

Competitive Research Grant

Sub-Project Completion Report

on

**Potentials of modernization in fisheries sector of
Bangladesh: Study on the people's profile
technologies and policies**

Project Duration

July 2017 to September 2018

**Department of Aquaculture
Sylhet Agricultural University
Sylhet-3100**



Submitted to
Project Implementation Unit-BARC, NATP 2
Bangladesh Agricultural Research Council
Farmgate, Dhaka-1215



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Acronyms

ACIAR	= Australian Centre for International Agricultural Research
ADB	= Asian Development Bank
ARMP	= Agricultural Research Management Project
BARC	= Bangladesh Agricultural Research Council
BFRI	= Bangladesh Fisheries Research Institute
BFDC	= Bangladesh Fisheries Development Corporation
BOBP	= Bay of Bengal Programme
C	= Capital value
CBFM	= Community-Based Fisheries Management
CREL	= Climate Resilient Ecosystems and Livelihoods
CRG	= Competitive Research Grants
CSOs	= Civil Society Organizations
DANIDA	= Danish International Development Agency
DA	= Development Area
DFID	= Department for International Development
DoF	= Department of Fisheries
ESBN	= Estuarine Set Bag Net
FAO	= Food and Agriculture Organization of the United Nations
FCDI	= Flood Control, Drainage and Irrigation
FGDs	= Focus Group Discussions
FRI	= Fisheries Research Institute
FTEP	= Fisheries Training and Extension Project
GAP	= Good Aquaculture Practice
GoB	= Government of Bangladesh
GEF	= Global Environment Facility
HACCP	= Hazard Analysis Critical Control Point
HH	= Household
I	= Indicator value
ICLARM	= International Center for Living Aquatic Resources Management
IFAD	= International Fund for Agricultural Development
IDA	= International Development Association
IDRC	= International Development Research Centre
IPAC	= Integrated Protected Area Co-Management
JICA	= Japan International Cooperation Agency
LGED	= Local Government Engineering Department
LoA	= Letter of Agreement
MCS	= Monitoring, Control and Surveillance
MEY	= Maximum Economic Yield
MoFL	= Ministry of Fisheries and Livestock
MPAs	= Marine Protected Areas
MSY	= Maximum Sustainable Yield
NATP	= National Agricultural Technology Project
NGOs	= Non-Governmental Organizations
NORAD	= Norwegian Agency for Development Cooperation

ODA	= Official Development Assistance
PCMs	= Participatory Consultation Meetings
PES	= Payments for Ecosystem Services
PCR	= Project Completion Report
PIU	= Project Implementation Unit
RRA	= Rapid Rural Appraisal
UN	= United Nations
UNCLOS	= United Nations Convention on the Law of the Sea
UNDP	= United Nations Development Programme
UNICEF	= United Nations Children's Fund
USAID	= United States Agency for International Development
USSR	= Union of Soviet Socialist Republic
SDGs	= Sustainable Development Goals
SPSS	= Statistical Package for the Social Sciences
STDF	= Standards and Trade Development Facility
Tk	= Bangladeshi Taka
VGD	= Vulnerable Group Development
VFF	= Vulnerable Group Feeding

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Executive Summary

With an overarching aim to strengthen national policy frameworks to promote a shift towards more sustainable fish production and resource efficiency, this research project unfolded the technological change and modernization which have taken place in the fisheries sector of Bangladesh. The project assessed how far technological changes and modernization affected the socio-economic condition of the fisherfolk as well as the sustainability of the fishery resources. By realizing these objectives as mentioned above, the research findings envision to assist stakeholders (government, private sector, and civil society) in designing and implementing specific policy-oriented activities to shift towards more sustainable fish production through modernization the sector. Overall, the output of the research might contribute to green growth and poverty reduction in Bangladesh towards achieving the Sustainable Development Goals (SDGs).

In terms of methodological considerations, both spatial planning as well as non-spatial planning (i.e. social and economic planning) techniques was adopted in the preparation of the plan. To identify problems, issues, people's need and project interventions, this research has employed social techniques such as Participatory Consultation Meetings (PCMs) at regional level, Focus Group Discussions (FGDs) and Rapid Rural Appraisal (RRA) at local level. Moreover, agency level and individual expert level consultations was being held to finalize the plan. This study collected data on three broad research themes aquaculture, open water fisheries and policy and legal framework. The desk based component of the research was undertaken a comprehensive review of literature on different aspects covering community livelihoods, fisheries production, harvest technology etc. for inland, coastal and marine waters of Bangladesh. To understand current status of aquaculture production and different culture practices, a review on relevant literature was conducted. All major policy and legal documents and regulations (e.g. government laws and policy documents, ministerial orders, gazettes) related to inland, coastal and marine fisheries of Bangladesh had been reviewed, to understand how existing policy and legal framework functions.

The study collected primary data through fieldwork in the pre-selected study areas. Fishers' and fish producers' households were selected through random sampling from each study sites. A semi-structured questionnaire was developed to collect data on socio-economic attributes. For collection of data on aquaculture, five villages had been selected where pond aquaculture is the most dominant agricultural activity. Respondents were interviewed from 60 selected villages. From each of the villages, 20 respondents were interviewed. Thereby, 1200 respondents were interviewed with structured questionnaires under this study. The qualitative information was collected through FGDs, case study, In-depth interview and Observation. For all study areas, Government Officials (concerned with fisheries, natural resources management and policy), NGOs were being interviewed to collect experts' views. A total of 12 consultation meetings was conducted with the stakeholders at fisheries hotspot areas (study sites) and national level to formulate the policy and as part of dissemination process.

As expected outputs, a report on people's socio-economic profile, existing fisheries and aquaculture technologies, assessment of technology needs as well as evaluation of existing legal and policy frame work with respective recommendations was produced. There were some limitations in the project activity. Time limitation was the major concern. Because it was a huge job and one year was not too long period to harvest all types of crops of the project with full satisfaction. Nevertheless, it is believed that this document may serve as a guideline for policy maker, manager and researcher. Involvement of stakeholders in different stages of the research will increase awareness of fisheries management. Outputs of the research would be excellent academic information for students. Application of the knowledge generated in this research will contribute increased sustainable fish production of Bangladesh towards achieving the Sustainable Development Goals (SDGs), particularly SDG1, 2 and 14.

CRG Sub-Project Completion Report (PCR)

A. Sub-project Description

1. Title of the CRG sub-project: Potentials of modernization in fisheries sector of Bangladesh: Study on the people's profile technologies and policies
2. Implementing organization: Sylhet Agricultural University, Sylhet-3100
3. Name and full address with phone, cell and E-mail of PI/Co-PI (s):
PI: Dr. Md. Tariqul Alam, Professor, Department of Aquaculture, Sylhet Agricultural University, Sylhet-3100, Cell: +8801715715112, Email: talam.aq@sau.ac.bd
Co-PI: Dr. Mohammad Mahmudul Islam, Assistant Professor, Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Sylhet- 3100, Cell: +8801921298383, Email: mahmud.cmf@sau.ac.bd
4. Sub-project budget (Tk):
 - I. Total:4,490,400
 - II. Revised (if any): 4,143,647
5. Duration of the sub-project:
 - I. Start date (based on LoA signed): 10 July 2017
 - II. End date : 30 September 2018
6. Justification of undertaking the sub-project: Fish and fisheries are part and parcel of the culture and heritage of Bangladesh society. Contribution of fisheries in the national economy of Bangladesh is substantial, particularly with reference to food consumption, nutrition, employment, and export. However, this sector is yet to utilize to its full potential. The production rate is still far below than what it is in major aquaculture producing countries such as China, Thailand and Vietnam. Thus there is ample scope for development. With increased demand and consumption, open water fisheries sector also facing a number of challenges. These challenges include overfishing, severe resource degradation, overcapacity, and climate change and variability, to mention a few. For fisheries management, a number of laws, rules and policies are in place but implementation of these laws and policies are often meet by non-compliance by the stakeholders that result in poor fisheries governance. Understanding of the socioeconomic context of dependent fishers is important for formulating effective policy and management strategies of the concerned fisheries. While use of appropriate fishing technology could contribute increased fishing efficiency thus provide better return of fishing investment. Conversely, many potential fishery stocks remain unutilized when appropriate fishing technology is not available to fishing population. Thus adaptation of appropriate fishing technology for proper exploitation of high seas fisheries is a right step forward to the government policy of enhancing blue economy of Bangladesh. This context highlights the necessity of informing policy makers with the science-based knowledge regarding inland, coastal and marine fisheries for developing a holistic fishery policy in the context of achieving Sustainable Development Goals (SDGs) and blue growth in fisheries sector. The study provides significant contribution for understanding the impact of technological change and modernization on fisher-folk and fishing resources. It will also help to understand the sustainability aspect so that policy interventions are framed.
7. Sub-project goal: The goal of this research is to increase sustainable fish production through technology modernization in Bangladesh
8. Sub-project objective (s): The project has focused on achieving three specific objectives:
 - a. To unfold the technological change and modernization which have taken place in the fisheries sector;

