



Institute of Social Studies

Graduate School of Development Studies

Sustainable Aquatic Resource Management and Rural Livelihoods: The MACH Intervention in Bangladesh

A Research Paper presented by:

**Mostafa Kamal
(Bangladesh)**

In Partial Fulfillment of the Requirements for Obtaining the Degree of:

**Master of Arts in Development Studies
Specialization:**

Rural Livelihoods and Global Change

Members of the Examining Committee:

**Dr. Max Spoor
Dr. Cris Kay**

The Hague, The Netherlands
December 2006

**This document represents part of the author's study Programme while at the
Institute of Social Studies: The view stated therein are those of the author and
not necessarily those of the Institute.**

**Research papers and theses are not made available for outside circulation by the
Institute.**

Enquiries:

Postal Address:

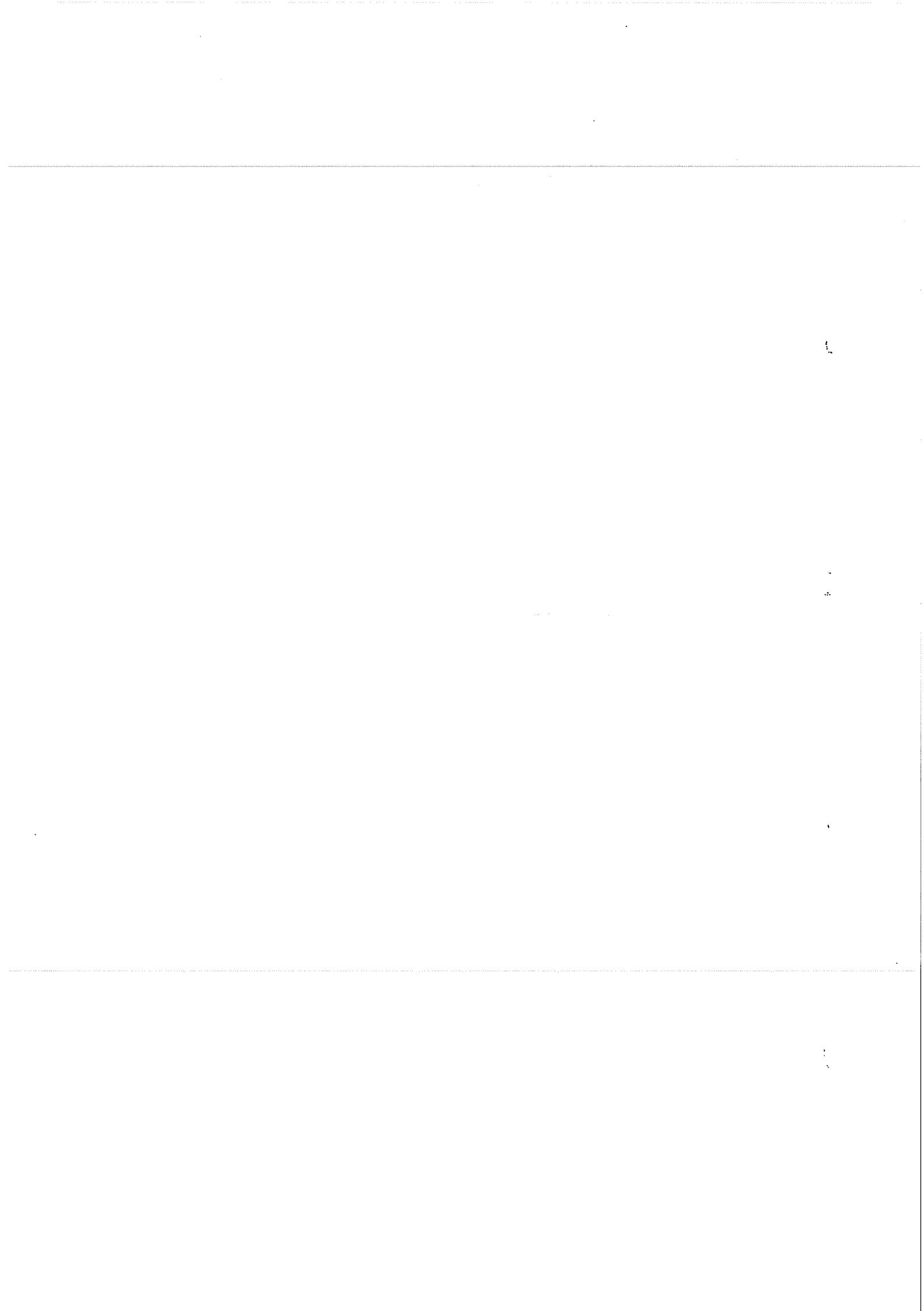
Institute of Social Studies
P O Box 29776
2502 LT, The Hague
The Netherlands

Telephone: 31 70 426 05 41
Fax: 31 70 426 07 47
Email: Voorvelt@iss.nl

Location:

Kortnaerkade 12
2518 AX, The Hague
The Netherlands

*Dedicated to my wife, Fera
And my children, Jarif & Jarin.*



ACKNOWLEDGEMENTS

I deem it a great opportunity to express my heartfelt sense of gratification and sincere appreciation to my research supervisor, Dr. Max Spoor, Associate Professor, ISS, The Hague, The Netherlands who sacrificed many of his precious hours with his professional and academic responsibilities in providing scholastic guidance, innovative suggestions, constant supervision, timely instructions and inspirations throughout the tenure of the research work. In addition, he spent adequate quality time in the laborious task of reviewing the entire draft and offered invaluable comments for the improvement of this research paper. His contribution, inspiration, and long endurance in careful looking into every phase of the study are truly unforgettable for me.

I would like to express my gratefulness to Dr. Cris Kay, Associate Professor, ISS, The Hague, The Netherlands for his valuable advice, constructive criticism and factual comments in upgrading the research work.

Sincere gratitude is due to Mr. S.N Chowdhury, National Coordinator of MACH Project, and Mr. Jahangir Alam, Site Coordinator of MACH, Sreemongol for their cordial cooperation during my field study in Bangladesh.

I would like to express my gratitude to the Nuffic for granting me NFP fellowship to study MA at the ISS.

Finally I express sincere gratitude to all respondents who gave the study life.

The author

Table of Contents

| | |
|--|-----|
| Dedication | i |
| Acknowledgements | ii |
| Table of contents | iii |
| List of Tables | v |
| List of Figures | vi |
| List of Maps and Picture | vi |
| | |
| CHAPTER- I: | 1 |
| 1.1 Introduction | 1 |
| 1.2 The Background of the MACH Intervention | 2 |
| 1.3 Relevance and Justification | 5 |
| 1.4 Research Objectives | 6 |
| 1.5 Research Methods | 7 |
| | |
| CHAPTER-II: | 9 |
| 2.1 Analytical Framework | 9 |
| 2.2 Conceptualization of Analytical Framework | 13 |
| | |
| CHAPTER-III: | 23 |
| 3. Profile of the Hail Haor and the MACH Intervention | 23 |
| 3.1 Location and Physical Characteristics of Hail Haor | 23 |
| 3.2 Traditional Management of Beels of Hail Haor | 24 |
| 3.3 Aquatic Biodiversity of Hail Haor Beels | 25 |
| 3.4 MACH Approach | 25 |
| 3.4.1 Establishment of New Management Paradigm for | 26 |

| | |
|--|----|
| Aquatic Resource Management | |
| 3.4.2 Major Aquatic Resource Management Activities under New Management Paradigm | 28 |
| 3.4.3 Community Based Organization (CBO)-an alternative livelihood development institutions for poor fishermen | 31 |
| CHAPTER-IV: | |
| 4. Results and Discussion on the Impacts of the MACH Intervention | 34 |
| 4.1 Development of Alternative Capital Assets and Improvement in Aquatic Resources | 34 |
| 4.1.1 Social Capital | 34 |
| 4.1.1.1 New Institution Building- RMO | 34 |
| 4.1.1.2 Local Alliance and Group Activity | 35 |
| 4.1.2 Financial Capital | 37 |
| 4.1.2.1 Impacts on Micro-credit on RUG | 37 |
| 4.1.2.2 Access to Beel Leasing Arrangement | 46 |
| 4.1.3 Physical Capital | 47 |
| 4.1.3.1 Establishment of RMO Office | 47 |
| 4.1.3.2 Aquatic Sanctuaries | 48 |
| 4.1.3.3 Re-excavation of Beels | 49 |
| 4.1.3.4 Wetland Forest | 49 |
| 4.1.4 Human Capital | 50 |
| 4.1.4.1 Organizing the Fishermen Community | 50 |
| 4.1.4.2 Awareness Development about Aquatic Biodiversity | 50 |
| 4.1.4.3 Skill Development for AIGA | 51 |
| 4.1.5 Aquatic productivity of Haor (Natural Capital) | 52 |
| 4.2 Linkages of RMO, RUG and Aquatic Biodiversity | 53 |

| | |
|---|----|
| CHAPTER-V | 55 |
| 5. Question of Sustainability and Conclusion | 55 |
| 5.1 Institutionalization Process of New Aquatic Resource Management | 55 |
| 5.1.1 Sustainability of RMOs and Aquatic Resource Management | 57 |
| 5.1.2 Sustainability of RUGs | 58 |
| 5.2 Concluding Remarks | 59 |
| References/Bibliography | 63 |

List of Tables

| | | |
|-------------|---|----|
| Table 4.1 | Distribution of RUG members according to their amount of loan received | 37 |
| Table: 4. 2 | Distribution of RUG members by principal earning occupation and their own income before joining the MACH Intervention | 38 |
| Table: 4.3 | Distribution of RUG members by principal occupation with income in the survey year (August 2006) | 39 |
| Table: 4.4 | Adjusted base year income of RUG members with inflation rate | 41 |
| Table 4.5 | Employment Status of respondent RUG members before joining the RUG. | 42 |
| Table 4:6 | Yearly Employment status of RUG members after joining the RUG | 43 |
| Table 4.7 | Average change in employment generation | 43 |
| Table 4.8 | The average changes in land ownership of RUG members | 44 |

| | | |
|------------|--|----|
| Table 4.9 | Consumption of Fish in Hail Haor (gram/person/day) | 48 |
| Table 4.10 | Statistics of Wetland forest in the Hail Haor | 49 |
| Table 4.11 | Distribution of RMO members | 50 |
| Table 4.12 | Fish species diversity | 52 |

List of Figures

| | | |
|----------|---|----|
| Figure 1 | Traditional State Management Structures of Aquatic Resources affecting Aquatic Biodiversity | 11 |
| Figure 2 | New Management Structures of Aquatic Resources contributing to improved Aquatic Biodiversity | 12 |
| Figure 3 | Links among rural community people, aquatic resource management and rural livelihoods for ensuring improved aquatic bio-diversity | 54 |

List of Maps and Picture

| | | |
|-------------|---|----|
| Annexure-I | Map of Bangladesh showing study area indicated by HH site | 69 |
| Annexure-II | Map of the Hail Haor (the Study area) | 70 |
| Annex-III | View of aquatic biodiversity in Hail Haor after the MACH Intervention | 71 |

CHAPTER-I

1.1 Introduction

Bangladesh has extensive floodplains/wetlands which are home to hundreds of species of aquatic plants, birds, wildlife and more importantly enrich in fisheries resources. These wetlands provide critical habitats for millions of migrating birds and are important source of livelihoods and nutrition for millions of rural Bangladesh's poor people and fishermen who are primarily dependent on these wetlands for their livelihoods. The contribution of inland fisheries of Bangladesh to the livelihood of in particular the rural people is historically reflected in the traditional popular saying "fish and rice make a Bangali (Bangladeshi)". About 70% of rural households undertake fishing for their subsistence needs (DoF, 2001).

The wetlands also contribute to cleanse polluted waters (up to a certain capacity), prevent floods, protect shorelines and very importantly recharge ground water aquifers. This is why wetlands are known as the "Kidneys of the Landscape" (Mitch et al., 1993). The wetlands have also been termed "Biological Supermarket" as because they support an extensive food web and wide range of biodiversity (Mitch et al, 1993).

Virtually we can see almost all Bangladesh is a vast network of fresh water wetlands which include river, lakes, floodplains, ponds, Haors/Beels¹ and flooded agricultural lands. In total, there are 4,494 Beels in Bangladesh comprising an area of 114,161 hectares (DoF, 2001). Over the years these Haors/Beels fisheries have been following an open-access fishing procedure ignoring consistence and well organized effective management policy of aquatic biodiversity (Ahmed, 1989).

¹ Beels are geologic depressions or swampy lands formed in the death channels of former rivers which contain water year round. Haors are floodplain lake and swamp systems usually described as bowl-shaped depressions between natural levees/ riverside embankment that are flooded every year by monsoonal floods from April to October (Nishat, 1993). Usually a Haor has more than one Beel.

There is increasing evidence that inland aquatic resources are drastically declining both in quality and quantity and there is a sever loss of aquatic biodiversity due to over-fishing, over-exploring aquatic products, siltation and conversion of more and more wetlands into agriculture to meet the demand of rapidly growing population (Billah, 2003).

The focal goal of the Bangladesh Government's economic policy is to reduce poverty so as to gradually lift the vast majority of the people above the poverty line which has been institutionalized through its PRSP (PRSP of Bangladesh, 2005). Within the context of the poverty reduction agenda through a participatory approach of the national PRSP, it is very important to ensure poor fishermen community's access to fisheries resources not only for their livelihoods but also conservation its aquatic biodiversity introducing community management.

The proposed research has basically focused on sustainable inland aquatic resource management and its interlocking relationship with rural livelihoods of poor people as well as fishermen who earn their livelihood mainly from open water based inland aquatic resources commonly known as Beel fisheries in rural Bangladesh. This has been done in the context of the MACH (Management of Aquatic Resource through Community Husbandry) project intervention (1999-2005) in the field of aquatic resource management and poverty alleviation of rural poor people in the project area (Hail Haor/Beels). The researcher has critically analyzed the different interventions done under the project to ensure sustainable aquatic resource management and their impacts on livelihood of the poor.

1.2 The Background of the MACH Intervention

Beel fisheries are basically grown and reared in the natural water bodies. One traditional way of Haor/Beel fishery management is that the government of Bangladesh leases Beels to the highest bidder through public auction. The qualified highest bidder (usually non fisherman local elite/political person) then subleases to the local poor fishermen or use them as cheap laborers for fishing. As every year the lease value goes up following a complicated public bidding process, the leaseholder

has the tendency to overexploit the fish stock including other aquatic products for maximizing profit from bidding, mostly the leaseholder uses harmful gears for fishing ignoring all rules and norms of safeguarding the aquatic resources. Subsequently, this revenue oriented leasing system has severely affected the biodiversity of aquatic resources and at the same time, displaced the poor fishing community whose livelihoods largely depend on Beel fisheries.

To have a better understanding in this regard, if we look back in historical perspective to the leasing system in Bangladesh, over the years the aquatic resources of Beels have been exploited as an open access system. In principle, all Beels are public water bodies which physical ownership belongs to the Ministry of Land but its aquatic resource management responsibilities go to the Department of Fisheries (DoF) under the Ministry of Fisheries and Livestock (Arifin, 1998). There are some aquatic biodiversity enriched Beels, located in the reserve forest that belong to the Department of Forest under the Ministry of Environment and Forest, while some Beels located near to rice production area are administered by the Bangladesh Water Development Board of the Ministry of Water Resources to mainly facilitate irrigation support for rice production (Rahman, 1989). In the past, before 1950, the inland fisheries became the property of feudal lords (Zamindars).

The history of Beel Management shows that aquatic resource management of the Beels was the responsibility of several government ministries and agencies since British regime (Aguero, 1989). Due to multiple participations of different agencies without proper institutional coordination, the aquatic resource management of inland beels became one of the most complicated and debated issues in Bangladesh, this has led to unclear responsibilities regarding management of aquatic resources which virtually resulted in malpractices for allocation of fishing rights, collection of revenue and surveillance of fishing activities. Under the prevailing system, fishing rights were given to the highest bidder through periodic leasing system followed by open auction. Although in this leasing system, the government policy has given priority to the fishermen's cooperatives to incorporate disadvantage fishermen community with the aquatic resource use and management (Rahman, 1989) but due

to bureaucratic institutional barriers and lack of leadership and financial capital, the fishermen's right to access Beel fisheries was always denied and in practice was displaced through an open bidding process, which mostly favored the rich people to be the successful bidder. The experience of traditional management system through periodic leasing (usually for three years) has resulted an adverse effect on the sustainability of the resources and most importantly worsening impact on the economic conditions of the thousands of poor community fishermen engaged in the fishermen over the years (Ahmed, 1989).

Since the British colonial period several policies were initiated and adopted as management tools for inland open water aquatic resources including Beels. But unfortunately no single initiative was proved to be successful and sustained. In recent time, community based aquatic resource management has been initiated on experimental basis for improvement and management of inland open water aquatic resources (Sugunan, 1997).

Under these circumstances, recognizing the need for new approaches towards floodplain and wetlands' resources management, the Government of Bangladesh and USAID jointly designed the MACH project in 1998 which would be concluded in August 2007.

