*, boat and net owners are usually rich and influential people. They are private investors in this sector, though the genuine fisher cooperative should have the priority to get lease for the Government (*jalmohals*) waterbodies. However, in many cases influential rich people lease the waterbodies and engage the fishers for fishing either as share-base contractor or as labourers, or they collect tolls from the fishers. Money lender/*Mohajan* lend money to the fishers at high rate of interest to cover operating cost of fishing or for purchasing net/boat. Some possess nets and boats which they provide to the fisher group on a catch sharing or hire basis. *Aratdars* are also sometimes the moneylenders or net and boat suppliers, who again usually impose conditions while lending money or boat that the fish caught by them should be sold to them sometimes at prefixed rate or at lower rate than the market price.

Given that fishers are generally unable to obtain working capital from formal sources to finance their fishing effort, this group is important to the productivity of the fisheries despite their rent seeking (as represented in the high loan rates that they charge fishers). In the absence of formal sources of working capital, the fishing effort of fulltime fishers and thus productivity of the fisheries, could be adversely affected were there to be a trend for this financing group to abandon the fisheries for more profitable investment opportunities elsewhere. Part-time fishers, using inexpensive gears and fishing primarily for subsistence, would be unlikely to be effected by such a scenario. However, despite their present importance to the fishery, there are negative aspects to the involvement of this financing group, not least because of the incentive for both fishers and their investment backers for to take a short-term view, and to maximise off-take at the expense of the sustainability of fisheries resources (Dixon 2000; Barr and Dixon 2001).

5.2 Livelihoods Dependant on Inland Fisheries

Quite a large number of studies have been done on the livelihoods and socio-economic conditions of those who are dependant on inland fisheries, but almost all studies concentrate on fishers only (mainly professional full time and part time fishers) and deal with income-earning issues rather than wider livelihood issues, while other types of stakeholder are not covered properly. Again very few studies have been undertaken using PRA techniques to obtain the perspectives of stakeholders on their livelihoods. Historically most studies have been carried out through surveys and interviews. A synthesis of those studies undertaken using survey and interview techniques is furnished below:

5.2.1 Livelihood Options and Income

According to HES-1995-96 (BBS, 1997) the main occupation of 2.5% households is fishing. However, the number involved can vary considerably between different regions. In riparian *charland* area (Jamuna, upper Padma, lower Padma, upper Meghna, lower Meghna) ISPAN (1995) reports that 8% households are professional fishers whose main occupation is fishing. Most other households are involved in fishing as a secondary source of livelihood with their main occupation agriculture, but fishing is also equally important for their livelihood. People of the area undertake fishing as a last resort for income when they are affected by land erosion and become dependant on fishing in vulnerable periods. Some people undertake fishing at night to supplement their household income from their daytime normal activities (i.e. agriculture, labouring). ISPAN (1995) found that in upper Meghna charlands 49% households were involved in fishing and 34% of them were professional fishers with their own boats and nets. Those fishers having no boats and nets undertake fishing on share basis or as labourer. In the Padma riverine area, monsoon is the peak fishing season. Only a few professional fishers continue fishing throughout the year. During dry season professional fishers make their livelihood from other activities like agriculture in own land, share cropping or as agriculture labourer.

In Surma-Kushiara river area 6% of households were involved in fishing as their principal occupation. Many people were engaged in part time fishing and other fishery related activities (ISPAN, 1995).

CNRS (2000) found that the fishing community in flood-plain fisheries in the CPP area, Tangail were generally very poor and most of them illiterate. About 98% of fisher households in floodplain are dependant on fishing as their main source of livelihoods, while about 65% households are involved in fishing as subsistence fishers.

CIDA (1998) pointed out that almost all households in the villages around Kawadighi Haor (Moulvi Bazar) were actively involved in fishing in some fashion. Their primary and secondary occupation was either fishing or agriculture. However, fishers depended on year round fishing. Trading provides an alternative livelihood for 15% full time and 11% seasonal fishers. Women are actively involved in home-based activities including the cleaning and repairing of fishnets and fish processing for domestic consumption and sale.

Income

In FAP 16 study (ISPAN 1992) average fishing income of full time fishers in riverine fisheries was Tk. 70 day/fisher. In catch-sharing system fishers or wage labourers earn Tk. 40/ day/labourer. ISPAN (1995) study reported that the average income of a fisher per day was Tk. 135 during peak period (mid April to mid July and mid September to mid October); but their average income per day was Tk. 45 in lean period. On the other hand wage-labour fishers earn Tk. 800 to 1200 per month in lean season.

CNRS (2000) reported that a full time fisher earns on an average Tk. 50 to 60 per person per day during peak season and Tk. 30 to 50 per day during lean season in CPP area, Tangail.

5.2.2 Capital Assets

(a) Human Capital

Professional fishers are usually poor, landless and illiterate. In most areas they live in unhygienic condition. BRAC, (2001) reported literacy rate to be 36% in eight open water fisheries area under Fourth Fisheries Project. The number of primary schools both in government and non-government schools are very few compared to requirement. The villagers also give value to religious education for their children. The villagers send their children to Madrashas also. People have access to tubewells for drinking water, but majority lack safe latrine (sanitary latrine) though they have developed awareness on health and hygiene.

(b) Natural Capital

CIDA (1998) reported that in Kawadighi Haor area 59% people were landless, of which 60% were full time fishers and 44% were part time fishers.

Access to fishing varies according to fisheries. In the flowing river fishing access is free since government declaration in 1995. Access to flood plains is also free but in the area adjacent to a leased *beel* the access is controlled by the lessee and fishers usually must pay the leasee to fish there. Access to other waterbodies (Government *khash* waterbodies – *Jalmohals*) is usually through lease or through permit from the lessee. Free access in the flowing river has encouraged over fishing. Fishers suggested reducing fishing efforts in the flowing rivers as well as in other water bodies to maintain desired level of fish stock. Fishers are also harassed by police while checking licenses. Often fishers have to pay excess toll for fishing or to save their nets, fish and catch from the unauthorized toll collectors.

CNRS (2000) observed that fishing in *beels* and rivers was open for everybody. But nearby fishers do catch more fish than distant villagers.

(c) Physical Capital

In the upper Meghna *char* area ISPAN (1995) found that 34% of the professional fishers possessed boats and nets, and those having no boats and nets catch fish on share basis with others or as labour.

CIDA (1998) reported that all fishers have fishing gear individually or jointly. About 73% full time fishers have gears individually and 27% jointly owned large size net while 39% full time fishers have boat individually in the Greater Sylhet *Haor* basin area.

(d) Social Capital

ISPAN (1992, FAP-16) states that though there exist fishers cooperative societies in many areas, these cooperatives are in the name only. They are controlled by local rich and influential persons who get the leases of the waterbodies using the cooperative societies as a front. The fishers' suggestion was to empower the Fisher Cooperative Societies so that they can solve their problems and get rid of the rich and the powerful who provide means of managing the fisheries.

CIDA (1998) reports that in Kawadighi Haor (Moulvi Bazar). The fisher organizations are not active and are in papers only. Some NGOs are working in this area to create awareness about the natural resource conservation and management needs and to organize people including fishers. There are primary schools in every village, and each union has a health centre.