- b. To assess how far technological changes and modernization affected the socio-economic condition of the fisherfolk as well as the sustainability of the fishery resources;
 - c. To assist stakeholders (government, private sector, and civil society) in designing and implementing specific policy-oriented activities to shift towards more sustainable fish production through modernization the sector.
9. Implementing location (s): Rangamati, Cox's Bazar, Bhola, Khulna, Bagerhat, Jhenaidah, Natore, Bagra, Kurigram, Mymensingh, Sunamganj and Sylhet

10. Methodology in brief:

The study primarily employed social techniques covering synthesis of fisheries-related projects intervention to build production trend at national level, Participatory Consultation Meetings (PCMs) at regional level, Focus Group Discussions (FGDs) and Rapid Rural Appraisal (RRA) at local level for identification of problems, issues, and people's need and project interventions. A six-step methodology that includes identification of problems and issues, policy analysis for future directive, present status and environment setting, review of past and ongoing development initiatives, strategy for future development and formulation of plan, was adopted for the preparation of the Master Plan following the above-mentioned principles. Development of the plan was initiated from policy analysis to set policy directives for it. The mandates of the MoFL/DoF were assessed and an in-depth analysis was done on existing policies, strategies and plans correlate the mandates of the MoFL with national policy directives. In the second step, development issues and problems of various development area/ sub-sectors such as water resources, agriculture, fisheries, health, education, communication, ecosystem was also identified. In the third step, past and ongoing development initiatives were reviewed to learn from the past about the success, achievements and failures. Adopting these steps helped to reveal the development potential of the fisheries sector during the preparation of the fisheries sector modernization plan. Problems and solutions was derived and formulated considering the demands of the local stakeholders, considering individual, cross-cutting and technical issues.

Development Area-wise strategies was developed in the next step. Different strategies were evaluated and risks was assessed for prioritization of the Development Areas (DAs). In the final step, based on the development strategies set in the previous step, a detail development plan was formulated. These steps include identification of problems and issues, policy analysis for future directive, present status and environment setting, review of past and ongoing development initiatives, strategy for future development and formulation of plan. The study collected data on three broad research themes aquaculture, open water fisheries and policy and legal framework. Considering these three aspects of fisheries, the research was performed through the following activities, literature review, selection of stakeholder/key informants and data collection. In this study Household survey, stakeholders' interviews, Focus group discussion, Key Informant Interviews etc. and consultation meetings were employed for collecting primary data. A semi-structured questionnaire was developed to collect data on socio-economic characteristics, households' dependency on fisheries resources, types of fishing gears they use, perception regarding catch efficiency of fishing gears and fisheries productivity, suggestions regarding fisheries management etc. For all study areas, government fisheries officers were interviewed to collect experts' views. Local Civil Society Organizations (CSOs) having expertise and interest in fisheries and aquaculture were also interviewed to collect their perspectives on fisheries and aquaculture. Other local government officials and policy makers were also approached for interviews.

The study collected data on three broad research themes aquaculture, open water fisheries and policy and legal framework by using following methods.

A. Literature review: Literature review covered different aspects covering community livelihoods, fisheries production, harvest technology etc. for inland, coastal and marine waters of Bangladesh, current status of aquaculture technologies of Bangladesh, existing policy and legal framework. Review of literature helped to understand current status of aquaculture production and different culture practices, existing policy and legal framework, all major policy and legal documents and regulations (e.g. government laws and policy documents, ministerial orders, gazettes) related to inland, coastal and marine fisheries of Bangladesh, to understand how existing policy and legal framework functions and how well it has covered the key aspects of fisheries management.

B. Selection of stakeholder/key informants and their number

The study collected primary data through fieldwork in the pre-selected study areas. Fishers' and fish producers' households was selected through convenient sampling from each study sites. From each study site, five fishing villages were selected. A semi-structured questionnaire was developed to collect data on pond aquaculture, socio-economic characteristics, households' dependency on fisheries resources, types of fishing gears they use, perception regarding catch efficiency of fishing gears and fisheries productivity, suggestions regarding fisheries management, different aquaculture practices in the region, production performances of the adopted culture practices, prospects and constraints of aquaculture practices in the region. In addition, local government fisheries officers, Civil Society Organizations (CSOs) and other local government officials and policy makers with stake and interest in fisheries and aquaculture was approached for interviews.

C. Data collection methods

In this study following data collections will be employed for collecting primary data.

- a. Household survey, stakeholders' interviews, Focus group discussion, Key Informant Interviews, etc.
- b. Consultation meeting

The survey covered all the major fisheries intervention areas of Bangladesh. Fifty villages with twenty respondents each were interviewed. Thereby, 1000 respondents in total was interviewed. The qualitative assessment was conducted through FGDs (195), case study (66), key informant interview (256). A total of 14 consultation meetings were conducted with the stakeholders at fisheries hotspot areas and national level. These consultation meetings were held to formulate the policy and as part of dissemination process.

To realize the livelihood status of peoples who are directly involved in different fisheries activity, livelihood assets pentagons are needed to be developed. For that reason, five types of livelihood asset capital and applicable indicators had been identified. Then various scaling and indexing methods were adopted to make them presented and to allow meaningful explanation. It is needed to note in advance that in the process of livelihood pentagon design all of the methods used are based on the reality of the study area and data characteristics.

Five types of livelihood asset capitals were namely Human capital, Physical capital, Natural capital, financial capital and Social capital. Age, Experience (Year), Training, Educational status and Secondary occupation were selected as Indicator in case of Human capital. Indicator Housing condition, Total land

size, Sanitary condition, Drinking water source, Light/energy facility were used for physical capital whereas Respondent perceptions on resource health, Respondent perception on resource longevity, Respondent perception on adaptation of modern technologies/ methods were used for natural capital, Total household income and Housing savings were used for Financial capital and Networks & connectedness, Membership in fishers association, Membership in different organizations, family type were used for Social capital.

Various indicator (I) values were determined by using weighting method that was plotted in two ways which were based on the design features of the questionnaire.

The first involved questions in the form of "Perception on resource health" including three answer choices: Good, Average and Poor; or any form of questions that the answer can be plotted as Good, Average and Poor.

$$I = \text{Good}\% \times 1 + \text{Average}\% \times 0.66 + \text{Poor}\% \times 0.33$$

(Using rating scale as weights, "0-0.33", "0.34-0.66" and "0.67-1" were interpreted as "Poor", "Average" and "Good" respectively. Moreover, to perform the calculations conveniently, it was chosen three critical values to represent different degrees. 0.33, 0.66 and 1 were used to replace Poor, Average and Good, respectively (Muangkaew and Shivakoti, 2005)).