The overall objective of the project was to establish sustainable management of the aquatic ecosystem of natural floodplain and wetlands, through new institutional settings involving local community participation. The specific objectives of the MACH project were as follows²:

- i) To introduce new institutional setting for natural floodplain and wetlands management to ensure sustainable growth of fisheries and aquatic resources through maintaining a balanced aquatic ecosystem.
- ii) To strengthen local community livelihoods and reduce dependency on fishing and aquatic resources by creating alternative non-farm income generating activities (IGA)

² As reported by Winrock International Bangladesh Office, Gulshan-2, Dhaka, Bangladesh

for the local poor community who are completely depending on fishing and aquatic resource base.

iii) To build local community awareness about aquatic ecosystems and sustainable use of local natural flood plain and wetlands.

The nature of the MACH project is new in Bangladesh for rural development utilizing local aquatic resources through introducing new strategic management. The project advocates multi-disciplinary, multi-sector and multi-actor based strategies of planning, implementation and monitoring for sustainable wetland resource management which was directly implemented by an International NGO, Winrock International³. Recognizing that the reduction of fishing pressure and over exploration of aquatic products is a critical part of reviving the wetland fisheries, MACH has included supplementary income-generating activities that have focused on local fishing community and other local poor people directly dependent of fishing and aquatic products⁴. The new element of the MACH intervention is that the inland open water body of aquatic resource previously managed and owned by the central government has been transferred to local poor people through establishing community based resource users' organizations. This intervention, possibly for first time in Bangladesh, has ensured local poor people's legal access to aquatic resource use and management. However, the aftermath of the MACH project is now a long heatedly debated, as it raised many questions, such as how far this intervention has contributed to sustainable aquatic resource management and rural livelihood of poor people.

1.3 Relevance and Justification

On the MACH project activities and their impact, no systematic academic study has been done until now. However, it is very important for the government to know the critical outcome of MACH project, which will create more space for sustainable

³ Project agreement signed between the USAID and the government of Bangladesh.

⁴ Information used here from brief paper on MACH by Mujibur Rahman, CNRS, Dhaka, Bangladesh.

management of local aquatic resources and livelihoods of rural poor people. It is also important to gain a better understanding about the overall success and limitations of the MACH project for further effective policy formation regarding sustainable aquatic resource management and poverty alleviation.

1.4 Research Objectives

The main objective of the proposed research is to critically investigate the new institutional structure, management strategy and their relationships with community people with regards to sustainable aquatic resource management and rural livelihoods, following the MACH project intervention. In this study, the researcher has tried to analytically explain how, why and to what extent MACH project intervention was involved to integrate sustainable aquatic resource management and rural livelihoods of community people especially poor fishery resource users through new institutional structure.

The research has tried to answer the following leading question:

Did the MACH project intervention positively contribute to sustainable aquatic resource management and rural livelihoods and if so to what extent?

Sub-Questions:

1. What is the new aquatic resource management structure and how does it work in practice?
2. Did the management contribute to create alternative capital assets base for rural poor to generate income in order to reduce an excessive dependency on aquatic resources and in which manner?
3. Did aquatic biodiversity improve after the MACH intervention? If yes/no, why?

By analytically investigating the MACH project the proposed research will try to answer the above questions by focusing on the interdependency relationships of three key components (Rural Livelihoods, Aquatic Resources and New Management

Structure) which theoretically lead to improve aquatic bio-diversity, but might have unintended outcomes in practice.

1.5 Research Methods

Sreemongal Hail Haor aquatic region under Moulvi Bazar district of Bangladesh has been selected as the study area to do a field based study. The reason behind this selection is that it is one of the richest aquatic bio-diversity areas in Bangladesh where intervention through the MACH project was done to protect it from increasing degradation.

Keeping the overall objectives as well as research question of the proposed study in mind, primary data both qualitative and quantitative was collected to lead the research in the right direction. The study is also reviewing all available secondary reports/documents regarding the MACH project produced since its inception to get a better understanding about the MACH intervention.

The quantitative and qualitative data was collected from aquatic resource user group's member using a structured questionnaire. Random sampling technique was applied to select a total of 23 members from different user groups in the study area. The qualitative data/information was collected through focus group discussion with concerned government official (local and central) and stakeholders, project implementing staff, members of community based organizations involved in aquatic resource management and other relevant stakeholders. For guiding the focus discussion to obtain required information, a list of pre-determined questions form was used.

The data for the present study was collected by the researcher himself from the selected respondents by using the prepared interview schedules. All possible efforts were taken by the researcher to minimize the error of the recall memory based data from the respondents. If any respondent faced difficulty in understanding any question/technical issue related to required data, utmost care was taken to clarify the same.

The findings of the proposed study would be particularly applicable to the selected project area in Bangladesh. However, the findings can also have implications for other areas to the country having similar aquatic resource management and socio-economic conditions. The findings of this study will throw some important light on the field of public open water aquatic resource management and poverty alleviation of local community people, which potentially can great use to the concerned planners and policy makers. This study may also help in generating further studies in this new field.

CHAPTER- II

2.1 Analytical Framework

Aquatic resources are among the most threatened of the world's largest natural ecosystem. In the industrialized North, vast areas have been lost over the past 200 years as human society has sought to put these parts of landscape to improved use. Today, as development pressures increase in the southern hemisphere, aquatic resources are under the same pressure. However, as aquatic resources have been losing out so, human society has become more aware of the many values which they yield and of the possible benefits of environmentally sound management. As a result, attention is today being focused on why aquatic resources are being lost to human society and how environmentally sustainable management of aquatic resources can be achieved (Dugan, 1989). In the context of Bangladesh, there are interdependency relationships between natural resource use (here aquatic resources) and rural livelihoods, which are the objectives here.

Rural Livelihoods:

Rural poor people do not rely for their livelihood on the agricultural sector alone. This perception has led in recent years to the emergence of sustainable livelihoods approach (SLA) defined as “a livelihoods comprises the assets (natural, physical, human, financial and social capital), the activities and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or households” (Ellis, 2000).

This approach basically examines the position of rural households in relation to the availability of various capital assets which can be expressed as:

$$RL = f(N_c, P_c, H_c, F_c \text{ & } S_c)$$

Here,

RL: Rural livelihoods

N_c (Natural capital): land, water, forest and aquatic resource (including wetlands, fishery and aquatic plants)

P_c (Physical capital): livestock, agricultural equipment, trading shop etc.

H_c (Human capital): skilled labour and unskilled labour

F_c (Financial capital): investment resource available to rural households
(savings and credit)

S_c (Social capital): networks which can be used as a facilitator to support livelihoods.

This support may come from informal organization within the community and/or from formal institutions at local and national level.

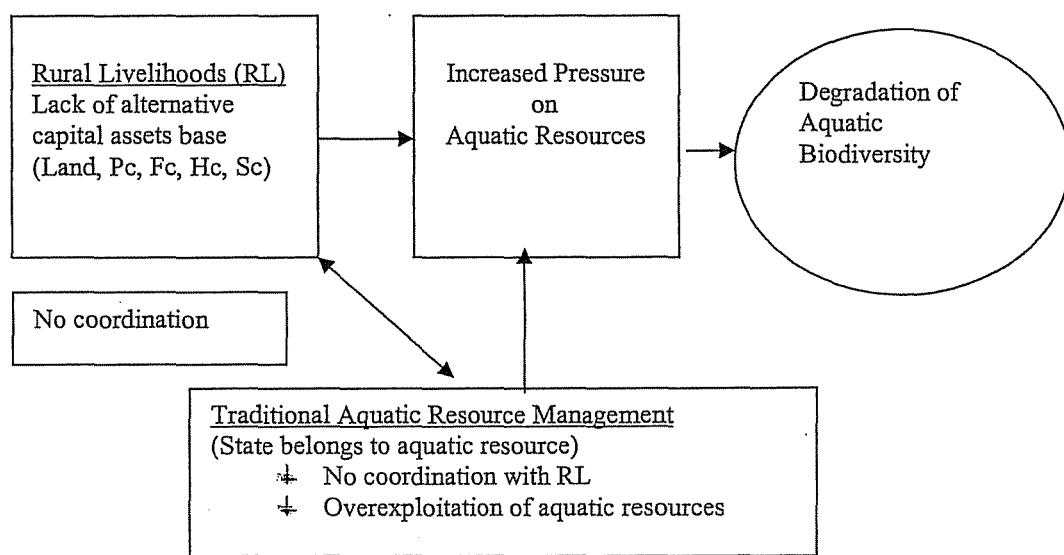
From the equation, it is clear that natural resources have important role in rural livelihoods.

Aquatic Resources Management:

'In order to design effective measures to protect aquatic resource and to manage them in an environmentally sustainable manner, both the proximate and ultimate causes should be identified and addressed properly' (Dugan, 1989). In this context, the livelihood equation shows that pressure on aquatic resources use may increase if rural people lack alternative capital assets for constructing their livelihood strategies which gradually damage aquatic biodiversity. In addition, the traditional management structures for management of aquatic resource no longer operate effectively in Bangladesh. Aquatic resources as well as all natural resources belong to the state and

in theory it can be exploited by all nationals which lead to overexploitation of them. In the absence of local control of community people over aquatic resources, the village community people have no guarantee that they will benefit from restraint in the use of resources. They have an increasing tendency towards short term overexploitation of the resources, rather than investment in their sustainable utilization (Ibid, 1989). Therefore, traditional aquatic resource management has negative impacts on aquatic biodiversity (Figure 1).

Figure 1: Traditional State Management Structures of Aquatic Resources affecting Aquatic Biodiversity



Source: Author

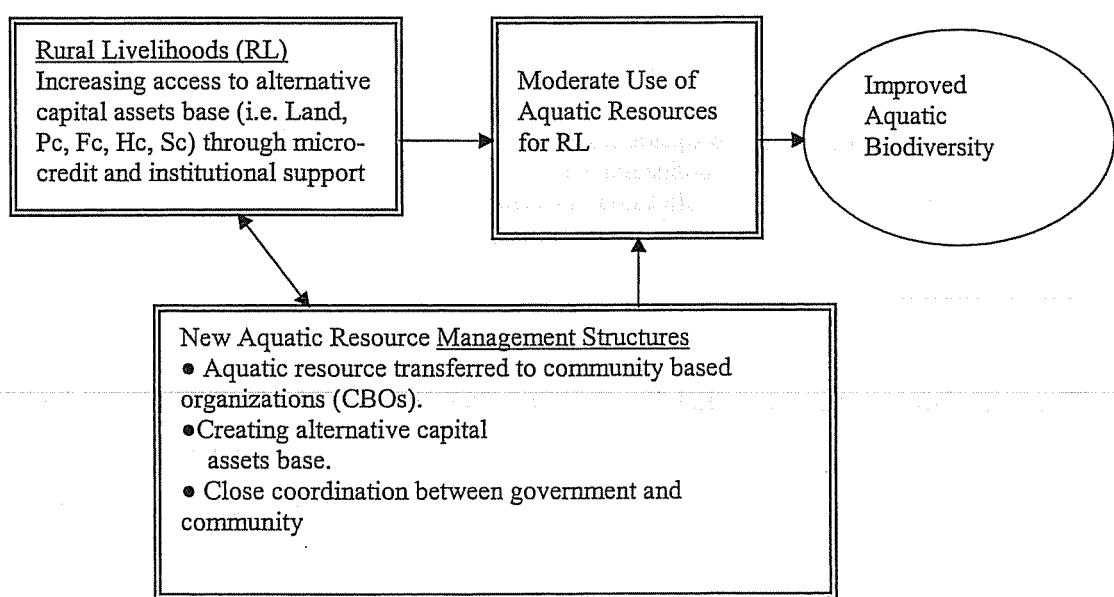
There is also an argument that the rich and powerful elites capitalize more aquatic resources and take most benefits from traditional state management structures by using political power, authority, bureaucracy and market mechanism (Rahman, Mallick, Haque & Nishat, 2002).

However, in reviewing the relationship between resource conservation and needs of the rural poor, the World Commission on Environment and Development succinctly summarized (Dugan, 1989) the fundamental dilemma of rural resource users and

suggested following prescription towards how effective management of natural resources can be achieved:

Firstly, Increasing investment in aquatic resource/wetlands conservation in the developing world should be placed upon the development of management mechanisms through which the rural resources users can more effectively plan long-term strategies for resource use and have the economic flexibility to do so (Establishing Community Based Organizations (CBOs)) and providing endowment funds) and such management needs to be provide short-term benefits to rural resource users group (by ensuring alternative capital assets for livelihoods through micro-credit and skill development training) while maintaining and enhancing the capacity of ecosystem to yield these benefits in the long-run.

Secondly, management activities need to be designed and elaborated in collaboration with the local communities who will benefit from the management. And finally, these management measures should be taken place within the framework of a broader planning process which should work to maintain the integrity of the hydrological system upon which aquatic resource base depends (Dugan 1989:342).



Source: Author

Figure 2: New Management Structures of Aquatic Resources contributing to improved Aquatic Biodiversity

The proposed research has mainly focused three key concepts which are rural livelihoods, aquatic resources and new management structures. In the analytical frame, the researcher has linked these concepts showing their interlocking relationship which theoretically leads to improved aquatic bio-diversity (Figure 2).

2.2 Conceptualization of Analytical Framework

Sustainable Development

So far, after publishing 'Our Common Future' known as 'the Brundtland report'⁵ by the World Conference on Environment and Development (WCED) in 1987 the 'sustainable development' discourse has been increasingly dominating in the context of globalised world (WCED, 1987 in Elliott, 2006). Many scholars have contributed in this field and attempted to define sustainable development from different points of view. Some important contributors among them are Christie et al (1992), Neefs (2000) Adams, (2001) and Elliott, (2006).

Over the decades especially through out the decade of 1990s there was huge debate and contestation concerning the meaning of sustainable development and by following this, there were so far 70 definitions of sustainable development in circulation (Holmberg and Sandbrook, 1992). Therefore it is quiet conundrum to conceptualize sustainable development although it is utmost necessary as it is the basis on which the tools for achieving sustainable development to be constructed. However, Elliott (2006) did some significant contributions in this context by summarizing the concept of sustainable development in the following way:

- ✳ 'In principle, such an optimal (sustainable growth) policy would seek to maintain an "acceptable" rate of growth in per-capita real incomes without depleting the national capital asset stock or the natural environment asset stock' (Turner, 1988:12).
- ✳ 'The net productivity of biomass (positive mass balance per unit area per unit time) maintained over decades to centuries.' (Conway, 1987: 96).

⁵ Gro Harlem Brundtland, the then Prime Minister of Norway.

- * *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' (World Commission on Environment and Development, 1987: 43 in Elliott 2006).*

Among the definitions, very challenging notions are natural resource, needs and optimum use of resources. Because the question of optimum uses of natural resources varies depending on the types of resource. For example decisions concerning economic use of fund resources (like coal, gas, oil etc.) are different than that flow resources (like aquatic resources, forest etc.) (Barlowe, 1986). On the other hand, the meaning of needs signifies different things to different people which also continue to vary over the time. As such, the discourse of sustainable development is a focal point of many conflicts like 'conflict between the benefits of the present generation and the future; between human well-being and the conservation of nature; between the poor and the rich; and between the local and global' (Elliott 2006: 11).

Besides these, ideas of sustainable development draw on critiques of the different schools of development process, for example from populist ideas (neo-populist theory of development), from radical ideas (such as dependency theory of development), and from more pragmatic critiques of development project appraisal and implementation (Adams, 2001:12). However, the notion of global crisis emerged as an important element of environmentalism in the 1960s and 1970s, and became a central element of in debates about sustainable development (*Ibid*) and later on it becomes a fashionable to use the concept of sustainability for every socio-economic development agenda like a slogan than it is a basis for theory. The proposed study will also suffer from the limitations of the definition of sustainability. However, the above-mentioned three definitions would be applicable in this research whenever necessary.

Aquatic Resource Management and Rural Livelihoods

"It is certain that in our global, common future, the spirit in which we approach the management of our planet in the course of the next few decades will determine whether or not we survive as a species in the face of seemingly overwhelming threats

to life on Earth" (Khalid, 1988). It signifies that sustainable management of nature is one of the greatest concerns for today's globalized world and these increasing concerns have caught careful attention of a wide range of scholars, scientists, politicians, industrialist, environmentalists and public policy makers over the world. Bangladesh is not exception in this process. As a part of this process, many scholars have conducted studies on aquatic resource management, water management and related issues in Bangladesh. Some of the important studies among them are Wester and Bron, ARD (2003) and Millick *et al* (2002).

Wester and Bron have basically focused on flood control and drainage system in Bangladesh and a little bit of its impacts on fisheries resources. Although their study did not focus floodplain aquatic resources but in the backdrop of their discussion, they pointed out that influential people always get benefits from open water fisheries through traditional government management by engaging fishermen to fish in the open water as labourers.

However, most of these literature are very descriptive rather than developing any theoretical framework by linking empirical data. Moreover, to my knowledge, these studies did not specifically focus the aquatic biodiversity issue in relation with rural livelihoods of poor people.

Sustainable aquatic resource development in context of Bangladesh

Beels/Haors are very important inland open water fisheries resources in Bangladesh. From time immemorial, following the availability of plentiful of fisheries resources especially different kinds of fishes, there were many proverbs in circulation and frequently used by the rural people which signifies the enriched aquatic biodiversity of Bangladesh inland water fisheries as well as the food habit and life style of the Bangladeshi rural people. One such prove which mentioned before is 'Maache bhate Bangali' meaning (Fish and rice make a Bengali) and, another important proverb/popular saying relating to the interlocking relationship between rural livelihood and aquatic resources is 'Likhibo poribo moribo duk-khe, motshya maria khakibo shukhe' (we would like to catch fishes to ensure our happy life and

livelihood (especially rural livelihoods) rather than reading and writing (taking formal education from school for white collar job) which will only lead to my drudgery and miserable death (Ali and Tsai , 1997).