(e) Financial Capital

Professional fishers are mostly landless and poor. They do not have access to institutional credit due to lack of collateral. So they are to depend on private credit or credit from money lender/ *mohajan/ aratdar* at a high rate of interest – 8% to 15% per month (ISPAN, 1985).

There is a lack of longitudinal studies of the trends in fisher incomes and poverty. Unpublished data from household surveys under CBFM project (WorldFish Center) indicate some improvements in housing condition, assets owned, sanitation etc., but this is with NGO support both for fishery management and additional income sources. Needs expressed in PRAs include better fishery management, help in organising, financial support (e.g. credit) and general infrastructure and service provision which is less accessible in the larger wetland and river areas (*haors* and *chars*) inhabited by many fishers.

5.2.3 Seasonality and Vulnerability

Peak fishing season for riverine fisheries including *Hilsa* fishery was found to be from July to October and lean fishing months in the river were between November and June. In the case of floodplain fishing peak period usually is between July and October. Peak fishing season in *haor* was from December to February (ISPAN, 1995).

Professional fishers get less income from fishing during October to June and they may suffer hard days during this vulnerable period, although this depends on whether they are fishing in flowing rivers and permanent water-bodies or not. Where water bodies dry up, they are naturally forced to stop fishing and must pursue other livelihood strategies. Most of them do not have cultivable land to cope hard days. Poor fishers sometimes migrate to distance places to work as fishers labour. Charland dwellers including fishers are vulnerable to river bank erosion, (ISPAN, 1995).

Seasonal diagramming undertaken during PRAs by Barr et al. (2000b; 2001 Vol 4.3, and 4.4) capture the seasonal activities of different primary stakeholder groups at two floodplain sites, and indicate the differences in livelihood strategies pursued by different groups and their potential vulnerability to seasonality (Annexure XIII gives these for one site).

Fishers' overall vulnerability to shocks, seasonality, and trends is high. Those fishing for an income depend on their daily catch and have limited reserves – illness, theft of gear, storms and high floods all prevent fishing and may push them into debt. To some extent fishers are cushioned from the impacts of high floods since these are years of higher fish catches, but at such times subsistence fishers are more active as they have less work, and fish prices fall. Some fishers undertake seasonal migrations to fish in the *haors* or estuarine areas when their own floodplains and rivers are dry, but declining catches and environmental changes in these areas may result in an inability to follow fishing as a year round profession. Only partially can aquaculture compensate for this and will continue to as it expands – professional fishers are employed to harvest ponds and to sell the fish, see Table 5.1 below.

Table 5.1 Reconciled fishery production estimates ('000 mt) based on fish consumption data (Bangladesh Bureau of Statistics) and DOF estimates.

Source	1991	1993	1995	1997	1998	1999	2000	*2001****	*2002****
Inland Capture*	1,019.9	1,219.1	1,365.7	1,164.0	1,058.6	1,023.8	949.8	*898.6*	*850.2*
Inland Culture**	211.1	237.7	317.1	485.9	574.8	593.2	650.8	*746.2*	*855.7*
Marine**	560.7	594.3	627.9	615.6	609.5	603.4	597.2	*592.3*	*587.4*
Total	1,791.6	2,051.2	2,310.7	2,265.5	2,242.9	2,220.3	2,197.7	*2,179.7*	*2,161.7*

** Residual value from BBS figure minus inland culture and Marine fish production*
*** DoF estimated figure*
**** Based in simple linear trend of last 5 years data.*
Source: Fishery Sector Review and Future Developments draft report 2002.

5.2.4 Policies, Institutions and Processes

Policies, institutions and processes have been reviewed in detail in previous sections. Overall their impacts on fisher livelihoods have at best been mixed. On paper they enable fishers to gain access to fisheries (either through preference in leasing or through open access), in reality the focus on revenue and the practical application of policies within the context of control by those with money and influence means that they are a constraint on fishers as they pay higher taxes compared with comparably poor rural households not fishing for an income. There is some hope from various projects working to develop fisher organisations and to establish community based management. But in the long term the success of this will depend on incorporation of lessons in policies and fundamental shifts towards understanding fisheries policy as a means of ensuring sustainability foremost, while also directing benefits to the poor. Participation by the floodplain resource users in setting policy and establishing their own institutions has to date been remarkable by its general absence.

5.2.5 Problems and Constraints of the Fishing Community

The fishers and those dependant on inland fisheries resources face various problems in their social and economic affairs of livelihood.

ISPAN (1995) identified some problems in the riverine *charland* area as follows:

1. Difficulty in getting capital or credit to purchase fishing equipments due to poor institutional support.
2. Fishers catch has declined over time due to depression of fish stock in absence of proper management.
3. New Fisheries Management Policy was unable to provide benefit to the fishers. The rich and powerful persons are still getting benefit from the fisheries.
4. Lack of economic bargaining power or cooperative sprit due to lack of fishers cooperative/organizations.
5. Fish catch is declining day by day and thus the professional fishers are facing hardship or their income is becoming less. Fish catch is declining due to over fishing and indiscriminate fishing by non-professional fishers and for using *current jal*. Leaseholder and rich people's domination affect the fishers' interest.

Open access fishing area in the floodplains and beels has been reduced due to loss of habitat as a result of FCDI projects and construction of roads, dams and other infrastructure (CNRS 2000).

Many professional fishers are unable to fish in the river Jamuna and the Dhaleshari due to high competition with other fishers who live adjacent to those rivers. A number of fishers have already left their professional occupation and adopted other livelihood activities like

agriculture, weaving and rickshaw pulling. Most of the *Khas* beels are now leased out to rich group of people. The over fishing has reduced fishers' catch on those water bodies.

Barr et al (2000b, 2001) found similar technical and institutional constraints being voiced by fishers in PRAs at a number of sites (Annexure XIV). Their work took the usual PRA process of elucidating constraints to different stakeholder groups' livelihoods further than is usual, to explore with stakeholders the underlying causes of the constraints and how these might be resolved. This has become part of what the authors refer to as the Participatory Action Planning for Development (PAPD) process for consensus management of floodplain natural resources (an example of a summative investigative matrix developed by primary stakeholders prior to detailed community management planning is given in Annexure XV).

6. ISSUES AND THEIR ANALYSIS

6.1 Gaps in Information in the Literature Reviewed

It appears from the review of existing literature on livelihoods dependant on inland fisheries that studies using PRA techniques are scanty compared to studies undertaken through surveys. Surveys are important, particularly using panel data, as this can give clear indications of trends in what is happening to population cohorts (i.e. whether a particular groups' poverty status is or is not changing for the better)[4]. However, surveys are less good for understanding why a groups' poverty status is as it is and is undergoing change. By contrast, PRAs with a strong livelihoods component, have proved to be invaluable in elucidating the pressures bearing upon livelihoods, why they are undergoing change, and how the pressures might be addressed (see World Bank 1996, 2001 in general; see un Nabi et al 1999, Barr et al 2000b, 2001).

Most of the PRAs/RRAs undertaken do not address all aspects of livelihood and related resources properly. The information provided in the reports about livelihood capital assets are very inadequate. Vulnerability, shocks and trends in fishers' livelihoods have not been fully addressed in the reports. This may be due to the fact that the PRA tools were not properly followed. There is no mention in the reports about the kinds of PRA tools used and the relevance of the tools in the study. Categorization of fishers by types varies widely among the reports reviewed. And as such the overall livelihood patterns and challenges to these of those who are dependent on inland fisheries is not readily grasped.