The second addressed questions in the form of "whether or Do." including two answer choices: Yes and No.

$$I = \text{Yes}\% \times 1 + \text{No}\% \times 0$$

After weight calculation, it was calculated the value of each type of capital (C) with the following integrated measurement equation- $C = \sum_{n=0}^n \frac{In}{Tn}$

Where C was the criteria score for each asset ($0 \leq C \leq 1$), n indicated *n*th indicator of criteria ($n = 1, 2, 3, \dots, n$); I denoted indicator; T denoted the total number of indicators (Chen *et al.*, 2013). Then livelihood assets value was calculated by averaging the obtained capital values.

D. Data analysis

Thematic analysis was done for the qualitative data of this research. Microsoft Office Excel 2015 was used to analyze quantitative data. Sustainable Livelihood Approach (DFID 1999) was employed as analytical lens for livelihood status throughout the study.

11. Results and discussion:

11. a. Fisheries Technology disseminated in Bangladesh

Since independence of Bangladesh in 1971, a good number of development projects were funded under national budget and foreign aid have been implemented for the development of the country's fisheries sector, which is an important contributor to nutrition, food security, income and employment. An attempt has been made to synthesize these projects in order to assess their impact on development. It was really a hard task to compile all the projects due to lack of sufficient information. Some of the project documents were not available even with the concerned agencies, and poor record keeping and documentation also made it difficult to collect the project related information. Thus, the list of projects

is not exhaustive and the information furnished here may not also be complete. So far information collected from different organization, about two hundred developmental projects have been implemented in the fisheries sector by mainly three organizations, viz. Department of Fisheries (DoF), Bangladesh, Bangladesh Fisheries Research Institute (BFRI) and Bangladesh Fisheries Development Corporation (BFDC) (Table 1). Some of these intervention had direct effect on the either capture or culture fisheries or both and some of these interventions had created scopes (conservation or investment) to boost up fish production.

Table 1: List of projects implemented in the fisheries sector by different organizations

SL no	Project Title	Donar/ Implementing Organization/ Duration
1.	Fishermen's Rehabilitation Programme	NORAD/ DoF/ 1972-75
2.	Neemgachi Fish Culture Project	UNICEF/ DoF/ 1973-82
3.	Pilot Project for Development of Zeol Fish	GOB/ DoF/ 1974-78
4.	Expansion of the Activities of Fisheries Training Institute for In-service Training of Fisheries personnel	NORAD/ DoF/ 1974-80
5.	Expansion, Development and Management of Derelict Water Areas for Fish Production in Bangladesh	GOB/ DoF/ 1974-80
6.	Fish Culture Development in and around Dhaka City	GOB/ DoF/ 1974-80
7.	Establishment of Fish Inspection and Quality Control Laboratories in Bangladesh	DANIDA, FAO)/ DoF/ (1974-80)
8.	Strengthening of Fisheries Extension Services in Bangladesh	UNICEF/ DoF/ 1975-81
9.	Fisheries Management in Chara and Beels of Western Region	GOB/ DoF/ 1975-82
10.	Development of Fishery in the Chandpur, Muhuri and Karnaphuli Irrigation and Flood Control Project	IDA/GOB/ DoF/ 1975-82
11.	Strengthening of Planning Cell of Fisheries Directorate	(GOB)/ DoF/ (1976-81)
12.	Aquaculture Experiment Station at Mymensingh	(DANIDA/GOB)/ DoF/ (1976-88)
13.	Serajonj Integrated Rural Development Project (SIRD) Fisheries Component	(IDA/GOB)/ DoF/ (1977-84)
14.	Expansion of the Scheme for Construction of Fish Seed Multiplication Farms in Bangladesh	(ADB)/ DoF/ (1978-84)
15.	Nokhali Integrated Rural Development Project	(DANIDA)/ DoF/ (1978-84)
16.	Bangladesh Aquaculture Development Project	(DANIDA/GOB)/ DoF/ (1979-85)
17.	Aquaculture Development Project	(ADB)/ DoF/ (1979-87)
18.	Baor Fish Development Project	(IDA/GOB)/ DoF/ (1979-85)
19.	Rural Development Project	(IDA)/ DoF/ (1979-83)
20.	Gulshan Lake Fish Culture Development	(FAO/UNDP)/ DoF/ (1980-85)
21.	Dinajpur Fish Culture Project	(ADB)/ DoF/ (1980-84)
22.	Expansion of Fish /Shrimp Culture in the Coastal Districts of Bangladesh	(ADB)/ DoF/ (1981-85)
23.	Intensification of Fisheries Extension Service	(DFID/GOB)/ DoF/ (1981-85)
24.	Fisheries Training and Extension Center at Faridpur	(GOB)/ DoF/ (1981-85)
25.	Fisheries Resource Survey System	(FAO/UNDP/GOB)/ DoF/ (1981-85)
26.	Special Fishery Project at Nandigram	(USAID)/ DoF/ (1981-84)
27.	Establishment of Fish Seed Farms in the Rural Thanas of	(ADB)/ DoF/ (1981-84)

SL no	Project Title	Donar/ Implementing Organization/ Duration
	Bangladesh	
28.	South-West Rural Development	(IDA/DFID)/ DoF/ (1982-86)
29.	Pilot Project for Development of Haor Fisheries	(IDA)/ DoF/ (1982-85)
30.	Establishment of Shrimp Culture Demonstration Farm at Satkhira, Khulna	(IDA/GOB)/ DoF/ (1982-85)
31.	Pilot Project for Fish Culture in 500 Village Ponds	(ADB)/ DoF/ (1982-84)
32.	Establishment of Fish Seed Multiplication Farms in Rural Thanas	(GOB)/ DoF/ (1982-84)
33.	Pilot Project for Cat fish Farming in Bangladesh	(UNDP)/ DoF/ (1983-83)
34.	Estimation of Fish Landing and Consumption in the Metropolitan Dhaka City	(IDA)/ DoF/ (1983-85)
35.	Shrimp Culture Project	(IDA/GOB)/ DoF/ (1986-93)
36.	Mymensingh Aquaculture Extension(1 st Phase) Project	(DANIDA/GOB)/ DoF/ (1988-92)
37.	North-West Fisheries Extension (1 st Phase) Project	(GOB)/ DoF/ (1987-94)
38.	Integrated Fisheries Development Project	(IDA/GOB)/ DoF/ (1987-92)
39.	Development of 13 Fish Seed Multiplication Farms and Establishment of Fish Farm at Kurigram	(IDA/GOB)/ DoF/ (1987-91)
40.	Parbatipur Hatchery Development and Development of Other Fish Farms in Dinajpur District	(DFID/GOB)/ DoF/ (1987-92)
41.	Marine Fisheries Surveillance Check Post	(GOB)/ DoF/ (1989-92)
42.	Institutional Strengthening of Fisheries Sector	(FAO/UNDP)/ DoF/ (1988-93)
43.	Oxbow Lake Fisheries Development and Management Project	(IFAD/UNDP/GOB)/ DoF/ (1988-94)
44.	Second Aquaculture Project	(ADB/GOB)/ DoF/ (1988-93)
45.	Marine Fisheries Survey Development and Management Project	(GOB)/ DoF/ (1989-90)
46.	Community Based Fisheries Management Project	(FORD FOUNDATION)/ DoF/ (1989-92)
47.	Third Fisheries Project	(IDA/UNDP/ODA/GOB)/ DoF/ (1990-96)
48.	Coastal Fisheries Management Project in the Bay of Bengal	(BOBP.FAO)/ DoF/ (1991-98)
49.	49. Socio-Economic Impact of Fish Culture Extension Project on the Farming System of Bangladesh	(ICLARM/USAID)/ DoF/ (1991-92)
50.	Noakhali Aquaculture Extension	(DANIDA)/ DoF/ (1994-04)
51.	Patuakhali-Barguna Aquaculture Extension	(DANIDA)/ DoF/ (1994-04)
52.	Shrimp Disease Prevention and Health Management	(FAO)/ DoF/ (1996-99)
53.	North-West Fisheries Extension (2 nd phase)	(DFID)/ DoF/ (1996-01)
54.	Bagda Shrimp Culture Technology	(GOB) DoF/ (1997-04)
55.	Fisheries Training and Extension (FTEP-II)	(DFID)/ DoF/ (1997-02)
56.	Strengthening of Coastal Fisheries Management	(GOB) DoF/ (1997-02)
57.	Aquaculture Development Project	(IFAD/GOB)/ DoF/ (1998-05)
58.	Golda Hatchery Development and Culture Technology extension	(GOB) DoF/ (1998-03)
59.	Jaboi Beel Aquaculture Development Project at Sapahar Upazila in Naogaon District	(GOB)/ DoF/ (1999-04)
60.	Poverty Alleviation Through Integrated Aquaculture (2 nd phase)	(GOB)/ DoF/ (1999-04)
61.	Fourth Fisheries Project	(IDA/DFID/GEF/GOB)/ DoF/