Now these kinds of maxims are only past memory as the present position of aquatic biodiversity is under threat. For centuries fish has been considered first to the diet of the Bangladeshi people. To this effect if we carefully look into fish consumption pattern we see that during the nineteenth and early twentieth century between 85% and 95% of the Bengal population consumed fish as main diet with rice (Ali and Tsai 1997), which was then possible as the Bangladesh had enriched and diverse aquatic resources.

However, there is scientific literature available on Beel fisheries resources discussed that fish diversity, production status, beneficiaries interaction, etc. (Ali, 1997; Rahman, 1995). Several studies indicated the biophysical-chemical characteristics of Beel fishery, based on production and management systems (FRI, 1996; Price *et. al.*, 1996). Rahman (1995) presented a study on the environmental and social unrest caused due to mismanagement of Beel/Haor.

For better understanding the Beels/Haor fisheries from the view point of Bangladesh, the present study has reviewed a body of that may show overall scenarios regarding the interlocking relationships between aquatic biodiversity and rural livelihood in the context of Bangladesh.

Understanding the Terms Beel/Haor

Bangladesh has extensive water resources within her boundaries. Water resources can broadly be classified into two categories i.e. inland and marine water fisheries (in between of these water bodies called brackish or coastal fisheries) (BARC, 1995). In Bangladesh, in land water body in general incorporate Beels, Haors, Baors, ponds, lakes, rivers and their tributaries and distributaries, canals, floodplains, etc. Among all

the types, floodplains are very extensive in areas (Welcomme, 1979). Beels/Haors are generally included with floodplains or capture fisheries.

Beels are a unique and special type of water bodies by nature and characteristics. Beel is a local term and the official term of Beels used by the government is ‘Jalmohal’ (open water bodies) (Rahman, 1989). However, there is a debate and ambiguity regarding the definition, nomenclature and classification of Beels adopted by various authors/workers of the fisheries discipline. For example, the word, Beel is loosely defined and very often used in common parlance to indicate some of the small irrigation reservoir and included in the floodplain lakes which is called Chaurs, Beels, Jheels etc. (Sugunan, 1997). Considering the capacity of containing water in different time period, these water bodies can be classified as permanent and seasonal water bodies.

It is very important to mention here that the characteristics of Beels are like that of Haors or Baors (these terms have been frequently used interchangeable in this research paper). In practice, the Beel, Haor or Baor are physically homologues to each other. During the monsoon period, these water bodies are inundated which result conducive aquatic ecosystem for total naturally grown Beel fisheries.

However, the permanent Beels are deeper, larger and retain water all the year around. And this is why Beels are usually the lowest part of the Haor. Sometimes each Haor consists of one or more Beels. During monsoon, when Beels within Haors are inundated, form a single water body. According to DoF (2001) survey, there are 4,498 Beels comprising an area of 114,161 hectares exists in Bangladesh.

Rahman (1989) mentioned that the permanent Beels have two types of fisheries practice, an annual fishery⁶ and a Jag or Katha fishery⁷. In annual fishery, fishing is

⁶ Annual fishery includes traditional fishing system through which rural people/fishermen catch all naturally grown fish from a Beel once in every year especially in the dry season (December to March) by netting or dewatering.

⁷ Jag or Katha fishery is a traditional method of gathering fish stock in the inland water body. In this system people occupy specific inland water body throwing tree branches in the water to make shelter for fish where fishes gather for food (especially planktons formed on the tree branches) and save breeding purpose. In this way when fish stock increased at significant level, the owner of Jag or Katha fishery harvested all fish stock.

done by traditional netting or by de-watering. On the other hand, the Jag fishery is harvested every two or three years following the same traditional netting. However, de-watering is the normal harvesting technique in seasonal Beels which is one of root causes of severe damage to aquatic biodiversity.

Management Aspects of Beels/Haors in Bangladesh

Bangladesh inland fisheries sectors can be classified into two sub sectors i.e. capture fisheries and culture fisheries. People of Bangladesh could not realize the importance of management of any sector of fisheries during 1950s (Ali and Tsai, 1997). Even, the government concerned department particularly DoF (Department of Fisheries) was not aware of aquatic resource management other than only promoting pond based aquaculture. It means that aquatic resource management through community is a very recent phenomenon in Bangladesh. It was common belief that the aquatic resources are the nature's free gift and nature will continually sustain these living aquatic resources.

Rural people's common job is to harvest fishes and aquatic products free of cost. This perception led to the indiscriminate harvesting of these resources and raised a big question regarding the management of Beel fisheries as indiscriminate harvesting caused over fishing and led to the depletion of natural stock.

However, for developing fishery sector from the part of the government, emphasis has always been given on the improvement and expansion of the culture based fisheries sub sector (pond aquaculture), on the other hand, the floodplain or open water or capture fisheries has always been neglected or ignored (Rahman, 1989). In recent time, some management options either suggested or tested in improving the complex habitat of Beel fisheries system in Bangladesh (BCAS, 1993; Rahman, 1995; Hossain, 1997; Price et. al., 1996). But these studies hardly focused interlocking relationship between aquatic resources and rural livelihoods.

The leasing system is one of the most crucial issues for the management of Beel fisheries. Under the leasing system Beels are leased out to the highest bidder. The system has been found undesirable and catastrophic for sustainability for many reasons (Siddique, 1981; Khan, 1985) as this system has a tendency of maximizing profits through intensive over fishing or de-watering resulting depletion of natural stock of aquatic resources and damage aquatic biodiversity. To protect the Beel habitat and fishing rights licensing system was introduced by the government (GoB, 1987) but it was failed to produce any effective results as there was no basic difference between these two systems introduced in 1973 (leasing system)⁸ and 1987 (licensing system)⁹ government provided license. However, the potentiality of licensing system has at least tried to address the issue of production and equity in the Beel fishery systems.

Some development activities like embankments project for irrigations created a disaster in Beel fishery in the context of its management. The Beel Dakatia is an example of environmental consequences where beel fishery was seriously affected by deteriorating water quality due to construction of embankment (Rahman, 1995).

Generally increasing fish stocking is not the only way of increasing production. In the context of increasing production, importance of social issues (i.e. multi dimensional rural institutions and power structure) have been over time realized and community based aquatic resource management approach adopted in addressing social issues (Begum et. al., 1997).

Ecological Aspects of Beels

About 6.7 percent of Bangladesh is always under water, 21 percent is deeply flooded (more than 90 cm) and around 35 percent experiences shallow inundation (FAO/UNDP, 1988).

⁸Leasing system: The government leased out inland water body to local people through competitive bidding.

⁹ Licensing system: Local people needed license from the government for fishing in the inland water body.

In recent years, human intervention has speeded up the loss of wetlands in Bangladesh. Significant increase in population since the late nineteenth century necessitated dramatic expansion of cultivated areas in wetlands for improvement in the supply of food grains (Khan, 1997). Moreover, all wetlands are flood prone and hence agricultural practices have been adjusted to minimize the risk of flooding.

Most of the inland and offshore river dependent species of fish are seriously threatened as a result of flood control interventions such as embankments, sluice gates and rural roads. For instance, major carps, such as the catla, mrigal and rohu, which used to account for up to 20 percent of open water fish catch now constitute less than one percent (BCAS, 1994).

In dry season, the dried Beels are used either as cultivable land or as grazing grounds. In a few cases, dry Beels remained fallow and various semi-aquatic plants emerged. Karim (1993) mentioned the occurrence of about 158 species of plants belonging to 49 families in the Beel aquatic ecosystems. During floods, nutrients are carried into the floodplains (Beels) with dispersion of plants and terrestrial animals (Dister, 1990). Aquatic fauna takes advantages of flooding water and move between inflow and outflow within the flooding basins of beels or floodplains.

NERP (1994) reported that increases on the flooding resulted in rising fish production to 15.6%. The open or flooded Beels are characterized by a transition between flood and dry stage. Because of their large supply of water and nutrients, the (Beels) floodplains are one of the productive ecosystems on the earth (Dister, 1990). As a result of their peculiar habitat and the critical interlink with other common water resources of floodplains, balance in the Beel ecology is a matter of critic. The Beel ecosystem always changed and influenced as the changes occurred in other floodplain systems. Not only the aquatic life, human life or the agrarian systems are also influenced due to the changes occurred in Beel ecosystems. A vast majority of people directly depends on the Beel sector for their economy and day-to-day survival. In the Haor system people conserve swamp forest and wildlife. Therefore, conservation of

Beels or floodplains for multiple usages is always felt needed. Any attempt of conservation of Beel resources into single crop agriculture may be a suicidal for other dependant (Khan, 1997). The Beel when inundated during the monsoon period crossed its normal boundaries and engulfs the adjoining private lands and become common property. As a result the scenario of Beel ecosystem completely changed and peculiarities occurred in the prevailing biodiversity. Similarly, when water recedes after monsoon, Beel areas physically reduced, ecological characteristics also changed and become detrimental to the livelihoods of Beel community people (ODA, 1996).

A total of 176 species of wildlife have been reported in the floodplains of Bangladesh (Khan, 1997). According to Sarker (1993), 282 out of 650 species of wildlife are known as freshwater wetland species in Bangladesh. Floodplains offer different habitats for wildlife. Khan (1997) reported diverse ecosystem of plants and animals in Tanguar Haor and Hail Haor (the present study area). These evidences provide clear indication about the importance of conservation of balanced wetland ecosystem in Bangladesh.

Beel/Haor Fisheries and Rural livelihoods

There are about 13,000 water bodies (Jalmohals) of different sizes including rivers, Haors, Baors and Beels in Bangladesh, which are significant sources of subsistence and livelihood, especially for poor people in developing countries (Hossain, et. al., 1998). About 75% of the rural families are engaged in seasonal consumption of fishing in floodplains, khals (canals) and Beels (DoF, 1989). “The poor, although often regarded as the proximate agents of aquatic biodiversity damage, are also usually its first victims and thus have a major stake, perhaps more so than other users, in the management and conservation of resources” (Capistrano, et. al., 1997). This is a powerful statement which signifies how the poor people’s live and livelihoods are very much inseparable from aquatic resources especially in rural area like Bangladesh.

A common property resource such as the Beel is broadly defined as a natural resource in which a group of people has common user rights. Traditionally, the CPRs (Common Property Rights) are not open-access, but are subject to rules and conventions, often unwritten, of local communities. Community Based Fisheries Management (CBFM) is recognized as a proper management approach as community based management strives for a more active people's participation in the planning and implementation of fisheries management (Pomeroy, 1994). Community based management is seen as an alternative and possibly improved approach for managing common property resources, such as fisheries (Kuperan et. al., 1994).

Tsai and Ali (1997) observed that all activities financed by ADB, IFAD in 1990s appear to have emphasized management of water bodies to earn a revenue income of government from the policy of land to increase Jalmohals¹⁰ rent by 25% or even 10%, every year. They further observed that revenue fixations¹¹ remain in the hands of the administration which do not have much understanding on aquatic biodiversity of Beel fisheries.

It would, therefore, be seen from the above critical discussion that the development of fishermen community has not been addressed in relation with the livelihood development of the community people rather it was linked with competitive revenue collection by leasing out inland water body to local people for fishing by the government.

¹⁰ Jalmohals: Public water body controlled and leased out by the Government of Bangladesh is called Jalmohal.

¹¹ To collect revenue from inland water body through leasing out system, the government official in-charge of administration basically fixed up the lease money depending on government target for revenue collection.

CHAPTER- III

Profile of the Hail Haor (the study area) and the MACH Intervention

3.1 Location and Physical Characteristics of Hail Haor

Hail Haor¹² is located in north-east of Bangladesh (known as Sylhet basin). It is in the anticline between the Balishara and Barshijura hills to the east and the stagnation hills to the west. Here water originates from the surrounding hills and flows through 59 streams into the Haor. The Haor is located in five unions of Sreemongal Upazila and in two unions of Sadar Upazila¹³ of Moulvi Bazar district.

The watershed of Hail Haor covers about 600 square kilometer. The wet season area of Hail Haor is approximately 13,000 hectares whereas dry season area from 3000 to 4000 hectares in an average hydrological year. Approximately 172,000 people in around 30,000 households live in 61 villages¹⁴. More than 80% of the total households fish in the Haor, many of them as regular fishermen. Besides fishing, local people's life and livelihoods also intensively depend on diverse aquatic products of the Hail Haor like fodder, building materials, plants/aquatic fruits for human food and medicine.

The Hail Haor was connected with the Kushiyara and Manu Rivers. However a series of flood control dikes along these two rivers and a sluice gate on the Kamerkhali Khal restrict river flows and fish access to and from the Haor. Another dike, at present in disappearance, was built around the northeastern and eastern sides of the Haor to reduce the impacts of flashfloods and to turn and to make the Haor into a large reservoir. Much of the area is cultivated with Boro paddy¹⁵ in the dry season. But many studies have indicated that the aquatic resources are more valuable than per acre

¹² The map of Hail haor (the study area) is attached as Annexure- I; Source: MACH Project Office

¹³ Upazila: The lowest level (local level) administrative unit of the Government of Bangladesh is called Upazila which is the administrative unit below the district level.

¹⁴ Data collected from MACH Project site office located in Sreemongal

¹⁵ Boro paddy: It is a kind of transplanted paddy cultivated commonly in the Haor area during dry season (From Mid November to March). The specialty of this paddy cultivation is that it is planted in the wetland which does not require any ploughing.

production of rice considering its negative externalities on overall environment and aquatic ecosystem (Billah, 2003: 226).

3.2 Traditional Management of Beels of Hail Haor

Open water bodies are solely state property in Bangladesh since the East Bengal State Acquisition and Tenancy Act of 1950. At present, the ownership of Hail Haor belongs to the Ministry of Land. There are so far 130 Beels in the Hail Haor area. These Beels were leased out by the government to individual highest bidders through open auction. Although there is a provision to lease these Beels to Fishermen's Cooperatives as a priority basis but in practice local elites, in most of the cases, political elites get the lease under the umbrella of fisheries cooperatives. It is remarkable that as the government regulations have given the priority to the fishermen's cooperatives for leasing the Beels, the local non fishermen elites have the tendency to dominate the fishermen cooperatives to personalize major benefits from Beel resource displacing fishermen from their rights. Besides, local elites enjoy lot of comparative advantages from social and bureaucratic power structure. Local elites are more conversant with the rules of leasing open water bodies. As such, very often they can influence local administration to get the Beels leased in their name (although being non fishermen) through manipulating existing leasing regulation of open water bodies. In most of the cases, the poor fishermen of the cooperatives did not show much interest in the leasing process of Beels truly for the fear of intimidation from the local elites. This is the common scenario how fishermen's rights to a decent livelihood through fishing were denied. Another important aspect of the present leasing arrangement is that the open bidding leasing policy's main target is to collect maximum revenue from leasing, ignoring its long term sustainability through protecting aquatic biodiversity. As a result the non fishermen lease holders as well as poor fishermen (as a wage labor or sub lease holders) usually overexploit all types of aquatic resources to make maximum profit over leasing value paid to the government which causes severe loss of aquatic biodiversity in the Hail Haor. In 1989 the MACH project intervention was initiated for sustainable management of aquatic resources of

Hail Haor introducing community based co-management of Beel resources through ensuring fishermen's rights to fishing as well as Beel management.

3.3 Aquatic Biodiversity of Hail Haor Beels¹⁶

Hail Haor is one of the largest and most important aquatic biodiversity enriched wetlands of Bangladesh. To the local community people, the most important resource of Hail Haor is fish. Besides this, there are many aquatic resources easily visible to anybody to watch and enjoy the panoramic beauty of the Haor. In the Haor, blooming hyacinths, lilies and lotuses in the wind will easily attract any body to the aquatic wealth of the Beels. The profusion of water plants such as Panishingara and Makhna (aquatic plants) is a good indication of the pristine nature of the Haor¹⁷.

Different kinds of birds are most visible and beautiful creatures frequently seen in the Haor over the year (MACH Report). There are other interesting aquatic creatures like snakes, frogs and turtles in and around of the Haor. As a recognition of the aquatic biodiversity, the Hail Haor site has recently been enlisted as an internationally 'important bird area' by BirdLife International. The Haor itself is a home of 160 bird species and 98 fish species¹⁸.

For many years, the natural productivity and biodiversity of the Haor have been in decline because of drainage for agriculture, excessive fishing pressure, hunting and conversion of wetlands into brickfields and pond based aquaculture.

3.4 The MACH Approach

The MACH intervention was done by introducing co-management and a participatory process for planning, implementation and monitoring for sustainable wetland aquatic resource management. The MACH realized that a reduction in fishing is likely to be a critical part of reviving the wetland fisheries. Recognizing the interdependency relationship between local poor community and aquatic resources, the MACH

¹⁶ Unless otherwise referred inform used in this section obtained from Government fishery office and MACH project office in Sreemongol

¹⁷ Brief paper on Hail Haor prepared by MACH project, Sreemongol, Moulvi Bazar

¹⁸ From MACH Project record

intervention has developed two important institutions which are Resource Management Organization (RMO) and Federation of Resource Users' Group (FRUG).