Most studies tend to cover fishers only. Other stakeholders such as fish traders, fish processors, fishery labourers, etc. are rarely covered. A major gap in the literature is a paucity of information about the livelihoods of women and children in relation to the aquatic resource base. Barr et al. (2000b, 2001) are unusual in capturing such information because they use a socially disaggregated and participatory methodology. Yet the above groups are stakeholders in the fisheries whose livelihoods may be affected by trends in the resource base. A general conclusion of a number of sources (Rahman 1998; DFID-B 1998) is that the nature of the sub-divisions within the poor and extreme poor are not well understood. A more detailed understanding of poverty, and the dimensions of poverty that different groups face is needed if more effective programmes to address it are to be developed.

In addition to the above, there are general gaps in information/ data about the resource and livelihood based on them. These have been identified as follows:

- Information about the impact of agro-chemicals on the aquatic resource are not assessed definitely with extent and nature.
- Information about the actual number of different stakeholders and its trend are lacking except that of the full time fishers, but there is also no reliable and valid basis for the estimate.
- Information about the present status and extent (both official and actual dry season water areas) of *jalmohals* and other water bodies and trends are not available.
- Information / data on fisheries resource status and trend (fish production, fish stock, etc.) are controversial. According to DOF estimate fish production in inland open water is increasing while the secondary stakeholders discussion and other sources have reported declining of fish production and fish stock in inland open waters.
- Impact of government policies / laws and regulations on fishers and aquatic resources have not been studied properly.

[4] See work by BIDS, e.g. Rahman and Hossain (1995)

6.2 Research Status and Needs

The present research focus is mainly on aquaculture development related issues. Commendable outcomes in fish breeding technology and enhancement in fish production have been achieved. Open water fisheries research focused mainly on the important *hilsa* fishery and some significant findings required for management of *hilsa* fisheries have been obtained. Research on socio-economic and livelihood aspects of those who are dependant on fisheries is small, except for some studies undertaken under different development projects and as part of feasibility of different development projects. Research on other important fisheries such as those for major carp and large catfish is also needed.

Research on environmental issues related to aquatic resources is very few and inadequately covers important issues like the impact and consequence of pollution due to industrial effluents, domestic wastes and agro-chemicals on aquatic resources.

Research focus needs to be intensified on inland (and coastal open water) fisheries and socio-economic and livelihood aspects of aquatic resource users and on environmental issues. Major constraints in the field of research identified (through secondary stakeholder discussion) are shortage of skilled manpower and funding.

6.3 Fisheries Resource Trends and Impact on Livelihoods

Literature review and secondary stakeholders discussions (plus PRAs undertaken for this study and reported separately) all reveal common concerns that the inland fisheries resources are under stress of depletion, although there is a lack of official data to support this. Factors referred to as causing this include: overfishing as a result of rapid population growth, policies that favour short-term exploitation beyond sustainable levels, habitat loss and degradation due to infrastructure such as FCD/I activities, agro-chemical and industrial pollution of water, and siltation and drying up of wetlands and rivers.

On the other hand measures have been taken up, or are being taken up, to mitigate or prevent the adverse situation and positive results have been achieved. For example the fish fingerling (carp) stocking programme in limited areas under different development project of the Government such as Third Fisheries Project (1991-96) and Oxbow lake small scale fishers project (1989-97), has enhanced the catch and income of the fishers. The stocking programme has also benefited the fingerling producers and hatchery operators. BCAS (1995) found a positive impact of stocking of fingerlings in three *beels* (BSKB, Chanda and Halti) under the Third Fisheries Project. The fishing income of the fishers was found to have increased by 550% in Chanda Beel, 105 % in BKSB Beel and 147 % in Halti Beel; but this was not sustained – stocking ended with the project. Physical assets like moveable assets, household assets, fishing gear, livestock assets etc and access to fishing site, land assets etc. also increased at different levels in different locations as shown in Annex-XII. Establishment of local fish sanctuaries by communities supported by CBFM project and MACH project have had positive impacts on fish catches and diversity, and the income of the fishers in the project area (Alam N et al. 2000; Sultana et al. 2002; Thompson et al. 2002; MACH 2001), and appear to be more sustainable although they lack formal recognition by the government. Revenue oriented fisheries management system with short lease terms, and with increases in lease value fixed without considering the productivity of the water body encourage over fishing and destructive fishing by dewatering by lessees to maximize profit. The responses to mitigate/ prevent the causal factors of declining resources, and the status of the resources are shown in Table 6.1. This table has been developed on the basis of the review of literature and discussion with secondary stakeholders.

Table 6.1 DPSIR (Driving forces, pressures, status, impacts and responses) analysis for Bangladesh inland fisheries.

Sl No	Driving Forces	Pressures	Status of resource	Livelihood impacts			Responses (addressing the)		
				F/t fisher	P/t fisher	Fish seller	Driving forces	Pressure	State
1	Increasing population & landlessness/ poverty / unemployment	Over fishing in inland water	Fish stock and biodiversity declining.	Low catch and income changing occupation	Some changing occupation	Selling culture fish/change occupation	Population control/create new employment opportunities	Alternate income generating activities	Enforcement of law (partly), fish conservation and stocking
2	Agricultural intensification, flood control and drainage and irrigation Unplanned construction of network.	Loss of fish habitat and interruption in migration routes of fish Interruption of migration routes	Fish stock and biodiversity declining	Low catch and income changing occupation	Some changing occupation	Selling culture fish/change occupation		Linking canals, fish pass under project at very small scale	Enforcement of law (partly), fish conservation and stocking
3	Agric-cultivation intensification and deforestation	Siltation of water bodies/ loss of water habitat	Fish stock and biodiversity declining.	Low catch and income changing occupation	Some changing occupation	Selling culture fish/change occupation	Afforestation		
4	Indiscriminate use of insecticide/ chemical fertilizers Industrialization	Degradation of water quality/ water pollution	Increasing diseases/ natural mortality	Low catch and low price	Some changing occupation	Selling culture fish/change occupation	Introducing IPM and use of organic fertilizer		
5	Short term leasing of *Jalmohal* and increase of lease value Open access to flowing river fisheries	Over fishing/ destructive fishing Over fishing	Fish stock and biodiversity declining	Low catch and income changing occupation	Some changing occupation	Selling culture fish/change occupation		Awareness raising and alternative livelihood activities	Enforcement of law (partly), fish conservation and stocking

Sources: literature review and secondary stakeholders.

6.4 Exogenous Factors and their Impact on the Fishers

Besides there are exogenous factors that have impacted on the fishers' livelihoods. Free market economy has promoted the export and import of fish. Export of fresh water fish like *hilsa,* catfish etc. has benefited the fishers and fish traders as they are getting better price of fish. Many cultured carps are imported from India. Imported carp are cheaper but this does not affect the price of local carp and other fish and the fishers are not affected. Local fish are preferred by people. But the collapse in foreign market is likely to affect the fishers to some extent because the price of fish in local market may fall.