SL no	Project Title	Donar/ Implementing Organization/ Duration
		(1999-04)
62.	Fisheries Resources Development Project in Open and Closed Water Bodies Under New Fisheries Policy	(GOB)/ DoF/ (1999-03)
63.	Shrimp Culture Improvement and Development	(France)/ DoF/ (1999-02)
64.	Development of Aquaculture Entrepreneurs through National Package Program	(GOB)/ DoF/ (1999-02)
65.	Creek Development and Fish Culture Extension Project in Chittagong Hill Tracts	(GOB)/ DoF/ (2000-05)
66.	Upazila Level aquaculture Extension (2 nd phase)	(GOB)/ DoF/ (2000-06)
67.	Brood Bank Establishment	(GOB)/ DoF/ (2000-04)
68.	Empowerment of Coastal Fishing Community for Livelihood Security	(FAO/UNDP)/ DoF/ (2000-04)
69.	Jhatka Hilsa Conservation and Management	(GOB)/ DoF/ (2000-03)
70.	Mymensingh Aquaculture Extension Project (Consolidation Phase)	(DANIDA)/ DoF/ (2000-03)
71.	Policy Planning Support Unit	(DANIDA)/ DoF/ (2001-05)
72.	Fish Culture Development and Management in Chara and Beels of the Western Region	(GOB)/ DoF/ (2001-05)
73.	Fisheries Resources Development and Management in the North-West Region	(GOB)/ DoF/ (2001-06)
74.	Development of Dhanmondi Lake and Other Water bodies in Dhaka City	(GOB)/ DoF/ (2002-05)
75.	Marine Fisheries Resources Survey, Management and development Project	(IDA)/ DoF/ (2002-05)
76.	Food Assisted Fisheries Sector Rural Development Project (2 nd Phase)	(GOB)/ DoF/ (2002-05)
77.	Community-Based Fisheries Management Project (CBFM 2 nd Phase)	(ICLARM/DFID)/ DoF/ (2002-06)
78.	Fisheries and Fishery Commodities Inspection and Quality Control Activity Enhancement Project	(GOB)/ DoF/ (2002-05)
79.	Aquaculture Development Project in Gopalganj, Sariatpur and Madaripur District	(GOB)/ DoF/ (2002-05)
80.	Pearl culture Research and Extension Project- a. DOF Part; b. FRI Part)	(GOB)/ DoF/ (2002-05)
81.	Fisheries Research Institute	(IDA/GOB)/ BFRI/ (1984-92)
82.	Strengthening Fisheries Research Institute	(FAO/UNDP)/ BFRI/ (1984-96)
83.	Hilsa Fisheries Development and Management Project	(IDRC)/ BFRI/ (1986-89)
84.	Third Fisheries Project- FRI Component	(IDA/GOB)/ BFRI/ (1990-96)
85.	Fisheries Research Institute (2 nd Phase)	GOB)/ BFRI/ (1992-95)
86.	Aquaculture Research For Sustainable Development	(USAID/ICLARM/GOB) / BFRI/ (1995-98)
87.	Hilsa Fisheries Research and Management in Bangladesh	(ACIAR/GOB)/ BFRI/ (1995-98)
88.	Fisheries Research Programme Development	(GOB) / BFRI/ (1995-98)
89.	Agricultural Research Management project (ARMP-FRI Part)	(IDA/GOB) / BFRI/ (1996-02)
90.	Bangladesh Fisheries Research Institute's Research Programme Strengthening	GOB/ BFRI/ (1997-02)

SL no	Project Title	Donar/ Implementing Organization/ Duration
91.	Fish and Rice Productivity Enhancement Research in the Flood-Prone Ecosystem in Bangladesh	(IFAD/ICLARM)/ BFRI/ (1997-00)
92.	Introduction of 12 Fishing Trawlers in the Bay of Bengal	(USSR, NORAD) / BFDC/ (1972-78)
93.	Fishing with 4 Trawlers in the Bay of Bengal	(ODA, DANIDA) / BFDC/ (1973-78)
94.	Establishment of a Quality Control and product Development Center	(DANIDA) / BFDC/ (1973-79)
95.	Establishment of a Marine Fishery Training Center at Chittagong	(USSR) / BFDC/ (1973-80)
96.	Establishment of Fish Preservation Unit at Mongla, Khulna	(GOB) / BFDC/ (1973-80)
97.	Mechanization of Country Fishing Boats	USSR, JICA) / BFDC/ (1974-78)
98.	Establishment of a Fish Processing Center at Chittagong fish Harbour	(USSR,DANIDA) / BFDC/ (1974-78)
99.	Boat Building and Mechanization	(DANIDA) / BFDC/ (1974-80)
100.	Marketing and Distribution of Fish	(ADB, DANIDA) / BFDC/ (1974-80)
101.	Reorganization of BFDC's Headquarters Set-up	(GOB) / BFDC/ (1975-78)
102.	Second-Phase Construction of Chittagong Fish Harbour	(FAO/UNDP,DANIDA) / BFDC/ (1975-80)
103.	Establishment of Fish Landing Center at Chittagong	(JICA) / BFDC/ (1990-94)
104.	Fisheries Development and Enhance Production in Kaptai Lake	(GOB) / BFDC/ (1995-00)
105.	Modernization, Expansion and Development of fish Markets and Fish Landing Centers at Cox's Bazar and Pathorgatha	(GOB)/ BFDC/ (1996-00)
106.	Bangladesh Marine Fisheries Capacity Building Project	DoF/ July/2007- June/2019
107.	Brood bank establishing project	DoF/ July/2007- June/ 2013
108.	Brood bank establishing project (3 rd Phase)	DoF/ September/2014- December/2019
109.	Fresh water Prawn culture extension project (2 nd phase)	DoF/ July/2012- June/ 2018
110.	Fresh water Prawn culture extension project	DoF/ July/ 2005- June/2010
111.	Aquaculture development and extension project in Chittagong Hill Tract region (3 rd phase)	DoF/ July/ 2012- June/ 2017
112.	Aquaculture development and extension project in Chittagong Hill Tract region	DoF/ July/ 2005- June/2010
113.	Crab and Kuchia culture and research project in selected areas of Bangladesh	DoF/ February/2015- June/2019
114.	Union level aquaculture technology services extension project (2 nd Phase)	DoF/ March/2015- June/2020
115.	Fisheries development project in greater Comilla district	DoF/ July/2015- June/2020
116.	Fish Production increase project through water body reconstruction	DoF/ October/2015- June/2019
117.	Aquaculture Development Project In Greater Jessore District	DoF/ January/2016- December/2019
118.	National Agricultural Technology Project (2 nd Phase)	DoF/ October/2015- September/2021
119.	Enhanced Coastal Fisheries (Eco Fish Bd)	DoF/ June/2014- May/2019
120.	Technical support for stock assessment of marine fisheries	DoF/ November/2016-