3.4.1 Establishment of a New Management Paradigm (Resource management Organization) for Aquatic Resource Management¹⁹

First of all, the MACH project identified critical aquatic resource areas in the Hail Haor through continuous field visits, area exploration and rapid rural appraisal and the RMO has been established around each of the critical resource area. The RMO mainly formed incorporating local community people living in and around the aquatic resource area and using its resources. The newly formed RMO was the focal point of sustainable aquatic resource management and primarily responsible for the management of aquatic resources including deciding on appropriate management interventions identified through participatory planning involving community people and implementing the same.

The following key steps were followed by MACH to establish the RMO as a local institution for Aquatic resource management²⁰:

- i. An introductory meeting was conducted by MACH's senior official at the Upazila level (local administrative unit) with Local Executive Officer and the locally elected Chairman.
- ii. Meetings with local council members and community leaders by senior program staff, USAID staff and government high official at the union Parishad offices.
- iii. Awareness programs to introduce MACH and sensitize villagers about the importance of aquatic resources/fisheries and other wetland wildlife and plants.

¹⁹ Unless otherwise referred information used here obtained from the Department of Fisheries under the Ministry of Fisheries, the Government of Bangladesh and MACH project office, Sreemongol, Moulvobazar

²⁰ Information used here collected from MACH project office

- iv. Use of a participatory action plan to identify wetland resource issues and possible management and physical interventions.
- v. Demarcation of the potential aquatic resource area for the specific RMO involving associated villagers and resource users. In total, eight (8) RMOs were formed in Hail Haor area.
- vi. Rapport building and awareness raising in the communities within each RMO area including dissemination of messages/information regarding the formation of RMO and the potential activities.
- vii. Posting of qualified RMO development organizers in each specific RMO area by MACH authority.
- viii. Formation of eight RMOs with active support of RMO development organizers taking 60% representative from resource users' group (RUG) and 40% from local elite.
- ix. Registration of RMO with the Social Welfare Department of the government of Bangladesh to give RMO a legal entity as a local non government organization. Registered eight RMOs are Agari, Balla, Baragangina, Dumuria, Jethua, Kajura, Ramedia, and Sananda RMO.
- x. Finally, the MACH project provided support through RMOs for ensuring sustainable aquatic resource management and at the same time project provided necessary capacity building support of all eight RMOs and their members.

From the viewpoint of MACH project Intervention, RMOs were considered as a new management paradigm which is the focal point of sustainable management of aquatic resources of Hail Haor. However, it is a question who really dominated the RMOs. Was it really dominated by the community poor fishermen or by local elites? This issue has been critically discussed in Chapter V: The Question of Sustainability'.

3.4.2 Major Aquatic Resource Management Activities under New Management Paradigm²¹

(i) Participatory Community Planning:

The first step of the RMO's activities was to conduct participatory community planning for aquatic resource management through which the community people identified key problems and then initiated activities to find out suitable management options and physical interventions to solve/mitigate the problems. The overall problems identified by the community people were siltation, declining fish catches along with losses of aquatic biodiversity and competitive water body leasing out by the government to earn revenue. Community people also suggested some physical interventions like establishment of sanctuaries, improvement of aquatic habitat and restoration connectivity of Hail Haor with different canals and streams. One of the most important consequences of this intervention was that this has transformed dynamism within the poor community people and created new space for them in the society to contribute local aquatic resource development initiative²².

(ii) Regulation for Protecting Beel Fisheries

Each RMO agreed to abide by basic rules and norms regarding fishing and aquatic biodiversity protection endorsed by the Department of Fisheries within their intervention area. The main regulatory mechanism includes:

- a. Ban all kinds of fishing during early monsoon to protect fish breeding grounds.
- b. Prohibit all fishing gears and activities that have been identified with the local communities to be most harmful to the fisheries and wetland for example dewatering and pumping out beels, use of current nets for catching juvenile fish.

²¹ Information regarding different activities under taken by RMO collected from MACH project office record, Sreemongol, Moulovobazar.

²² During field data collection, all most all respondents explained the author how community people have, for first time, actively involved their local resource planning and development initiative supported by MACH.

(iii) Establishment of Sanctuaries

One of the most important interventions done under MACH initiative is the establishment of sanctuaries. Following the dry season, water level goes down even in the deeper parts of wetlands which create adverse condition for aquatic resources especially living place for fishes get small to smaller. This disadvantage situation creates technical advantage for greedy community people to pump out the remaining water to catch all fishes from the Beels. This anti-environmental activity does not only destroy the fish forever but also eradicate all other aquatic animals and plants and hamper the aquatic ecosystem of the Beel. For addressing this crucial problem, the MACH intervention adopted the policy of establishment of aquatic sanctuaries as its main management tool to conserve and enhance aquatic biodiversity.

Therefore, realizing the positive impacts of sanctuaries for conservation of aquatic biodiversity, MACH established 26 sanctuaries (390.14 acre of water body). Most of the sanctuaries were established under the leadership of community people organized by RMOs. Besides, in the Hail Haor, the community people presented under the umbrella of new institution namely RMO, were initially successful to create a platform for the community poor people to bargain with the government for participating sustainable management of Hail Haor fisheries. To this effect, it is very important to mention that a few aquatic enriched water bodies were declared as permanent sanctuaries by the Ministry of Land after a proposal was made by the RMOs presented by community people²³.

Another important innovative aspect of the sanctuaries was that for establishing sanctuaries, in almost cases indigenous technology (IT) was used. In this case RMOs followed traditional aquatic resource aggregating approach which basically used tree branches to make brush piles (covered land area with tree branches) in the deeper parts of water body to provide shelter for fish. This traditional approach of aquatic

²³ Upazila (the lowest administrative unit of the Government of Bangladesh) fisheries officer opposed the new approach and shared his opinion during interview.

conservation serves two purposes like it provides food for aquatic animals growing algae, plankton and other organisms on the surface of the tree branches and secondly these tree branches prevent unwanted fishing. Besides assimilation of local community resource users with their indigenous knowledge into aquatic resources management will of course help to minimize adverse social and environmental impacts and lead to more socially and environmentally sustainable aquatic resource management (Nielsen et al 2002). However, the MACH project expert also has developed an alternative of traditional conservation method which used 'hexapods' and 'pipes' made of concrete for providing shelter and preventing fishing. But this new approach of conservation is a debated issue as it was not environmental friendly for the growth of aquatic resources. On the other hand, it expedites the siltation process which identified one of the crucial problem for aquatic resources in the Haor.

(iv) Re-excavation of Beels and Canals

As it was mentioned earlier that siltation of canals and Beels is one of the major problems that results in a decrease of water (basic element of aquatic resources and its ecosystem) in the Beels. From the MACH record, it was found that at the beginning (in 1999) of the intervention, one hill stream carried over 200,000 cubic meter of sediment to the Beels and Hail Haor is changing rapidly due to siltation problem and if it is continued, the Haor may disappear in the near future. To address this problem, aquatic resources have been restored by re-excavating canals (56.4 ha) to improve water flows and re-excavating Beels (13.9 ha) to increase the volume of storage of water. Although the area re-excavated is very insignificant compare to total area (11.2 Km canal)²⁴ but of course it can be considered as a positive initiative taken by community people under the institutional support of RMOs.

(v) Reforestation and Soil Conservation

Re-excavation of wetlands especially canals and Beels (although insignificant area) only addresses the outcome of the siltation problem but could not be able to address the root causes. The MACH project intervention also addressed the problem

²⁴ Statistics taken from MACH Project Office

introducing contour cultivation of pineapple replacing row cultivation of it. The Project claimed that it reduced siltation problem but it is really very difficult to comment on how effective it is for long time perspective. A very good job was done by RMOs to stop siltation with swamp tree plantation. Huge numbers of tree planting were done by the RMOs' initiatives under strong support by MACH to mitigate the past trend of losses of swamp forest.

It is expected that this planting will significantly help to reduce the sedimentation problem in the Haor area. From the view point of aquatic resource conservation and management, the main feature of this plantation is that it introduced native wetland trees like Hijal (*Barringtonia aquatangula*) and Koroch (*Pongamia glabra*) which were previously lost from this Haor area. The specialty of these trees is that these are water loving trees and can grow by a meter or more of water for up to half of the year. Hijal and Koroch are also important for providing habitat for growing fish during the monsoon as well as habitat for other wildlife and help to shelter villagers and provide branches for piles. According to the MACH project report, total 183,186 trees, dominated by Hijal and Koroch were planted in the Hail Haor area.

One can easily see the outcome of the plantation which has already created vast greenery in the Haor area representing RMOs strong involvement in this process.

3.4.3 Community Based Organization (CBO)-an alternative livelihood development institution for poor fishermen

From the outset of the MACH intervention, it recognized the inter-dependency relationship between aquatic resources and rural livelihoods. From this point of view, new institutional paradigm RMO put limits on fishing through enforcing regulation and establishing sanctuaries. The remaining wetlands/Beels available for fishing are not good enough for ensuring decent livelihoods of increasing number of community

fishermen as well as rapidly growing population (moreover, almost 50% of the remaining Beels are still directly controlled by the local elites)²⁵.

To address this interdependency relationship for ensuring sustainable management of aquatic resources by reducing pressure on fishing and other aquatic resources, the MACH intervention developed alternative income generating sources for decent livelihood of local community poor people largely depended on aquatic resources by adopting micro-credit approach first tried and tested in Bangladesh by the Grameen Bank (Bangladesh Economic Review, 2004). Under this approach MACH formed small groups of 15 to 30 men or women from households that identified as poor²⁶. According to official records, 5,334 households have joined to RUGs (Resource User Groups). According to micro-credit operational regulation, the participant have access to micro credit²⁷ and skill development training for taking suitable enterprise (basically non farm activities) and can make regular savings through their groups.

To operate micro-credit independently after the completion of this project, Federations of RUGs (FRUGs) were formed. According to the MACH project report all together 13 FRUGs were formed in Hail Haor and all these FRUGs have been registered with the Social Welfare Department to handle with over all micro-credit activities after completion of the project. RUG members have accumulated US\$95,000.00 and revolving loan fund of US\$ 250,000.00. It is the specialty of this micro-credit program is that after completion of this project, these funds would not be taken back by the project authority rather it would be transferred to the registered FRUGS. Then the FRUGs will have the responsibility for managing the total micro-credit operation instead of the MACH project authority.

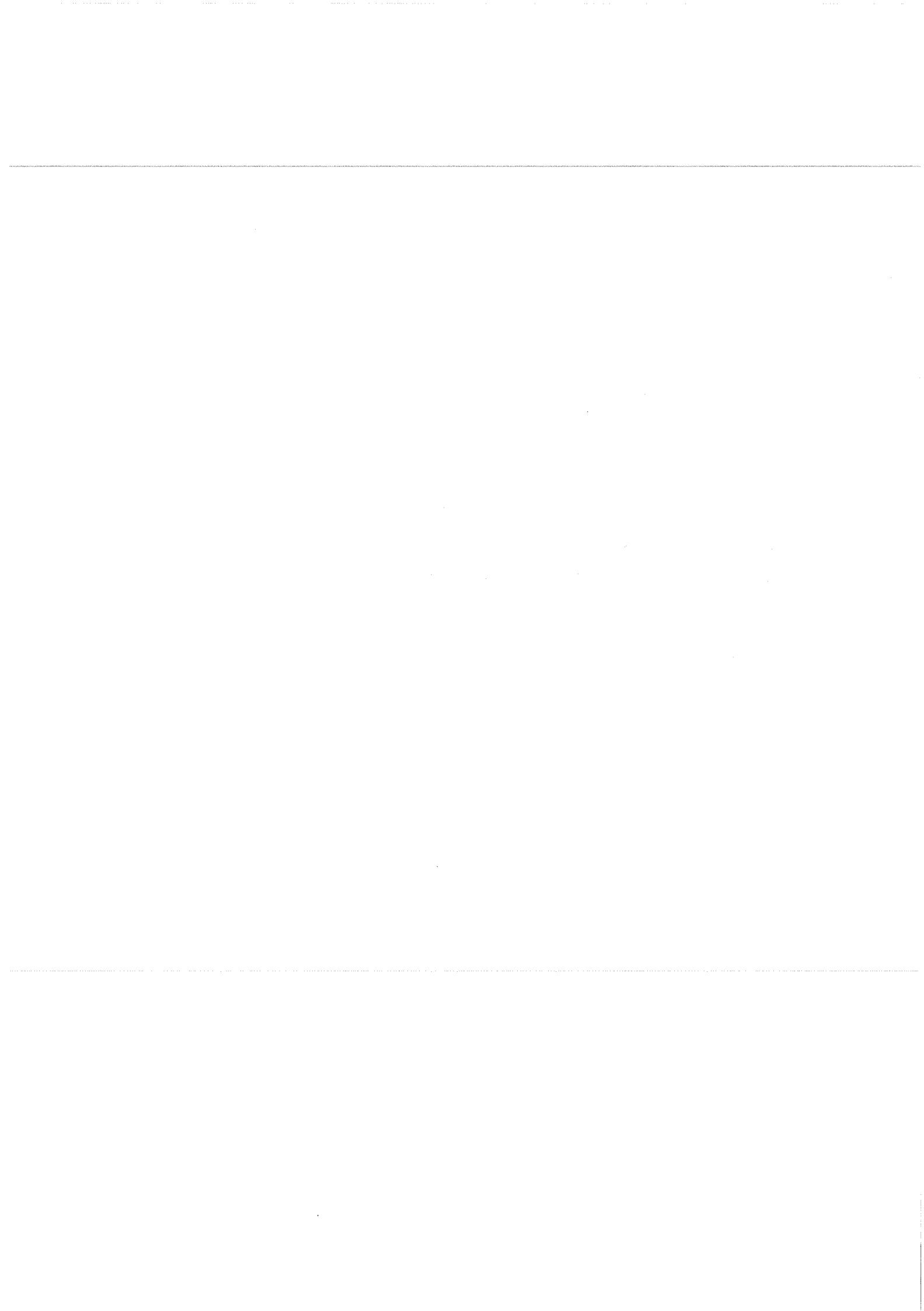
²⁵ During an interview, Mr. Ketab Ali, member of Mirzapur RMO expressed this opinion which was shared by the other community in the study area (date of interview 10 August 2006)

²⁶ MACH defined poor who possess land under 0.2 ha, work as wage labour for part of the year and generally having low education level (MACH official record).

²⁷ Micro-credit has been as a small amount of money ranging from TK 5,000.00 to TK 50,000.00 (US\$75 to 750) for pursing small income generating activities. (Exchange rate: Tk 65.00=US\$1 (approximate))

This is very interesting to see that how the MACH approach has created community based new micro-credit institutions totally managed by its members.

From the view point of MACH intervention, it can be summarized that it basically initiated to develop two community based organized organizations (RMO and FRUG) to ensure sustainable aquatic resource management recognizing its interdependency relationship with livelihoods of local community people whose livelihoods largely depend on aquatic resources. It has been observed in the study area that these two types of organizations (RMOs and RUGs) are functioning very well since its inception by MACH but its functioning is heavily dependent on the MACH support. Therefore, it is a debated issue whether these organizations can survive independently after termination of the project (August 2007). This issue has been addressed separately in the Chapter V 'the question of sustainability'.



CHAPTER-IV

Results and Discussion on the Impacts of the MACH Intervention

4.1 Development of Alternative Capital Assets and Improvement in Aquatic Resources

4.1.1 Social Capital

4.1.1.1 New Institution Building- RMO

It is prerequisite to design appropriate institutions that can effectively contribute to safeguard the dynamic capacity of the natural aquatic biodiversity as well as to secure human well-being (Hanna et al.,1996). In true sense, the MACH intervention tried to develop the above-mentioned institutions (RUGs and FRUGs) to ensure sustainable management of aquatic resources and livelihoods of local aquatic resource users.

RMO (Resource Management Organizations)

The RMO is a new community based institution developed in Bangladesh for aquatic resource management. During my field study in Hail Haor, all respondents from different strata (stakeholders, MACH project staff and government official) openly admitted that these new institution (RMO) has positively changed the traditional pattern of Beel management. This happened because the RMO has linked poor community people/resource users' right to Beel fisheries and created the interface between community people and aquatic property rights regimes. The fundamental objective of the RMOs is to lease in Beels (inland water bodies) from the government and ensure sustainable management of it which was previously (before intervention of the MACH) used by the local elites and used unsustainable way for maximizing profit. Questions remain about the organizational structure of the RMOs. Do really community poor fishermen dominate the RMOs especially in terms of decision making aspects? The by-laws of RMOs state that 60% personnel of management will come from community poor resource user groups (RUG) and the rest will be nominated from non fishery rural elite. Although by constitution, poor fishermen are more in number than local elite but in practice most of RMOs are still dominated by non fishery rural elites. In this regard, Mr. Premanando Sarkar, a fisherman and

chairman of a FRUG said that he never got the opportunity to be a member of RMO, due to the resistance from local non fishery elites who in real sense tried to control the MRO for their interest. However, he candidly admitted that the concept of RMO is good, as if which at least developed awareness among community poor fishermen about their rights to Beel fisheries as well as aquatic resources.

Property- right regimes are always critical institutions (Costanza and Folke, 1996) which is equally applicable for Beel fisheries property rights in Bangladesh. As such, it is a big challenge for the RMO to get community based property rights of Beel fisheries from the government through a leasing system. Therefore newly established RMOs are not the final solution for sustainable management of aquatic resources but, of course, it could be a test case in this regard.

4.1.1.2 Local Alliance and Group Activity

In rural Bangladesh poor people's participation in socioeconomic development is very restricted because the rural power structure constrains the individual power of the poor. But the scenario has considerably changed positively through the process of rapport building by the MACH intervention.