Urbanization may be a factor that may impact the fishers. As the proportion of the population which is urbanised grows and the rural economy diversifies into non-farm strategies, there are likely to be different demands on the fisheries sector. As urban population's incomes rise so too will their demand for food (including protein-rice fish). Urbanization is seen by many policy-makers as offering opportunities to rural dwellers to supply urban population's needs and thus to become more market oriented. Such demand-led development may lead to further pressure on wild stocks, but also will stimulate aquaculture production, and in turn should lead to income gains for the rural poor.

6.5 Trends, Threats, Opportunities and Constraints

It appears from the literature review and secondary stakeholder discussion that the physical resource (water bodies) are on gradual decline both qualitatively and quantitatively due to man made and national causes like siltation, pollution, FCD/I activities, which coupled with over fishing/ destructive fishing are affecting aquatic resources/ stock and fauna. Some species of fishes have already become extinct and many are endangered. Fish production in inland waters has declined and accordingly the fishers' income has decreased. Many of the fishers have either adopted other occupations as secondary sources of income or fishing has become their secondary source of income.

However, the promotional activities are gradually increasing through policy, institutional and technological development to counter the adverse situation in the fisheries sector.

The gradual loss and degradation of water bodies (fish habitat) through natural and manmade causes along with over fishing/ destructive fishing are the major threats to the inland fisheries.

In spite of the threats in the fisheries sector there exist opportunities and facilities for development of the fisheries resource and improvement of the socio-economic condition of those dependant on inland fisheries. The major opportunity is the Govt. policy commitment for development of the fisheries sector. The high productivity of the water bodies is nature's gift for development of fisheries in Bangladesh. The national fisheries policy and the existing policy implementation laws and regulations offer scope for protection, conservation, development and management of the fisheries resources.

In spite of the above mentioned opportunities there are problems and constraints in implementation of Govt. policies and strategies. They is a lack of coordination among different agencies involved in fisheries sector, shortage of manpower and financial support in the Department of Fisheries which is responsible for overall development and management of the fisheries resources for sustainable fish production and improvement of socio-economic

conditions of the fishing communities. Besides the lack of initiatives and pursuance for sustainability or continuity of any successful programme after the development phase is over have been major constraints in the public sector.

6.6 Bangladesh National Workshop on Understanding Livelihoods Dependent on Inland Fisheries

The national workshop to disseminate findings of this study was held in Dhaka at LGED on 13 March 2003. The summary report was presented and circulated. The comments, conclusions and observations made by invited commentators are reproduced here along with the proposals made by the working groups.

6.6.1 Comments of invited speakers and guests

Dr. A. Atiq, BCAS
- can't have formal jobs for all poor people
- fisheries sector part of livelihoods
- leasing from Govt-NGO-fisheries cooperative so far effective
- opportunities in private sector (fry production)

Bill Collis, MACH

Livelihood
- waterbodies are critical for poor people – shown in studies in Hail Haor and Noakhali,
- poor are main beneficiaries of wetlands.

Contradiction
- declining catches etc – only solution is to reduce use but this will keep poor people out,

Problems
- very few can be addressed by DoF – most lie in the remit of other Ministries etc.

Key issue in future
- use of land – DoF has a voice but MoL is in control – needs land use planning to permit wetlands to function.

Anwara Begum Shelly, Caritas
1. main text will be bigger, timely study, condensed information useful,
2. more insight on policy related to waterbodies – leasing fees and short term leases – needed, jalmohals important to poor fishers,
3. covers policies under other Ministries,
4. livelihood analyses – similar findings to other studies,
5. should have recommendations.

Dr. Toufique, BIDS
- Main finding fish catch increasing in DoF statistics, problem with fish habitat and catch data which are inconsistent with PRA information,
- status of fish catch, poverty, and resource degradation are inconsistent.

Insufficient in report on access rights:

Aquaculture is caught up with capture fisheries:

	- poor use less productive environments, - rich/better off fishers have access to more productive resources (capture or increasingly aquaculture/culture). Rivers – open access Main point is that improving environment for fisheries leads to exclusion of poor (solve over use but not poverty).
Mokhlesur Rahman, CNRS	Beels/Floodplain are an integrated resource including fishery. In the haor ecosystem the benefit from wetland resources is twice that from crop returns, and the benefits are more widespread – from landless to rich, whereas agricultural development benefits landowners. Responsibilities are at different levels. In law enforcement there is no scope for DoF where jalmohals are leased out on competitive basis. LGED role in small-scale water resources includes fisheries and its new Sunamganj project will give it an increasing role. There is a contradiction between statistics and people's opinions on fish catch trends – what message should policy makers get? We need to highlight more other aquatic resources. What should be the role of DoF when multiple uses and different actors are involved in fisheries? DoF has both controlling and facilitating/advising roles in fisheries. Messages need to be developed to go to different audiences – from policy makers to local communities.
Sharif Taibur Rahman, Joint Secretary, Ministry of Land	In reducing poverty there is a role for fisheries. There is aquaculture scope in southern half of country but under use of ponds due to social factors cooperation/jealousy, lack of interest to invest. Some information and technology but there is variable update. Capture fish catches not increasing. IUCN report – 53 fish species threatened with extinction, which species? There should be recommendations for culture and sanctuaries for these fish.

The problems from water control projects are correctly stated. Ministry of Land is now ready immediately to hand over jalmohals where DoF/MoFL requests this, thereafter it will not involve itself in them.

Jalmohals of 3-20 acres have been transferred to MOL or LGED groups and cooperatives.

Field problems – non-payment of lease even for 10-20 years – there is much mismanagement in different areas. Reported that under DoF control catches are less than those of private entrepreneurs.

The total number of jalmohals is flexible, but we are ready to hand over more to MoFL.

Nasir Uddin Ahmed, Director General, Department of Fisheries:

Two key points:

1. fishery management is linked with fisher livelihoods,
2. fisher livelihoods are not just DoFs concern but relate to many government agencies – DoF has a role (eg technology), but health, education, marketing etc need help from other government agencies.

Leasing: we have seen policy problems leading to various changes and now advocate community participation

Now the Cox's Bazar empowerment of fishing community project involves all government agencies to help fishers, we should also take a more integrated approach in inland fisheries.

Statistics – these are alright but we need suggestions on how to manage resources, most of the information is known already.

- We don't invest in fisheries, we just collect taxes,
- Need re-excavation and long-term access for fishers. Fishers often work as labourers rather than owner – short-term approach is the problem which results in over fishing at the end of the lease period.

A key point is that government agencies should work together not be separate.

Hilsha catch is falling, no licensing or control, open access in rivers and coast.

Sundarbans - license for fishing but poisons used and juveniles killed – there is a need for fish sanctuaries there.

Offer to give further views on the report from DoF to make it more relevant.

Mohd. Abdul Huq
Secretary, MoFL

All citizens know that the poor depend on fishing. But how to improve the conditions of poor? Poor lack the means of production, eg no land, no funds, they need investment and training, and to be empowered in all respects.

DoF and NGOs combined can help through training, education, and by organizing so fishers have their own organizations.

In Comilla area cooperatives were a success of the 1960s, they helped the poor earn an income and move up in society. That is one way and there are others too for organizing people.