SL no	Project Title	Donar/ Implementing Organization/ Duration
	resources in Bangladesh	October/2018
121.	Sustainable coastal and marine fisheries project in Bangladesh: Preparation facilities	DoF/ March/2017-February/2018
122.	Integrated agricultural productivity project (Fisheries Department Part)	DoF/ July/2011-December/2016
123.	Strengthening Of Fishery And Aquaculture Food Safety And Quality Management System In Bangladesh Project	DoF/ July/2010-December/2016
124.	Enhancing Aquaculture Production For Food Security And Rural Development Through Better Seed And Fish Production	DoF/ November/2014-October/2016
125.	Climate Resilient Eco System And Livelihood Project	DoF/ July/2013-September/2016
126.	Economically Backward Areas Peoples Poverty Redemption And Livelihood Confirmation Project	DoF/ April/2010-June/2016
127.	Greater Faridpur District Aquaculture Development Project	DoF/ January/2010-June/2016
128.	Haor Region Aquaculture Management Project	DoF/ October/2010-June/2016
129.	Integrated Agricultural Productivity Project (Fisheries Directorate Part)	DoF/ July/2011-December/2016
130.	Wetland biodiversity rehabilitation project	DoF/ July/2009-June/2016
131.	Building trade capacity of small scale shrimp and prawn farmers in Bangladesh investing in the bottom of the pyramid approach (STDF)	DoF/ January/2013-June/2016
132.	Jatka conservation, fishermen's alternative employment and research project (A) Fisheries Directorate Part	DoF/ July/2009-June/2015
133.	Economically backward areas peoples poverty reduction and livelihood confirmation project	DoF/ April/2010-June/2016
134.	Kaptai lake fisheries production increase, conservation and management strengthening project (A) Fisheries Directorate part	October/2011-December/2014
135.	Hura Sagor Aquaculture Management Project	DoF/ July/2011-June/2015
136.	National agricultural technology Project (Fisheries Directorate Part)	DoF/ July/2007-December-2014
137.	Reclamation project of natural fisheries breeding ground in Halda river	DoF/ July/2007-June/ 2014
138.	Greater Pabna Fisheries Development Project	DoF/ January/2009-June/2014
139.	Emergency 2007 Cyclone Recovery and Restoration Project (A) Fisheries Directorate Part	DoF/ August/2014-June/2014
140.	Jatka Saving, Alternative Employment Opportunities for Fishermen and Research Project (A) Fisheries Directorate Part	DoF/ July/2009-June/2014
141.	Union level aquaculture technology service extension Project	DoF/ July/2009-June/2014
142.	Aquaculture and Management Project in the Bhabdaha Region of Jessore District	DoF/ July/2009-June/2014
143.	Development and Management of selected Degraded water body and Indigenous Small Fish Species Preservation Project	DoF/ April/2010-June/2014
144.	Control the Use of Formalin in Fish Preservation and Rising Awareness Project	DoF/ March/2011-June/2014
145.	Strengthening Project on Enhancing Fish Production, Preservation	DoF/ October/2011-

SL no	Project Title	Donar/ Implementing Organization/ Duration
	and Management in Kaptai Lake (A) Fisheries Directorate Part	December/2014
146.	Excavation of River Ganja Beel, Sujanagar Upazila of Pabna District, Irrigation Facilities Development and Aquaculture Project (A) Fisheries Directorate Part	DoF/ January/2010-June/2016
147.	National Agriculture Technology Project	DoF/ July/2007-December/2014
148.	Integrated Agricultural Productivity Project (A) Fisheries Directorate Part	DoF/ July/2011-June/2016
149.	Regional Fisheries and Livestock Development Project (Barisal Component)	DoF/ July/2007-June/2013
150.	Greater Pabna Fisheries Development Project	DoF/ January/2009-December/2013
151.	Aquaculture and Management Program in Haor Region	DoF/ July2009-june2013
152.	Shrimp Culture Technology Extension Project (2 nd Phase)	DoF/ July/2007-June/2012
153.	Strengthening The Institutional capacity of the Department Of Fisheries Project	DoF/ October/2006-September/2011
154.	Integrated Fisheries Livelihood Project, Bangladesh (Preparatory Phase)	DoF/ September/2011-August/2012
155.	Coastal Fisherman Damaged In Cyclone Ila Rehabilitation Program for coastal fish farmer and fishers affected by cyclone 'Ila'	DoF/ July/2009-December/2012
156.	Aquaculture and management program in Haor area	DoF/ July/2009-June/2012
157.	Fisheries infrastructure building project in the Floodplain of Cumilla District (Dauth Kandi Model) A) Fisheries Directorates Part B) LGED Part	DoF/ July/2006-June/2011)
158.	Fresh Water shrimp culture extension project.	DoF/ July2005/-June/2010
159.	Fishing ground restore project in inland open water body	DoF/ July2005/-June/2010
160.	Aquaculture development and extension Project In Chittagong hill tract area.	DoF/ July2005/-June/2010
161.	Fisheries Development Project in Chalan Beel.	DoF/ July/2006-June/10
162.	Regional Fish And Livestock Development Project (Barisal Component).	DoF/ July/2007-June/2012)
163.	Fish product inspection and quality control project E,U.	BFRI / July/03-June/10
164.	Developing a National Shrimp Seed Certification Project.	BFRI / June-July/07-December/09
165.	Poverty Alleviation Project Through Integrated Fisheries Activities.	BFRI
166.	Fisheries development and management project in streams and beels of western region of the country	BFRI
167.	Aquaculture extension project at union level	BFRI
168.	Community based aquaculture Extension Project/3	BFRI
169.	Fourth fisheries Project/3	BFRI
170.	Open and closed water fisheries resources development project under the new Jalmahal (water)policy/03	BFRI
171.	Community based fisheries resource management project/03	BFRI
172.	Investment assistance project of Mach activity	BFRI

SL no	Project Title	Donar/ Implementing Organization/ Duration
173.	Empowerment of coastal fishing community for livelihood security Project	BFRI
174.	Support for university fish reduction research project	BFRI
175.	Aquaculture project in Faridpur (IFAD)	BFRI
176.	Mymensingh Aquaculture Project/04	BFRI
177.	Aquaculture extension project in greater Noakhali district	BFRI
178.	Fisheries Resource development and management Project in North-West region Part/04	BFRI
179.	Fish inspection and quality control strengthening Project /05	BFRI
180.	Aquaculture project in hilly water bodies of Hill tract region/6	BFRI
181.	FCDI Project/6 (Flood control and irrigation Project)	BFRI
182.	Project on food security assurance and poverty alleviation of poor community in poverty seized area under revenue budget t/6	BFRI
183.	Integrated fish and livestock development Project (Noakhali component)	BFRI
184.	World Bank funded Project (NATP)/07	BFRI
185.	Marine and coastal fisheries resource survey management Project/07	BFRI
186.	Integrated fish and livestock development project (Barisal Component)/07	BFRI
187.	Bagda chingri culture technique extension Pproject/07	BFRI
188.	IPAC (Integrated Protected Area Co. Management Project/08)	(USAID)/ BFRI
189.	DANIDA funded project/09	BFRI
190.	Community based adaptation to climate change through afforestation in Bangladesh	BFRI
191.	Rural development project in fisheries sector/11	BFRI
192.	Community based sustainable management of Tanguar haor/12	BFRI
193.	CREL (Climate Resilience Environmental Livelihood) Project/13	BFRI
194.	Bangladesh Agriculture Research Project/12	BFRI
195.	Protected area co-management project/14	BFRI
196.	Disaster and climate re-management in fisheries project/15	BFRI
197.	Enhanced Coastal Fisheries (Eco fish Bd)	BFRI / June/2014-2019

While the impacts of these implemented projects are varied and the current project did not establish any correlation between implemented projects and increased fisheries production. However, government production data clearly indicated increased fisheries production as shown in the below table (Table 2)