In the past, before joining the MACH intervention, poor fishermen could never be organized but now fishermen are more organized within their community and aware about their rights. Community fishermen now have their institutional identity under the umbrella of RMOs and FRUGs through which they not only solve their aquatic resource related problem but also very often participated in village arbitration to settle various disputes among the neighbours. It indicates that poor community people have developed leadership by working as a member of RMOs and FRUGs in Hail Haor area. In this regard, during interviews with some RMO/FRUG members said 'Now the people of our' Para (hamlet) know us as a RMO or FRUG member/secretary and the neighbours call us to settle disputes among themselves and they obey our verdict while before joining the MACH Intervention they would not call us or even listen to us" (Mr. Sattendro Kuram, Secretary of Sanada RMO expressed this opinion during

interviews, Date of interview: 10 August 2006, Srimongol, Moulovibazar). From the above discussion it would be concluded that RMO/FRUG members are valued more in the society which manifests their social empowerment obtained after MACH intervention along with integration with local aquatic resource management.

But my observation is that still formation of this social capital is in a rudimentary stage as it can hardly influence the local power structure. During another interview, it was known that the monthly meeting of the Local Government Committee (LGC), the highest decision making body for local level development never invited RMOs/FRUGs members or included any agenda for discussion on Beel fisheries management during the meeting on inland water body management²⁸.

However, it is observed that mutual cooperation has been increased among the community people most of cases within the same class people in the study area.

Most of the respondents in the study area said 'If one among our group members has a problem we all help him while before joining RMOs/FRUGs we had no any cooperation with one another'²⁹.

Some respondents in the study area expressed, 'If we see any injustice in our Para (hamlet) we all unite and protest. Today we are more organized than before'.

Almost all community based organizations (CBOs) established by different NGOs³⁰ including MACH intervention widely claimed above-mentioned success stories like social alliance building, group dynamism, cooperation and social mobility. But it is my observation that these kinds of social cooperation are very much class based and limited to relations within the same social class.

²⁸ One of the MACH staff provided this information dated 11 August 2006, Sreemongol

²⁹ Focus Group discussion with RMO and RUG members at Mirzapure village in Sreemongol dated 11 August 2006 at 7.00 pm (Bangladesh time)

³⁰ For details information in the context of Bangladesh, visit web site of some pioneer micro-credit organization like Grameen Bank (special scheduled Bank approved by the central Bank of Bangladesh), BRAC, PROSHIKA, RDRS, ASA (all are NGOs)

4.1.2 Financial Capital:

4.1.2.1 Impacts of Micro-credit on RUG members

Economic Empowerment of RUG members through IGA

It was already discussed that there is strong interdependency relationship between usage of aquatic resources by the poor community people and their access to other capital assets. In order to tackle the problem, the MACH authority distributed micro-credit to empower poor community people reducing dependency on aquatic resources.

Amount of loan received by RUG members

The range of loans taken by the respondents was found from Tk. 10,000 to Tk. 35,000 with an average amount of Tk. 15,900. On the basis of the amount of loan taken by the respondents, they were classified into the following three categories. Number and percentage distribution of RUG member according to their amount of loan received has been shown in Table 4.1.

Table 4.1 Distribution of RUG members according to their amount of loan received

| Categories | RUG member | | Average (Tk) |
|------------------------------------|------------|----------|-----------------|
| | Number | Per cent | |
| Small amount (less than Tk.10,000) | 4 | 17.4 | 15,900 |
| Medium amount (Tk. 10,000-20,000) | 14 | 60.9 | |
| Big amount Above (Tk. 20,000) | 5 | 21.7 | |
| Total | 23 | 100 | |

Data presented in Table 4.1 show that majority RUG loanees fell in the medium loan category which is 60.9% while small and big amount category comprised 17.4% and 21.7% of loanees respectively.

This part of study has examined the impacts of micro-credit on RUG members by using following three important indicators:

- (i) Income (ii) Employment and (iii) Resources owned (especially land).

Impact on income

Household income is very common and widely used as an indicator for economic empowerment. The MACH authority provided micro-credit to the rural poor

community fishermen as they can earn and raise their income level to be empowered in the economic sense by using credit in productive income generating employment.

Table: 4. 2 provides information on the distribution of members of RUG by principle occupation and its income just before becoming under MACH intervention (in 1989).

Table: 4. 2 Distribution of RUG members by principal earning occupation and their own annual income³¹ before becoming under MACH Intervention (in 1999).

| Principal earning occupation | No. of members | Per cent | Annual income(Tk.) |
|------------------------------|----------------|----------|----------------------|
| Fishing | 13 | 56.5 | 21864.0 (1822.0)* |
| Agriculture | 8 | 34.7 | 23400.0 (1950.0) |
| Small business | 2 | 8.6 | 21996.0 (1833.0) |
| Total | 23 | 100 | 22420 (1868.3) |

*Figures within parenthesis indicate monthly income.

Source: Field Survey, August 2006

The survey showed that before joining the RUG, the majority number of community people involved in fishing as their main earning profession with an annual earning of TK. 21864.0.

In this study, the second highest RUG members (35%) were primarily engaged in agriculture profession and earned Tk.23400.0 per year. This income is a bit higher than that of fishing because those RUG members also engaged part time fishing. The rest of the members did small business and earned Tk.21996.0 before joining the RUG.

However, these statistics did not strongly support that most of the community people are fishermen and their main occupation is fishing. So, it raised a big question about poor community people's involvement in the process of overexploitation of aquatic resources of the Beels of Hail Haors.

³¹ In this study annual income refers the per capita annual income of a RUG member. It does not reflect total household income of the RUG member family

Table: 4.3: provides information on the distribution of RUG members by main earning occupation and their income in the survey period (August 2006).

Table: 4.3: Distribution of RUG members by principal occupation with income in the survey year (August 2006).

| Sources of earning | No. of members | Per cent | Annual income(Tk.) |
|---|----------------|----------|--------------------|
| Livestock and poultry rearing and fishing | 11 | 47.82 | 33120.00 |
| Grocery shop and small business | 7 | 30.43 | 30600.00 |
| Agriculture and fish trading | 3 | 13.04 | 32040.00 |
| Plant nursery | 2 | 8.69 | 33480.00 |
| Total | 23 | 100.00 | 32310.00 |

Source: Field Survey, August 2006.

The above table reveals that the highest number of members of community people undertaken livestock, poultry and fishing as their main profession after joining the MACH intervention which showed wide range of diversification in principal earning profession whereas majority of them were engaged in fishing (56.5%) and agriculture (34.7%) as their principal earning profession in 1999 before joining the MACH intervention.

After joining the MACH intervention, about 47.8 per cent of RUG members engaged in livestock & poultry rearing and fishing earning a yearly income of Tk. 33120.0. In this study area, the highest income earning activity was plant nursery with a yearly income of Tk. 33480.0. But only few RUG members have taken this enterprise although it was found highest income earning activity. This paradox can be explained in the light of ‘risk strategies’ by Ellis (2000:60) in the context of livelihood diversification. Ellis theorized that ‘income diversification as a risk strategy is often taken to imply a trade-off between a higher total income involving greater probability of income failure, and a lower total income involving smaller probability of income failure’. The author further explained that rural households always tried to be risk

averse and this is why as a part of risk-averse strategies, they use to pursue lower income earning activities for greater income security.

It is very important from the academic point of view that this empirical study supports Ellis' theorization regarding household income diversification. For example plant nursery is a risky profession as it is highly technical which needs both expertise and experiences. On the other hand, it has a risk because still this enterprise is not well integrated with marketing channels. In this connection during interviews, respondents undertaken plant nursery enterprise informed that they did good business from plant nursery because MACH authority was the only buyer of plants and they offered good price for the plants. But actually there is no market demand for these plants as it is basically useful for preserving aquatic biodiversity. Hence, after completion of the project (in August 2007 approximately³²), this enterprise will face immediate risk for survival. Therefore, to be risk averse, most of the RUG members were engaged comparatively lower income earning activities for greater security of income.

In this study, the second highest income by RUG members were engaged in grocery shop and small business (non-farm activities), but it also was the lowest income earning sector. However, it was suitable for landless community people as they can easily start this activity with a small amount of credit. Besides, from the theoretical point of view, livelihood diversification into these kinds of non-farm activities can produce low risk rather than on farm activities (Ellis, 2000:61).

From the above table (Table 4.3) it can be seen that overall income of RUG member has increased by 44.1% (from Tk.22420.0 (base year 1989) to TK. 32310.0 (survey year 2006)).

It is remarkable here that although RUG members' income has increased and all RUG members reduced dependency on fishing for their livelihoods and joined diversified income earning professions by enlarging their livelihoods choice. Still, their

³² As per project design document, the project would be formally terminated in 2005 but during field visit it was known that project implementation time has extended up to August 2007 to utilize unspent fund.

employment opportunities are very much limited within the traditional activities with very small scale production. It is an important question that how far this kind of so-called micro-credit is useful to create suitable income earning profession. In context of rural livelihood, is micro-credit a panacea with creating other basic service like linking with market, transportation, skill development training etc. for undertaking new profession to ensure rural livelihoods which may in turn reduce the pressure from natural aquatic biodiversity?

The study apparently indicates that the positive income effect (44.1% increased income) of RUG members was due to the disbursement of micro-credit. But this represents nominal change of income rather than real change of income. To reflect the real change, the base year average income (Tk 22420.0 in 1998) of RUG members has been adjusted with inflation rate in the following Table 4:4. The table shows that the base year income of the RUG member would be reached at Tk. 30,583.2 after adjusting with national inflation rate without any intervention whereas the calculated income of the RUG member for 2005 (Survey year 2006) with MACH intervention was found Tk 32,310.0. It means the real income change was only 7.7% which is much lower than the nominal change (44.1%).

Table: 4.4: Adjusted base year income of RUG members with inflation rate

| Year | Inflation rate* | CPI | Base year income | Deflated income (TK) |
|------|-----------------|--------|------------------|----------------------|
| 1998 | Base year | 100 | 22420.0 | - |
| 1999 | 7.0 | 107.0 | | 24002.8 |
| 2000 | 2.7 | 102.7 | | 24672.5 |
| 2001 | 1.9 | 101.9 | | 25151.1 |
| 2002 | 2.7 | 102.7 | | 25852.9 |
| 2003 | 4.3 | 104.3 | | 26985.2 |
| 2004 | 5.8 | 105.8 | | 28558.4 |
| 2005 | 7.09 | 107.09 | | 30583.29 |

*Source: (i) Bangladesh economic review (2004), the ministry of finance, the government of Bangladesh and (ii) The Central Bank of Bangladesh.

Impact on Saving Formation

Practice of saving formation brought new dynamism to the functioning of RUGs. Sense of economic gain encouraged the RUG members in savings it was critically

observed that due to saving practice the group dynamism gained new momentum. In the project area, all RUG members have shown great interest to accumulate their savings weekly basis. The obligatory saving per RUG member was TK. 5.00/week but most of the members saved more than the obligatory amount. The total savings of all RUG members were Tk.2.06 million in the study area³³. In this study area, most important aspects of the saving is not to contribute for financial capital but to develop the habit of savings by the poor community people as part of human capital building.

Impact on employment

RUG members were free to select their income earning activities with micro credit. Based on their knowledge and personal skill the members themselves selected income - generating activities and prepared the loan utilization plan. Selection of such activities is, of course, discussed at length in the group meetings and unanimously approved by the group members. This sense of participation in self employment by the RUG members strengthened the base of self-help among the community people.

In this study, major factor behind the growth of income of RUG member is increased self-employment by utilizing credit. RUG members usually remained underemployed and basically engaged in different works mostly related to Beel fisheries especially fishing before taking the micro-credit for self employment. Table 4.5 provides information on employment status of RUG members before joining the RUG.

Table 4.5 Employment Status of respondent RUG members before joining the RUG.

| Employment | Total No. of member | Per cent | Total Number of working days in a year |
|-------------------------|---------------------|----------|--|
| less than 150 man days* | 11 | 47.8 | 152 |
| 151-170 man days | 5 | 21.7 | 168 |
| 171-190 man days | 4 | 17.4 | 181 |
| Above 190 man days | 3 | 13.0 | 205 |
| Total | 23 | 100 | 176.5 |

* 1 man day = 8 working hours

³³ Source: MACH project office record, Sreemongol

Figures in this table reveals that about 47.8 per cent of RUG members working days were less than 150 man-days in a year and only 13 per cent of members working days were above 190 man-days. The loanees on an average worked 176.5 in a year before joining the RUG through MACH intervention. Table 4.6 gives information on employment status of RUG members after joining the RUG.

Table 4:6 Yearly Employment status of RUG members after joining the RUG

| Employment level | No. of member | Per cent | Number of working days in a year |
|------------------------------------|---------------|----------|----------------------------------|
| Less than 260 man days* | 5 | 21.7 | 255 |
| 261-300 man days | 12 | 52.1 | 290 |
| Above 300 man days (over the year) | 6 | 26.0 | 331 |
| Average | 23 | (100) | 293 |

* 1man day=8 working hours

The table shows that about 50% per cent of RUG members' working time was 290 days in a year and 26 per cent of members working time were 331 days in a year. The RUG members on an average worked 293 days in a year after joining the RUG. Finally, the Table 4.7 provides information on overall changes in employment generation.

Table 4.7 Average change in employment generation

| Time period | Average working days a year | Changes in a day | Change in Per cent |
|------------------------|-----------------------------|------------------|--------------------|
| After joining the RUG | 293 | 117 | 66.4% |
| Before joining the RUG | 176 | | |

It depicts that the RUG member on an average worked 176 days in a year before taking RUG loan for self employment/IGA. But after taking RUG loan, they, on an average, worked 293 working days to their self employment activities especially for

whose loans were taken. Thus increased working day was 117 man-days in a year and the change in employment was 66.4 per cent.

These positive changes of employment indicate that the RUG loan has generated new self-employment activities for the rural poor community people and encourage to be micro-entrepreneurs. On the basis of such evidence, it would be fair to conclude that RUG loans through the MACH intervention have positively contributed to self employment opportunity for the rural poor community people.

Impact on resources owned

The RUG loan by MACH intervention has deliberately aimed at helping the rural poor community people to climb on to the economic ladder by creating alternative capital base so that they can own resources. The impact on main resources owned by the RUG members was also measured to examine their economic status in the study area. Table 5.7 shows the average change in owned land of RUG members.

Table 4.8 The average changes in land ownership of RUG members

| Time Period | Land area (hectare) | Change in land resource (hectare) | Change in Per cent |
|------------------------|---------------------|-----------------------------------|--------------------|
| Before joining the RUG | 0.23 | 0.04 | 17% |
| After joining the RUG | 0.27 | | |

Source: Field Survey 2006

The change was very insignificant. Because purchasing of land was not an easy matter for the rural poor community people and earning from micro-credit is not also suitable to do so. This is why the ownership of land hardly changed.

On the average, RUG member owned 0.23 ha of land before joining the RUG and 0.27 ha after joining the RUG. Thus the positive change in land ownership was 17 per cent. Although, the change was insignificant, it indicates their better economic performance as because the rural poor are expected to lose their land rather than gaining it due to adverse livelihood condition. So, in this case it is important to

observe that the poor RUG members have not only retained their owned land but also made a bit addition to their earlier possession of land after joining the RUG.

However, in rural area land ownership remains the key element of livelihoods as well as living standards because land is the most important income-earning asset (natural assets). Now it is widely true phenomenon that due to increasing landlessness in the rural area, there is increasing inequality in households distribution and growing inequality in household distribution creates growing unequal access to institutional services, the decision making process and the development effort of the government³⁴. This is why; most of landless households cannot receive benefit from these institutions. Households or individuals who have abundant land resources, control and manipulate other resources and social institutions by using their land based power. They also use this to get undue privileges of government and NGO sponsored development programs that are allocated for the rural poor. These are the outcome of asymmetric patterns of markets where rural institutions and state made transaction costs higher for the landless rural people and this leads them to personalized transaction to get access to land. As the personalized transactions takes place under unequal endowments of landowners and the landless this virtually turns to principle agent relation, which finally push landless farmers to interlocking market for their livelihoods where they are used for the interest of landlords³⁵. Therefore this vicious circle needed to be resolved first for ensuring rural livelihoods for poor community people. Has the micro credit approach taken the matter into serious consideration? or it became a fashion to use micro credit for every rural community problems as a single panacea just to suppress the problem without solving the root causes of it because landless poor people can not use micro-credit in gainful earning enterprise like agriculture (horticulture), livestock and fisheries. If we look insights the total micro-credit distribution in Bangladesh, the trend shows that 49.8% of total micro-

³⁴ Essay (4019) on analysis of rural poverty in a context of cropland ownership in Bangladesh, ISS, The Hague, The Netherlands, by the author , unpublished material

³⁵ Concept/terminology/academic phrases used here for interpretation obtained from Haroon (2006), Ankarloo and Palemo(2004), Ellis (1992) and Toufique (2002), Zoomers (2001).

credit was distributed in petty trading, 12.3% for agricultural, 17.64% livestock and only 7.4% for fisheries (aquaculture)³⁶. The issue needs serious consideration as micro credit regime has been dominating since 1976 first introduced by Dr. Yunus through the Grameen Bank³⁷.