A combined government effort is needed, not just one government agency.

The purpose must be to alleviate and remove poverty and enable them to live decent/better lives.

We need a standing committee or coordinating body representing all government agencies concerned. It cannot be achieved by DoF or NGOs alone.

For example, Cox's Bazar empowerment project is organizing women and children who are now interested in sanctuaries etc collectively.

There are diverse fisheries in Bangladesh, but the users are well aware about each fishery, but do not know how to sustain – knowledge is the gap.

There is a debate over whether wild fish catch is increasing or decreasing. But the catch from aquaculture is clearly increasing. The problem is a lack of interest for sustainability in capture fishery, over-fishing, pollution (agriculture and industrial).

The poor need financial empowerment – credit from NGOs is one way but NGOs are harsh in recovering credit and charge high interest rates (32% in practice) and for example give an amount less than the one on which interest payment is calculated.

6.6.2 Conclusion of Working Group 1

Proposed priorities for research relating to inland fisheries and livelihoods.

12. adopt a holistic approach needed in research (livelihoods).
13. legal and institutional gaps for CBFM.
14. areas of fish and wetland resources, their status, access, security of use, and legal versus actual status.
15. valuation of wetland use and of improved wetland management (benefit and costs of habitat restoration etc.,) and how much benefits go to poor people.

16. security issues of resources and users – resource, access, musclemen, security etc. lack of incentives to invest.
17. traditional fishers giving up profession – patterns and recent trends.
18. impacts of trans-boundary (e.g. in upstream nation) changes on livelihoods of poor fishery dependent people.
19. indigenous knowledge and good practices in fishery management and conservation
20. what messages are being conveyed, how best to inform policy makers, and how to harmonise policies affecting wetlands/fisheries.
21. PRAs are widely used they should incorporate solution analysis by communities.
22. openwater fisheries decline – extraction or environmental changes? Research to determine which is the main factor in their decline. To what can we attribute losses e.g. threatened species, etc.
23. what objective should we adopt for fishery management e.g. maximise poverty reduction, maximise catch in long term, maximum economic value of catch.
24. if we adopt the integrated natural resource management objective rather than poverty reduction objective, then which system gives more revenue, fair/equitable distribution benefits, maximum catch etc? Compare and assess alternative systems including: open access, leasing, CBFM, etc. Who benefits, in which way?

Research should also be on private enclosure of floodplains for stocking fish, there is a rapid change through local private initiatives, needs research to understand the impacts on poor people, and the differences between this and other floodplains (Nigel Brett, IFAD).

6.6.3 Conclusions of Working Group 2

Opportunities for improving livelihoods dependent on aquatic resources.

1. Leasing system - now jalmohals are handed over to DoF for 10 years but this needs extending further with handed over waterbodies. There is no change in revenue rates yet.
2. Coordination - between government agencies should be better
3. Survey of waterbodies - problem of areas, what are the real and legal areas?
4. Open access rivers - how to manage? Need to develop a regulatory system.
5. Rivers drying up.
6. Seasonal rice fields - opportunity for aquaculture.
7. Non fish aquatic resources are important.
8. Future investments – given the shrinking floodplain and growing urban area, we should aim now at diversification and high value products eg fish.
9. Provide a comparative analysis of alternative scenarios for floodplain development, eg. flood control and rice versus open water fisheries in monsoon – overall what is the total value?
10. Issues raised in discussion to complement these points:

    DoF needs a communications unit and to decide how to portray fisheries/wetlands (Mokhlesur Rahman, CNRS).

    In the field level there is a lack of coordination – practical field based coordination is needed (Muzaffar Ahmed, WorldFish Center).

BWDB is trying to consider fisheries properly in planning (BWDB).

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Annexure-I : Incidence of Poverty Levels

Year	Percentage of Population Below Poverty Line					
	National		Rural		Urban	
	Absolute Poverty	Hardcore Poverty	Absolute Poverty	Hardcore Poverty	Absolute Poverty	Hardcore Poverty
2000	44.3	20.0	42.3	18.7	52.5	25.00
1995-96	47.5	25.1	47.1	24.6	49.7	27.3
1991-92	47.5	28.0	47.6	28.3	46.7	26.3
1985-86	55.7	26.9	54.7	26.3	62.6	30.7

Annexure-II Distribution of households by main occupations (HES-1995-96)

Occupation	Percentage Of Households		
	HES 95-96	HES 91-92	HES 88-89
1. Farmer	28.8	33.3	16.5
2. Tenant Farmer	5.0	5.3	16.2
3. Tenant	2.4	1.6	2.7
4. Agri. labourer	14.7	18.0	19.0
5. Fisherman	2.5	2.6	1.5
6. Professional / Executive	2.4	2.5	2.6
7. Executive/Adm. Executive	0.4	0.5	0.4
8. Other Office Staff	4.2	5.3	5.1
9. Businessman	16.0	14.2	12.7
10. Transport/Communication	6.7	4.9	4.8
11. Production Labourer	4.4	2.8	5.9
12. Construction Labourer	2.2	1.3	-
13. Electricity, Water & Gas Labourer	0.4	0.2	-
14. Manual Labourer	3.5	2.3	-
15. Sports/ Cultural	0.9	0.5	-
16. Services	2.2	2.2	1.2
17. Others	3.3	2.5	11.4
Total	**100**	**100**	**100**

Annexure-III : Literacy Rate

Year	Percentage of population who can read and write		
	National	Male	Female
2002	53.00	-	-
2000	44.9	49.5	40.1
1991	24.90	30.00	19.50

1981	19.70	25.8	13.2
1974	20.20	27.6	12.2
1961	17.00	26.0	8.6

Annexure-IV: Households by Sources of Drinking Water

Year	Area	Percentage of Households by Source of Drinking Water			
		Tap water	Tube-well	Wells	Pond
2000 (HIES)	National	6.79	89.91	0.84	2.46
	Rural	0.37	95.75	0.97	2.91
	Urban	32.06	66.93	0.33	8.67
1995-96 (HES)	National	6.95	88.66	2.38	
	Rural	.83	94.08	2.75	
	Urban	38.16	61.05	0.47	
1991 (PC)	National	4.3	75.73	9.46	10.48
	Rural	0.14	77.76	10.56	11.75
	Urban	22.48	67.75	4.69	5.07

Annexure-V Access to Toilet

Year	Area	Percentage of Household using Toilet				
		Sanitary	Pacca scaled	Pacca non-scaled	Kancha	Open space
2000 (HIES)	National	14.20	4.47	11.27	50.74	19.26
	Rural	9.87	2.25	8.47	56.10	23.31
	Urban	31.50	13.21	22.29	29.66	3.34
1995-96 (HES)	National	6.61	14.00	4.70	44.58	30.11
	Rural	2.28	11.24	3.39	48.74	34.34
	Urban	28.67	28.07	11.36	23.37	8.52
1991 (Census)	National	12.46		53.34		34.20
	Rural	7.25		55.56		36.36
	Urban	54.64		34.12		11.22

Annexure-VI: Access to Electricity

Area	Percentage of Households having access to electricity		
	Year		
National	31.2	20.5	14.57
Rural	18.7	10.3	7.23
Urban	80.4	72.60	68.31