Table 2: Fish production (t) trend and growth rate (%) in Bangladesh

Fish Production Year	Inland Open water	Aquaculture	Inland Total	Marine Total	Grand Total	Growth rate
1971-72	729000	-	729000	85000	814000	-
1972-73	731000	-	731000	87000	818000	0.4914
1973-74	732000	-	732000	88000	820000	0.244499
1974-75	734000	-	734000	90000	824000	0.487805
1975-76	732000	-	732000	89000	821000	-0.36408
1976-77	541000	-	541000	100000	641000	-21.9245
1977-78	533000	-	533000	110000	643000	0.312012
1978-79	529000	-	529000	116000	645000	0.311042
1979-80	524000	-	524000	122000	646000	0.155039
1980-81	524000	-	524000	126000	650000	0.619195
1981-82	556000	-	556000	130000	686000	5.538462
1982-83	584000	-	584000	142000	726000	5.830904
1983-84	472000	117000	589000	165000	754000	3.856749
1984-85	463000	123000	586000	188000	774000	2.65252
1985-86	441799	144723	586522	207401	793923	2.574031
1986-87	431000	166000	597000	218000	815000	2.654791
1987-88	424000	175000	599000	228000	827000	1.472393
1988-89	424140	183505	607645	233281	840926	1.683918
1989-90	423872	192592	616464	239063	855527	1.7363
1990-91	443404	210993	654397	241538	895935	4.723171
1991-92	479742	226863	706605	245474	952079	6.266526
1992-93	532419	237743	770162	250492	1020654	7.202659
1993-94	573376	264190	837566	253044	1090610	6.854037
1994-95	591145	317073	908218	264650	1172868	7.542385
1995-96	609151	379087	988238	269702	1257940	7.253331
1996-97	599900	485864	1085764	274704	1360468	8.150468
1997-98	615949	574812	1190761	272818	1463579	7.579083
1998-99	649418	593202	1242620	309797	1552417	6.069915
1999-00	333799	657120	990919	670465	1661384	7.019184
2000-01	688920	712640	1401560	379497	1781057	7.203211
2001-02	688435	786604	1475039	415420	1890459	6.142532
2002-03	709333	856956	1566289	431908	1998197	5.699039
2003-04	932067	914752	1846819	455207	2302026	15.20516
2004-05	859269	882091	1741360	474597	2215957	-3.73884
2005-06	956686	892049	1848735	479810	2328545	5.080785
2006-07	976604	975969	1952573	487438	2440011	4.786938
2007-08	1027250	1038473	2065723	497573	2563296	5.052641

Fish Production Year	Inland Open water	Aquaculture	Inland Total	Marine Total	Grand Total	Growth rate
2008-09	1088083	1098643	2186726	514644	2701370	5.38658
2009-10	1029937	1351979	2381916	517282	2899198	7.323247
2010-11	1054585	1460769	2515354	546333	3061687	5.604619
2011-12	957095	1726067	2683162	578620	3261782	6.535449
2012-13	961458	1859808	2821266	588988	3410254	4.551868
2013-14	995805	1956925	2952730	595385	3548115	4.042543
2014-15	1023991	2060408	3084399	599846	3684245	3.836685
2015-16	1048242	2203554	3251796	626528	3878324	5.267809
2016-17	1163606	2333352	3496958	637476	4134434	6.603626
2017-18	1216539	2405415	3621954	654687	4276641	3.439576

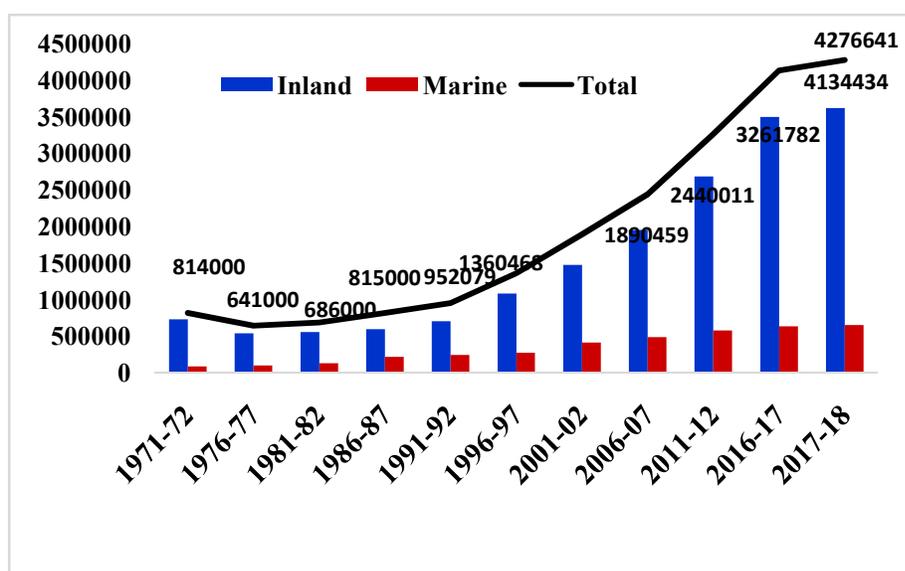


Figure 1: Fish production trend shows that the culture fisheries are boosting in Bangladesh

11. b. Analysis of Peoples' Profile:

Baor Fishery System:

The study found that (Table 3, Figure 2) the total value of livelihood assets was 0.62 for the *Baor* fishers which belong to "Average" category of livelihood conditions. Study also found value 0.63 for Human capital (Age 0.58, Experience 0.84, Training 0.56, Educational status 0.41 and Secondary occupation 0.74) which was belong to "Average" category, 0.78 for Physical capital (Housing condition 0.60, Total land size 0.76, Sanitary condition 0.77, Drinking water source 0.80, Light/energy facility 0.99) which was belong to "Good" category, 0.68 for Natural capital (Respondent perceptions on resource health 0.67, Respondent perception on resource longevity 0.74, Respondent perception on adaptation of modern technologies/ methods 0.63) which was belong to "Good" category, 0.47 for Financial capital (Total household income 0.48 and Household savings 0.46) which was belong to "Average" category and 0.53 for Social capital (Networks & connectedness 0.73, Membership in fishers association 1.00, Membership in different organizations 0.23, family type 0.16) which was also belong to "Average" category.

Table 3: Livelihood capital of Baor Fishery System

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	Age (Year)	0.5827	0.62746	0.615586333
	Experience (Year)	0.8446		
	Training	0.56		
	Educational status	0.41		
	Secondary occupation	0.74		
Physical capital	Housing condition	0.5997	0.78308	
	Total land size(own)	0.7592		
	Sanitary condition	0.7671		
	Drinking water source	0.7994		
	Light/energy source facility	0.99		
Natural capital	Respondent perception on resource health/ environment	0.6722	0.681266667	
	Respondent perception on resource longevity/ sustainability	0.7393		
	Respondent perception on adaptation of modern technology/ methods	0.6323		
Financial capital	Total HH income (tk)	0.4526	0.4563	
	HH savings (tk)	0.46		
Social capital	Networks & connectedness	0.7293	0.529825	
	Membership in Fishers Association	1		
	Membership in different organizations	0.23		
	Family type	0.16		

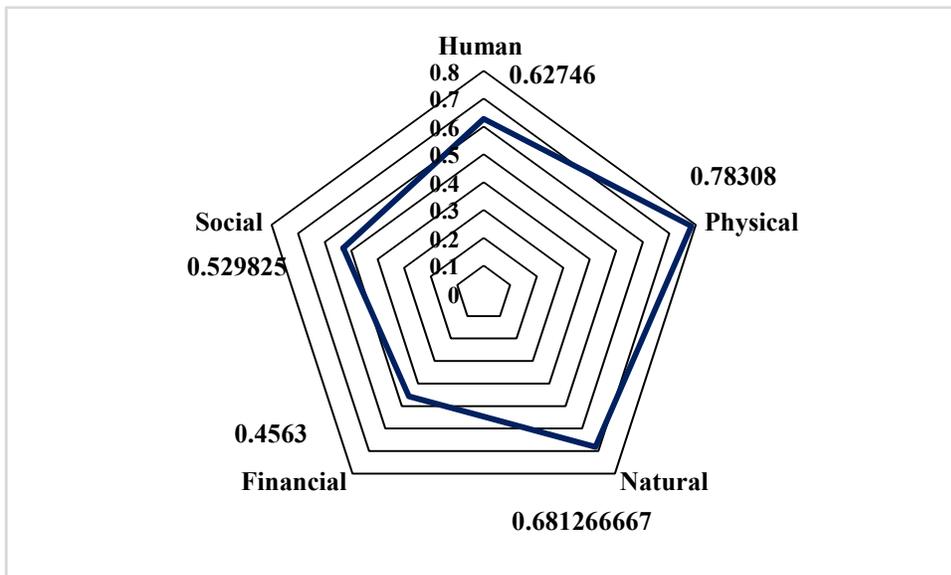


Figure 2: Livelihood Pentagon of Baor Fishery System

Haor Fishery System:

The study found that (Table 4, Figure 3) the total value of livelihood assets was 0.59 for the *Haor* fishers which belong to “Average” category of livelihood conditions. Study also found value 0.63 for Human capital (Age 0.71, Experience 0.63, Training 0.51, Educational status 0.53 and Secondary occupation 0.76) which was belong to “Average” category, 0.75 for Physical capital (Housing condition 0.49, Total land size 0.75, Sanitary condition 0.68, Drinking water source 0.87, Light/energy facility 0.94) which was belong to “Good” category, 0.63 for Natural capital (Respondent perceptions on resource health 0.62, Respondent perception on resource longevity 0.69, Respondent perception on adaptation of modern technologies/ methods 0.58) which was belong to “Average” category, 0.38 for Financial capital (Total household income 0.45 and Household savings 0.31) which was belong to “Average” category and 0.57 for Social capital (Networks & connectedness 0.66, Membership in fishers association 0.57, Membership in different organizations 0.66, family type 0.38) which was also belong to “Average” category.

Table 4: Livelihood capital of Haor Fishery System

Indicators	Indicator weights	Capital value	Livelihood asset value
Age (Year)	0.7131	0.62778	0.590682333
Experience (Year)	0.6258		
Training	0.51		
Educational status	0.53		
Secondary occupation	0.76		
Housing condition	0.4931	0.74644	
Total land size(own)	0.7524		
Sanitary condition	0.6793		
Drinking water source	0.8674		
Light/energy source facility	0.94	0.630566667	
Respondent perception on resource health/ environment	0.6194		
Respondent perception on resource longevity/ sustainability	0.6891		
Respondent perception on adaptation of modern technology/ methods	0.5832	0.3813	
Total HH income (tk)	0.4526		
HH savings (tk)	0.31	0.567325	
Networks & connectedness	0.6593		
Membership in Fishers Association	0.57		
Membership in different organizations	0.66		
Family type	0.38		

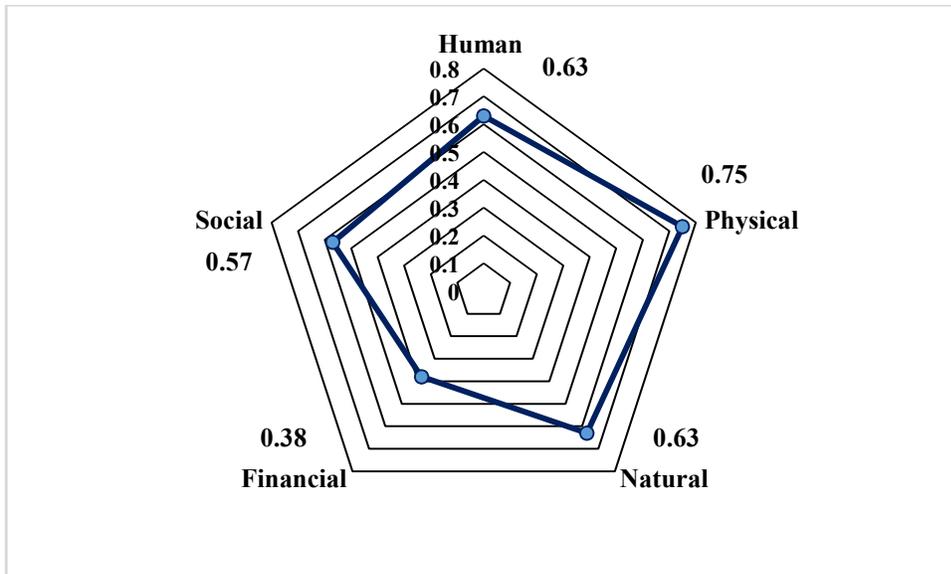


Figure 3: Livelihood pentagon of Haor Fishery System

Beel Fishery System:

The present study found that (Table 5, Figure 4) the total value of livelihood assets was 0.56 for the *Beel* fishers which belong to “Average” category of livelihood conditions. Study also found value 0.63 for Human capital (Age 0.72, Experience 0.60, Training 0.34, Educational status 0.66 and Secondary occupation 0.81) which was belong to “Average” category, 0.74 for Physical capital (Housing condition 0.58, Total land size 0.65, Sanitary condition 0.66, Drinking water source 0.82, Light/energy facility 1.00) which was belong to “Good” category, 0.66 for Natural capital (Respondent perceptions on resource health 0.62, Respondent perception on resource longevity 0.72, Respondent perception on adaptation of modern technologies/ methods 0.64) which was belong to “Average” category, 0.38 for Financial capital (Total household income 0.50 and Household savings 0.27) which was belong to “Average” category and 0.40 for Social capital (Networks & connectedness 0.75, Membership in fishers association 0.34, Membership in different organizations 0.25, family type 0.27) which was also belong to “Average” category.

Table 5: Livelihood capital of Beel Fishery System

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	Age (Year)	0.7169	0.62528	0.563406333
	Experience (Year)	0.5995		
	Training	0.34		
	4.Educational status	0.66		
	5.Secondary occupation	0.81		
Physical capital	1.Housing condition	0.5823	0.74396	
	2.Total land size(own)	0.6549		
	3.Sanitary condition	0.6594		

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
	4.Drinking water source	0.8232		
	5.Light/energy source facility	1		
Natural capital	1.Respondent perception on resource health/ environment	0.6221	0.660966667	
	2.Respondent perception on resource longevity/ sustainability	0.7224		
	3.Respondent perception on adaptation of modern technology/ methods	0.6384		
Financial capital	1.Total HH income (tk)	0.4989	0.38445	
	2.HH savings (tk)	0.27		
Social capital	1.Networks & connectedness	0.7495	0.402375	
	2.Membership in Fishers Association	0.34		
	3.Membership in different organizations	0.25		
	4.Family type	0.27		

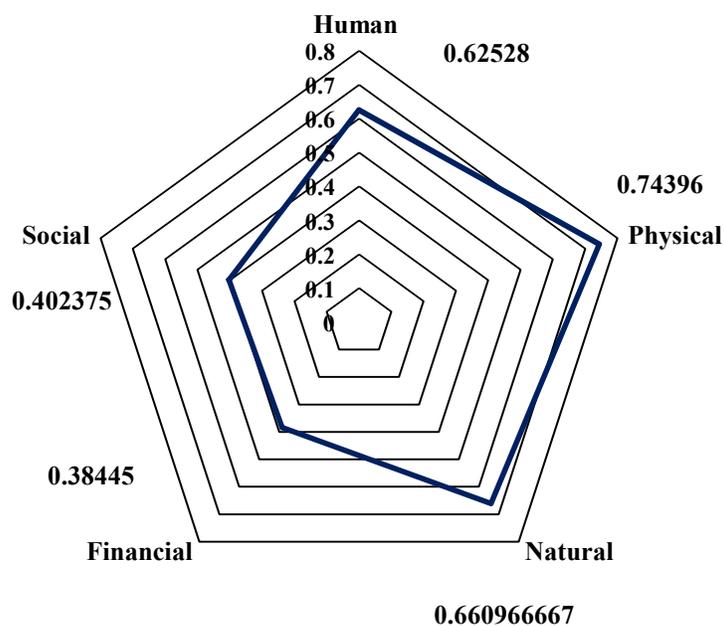


Figure 4: Livelihood pentagon of Beel Fishery System

Aquaculture Sector

The study found that (Table 6, Figure 5) the total value of livelihood assets was 0.74 for the people who were involved in fish culture which belong to “Good” category of livelihood conditions. Study also found value 0.69 for Human capital (Age 0.76, Experience 0.65, Training 0.75, Educational status 0.76 and Secondary occupation 0.52) which was belong to “Average” category, 0.90 for Physical capital (Housing condition 0.78, Total land size 0.91, Sanitary condition 0.88, Drinking water source 0.93, Light/energy facility 1.00) which was belong to “Good” category, 0.79 for Natural capital (Respondent perceptions on resource health 0.80, Respondent perception on resource longevity 0.80, Respondent perception on adaptation of modern technologies/ methods 0.78) which was belong to “Good” category, 0.91 for Financial capital (Total household income 0.87 and Household savings 0.96) which was also belong to “Good” category and 0.42 for Social capital (Networks & connectedness 0.86, Membership in fishers association 0.06, Membership in different organizations 0.39, family type 0.37) which was belong to “Average” category.