4.1.2.2 Access to Leasing Arrangement

Before starting the MACH intervention in Hail Haor area, the poor community people had no access to Beel leasing arrangement, as it was very competitive and usually the rich people dominated to get Beels leased in their favour. But through MACH intervention, now local poor real fishermen have formal access to Beel fisheries through leasing access. The MACH project staff as well as RMO management staff informed that every year all RMOs in the study area (eight (8) RMOs) get Beel leasing from the Government on priority basis. It was observed that it was a good sign for poor fishermen access to Beel fisheries for ensuring their livelihoods. Still this system is not running smoothly as because of lot of institutional barriers. For example, the present system of revenue collection shows that Beels are leased out for a period of three (3) years with an increase of 25% lease value over the previous rate and then 10% increment is applied³⁸. In this regard, during interview, all poor fishermen admitted that although they got Beel leased from the government but due to high value of lease, it was not suitable for them as high value resulted more fishing to get return lease money which in most of cases are a big bar for sustainable management of aquatic resources. Therefore the poor fishermen demanded to lease all Beels to the RMOs represented by fishermen for long duration (at least for twenty years) at a minimum lease value. However, these facts also supported by local government official that high revenue earning policy pressed fishermen for more fishing.

³⁶ *Bangladesh Economic Review 2004*, Finance Division, Ministry of Finance, the Government of Bangladesh

³⁷ Grameen Bank is the brainchild of Dr. Yunus who started it as an action research project in 1976 which formally transformed into specialized rural credit institution by the ordinance of the Government of Bangladesh in 1983. Dr. Yunus and his Bank achieved Nobel Prize 2006 (in peace).

³⁸ Jalmohol Leasing Regulations, The Ministry of Land, the Government of Bangladesh.

Besides these, it was known that other legal barriers very often delayed hand over the beels to the fishermen through RMOs. In most of the cases these kinds of barriers are created by local rural elites by filing case to claim the ownership of the Beels when they are dispossessed from the Beels due to fishermen access to Beel resources through RMOs. And due to lack of proper legal aid, the case was pending for a long time without any solution which creates quite good excuse for the rural elites to control over Beels illegally. Some RMO members also openly expressed their opinion that the legal procedures also intentionally delayed by the concerned institutions to favour the elites³⁹. It was observed that rural elite people know better about the legal institutions better than the fishermen and maintained liaison with political elites which easily helps them to manipulate the Jalmahol Regulations (Inland water body leasing regulation of the government) in their favour⁴⁰.

4.1.3 Physical Capital

Physical capital is an important asset for livelihoods. Realizing the importance of physical capital for rural community people, the MACH intervention developed following important physical capital assets for community people in the study area:

4.1.3.1 Establishment of RMO Office

Before the MACH intervention in Hail Haor area, there was no community based resource management centre for the community people from where they can coordinate their resource management and livelihoods related planning and related activities. Recognizing the need of community people for improved management of aquatic resources, the MACH authority has built six community centre for six RMOs⁴¹. After the establishment of these centers, it became the pivot of the all community based activities concerning Beel fisheries management. During interview

³⁹ Hari Charon Das and others shared their opinion during interview with Balla RMO, Sreemongol.

⁴⁰ An anonymous high official shared his opinion in this connect.

⁴¹ Out of 8 RMOs, 6 community centers have been established for six RMOs. The rest two RMOs have not got any centre yet as it was not possible to build it due to lack of proper land allocation for the establishment.

with all RMO members, they expressed their opinion that it is a very important asset for them where they can use the centre for conducting meeting, resource management plan, alternative livelihood activities, awareness building training, election for RMO committee formation etc.

It is so far for the first time in Bangladesh fishermen community has got their office for coordinating their activities which can be termed as important physical asset. But it was critically observed that these newly built community based centre might be politicized following the up coming general election in at the beginning of 2007 (probably 3rd week of January 2007) and could be used for political campaign which may create conflicts among the RMO members loosing the newly grown community cohesion.

4.1.3.2 Aquatic Sanctuaries

In chapter-III, it has been discussed that MACH authority has established 26 sanctuaries (390.1 hectares of water body) by realizing the positive impacts of sanctuaries for conservation of aquatic biodiversity. From the point of SLA, it can be seen that these sanctuaries have created new physical resource base for the poor fishers which primarily helped them to increase aquatic resources in natural way especially help to increase fisheries stocks in the water reducing the cost of fingerlings for production of fisheries.

These aquatic sanctuaries have direct positive impacts on the consumption of fishes in the study area.

Table 4.9: Consumption of Fish in Hail Haor (gram/person/day)

| Year | Amount of fish (gram/person/day) | Changes in % (compare to base year) |
|------|-------------------------------------|--|
| 1999 | 49 | Base year |
| 2000 | 52 | 06.1 |
| 2001 | 54 | 10.2 |
| 2002 | 60 | 22.4 |
| 2003 | 58 | 18.4 |
| 2004 | 65 | 32.7 |

Source of data: MACH project office record

The above table clearly shows that the fish consumption in the rural community people has gradually increased since the baseline year consumption in 1999. It is

widely recognized that fish contributes the majority of animal protein (85%) in Bangladesh (Ahmad and Hassan, 1983) but national fish consumption has drastically been declined due to severe degradation of aquatic resources. Therefore it is a positive sign that due to establishment of community based physical assets like sanctuaries have positive impacts on Beel fisheries consumption.

4.1.3.3 Re-excavation of Beels

It has been discussed that following the siltation of canals and Beels which was one of the major problems that resulted decrease of water (basic element of aquatic resources and its ecosystem) in the Beels, the MACH has re-excavated canals (56.4 ha) and Beels (13.9 ha) in the Hail Haor area to create conducive environment for aquatic resources. Due to this intervention, community poor fishermen have more access to improve aquatic resources which virtually strengthen their physical capital base.

4.1.3.4 Wetland Forest

One of the most important interventions done by MACH is the creation of wetland forest in the Hail Haor area. The MACH intervention has undertaken a major program of native tree plantation to mitigate the past trend of loss of trees including swamp forest. This also is expected to reduce the sedimentation loads in small rivers and channels flowing into the wetlands. The intervention was widely successful to create swamp forest in the study area.

Table 4.10: Statistics of Wetland forest in the Hail Haor

| Patter of trees/forest | Number of trees planted (during 1999 to 2005) |
|------------------------|--|
| Swamp forest | 72,105 |
| Riparian plantation | 52,053 |
| Other mixed plantation | 59,028 |
| Total | 183,186 |

Source: MACH Office record, Srimongol

From the SLA point of view, these plantations have, not only, been providing habitat for growing fish during the monsoon as well as habitat for other wildlife and helping to shelter the community villagers by providing branches for piles but very significantly emerging as an important physical capital for them.

4.1.4 Human Capital

4.1.4.1 Organizing the Fisher Community

One of the main focal points of community development is organizing community people to RUGs and RMOs to ensure sustainable aquatic resource management involving community people in the study area. In this connection, the MACH project has organized 46 RUG groups consisting of 1,195 community peoples and 8 RMOs in the study area. The numbers of RMO members are shown below:

Table 4.11: Distribution of RMO members

| Name of RMO | Number of Members |
|-------------|-------------------|
| Agari | 58 |
| Balla | 54 |
| Baragangina | 50 |
| Dumuria | 56 |
| Jethua | 62 |
| Kajura | 40 |
| Ramedia | 57 |
| Sananda | 80 |
| Total | 457 |

Source: MACH project office, Sreemongol

It was observed that after group formation through RUG and RMO, they carried out their responsibilities as per their by-laws and took all decision on the basis of group consensus which they never did before the MACH intervention. Therefore, it can be said that MACH initiative has directly helped to create this kind of human capital for the rural community people to be organized for their aquatic resource management and livelihoods.

4.1.4.2 Awareness Development about Aquatic Bio-diversity

Different types of awareness building program has been conducted in the study area which helped to create massive awareness not only the RUGs and RMOs but also all people living in the Hail Haor area. The following awareness initiatives were taken:

- (i) Court yard meeting participated by RUG, RMO members and other community members.
- (ii) Village level awareness session by RUG, RMO members and other community members.
- (iii) Union Parishad level awareness program including observing

different national and international days depicting the significance of environment and aquatic biodiversity.

- (iv) Annual rallies and gatherings.
- (v) Staged live dramas representing the importance of biodiversity.

Source: MACH Project Report, Sreemongol.

In addition, to share the experiences, the MACH authority arranged cross-visit among RUGs and RMOs.

The above mentioned programs have primarily helped the community people to develop awareness regarding core aspects of environment and aquatic biodiversity in the study area which in turn strengthened their human capital base supported by evidence from the respondents. During interviews, all respondent shared their experiences about the importance of environment and aquatic biodiversity. For example most of the respondents admitted that aquatic biodiversity especially different kinds of fish, aquatic plants, birds, frogs have been severely damaged due to over used of the Beel resources.

4.1.4.3 Skill Development for AIGA

Training was an important area of intervention as because it is the basic tool for capacity build of community people in the study area. Selected RUG members have received specific training to develop their skill to purse suitable IGA for their livelihood. Most of the training was provided in the field of poultry/livestock rearing, petty trading, handicrafts, plant nurseries, agriculture etc with credit support. Although most of the training seems to be very traditional, but it was very suitable for the poor RUG members to under take IGA by utilizing their indigenous technologies (IT) and enhanced their human capability.

4.1.5. Aquatic Productivity of Haor (Natural Capital)

Fish biodiversity has been increased in the study area following the MACH intervention.

Table 4.12: Fish species diversity

| Year | Number of fish species |
|------|------------------------|
| 1999 | 71 |
| 2000 | 71 |
| 2001 | 69 |
| 2002 | 79 |
| 2003 | 67 |
| 2004 | 81 |

Source: MACH project Office record, Sreemongol

The above table showed the modest trend of increase number of fish species in the Hail Haor.

However, it is increasingly recognized that the economic value of wetland ecosystems has been undermined worldwide by the policy makers (Barbier et al 1997) and in the connection Bangladesh is no exception. Conservation of wetland area produces a wide range of benefits. Among them, some of the benefits like number of species of fish, aquatic products can be easily identified and quantified than other critical benefits like recreational value, flood control and erosion value, water quality improvement, pasture value, biodiversity water table impacts, other ecological services etc. Due to lack of proper measurement tool and techniques, it was not possible to measure exact improvement of aquatic biodiversity improvement in the study area but it has been widely accepted by the all level respondents during interviews (Stakeholders, management staff, RMO members, Government official) that following the MACH intervention, aquatic biodiversity has been improved a lot which easily understood by visiting Baikka BEEL Conservation area in the Hail Haor⁴². Due to improved aquatic biodiversity in Baikka Beel, for the first time in Bangladesh, this Beel has been converted as rural tourism site in Sreemongol. Although it will take considerable time for commercial viability of this tourist spot as it needs necessary local capacity building, required training for running tourism business and especial hospitality skills (Keane, 1992) but the specialty of this initiative is that it is a community based

⁴² The view of aquatic biodiversity in Baikka beel attached in Annexure-III, Source: MACH Project Office, Sreemongol

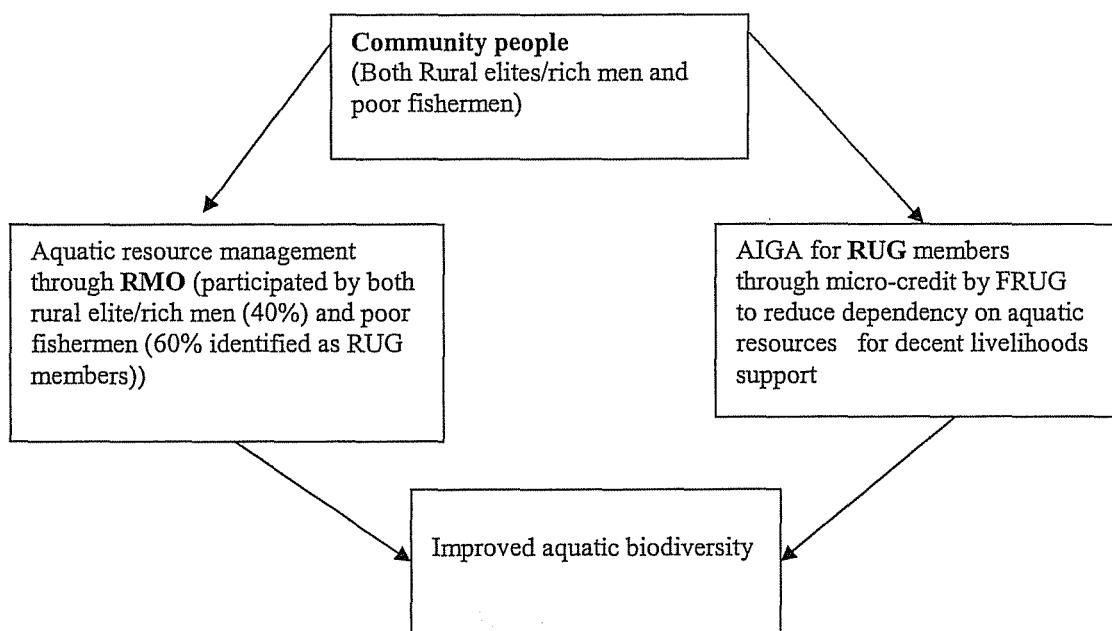
product which has developed utilizing local natural resources. The important insight of aquatic based rural tourism for community people as well as policy makers is that it shows how local natural assets can be used by the community people to generate economic benefits for community people's livelihoods by restoring its biodiversity.

4.2 Linkages of RMO, RUG and Improved Aquatic Bio-diversity

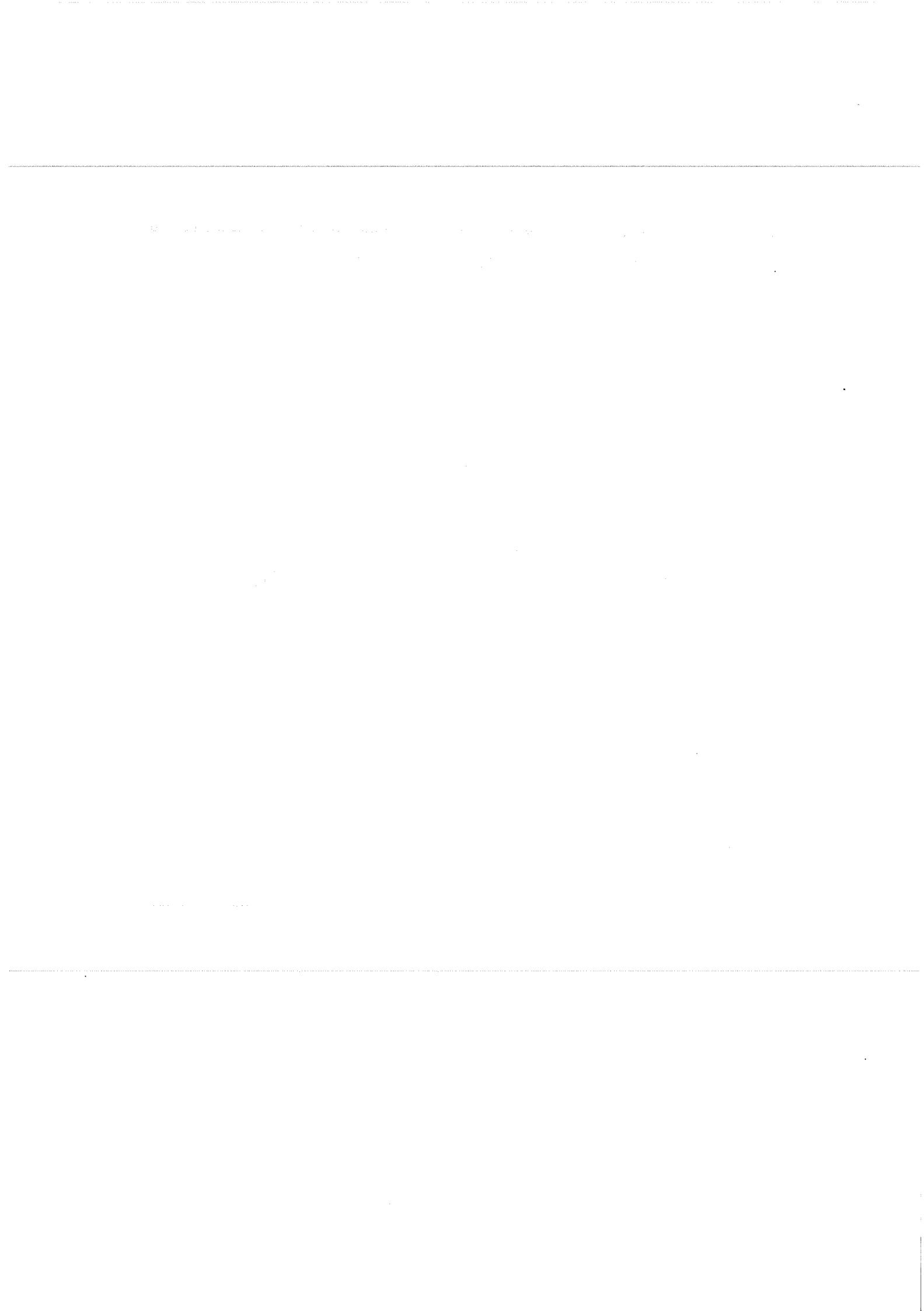
The above discussion shows that the MACH intervention has positively contributed to improve aquatic resources of the Hail Haor through RMO and RUG by creating different capital bases which directly improved aquatic resources and at the same time helped community poor fishermen to reduce dependency on aquatic resources for their livelihoods.