Annexure-VII: Species Group-wise Catch in Inland Fisheries by Sectors, 2000-2001

Species	Inland Capture Fisheries							Aquaculture			All total (capture + culture)
	River	Sundarban	Beels	Flood Lands	Kaptai Lake	Baor	Total	Pond	Shrimp Farm	Total	
Major Carp	1,900	-	17,141	32,097	234	530	51,902	332,387	-	332,387	384,289
Other Carp	319	-	1,833	-	272	-	2,424	4,610	-	4,610	7,034
Exotic Carp	-	-	9,629	-	39	1,994	11,662	197,574	-	197,574	20,9236
Cat Fish	2,766	-	7,840	14,736	433	-	25,775	5,701	-	5,701	31,476
Snake Head	494	-	2,661	41,268	86	-	44,509	11,932	-	11,932	56,441
Live Fish	141	-	1,356	43,450		-	44,,947	10,555	-	10,555	55,502
Other Fish	62,243	11175	29,051	284,780	5,987	1,277	394,513	50,652	28,044	78,696	473,209
Hilsa/Illish	74,650	410	-	-	-	-	75,060	-	-	-	75,060
Big Shrimp & Prawn	645	255	596	1,914	-	-	3,410	-	55,746	55,746	59,156
Small Shrimp & Prawn	6,971	195	4,420	26,933	-	-	38,519	2,414	9,224	11,638	50,157
Total	150,129	12,035	74,527	445,178	7,051	3,801	692,721	615,825	93,014	67,384	1,401,560

Annexure-VIII: Fish Production of Bangladesh

(Thousand Metric Tons)

Year	Inland			Marine	Country Total
	Capture	Culture	Total		
1960-61	-	-	646	42	688
1961-62	-	-	666	42	708
1962-63	-	-	695	42	737
1963-64	-	-	700	42	750
1965-66	-	-	720	81	799
1975-76	-	-	545	95	640
1979-80	-	-	524	122	646
1980-81	-	-	525	125	650
1981-82	-	-	556	130	686
1983-84	472	117	589	164	753
1984-85	463	124	587	187	774
1985-86	442	145	587	207	794
1986-87	431	166	597	217	814
1987-88	424	176	600	227	827
1988-89	424	184	608	233	841
1989-90	424	192	616	239	855
1990-91	443	211	654	241	895
1991-92	480	227	707	245	952
1992-93	532	238	770	250	1020
1993-94	573	264	837	253	1090
1994-95	591	317	908	265	1173
1995-96	609	379	988	270	1258
1996-97	600	486	1086	275	1361
1997-98	616	575	1191	273	1464
1998-99	649	593	1242	310	1552
1999-2000	670	657	1327	334	1661
2000-2001	689	713	1402	379	1781

Annexure-IX: Inland Capture and Enhanced Fisheries Catch Trend by Type of Fish.

Year	Hilsa	Major Carp	Other Carp`	Exotic Carp	Catfish	Snake head	Live fish	Large shrimp + Prawn	Small Shrimp	Other	Total (%)	Total Actual Catch
1985-86	21.46	0.64	1.20	-	6.45	3.63	2.37	0.71	11.39	52.14	100	441767
1986-87	28.70	1.56	2.18	0.20	4.03	8.56	4.30	0.75	12.34	37.38	100	317674
1987-88	18.49	2.56	0.68	0.10	2.62	4.01	3.88	0.40	8.01	59.25	100	424852
1988-89	19.19	2.72	2.01	0.20	4.99	2.54	4.17	0.60	9.27	54.31	100	425461
1989-90	26.43	3.40	2.78	0.14	5.51	2.95	6.67	0.18	8.06	43.87	100	425229
1990-91	15.12	6.49	1.87	0.24	5.27	5.96	0.72	0.17	13.13	51.04	100	452141
1991-92	15.02	4.62	1.94	0.28	6.05	4.53	6.66	0.25	9.26	51.39	100	444948
1992-93	13.73	3.51	1.30	0.16	5.12	6.37	10.79	0.15	14.03	44.85	100	544222
1993-94	13.26	7.69	1.26	0.19	5.03	10.45	11.20	0.65	8.45	41.83	100	538375
1994-95	12.61	6.72	0.85	8.20	3.85	8.03	8.36	0.10	8.51	42.76	100	669516
1995-96	13.17	7.64	0.87	0.17	4.96	9.88	10.40	0.62	6.36	45.94	100	612114
1996-97	13.81	10.52	0.19	0.89	4.16	5.76	9.04	0.42	6.24	48.97	100	602794
1997-98	13.18	8.48	0.24	0.52	4.45	4.90	8.03	0.55	6.68	52.95	100	619156
1998-99	11.30	6.66	0.31	1.54	4.76	5.25	8.19	0.61	6.65	54.72	100	652954
1999-00	11.74	10.58	0.31	0.99	5.04	5.35	4.66	0.43	5.58	55.32	100	674087
2000-01	10.89	7.52	0.35	1.69	3.73	6.10	6.51	0.49	5.58	57.14	100	690422

Annexure-X: Distribution of Inland Fisheries Potential (Water area in hectare) in Bangladesh.

District	River and estuaries	Beels	Flooded Land*	Baor	Kaptai Lake	Total
Chittagong	60,010	89				60,099
Chittagong H.T.	20,570	367			68,800	89,737
Noakhali	95,732	3				95,735
Comilla	39,505	1,103				40,608
Sylhet	20,802	32,700				53,502
Dhaka	47,317	4,918				52,235
Faridpur	51,530	1,915		965		54,410
Mymensingh & Jamalpur	35,496	29,406				64,902
Tangail	13,130	2,333				15,463
Barisal	176,105	79				176,184
Jessore	17,482	5,039		2,734		25,255
Khulna	203,612	365		331		204,308
Kushtia	11,311	2,197		1,458		14,966
Patuakhali	107,443					107,443
Bogra	13,736	3,801				17,537
Dinajpur	9,104	1,252				10,356
Pabna	41,378	3,255				44,633
Rajshahi	20,991	19,849				40,840
Rangpur	46,309	5,492				51,801
Total	**1,031,563**	**114,161**	**2,832,792**	**5,488**	**68,800**	**4,052,804**

DOF (2001)

* Data of flood land area are not available by districts.