In the context of the SLA, the hallmark of the MACH intervention is that the joint impacts of RMO and RUG have introduced new and improved aquatic resource management in Bangladesh involving community people and as well as local government in a participatory manner which positively contributed to develop the five capital base of the poor community people by enlarging their livelihood opportunities which, in turns, collectively continued to improve aquatic resources and these relationship can be shown in the following figure 3:

Figure 3: Links among rural community people, aquatic resource management and rural livelihoods for ensuring improved aquatic bio-diversity



Source: Author



CHAPTER-V

Question of Sustainability and Conclusion

5.1 Institutionalization Process of New Aquatic Resource Management

The MACH project, for the first time in Bangladesh, has very systematically implemented a wide range of interventions recognizing interlocking relationship between rural community people's livelihood and aquatic resources to restore the productivity of wetland ecosystem by introducing sustainable aquatic management practice directly involving community people and local government together. If we critically look into the whole MACH interventions from the research point of view, it would be easily observed that the MACH tried to institutionalize the process of aquatic resource management in the study area through establishing RMO and RUG as two core community based organizations.

During interviews with the concerned high officials from local government and central government⁴³ regarding the outcome of MACH, everybody recognized the achievement of the MACH interventions. But crucial questions about the MACH outcome now are related to the sustainability (after termination of project in August 2007) which largely depends on the newly built two core community organizations, the RMO and RUG.

It was observed that the MACH authority was also very much aware about the sustainability issue of their success done in Beel fisheries management in Hail Haor area. From the view point of sustainability of the MACH intervention, the site coordinator of Sreemongol informed that MACH has been seriously pursing the institutionalization of local community based Beel fisheries management. In this connection, it was known that through a series of meetings, workshops the MACH authority has been successful to motivate the Department of Fisheries (DoF) to include MACH MODEL in the Inland Capture Fisheries Strategy, a draft strategy and action plan has been formulated by the DoF, the key government organization

⁴³ Executive officer and Fisheries officer of local government, Sreemongol, Director of community based fisheries management of Department of fisheries, Deputy secretary of the Ministry of Land (in charge of Jalmhal management)

responsible for fisheries resource management in Bangladesh. It is obviously a positive sign for institutionalization of MACH model but its implementation largely depends on the sincerity and availability of resource allocation for this purpose by the concerned government departments and agencies. In this regard, local government official's opinion⁴⁴ was found very significant. They frankly commented that the MACH really do present significant achievement in BEEL fisheries management but it was possible because of huge spending, close monitoring and supervision by group of expert high salaried staff recruited by MACH which in practice is not really possible by the government as because of financial constraint. During interviews this discourse influenced me very much and changed the author's mind frame to investigate the transaction cost for the achievement done by the MACH.

It has been mentioned earlier that the basic outcome of MACH is the establishment of two kinds of community based organizations; RMO (aquatic resource management) and RUG (for creating alternative rural livelihoods). According to the MACH project expenditure record, the average expenditure has been Tk. 242,000.00 (approximately) per month per RMO (which is about US \$ 3,723.00 per month per RMO)⁴⁵ and of this 62% expenditure was for organizational and management support, 25% was aquatic resource management interventions and the rest 13% was for training for RMO members.

On the other hand, the average expenditure for organizing RUG member for providing alternative livelihood support was TK. 560.00 per month per RUG member. Of this, 65% was operational cost, 13% was for training, 9% for creating revolving fund and the rest 13% was other supporting cost. And it is very important to observe that the estimated expenditure has been spending every month by MACH project since starting point of the project (1998).

⁴⁴ Upazila executive officer and Fisheries Officer of Sreemongal

⁴⁵ The currency name of Bangladesh is Taka (TK). Exchange rate: US \$ 1.00= TK. 65.00 (approximately)

Therefore from the view point of transaction cost of MACH outcome, the establishment cost of RMO is really too very high in the socioeconomic context of Bangladesh. But the site coordinator argued that to establish new organizational structure always needs huge cost involvement at the initial stage.

5.1.1 Sustainability of RMOs and Aquatic Resource Management

Throughout the MACH intervention, there was an emphasis on building sustainable institution so that the physical resource management and changes in local positive attitudes regarding aquatic resource management achieved by the MACH can continue for the long term in the intervention area. The key organization in this regard through which aquatic management practice will be sustained is community based RMO (Resource Management Organization). To this effect, all eight (8) RMOs in the study area has been registered with the social welfare department of the Government of Bangladesh which provided the RMOs its legal identity and linked these organizations with local government committee (LGC) where they can take decision regarding aquatic resource management. From available office records of MACH and during interviews with respondents, it was known that different management practices and regulations regarding aquatic resource management became local community norms. For example fishing by dewatering Beels in the intervention area has totally stopped. Besides, all RMOs have been promoting their active initiatives to ban using all kinds of destructive gears for fishing and it was known that birds hunting have totally stopped in the Hail Haor area which turned the Hail Haor as a living paradise of different Birds. As recognition of the improved aquatic biodiversity, the Hail Haor has recently been enlisted as an important site for birds by Birdlife International.

To ensure transparency of RMOs activities and broaden community people's participation in RMOs, different sub committees have been formed with specific terms of reference to perform their duty properly e.g. financial management sub-committee, audit sub-committee, sanctuary sub-committee and plantation sub-committee.

The most important and innovative idea for sustainability of aquatic biodiversity through RMOs is the provision of an endowment fund for each RMO to maintain basic minimum financial support for continued management and restoration of wetland resources after termination of the project. In this respect, during an interview with the project site coordinator, it was known that this fund will be placed in the government schedule bank located in the project site as continuous fixed deposits. The annual operational cost for the management of newly established RMOs will come from the accrued interest and will be distributed among eight (8) RMOs by local government committee (LGC) according to aquatic resource management plan to be submitted by the concerned RMO. Operational guidelines for endowment fund has been formulated and submitted to the Ministry of Fisheries and Livestock, the Government of Bangladesh for central government approval.

However, it is a new approach for ensuring sustainability of newly established RMOs, the focal point of aquatic resource management in Hail Haor. But the MACH cannot guarantee that this approach will be sustaining after termination of this project unless local government staff cooperates with the RMO members.

5.1.2 Sustainability of RUGs (Resource Users' Groups)

Realizing the potential threat of RUG member and their micro-credit program for pursing AIGA after termination of the MACH intervention, the MACH has taken systematic approach to ensure the sustainability of the RUGs in accessing to micro-credit and continuing their alternative income generating activities. As a part of this action, the MACH has developed a plan to establish Federation of RUGs (FRUG) which will own the revolving credit fund and manage all micro-credit programs after termination of the project intervention. According to the MACH office record⁴⁶, it has established 5 (five) Federation of RUGs (FRUG; namely (i) Sreemongol FRUG (ii) Kalapur Union FRUG (iii) Nazirabad Giasnagar Union FRUG (iv) Vhunobir Mirzapur Union FRUG and (v) Ashidron FRUG) in the study area. The managing committee of FRUG has been formed with concerned RUG members elected two (2)

⁴⁶ MACH project site office, Sreemongol, Moulovibazar

from each RUG who will be mainly responsible for overall micro-credit management after termination of the project. For ensuring smooth management activities of FRUGs to operate micro-credit program, the MACH has prepared an operational guidelines for the FRUGS through an extensive process of discussion with RUGs and FRUGs members. Finally these, FRUGs have been registered with the Social welfare department of the Government of Bangladesh for its legal identity.

Theoretically, there is no room for doubt that the above mentioned arrangement sounds well for the sustainability of RUGs through formation of FRUGs and it is, of course, an unique example for Bangladesh that community based organizations are going to take full responsibility for operating micro-credit by themselves. But from the critical point of view, it raises questions about the capability and professional skill of elected managing body members of FRUGs (elected by RUG members to join FRUG management body) who will basically run the whole micro-credit operation through FRUG. During group discussions with RUG/FRUG members in the study area, it was observed that almost 85% members have no clear idea/understanding about the FRUG. One important reason behind this is that most of the members are illiterate and as such it is not possible for them to keep official record of micro-credit, meetings and decisions. Therefore from the viewpoint of management, the lack of skilled manpower is a big potential threat for the sustainability of FRUG micro-credit program.

5.2 Concluding Remarks

The overall objective of this research paper was to provide important insights about community based aquatic resource management and rural livelihoods recognizing its interlocking relationship through investigating new management structure (RMO and RUG) established under MACH intervention. To this effect, the research paper analyzed MACH intervention in Beel fisheries of Hail Haor (the study area) especially focusing different activities and impacts of newly established community based organization for aquatic resource management (RMO) and rural livelihood support (RUG/FRUG).

For a better understanding about Beel fisheries (closed inland water fisheries) and its immense importance in Bangladesh, this paper critically reviewed relevant literature in the context of Bangladesh, shows that the concerned department of Bangladesh Government (mainly, Department of Fisheries) was not aware of sustainable aquatic resources management of inland water fisheries and local fisheries community whose livelihood largely depend on fisheries resources. Critical discussion on Bangladesh inland fisheries indicates that the development of fisheries community has not been addressed by the government at all in relation with interlocking relationship with aquatic resource management and rural livelihoods of fisher community rather government machineries (represented by the Ministry of Land) were engaged with revenue collection from inland water bodies by competitive leasing system through which local poor community fishermen are displaced by the local elites mainly rich people and caused sever damage of aquatic resources.

In this regard, the MACH intervention came as solution for sustainable aquatic resource management of inland water fisheries (mainly Haor/Beel fisheries) addressing community poor people's livelihood directly involving community people with aquatic resource management. The case study shows that the MACH intervention introduced co-management and participatory process for inland fisheries management by establishing two core community based organizations namely Resource Management Organization (RMO for managing aquatic resources) and Federation for Resource Users' Group (FRUG for providing AIGA for poor community fishermen through micro-credit to reduce dependency on aquatic resources for livelihood support).

This empirical study confirms that a wide range of MACH interventions like establishment of aquatic sanctuaries, re-excavation of Beels and canal, plantation of different aquatic trees, awareness development training for community people etc. under RMO have immense impacts to improve as well as restore the aquatic biodiversity of the study area. In this connection, Baikka Beel can be mentioned as an example of aquatic biodiversity enriched area developed through MACH intervention

which has been converted as rural tourism site in the study area. The case study also shows that MACH intervention not only introduced community based aquatic resource management through RMO by ensuring community poor fishermen's legal access to inland fisheries (commonly known as Beel fisheries) but also simultaneously linked it with diversified livelihood support strategies to enhance income and employment opportunities of the poor community people through RUG for reducing dependency on aquatic resources.

From the SLA (which recognized five principal capital for constructing rural livelihood i.e. natural capital, human capital, physical capital, financial capital and social capital) point of view, the significance of MACH approach is that the joint impacts of RMO and RUG have positively contributed to develop the five capital bases which helped the poor community people to enlarge their livelihood opportunities and at the same time contributed to improve aquatic biodiversity as a whole.

However, many concerns were observed among RMO and RUG members in the study area regarding protection of the MACH outcome after termination the project (August 2007). One of the common concerns among the stakeholders/community poor fishermen is that the RMO can suffer from the occupation of local influential people which may again displace the community poor fishermen from Beel fisheries by destroying pro poor aquatic resource management approach⁴⁷. Another potential threat is that community poor people may feel discourage to continue RMO and RUG activities if they do not get overall support and cooperation from local government official especially local executive officer and fisheries officer after termination of the project.

Despite many concerns, incorporation of the MACH intervention as a model in the 'Inland Capture fisheries Strategies' prepared by the Ministry of Fisheries and Livestock, the Government of Bangladesh for managing inland capture fisheries can be seen as a success. However, still it requires government firm commitment

⁴⁷ Salikur Rahman, member of RMO and Premanando Sarkar, chairman of FRUG, Sreemongol MACH project site shared their opinion during interview on 10 August 2006

regarding additional resource allocation to implement the MACH Model for inland aquatic resource management along with active participation of different community development actors. To address all these issues to overcome the shortcomings need good span of time with careful attention and the apparent success of the MACH intervention so far achieved can be acknowledged as a good introduction of community based aquatic resource management considering its interdependency relationship with rural livelihoods.

References/Bibliography:

Adams W. M (2001) *Green Development, 2nd edition*, Routledge, London and New York.

Ahmad and Hassan (1983) 'Nutrition Survey of rural Bangladesh 1981-1982', Institute of Nutrition and Food Science, University of Dhaka, Bangladesh.

Ali, Alam and Tsai C (1997) *Fishing gears of floodplain fisheries in Bangladesh: A case study of Chanda, BKSB and Halti Beels*, The University press limited, Dhaka.

Aguero (1989) 'Inland water fisheries in Bangladesh: Management option and national interventions', the paper presented in the seminar on experiments in new approaches to fisheries in Bangladesh, Dhaka, Bangladesh.

Ahmed (1989) 'Development Impacts of rural infrastructure in Bangladesh', International food policy research institution, Washington.

ARD- Agricultural and Rural Development, Royal Haskoning (2003) 'Controlling or Living with Floods in Bangladesh, Towards an Interdisciplinary and Integrated Approach to Agricultural Drainage' Working Paper 10, Dhaka, Bangladesh.

Ankarloo and Palemo (2004) 'Anti-Williamson: a Marxian Critique of New Institutional Economics' in Cambridge journal of Economics, Vol. 28, No. 3, pp 413-430.

Arifin (1998), *Rules of Business of the Government of Bangladesh*, Book Syndicate, Dhaka, Bangladesh.

Barbier et al (1997), 'Economic valuation of wetlands: a guide for policy makers and planners', Ramsar Convention Bureau, Gland.

BBS (2003), *Statistical Year Book of Bangladesh 2002*, Bangladesh Bureau of Statistics, Dhaka, Bangladesh.

Barlowe R (1986) *Land Resource Economics, fourth edition*, Prentice-Hall, Englewood Cliffs, N.J. 07632.

BARC (Bangladesh Agricultural Research Council) 1995, 'Strategic plan for the national agricultural research system to the year 2010 and beyond', BARC, Dhaka, Bangladesh.

BCAS (Bangladesh Centre for Advance Studies) 1994, 'Report on new floodplain planning, third fisheries project', Department of Fisheries (DoF), the government of Bangladesh, Dhaka.

BCAS (Bangladesh Centre for Advance Studies) 1993, 'Minor floodplain study report', BCAS, Dhaka, Bangladesh.

Begum, A and S. M. N Alam 1997, 'Organizing fisheries for community based fisheries management in Beel fisheries constraints found by Caritas', Dhaka, Bangladesh.

Billah (2003) *Green accounting: Tropical experience*, Dhaka, Bangladesh.

BRAC (Bangladesh Agricultural Research Council) 1995, 'Strategy plan for the national agricultural research system to the year 2010 and beyond', BARC, Dhaka, Bangladesh.

Carley, M & Christie, I (2000) *Managing Sustainable Development*, Earth Scan Publication Ltd, London and Sterling, VA.

Capistrano, AA D, 'Hussain, M and Ahmed, M 1997, 'Poverty alleviation, empowerment and sustainable resource use: Experiment in Inland fisheries management' in Bangladesh in Frazer Smith (ed.) Environmental sustainability: Practical global implications, pp141-162.

Conway, G.R (1987) 'The properties of Agro-ecosystem, Agricultural Systems'.

Costanza and Folke (1996) 'The structure and function of ecological systems in relations to property rights regimes' in *Rights to nature: Ecology, economic, cultural, and political principles of institutions for environment*, Island Press, Washington, D.C. (edited by Hanna et al).

Dugan, P.J (1988) 'Managing Wetlands for Sustainable Development' in

Verwey W.D (1989) *Nature management and Sustainable Development*, IOS, Van Diemenstraat 94, 1013 CN Amsterdam, Netherlands.

DOF (2001), *Fishery Statistical Year Book, Department of Fisheries (DOF)*, Matsha Bhaban, Dhaka, Bangladesh.

DFID (2003), 'Understanding Livelihoods Dependent on Inland Fisheries in Bangladesh and Southeast Asia', Department for International Development (DFID).

Dister, E (1990) 'Floodplain protection in central Europe, World Wildlife Fund, Institute of Floodplains Ecology, Germany in Begum A – Report on Community Management of Beel fisheries', Caritas, Dhaka.

DoF (Department of Fisheries) (1989) *The Souvenir of fish week, DoF*, the Ministry of Fisheries and Livestock, the government of Bangladesh.

DoF (Department of Fisheries) (2001) *The Souvenir of fish week*, DoF, the Ministry of Fisheries and Livestock, the government of Bangladesh.

Ellis (1992) 'The Neoclassical theory of farm production', in *Peasant Economics: Farm Households and Agrarian Development (Second edition)*, Cambridge University Press, pp: 17-44.

Ellis, F (2000) *Rural Livelihoods and Diversity in Developing Countries*, Oxford University Press.

Elliott, J. A (2006) *An Introduction to Sustainable Development, 3rd edition*, Routledge, London and New York.

Elliott, J. A (1994) *An Introduction to Sustainable Development, The Developing World, 1st edition*, Routledge, London and New York.

FAO/UNDP (1998) Report-2, 'Agro-ecological regions of Bangladesh', FAO, Rome, Italy.

FRI (Fisheries Research Institute) (1996) 'Gear Selectivity study of the three floodplains, 3rd fisheries project', Santahar, Bogra, Bangladesh.

Gopakumar, K and Devadasan, K, 'Utilizing Different Aquatic Resources for Livelihoods in Asia: General issues and Principles', World Fish Centre.
<http://www.worldfishcentre.org/Pubs/IIRR/iirr.htm>

GoB (The Government of Bangladesh) (1987) 'Bangladesh Inland Fisheries Review, Final Report', the Ministry of of Fisheries and Livestock, Dhaka, Bangladesh.

Hanna, et al (1996) 'Property rights and the natural environment in Rights to nature: Ecology, economic, cultural, and political principles of institutions for environment', in *Rights to nature: Ecology, economic, cultural, and political principles of institutions for environment*, Island Press, Washington, D.C. (edited by Hanna et al).

Haroon (2006) 'Lecture note on Neoclassical and New Institutional Economics (NIE) of MA RLGC 2005/06', ISS, The Hague, The Netherlands.

Hossain, et al (1997) 'Limnological observation on Basuhkali-Salimpur, Kol-Barnal (BSKB) Beel, Part I: Physico-chemical parameters', Bangladesh 25 (2).

IUCN (200b), 'Red Book of Threatened Fish of Bangladesh', IUCN- The world Conservation Union, Dhaka, Bangladesh.

Karim, A, (1993) 'Plant diversity and their conservation in fresh water wetlands' in In Nishat et al (ed.) 'Fresh water wetlands in Bangladesh'- Issues and approaches for management, IUCN, the World Conservation Union, Dhaka, Bangladesh.

Kenane (1992), 'Rural tourism and rural development' in *Tourism and the Environment: Regional, economic and policy issues*, Kluwer academic publisher edited by Briassoulis.

Khan, A A, (1985) 'Mobilization of resources by local government in Bangladesh: Projects and problems', BPATC, Dhaka, Bangladesh.

Khan, M A, (1997) 'Ecology of floodplains in the northern region of Bangladesh' in Tsai, Chu-fa and Ali, M Y (ed.) *Open water fisheries of Bangladesh*, The university Press Limited, Dhaka. Bangladesh.

Kuperan, (et al 1994) 'Planning and management of small scale coastal fisheries' in R.S Pomeroy (ed.) Community management and common property of coastal fisheries in Asia and the pacific; concepts , methods and experiences, ICLARM.

Manjarrez, J. A, 'Utilizing Different Aquatic Resources for Livelihoods in Asia: Participatory Approaches and Extension Strategies', World Fish Centre.
<http://www.worldfishcentre.org/Pubs/IIRR/iirr.htm>

Martell, L (1994) *Ecology and Society*, Polity Press, 65 Bridge Street, Cambridge CB2 IUR, UK.

Mitch et al (1993) *Wetlands*, Van Nostrand Reindhold 115, New York, USA.

Neefjes K (2000) *Environment and Livelihoods*, Oxfam Publication.

NERP (North East Regional Project) (1994) 'Project monitoring report, Shamir Haor FCDI Project', Canadian International Development Agency (CIDA), Dhaka, Bangladesh.

Nielsen J.R et al (2002) 'Fisheries Co-management –An Institutional Innovation, Institute for Fisheries Management and Costal Community Development' (IFM), Denmark.

ODA (Overseas Development Administration) (1996) 'Impacts of flood control and drainage with or without irrigation project (FC/I) on fish resources and fishing community in Bangladesh: Executive summary of Flood Action Plan (FAP-17) Final report' In Chu-Fa Tsai and Youssouf A M (ed.) *Open water fisheries of Bangladesh*, the University Press Limited, Dhaka, Bangladesh.

Price, et al (1996) 'Ox-bow lakes in West bangle: Livelihood system', Annex IV, ODA fact finding mission.

PRSP (Poverty Reduction Strategy Paper (2004) ‘Unlocking the potential: National Strategy for accelerated poverty reduction’, General economics division, Planning Commission, Government of the people’s republic of Bangladesh.

Pomeroy, R. S (1994) ‘Introduction and community management and common property of coastal fisheries in Asia the Pacific; Concept, methods and experiences’, ICLARM, Dhaka, Bangladesh.

Rahman A, 1995, *Beel Dakatia: the environmental consequences of a development disaster*, University press limited, Dhaka.

Rahman, AKA (1989), ‘Freshwater fishes of Bangladesh, Zoological Society of Bangladesh’, University of Dhaka, Bangladesh.

Rahman, M,(2003) ‘Brief on MACH Project’, CNRS, Dhaka, Bangladesh.

Rahman, A.A, Mallick, D.L, Haque, N & Nishat A, (2002), ‘Trends in Natural Resource Management in Bangladesh: Looking for Integration and a new Institutional Framework’ paper presented in Natural Resource management Workshops organized by Bangladesh centre for Advanced Studies (BCAS), Dhaka, Bangladesh.

Singleton S, Cooperation or Capture? ‘The Paradox of Co-management and Community Participation in natural Resource Management and Environmental Policymaking’, Tulane University, Political Science Department, Norman Mayer Building, New Orleans, LA 70118-5698
<http://www.oregonstate.edu/dept/IIFET/2000/speakers.html>.

Sugunan, V V, (1997) ‘Fisheries management of small water bodies in seven countries in Africa, Asia and Latin America’, FAO of United Nations Organization in Begum A, Beel Fisheries Management in Bangladesh, Caritus, Dhaka, Bangladesh.

Siddiqui, K U (1981) ‘The political economy of land reform in Bangladesh’, BIDS, Dhaka, Bangladesh.

Sarkar, S. U, (1993) ‘Faunal diversity and their conservation in freshwater wetlands’ in Naishat, A, Hussain, Z, Roy, M.K and Karim, A (ed.) freshwater wetlands Bangladesh: Issues and approaches for management IUCN, the World Conservation Union, p 105-122.

Toufique (2002) ‘Agricultural and non-agricultural livelihoods in rural Bangladesh: A relationship in flux’ in *Hands Not land: How livelihoods are changing in rural Bangladesh*, by Kazi Ali Toufique and Cate Turton (eds, 2002), BIDS, Dhaka, Bangladesh.

Turner, R.K (1988) *Sustainable Environmental Management*, Belhaven, London.

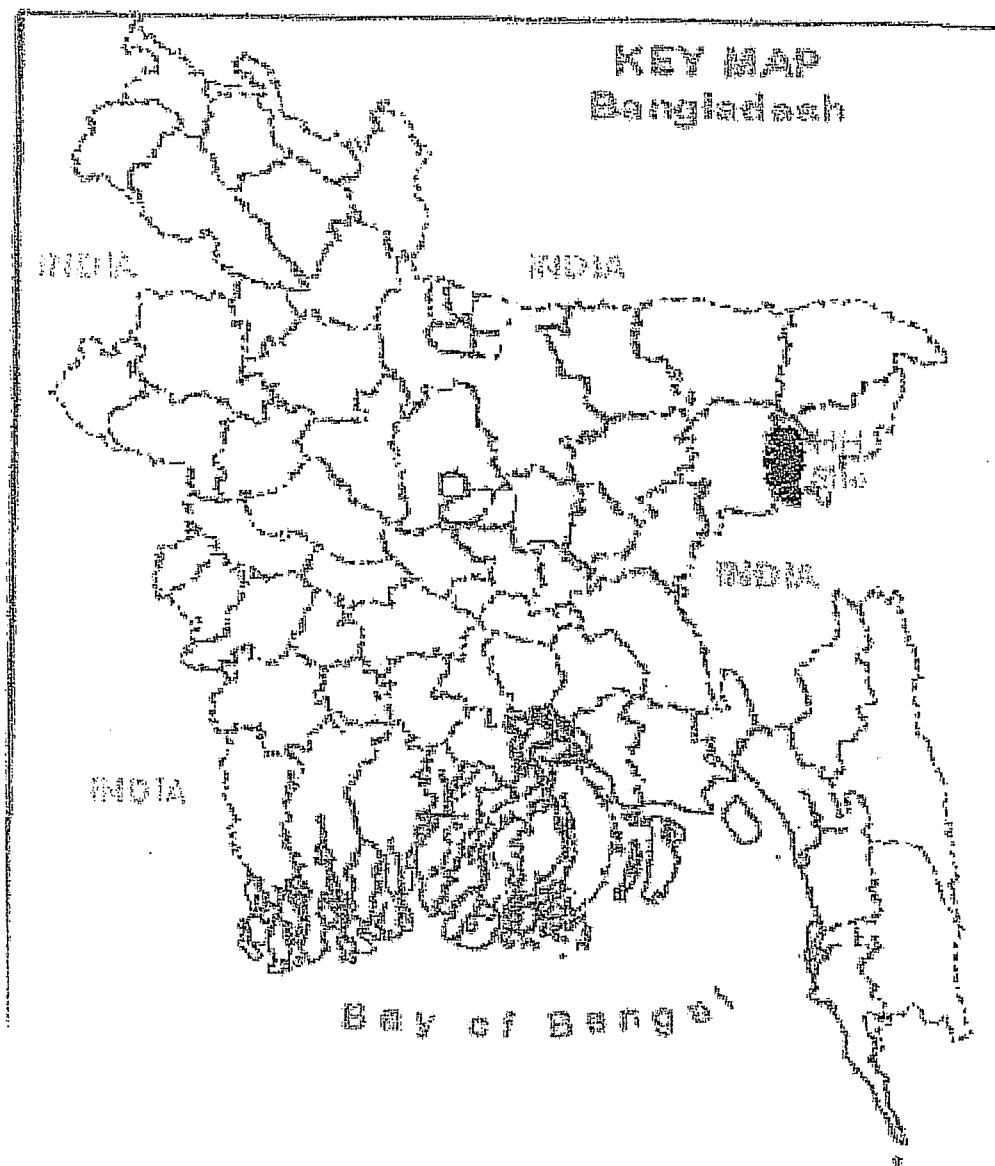
Wester, P & Bron 'Coping with Water, Water management in Flood Control and Drainage Systems in Bangladesh', pp: 15-51.

Welcomme (1979) Fisheries Ecology of Flood plain rivers, Laxman Group limited, London.

World Commission on Environment and Development (1987) Our Common Future, Oxford University Press, Oxford.

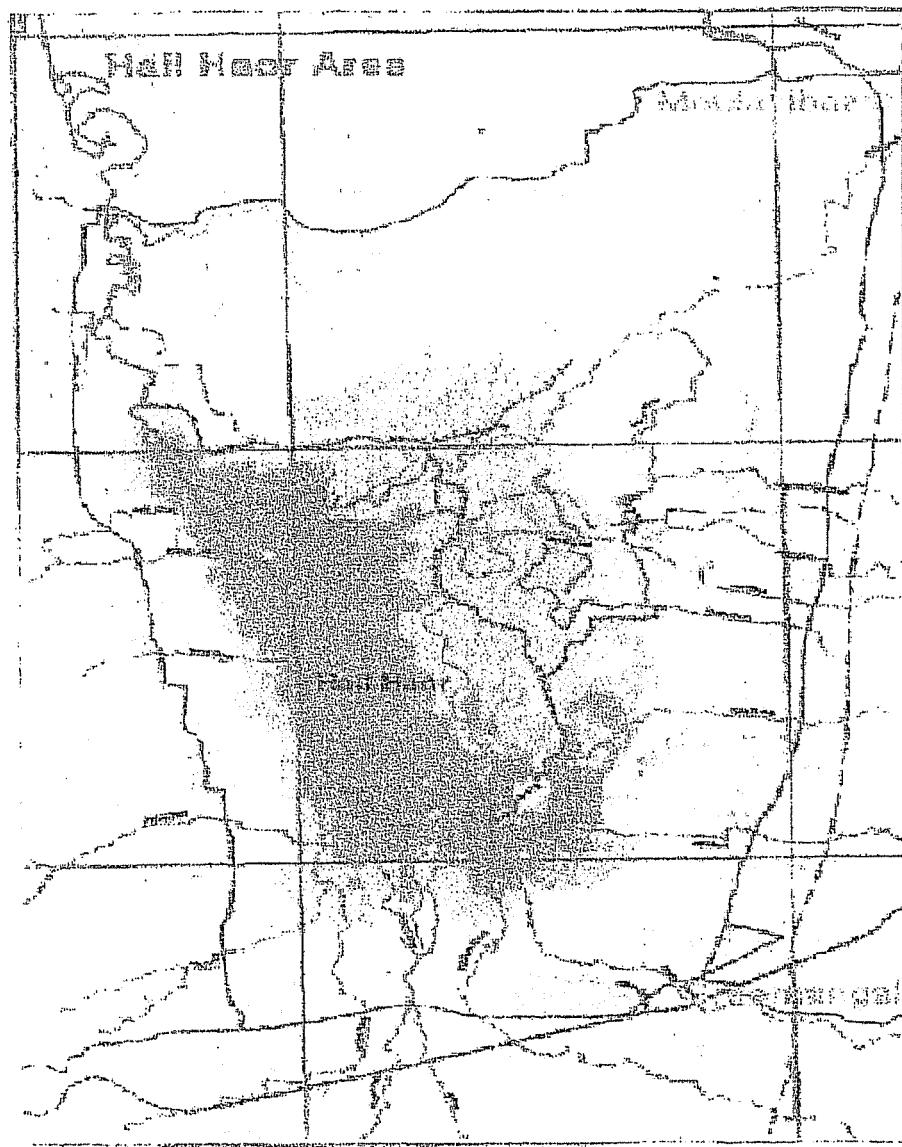
Zoomers (2001) 'Land and sustainable livelihoods in Latin America', Royal Tropical Institute, Netherlands.

Annexure I: Map of Bangladesh indicating study area by HH (Hail Haor) site



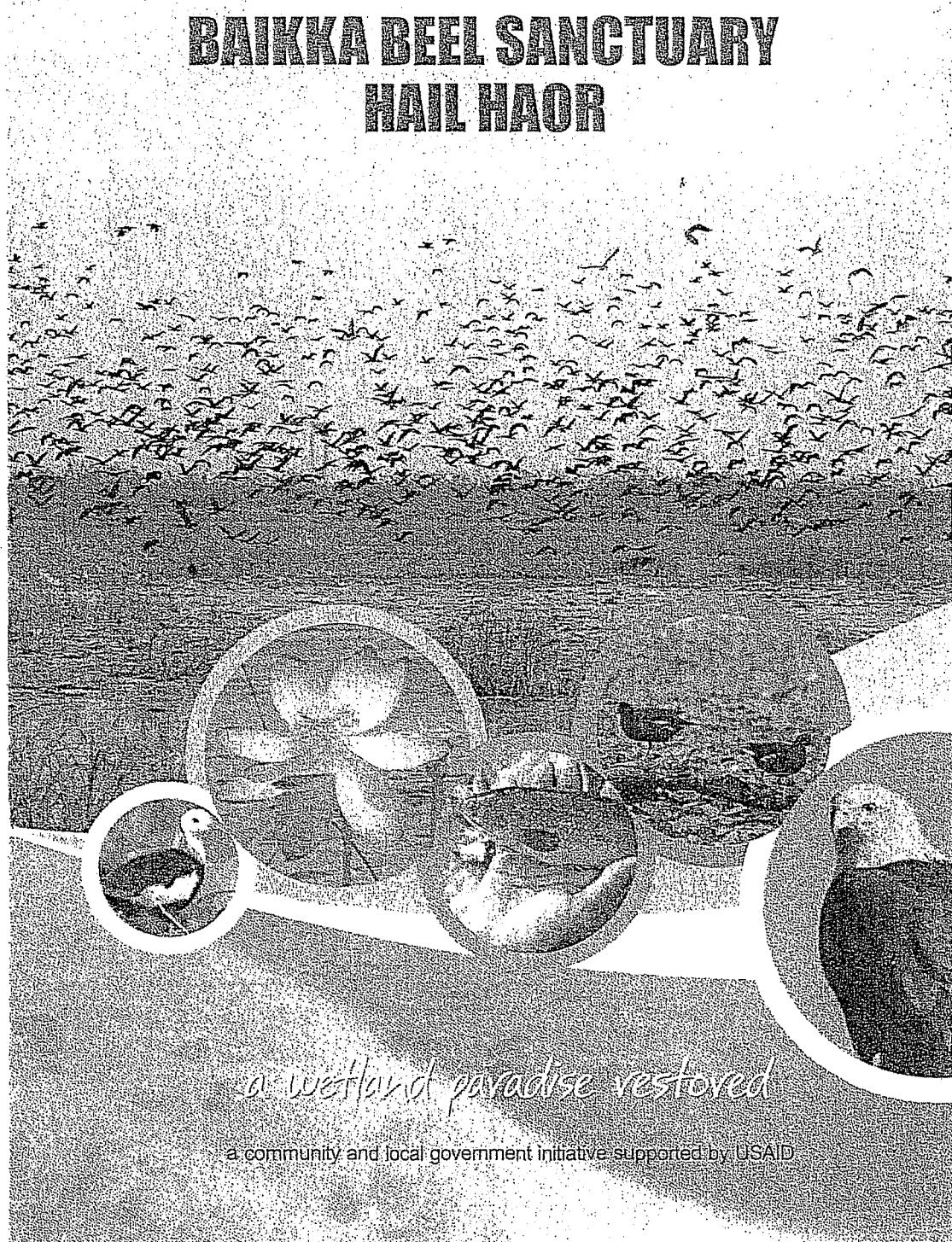
Source: MACH Project Office, Sreemongol

Annexure II: Map of the Hail Haor (the study area)



Source: MACH Project Office, Sreemongol

Annexure III: View of enriched aquatic bio-diversity in Hail Haor after the MACH intervention



Source: MACH Project Office, Sreemongol