Annexure-XI: Annual Total Catch of Inland Water By Districts 1999-2000

(Figures in Metric tons)

Former District (old)	River Canal & Estuary	Sundarban	Beels	Kaptai Lake	Flood Land	Baor	Total
Chittagong	6564		204		17,890		24658
Chittagong H.T.	39			6,852	754		7645
Noakhali	19810		1		23,251		43062
Comilla	21200		819		37,205		59224
Sylhet	4135		27,217		39,019		70371
Dhaka	4002		2,590		49,762		56354
Faridpur	3975		1,663		22,500	542	28680
Mymensingh	8309		18,878		73,479		100666
Jamalpur							0
Tangail	955		2,387		5,034		8376
Barisal	53468		17		24,669		78154
Jessore	2662		2,225		11,902	1,988	18777
Khulna	6767	11,648	113		17,295	195	36018
Kushtia	553		969		5,986	897	8405
Patuakhali	11565				9,087		20652
Bogra	241		1761		14,132		16134
Dinajpur	104		318		5,406		5828
Pabna	4248		1,729		8,512		14489
Rajshahi	3524		8,846		25,430		37800
Rangpur	1214		3,088		33,488		37790
Total	**150,830**	**11,648**	**72,825**	**6,852**	**424,805**	**4,940**	**671900**

Annexure-XII : Percentage Composition of Riverine Catch by Species Groups

Year	Hilsa	Major Carp	Other Carp	Cat Fish	Snake head	Live fish/ Air breath	Big Shrimp	Small Shrimp	Others	Total	Total annual riverine catch (Metric ton)
1983-84	43.4	4.1	1.0	4.8	0.0	0.6	1.8	4.9	39.4	100	207,766
1984-85	34.4	4.7	1.2	5.9	0.0	0.5	2.2	7.5	43.8	100	213,057
1985-86	47.2	1.1	1.3	3.0	-	-	1.6	12.9	32.6	100	199,600
1986-87	46.4	0.5	0.5	1.9	-	0.1	1.00	11.2	38.4	100	195,117
1987-88	42.20	0.65	0.56	1.82	-	0.02	0.62	9.6	44.5	100	183,817
1988-89	44.8	1.0	2.0	1.7	0.0	0.0	1.1	9.7	39.7	100	181,140
1989-90	64.3	1.5	2.1	1.5	0.1	1.2	0.2	8.0	21.1	100	173,410
1990-91	48.9	2.9	1.6	5.00	0.1	0.1	0.6	14.6	26.2	100	135,355
1991-92	54.3	1.4	0.7	3.1	0.2	.2	0.4	16.0	23.9	100	124,843
1992-93	53.5	1.0	0.5	3.5	0.1	0.0	0.4	19.4	21.6	100	138,746
1993-94	49.5	1.3	1.0	3.7	.2	.3	0.5	14.9	28.7	100	143,425
1994-95	55.0	1.3	0.5	2.0	0.1	0.1	0.3	15.7	25.2	100	152,782
1995-96	48.4	1.6	0.4	3.0	0.1	0.5	0.3	8.3	36.7	100	165,637
1996-97	51.7	1.3	0.3	2.7	0.2	0.1	0.6	9.9	33.8	100	159,660
1997-98	51.8	1.7	0.6	2.2	0.2	0.6	0.4	6.7	35.8	100	156,894
1998-99	48.5	2.0	0.8	2.7	0.2	0.3	0.5	5.3	39.8	100	151,309
1999-00	51.0	1.1	0.2	1.9	0.2	0.6	0.8	7.4	36.8	100	154,335
2000-01	49.7	1.3	0.2	1.8	0.3	0.1	0.4	4.6	41.5	100	150,129

Annexure-XIII: Seasonal calendars prepared by five stakeholder groups at Dikshi Beel, Chatmohor, Pabna, Bangladesh

Fisher group:

No	Activities	J	F	M	A	M	J	J	A	S	O	N	D
1.	Fishing in Beel and other place												
2.	Crop cultivation												
3.	Agricultural labour												
4.	Non agricultural labour												
5.	Migration for selling out labour												
6.	Van pulling												
7.	Beel dries up and lack of fish												
8.	Lack of safe drinking water												
9.	Fish disease												

Landless (men) group:

No	Activities	J	F	M	A	M	J	J	A	S	O	N	D
1.	Peak labour: rice (Aus and Aman)												
2.	Peak labour rice (HYV Irri/Boro)												
3.	Peak labour: Jute												
4.	Peak labour: dal (Keshari)												
5.	Eak labour: other rabi crops												
6.	Fishing												
7.	Fish trading												
8.	Migrate to other areas to sell labor												
9.	Earth cutting												
10.	Honey collection/harvesting												
11.	Lack of employment												
12.	Van pulling												

Landless (women) group:

No	Activities	J	F	M	A	M	J	J	A	S	O	N	D
1.	Livestock and poultry rearing												
2.	Handicrafts (Kantha making)												
3.	Net making												
4.	Lack of food												
5.	Lack of women employment												
6.	Lack of fish in the beel												

Marginal-small farmers:

No	Activities	J	F	M	A	M	J	J	A	S	O	N	D
1.	Agriculture farm activities												
2.	House repairing												
3.	Fishing												
4.	Fish trading												
5.	Migrate to other areas to sell labour												
6.	Vegetable cultivation												

Medium-large farmers:

No	Activities	J	F	M	A	M	J	J	A	S	O	N	D
1.	Agriculture/crop cultivation												
2.	Cutting earth												
3.	House repairing												
4.	Fishing												
5.	Agricultural labour												
6.	Fish trading												
7.	Activities weaving												

8.	Business												

Source: Barr et al. (2001; Vol 4.3)

Annexure XIV: Problem census results according to stakeholder groups

Landless sharecroppers and other labourers	**Women from poor families**
1. No local control over NR distribution	1. Landlessness; no land even for homesteads
2. Low crop prices early in season	2. Extreme poverty; lack of capital
3. Access to irrigation water	3. No room for stock rearing
4. Access to capital for cropping	4. No land for sharecropping
5. Water depth in *beels* for fish and irrigation	5. Fuel crisis; difficult to gather biomass fuel
6. Poor local support structures *(samities*)	6. No CPR for stock needs
7. Early flooding of *beel* lands damaging crops	7. Pay discrimination; half wage of male workers
8. Scarcity of sharecropping land	8. Fish and mollusc/ snail/crab very scarce; wild vegetable, fruits, seeds from village trees scarce
9. No training in rice-fish production techniques	9. High prices of fertilisers, insecticides, seeds
10. No water regulator for crop /fish cultivation	10. No medical facility, treatment expensive
11. No jobs during lean period (the rainy season)	11. Too high a work load
12. Low wage rates for agriculture labour	12. No veterinary service for stock
13. Low fish stocks in open water bodies	13. Difficulty in accessing draught animals
14. Poor quality fertiliser, pesticides, seeds	14. BRAC not buying growing chicks
15. No training for poultry/cattle raising	15. Lack of sanitary latrine, poor hygiene
16. No efficient drainage system for irrigation	16. Joblessness of manual rickshaw pullers
	17. Husband's negligence and torture
Rich farmers	**Women from non-poor families**
1. Stagnant flood water in *beel* delaying planting	1.Lack of capital and cash
2. Scarcity of quality agricultural inputs	2.Lack of homestead land
3. Lack of agricultural training	3. Lack of veterinary facilities for small stock
4. Lack of local control in villages	4. Disease of vegetables, fruit and garden plants
5. Lack of capital	5. Scarcity of domestic servant during harvest
6. Low crop prices early in season	6. Scarcity of crop land
7. Scarcity of irrigation water	7. No access roads to the homesteads
8. Lack of training in fish culture	8. Insects destroying the fruits on trees
9. No improved livestock and veterinary facility	9. Scarcity of domestic fuel
10. Problem of poor fruiting of fruit trees	10. Lack of earning members in the family
11. Disease of fish and over fishing	11. Problems with sharecropping
	12. Lack of drinking water during the dry season
	13. Lack of opportunities of female education
	14. Lack of training in small stock raising
Fishers	
1. Shortage of capital	
2. Sluice gates blocking fish migration	
3. Decline of open water fish species	
4. Use of fish poison to kill indigenous fish	
5. Decline of young fishes due to fine-mesh net	
6. Crabs killing fish and cutting nets	
7. Rich farmers leasing Government water bodies	
8. Decline of beel fish species	
9. Heavy work load	
10.Rich landowners restricting fishing near *kua* (pits)	
11. Fishing by non-fishers in the water bodies leased by the fishers	

Source: Barr et al. (2000b) (n.b. The constraints are not ranked)

Annexure XV: Matrix showing problems, causes, effects and possible solutions prioritised by Fisher group during PAPD process

Problems	Cause	Effect	Solution	Affected Group
Silted up canals	• Conversion of land • Natural siltation • Encroachment • Construction of closure the canals	• Degraded of water connectivity for fish migration • Less water movement • Difficult to cultivate cropping land • Occurred water logging • Water become polluted • Increased fish diseases • Decreased fish production	• Reestablish connectivity between Posna beel and Katwar beel by the southern side of the Mosque	• Fisher • Pagar owner • Landless
Decrease fish production	• Water cannot flow towards the beel • Lack of egg spawning ground • Lack water connectivity for the fries movement • *Beel* dewatering to catch brood fish and fries • Water pollution	• Decreased fish production • Decreased fish diversity • People become affected by malnutrition	• Stop to catch fish fry and brood fish • Establish fish sanctuary • Reestablish connectivity for fish migration	• Fisher • Land owner • Pagar owner
Shortage of capital	• Less catch of fish from beels • Can not cultivate agricultural land • Scarcity of agricultural land of the poor	• Food insecurity • Unable to buy fishing gears • Unable to earn livelihood from alternative activities	• Re-establish connectivity among water bodies • Establish fish culturing farms	• Poor
Lack of unity	• Land owners do not cooperate the fishers • One's opinion is respected by others • Influential/rich people are not helpful regarding conflict resolving	• Occurred conflicts in the villages • Increased social problems • Difficult to take initiative for social development	• Organize general meeting to make villagers united • Trust others opinion	• Fisher • Landless • Land owners
Unable to buy boat-net	• Shortage of capital • Less employment opportunities • Less income from fishing • Limited access in the fishing ground	• Difficult to meet livelihood expenses	• Introduce micro-credit facility • Create employment opportunities	• Fisher
Decrease fish diversity	• Fish disease • Blockage of water connectivity • Water pollution • Over harvesting • Beel becomes dry up during dry season • Beel dewatering for fishing	• Decreased fish production • Decreased income • Lack of big fish in the beel • Do not get fish round the year	• Stop catching of brood fish and fries • Establish fish sanctuary/ conserve pagar • Re-excavate connecting canals	• Fisher • Pagar owner
Scarcity of fish feed	• Less growth (aqua-vegetation) natural fish feed • Blockage of water connectivity	• Fish does not migrate to beels/floodplain due to lack of food • Decreased fish	• Re-establish water connectivity • Provide artificial feed	• Fisher

Problems	Cause	Effect	Solution	Affected Group
	• Water pollution	production • Decreased fish growth		
Fishes can not grow up at good size	• Over harvesting • Over ruling the existing fisheries rules • Water pass properly through connecting canals • Fish diseases	• Decreased income • Increased poverty • Decreased fish production	• Re-excavate canals • Create unity among the community people • Stop fishing during the breeding time • Create alternative income generating activities	• Fisher
Low recruitment of fingerlings	• Lack egg spawning ground due to insufficient current in the canals • Water Pollution • Dewatering for fishing	• Decreased fish production • Decreased fish quantity and diversity • Increased financial crisis	• Establish fish sanctuary • Release fish fries/fingerlings • Re-establish connectivity between the river and canals • Release extinct species in the beels from elsewhere	• Fisher
Beel becomes polluted	• Silted up connectivity • Washed down residual fertilizer and pesticides from agricultural lands • Rotten vegetation of water bodies	• Fish affected by diseases • Resource users often infected by skin diseases • Increased fish mortality • Decreased income of fishers • Declined fish seed (fries/fingerlings) for next production • Decreased fish growth	• Re-excavate canals • Apply fertilizer and pesticide wisely	• Fisher

Source: Barr et al (2001, Vol 4.1) (n.b. similar matrices exist for all primary stakeholders at the four sites studied).

Annexure XVI: Impact of Stocking on the Local Fishers

	Percentage increase of assets and income		
Indicators/ asset	Chanda	BKB beel	Halti Beel
1. Land assets	4	14	5
2. Fishing right	104	15	7
3. Moveable assets	23	33	13
4. Fishing gear	10	2	3
5. Livestock	31	100	12
6. Household assets	7	11	2
7. Fishing income	550	105	147
8. Fish consumption	140	220	180

Annex-XVII: List of Secondary Stakeholders met.

Name		Organization	Date of discussion
1.	Mr. Nasiruddin Ahmed Director General	Department of Fisheries	8.2.2002
2.	Dr. M.A. Mazid Director (Inland Fisheries)	Bangladesh Fisheries Research Institute	11.7.2002
3.	Mr. Nazrul Islam Director (Inland Fisheries)	Department of Fisheries	10.9.2002
4.	Mr. Mokammel Hossain Dy. Director	Department of Fisheries	11.9.2002
5.	Mr. Mohiuddin Dy. Director, Dhaka Division	Department of Fisheries	11.9.2002
6.	Mr. M.A. Hai Manager (Implementation)	Bangladesh Fisheries Development Corporation	16.9.2002
7.	Mr. A M Iqbal Manager (Planning)	Bangladesh Fisheries Development Corporation	16.9.2002
8.	Mr. Salahuddin Ahmed President	Bangladesh Frozen Food Exporters Association	12.8.2002
9.	Mrs. Anwara Begum Director (Fisheries)	Caritas, Bangladesh	8.9.2002
10.	Mr. Quazi Khaze Alam Director (Natural Resources)	Proshika, Dhaka	8.9.2002
11.	Mr. Abdur Rahman Senior Coordinator	Proshika, Dhaka	8.9.2002
12.	Mr. Mokhlesur Rahman Executive Director	Centre for Natural Resource Studies (CNRS)	28.9.2002
13.	Mr. Anwar Hossain Sikdar	Bangladesh Khudra Matshyajibi Jeley Samiti	2.7.2002
14.	Mr. Mokadem Hossain	Bangladesh Khudra Matshyajibi Jeley Samiti	2.7.2002
15.	Mr. Warish Ahmed	Bangladesh Khudra Matshyajibi Jeley Samiti	2.7.2002
16.	Mr. Kazi Rezaul Karim	Bangladesh Khudra Matshyajibi Jeley Samiti	2.7.2002
17.	Mr. Zulfiqur Raja Ali	Bangladesh Khudra Matshyajibi Jeley Samiti	2.7.2002
18.	Mr. Harun-Ar-Rashid Bhuiyan	Bangladesh Khudra Matshyajibi Jeley Samiti	2.7.2002
19.	Mr. Islam Ali President	Jatio Matshyajibi Samiti	2.7.2002
20.	Chan Mia Bepari	Jatio Matshyajibi Samiti	2.7.2002
21.	Sree Fani Bhushan Malo	Jatio Matshyajibi Samiti	2.7.2002