Table 6: Livelihood capital of Aquaculture Sector

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.7631	0.68924	0.743280333
	2.Time of involvement/Experience (Year)	0.6531		
	3.Training	0.75		
	4.Educational status	0.76		
	5.Secondary occupation	0.52		
Physical capital	1.Housing condition	0.7798	0.89952	
	2.Total land size(own)	0.9116		
	3.Sanitary condition	0.8776		
	4.Drinking water source	0.9286		
	5.Light/energy source facility	1		
Natural capital	1.Respondent perception on resource health/ environment	0.8041	0.794566667	
	2.Respondent perception on resource longevity/ sustainability	0.7968		
	3.Respondent perception on adaptation of modern technology/ methods	0.7828		
Financial capital	1.Total HH income (tk)	0.8674	0.9137	
	2.HH savings (tk)	0.96		
Social capital	1.Networks & connectedness	0.8575	0.419375	
	2.Membership in Fishers Association	0.06		
	3.Membership in different organizations	0.39		
	4.Family type	0.37		

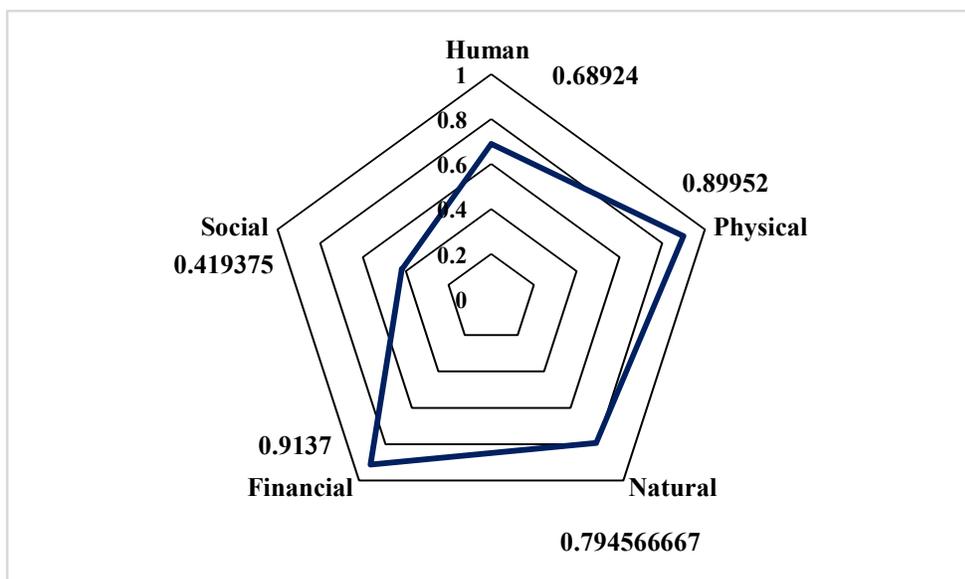


Figure 5: Livelihood pentagon of Aquaculture Sector

Fish Hatchery Sector

Study found that (Table 7, Figure 6) the total value of livelihood assets was 0.73 for the *Haor* fishers which belong to “Good” category of livelihood conditions. Study also found value 0.64 for Human capital (Age 0.69, Experience 0.75, Training 0.79, Educational status 0.86 and Secondary occupation 0.11) which was belong to “Average” category, 0.94 for Physical capital (Housing condition 0.82, Total land size 0.94, Sanitary condition 0.94, Drinking water source 1.00, Light/energy facility 1.00) which was belong to “Good” category, 0.73 for Natural capital (Respondent perceptions on resource health 0.79, Respondent perception on resource longevity 0.70, Respondent perception on adaptation of modern technologies/ methods 0.69) which was belong to “Good” category, 0.87 for Financial capital (Total household income 0.85 and Household savings 0.88) which was also belong to “Good” category and 0.47 for Social capital (Networks & connectedness 0.87, Membership in fishers association 0.00, Membership in different organizations 0.59, family type 0.42) which was belong to “Average” category.

Table 7: Livelihood capital of Fish Hatchery Sector

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.6929	0.64068	0.728194667
	2.Time of involvement / Experience (Year)	0.7505		
	3.Training	0.79		
	4.Educational status	0.86		
	5.Secondary occupation	0.11		
Physical capital	1.Housing condition	0.8206	0.93896	
	2.Total land size(own)	0.9354		
	3.Sanitary condition	0.9388		
	4.Drinking water source	1		
	5.Light/energy source facility	1		

Natural capital	1.Respondent perception on resource health/ environment	0.7858	0.725933333
	2.Respondent perception on resource longevity/ sustainability	0.7029	
	3.Respondent perception on adaptation of modern technology/ methods	0.6891	
Financial capital	1.Total HH income (tk)	0.8504	0.8652
	2.HH savings (tk)	0.88	
Social capital	1.Networks & connectedness	0.8708	0.4702
	2.Membership in Fishers Association	0	
	3.Membership in different organizations	0.59	
	4.Family type	0.42	

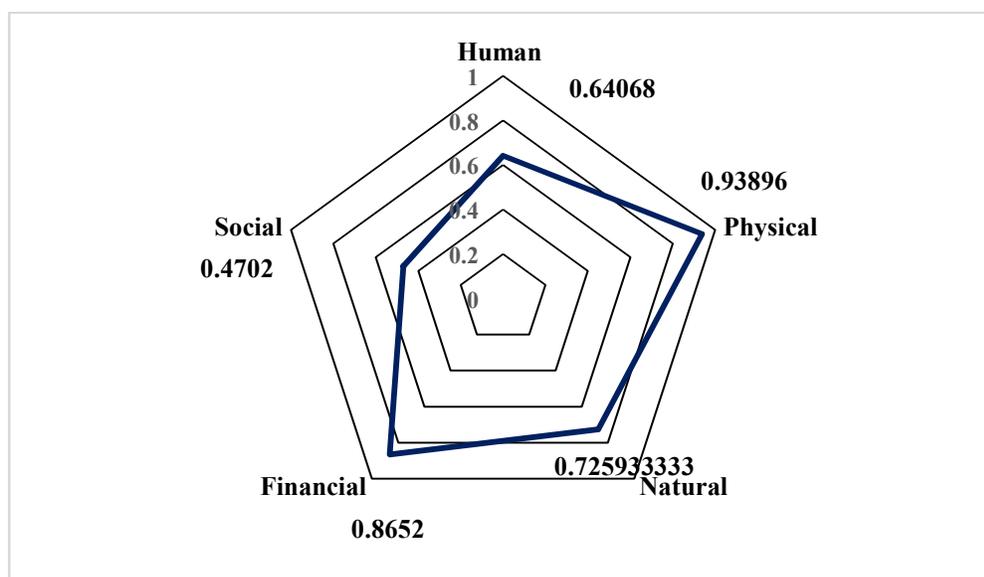


Figure 6: Livelihood pentagon of Fish Hatchery Sector

Dry Fish Sector

The study found that (Table 8, Figure 7) the total value of livelihood assets was 0.55 for the people who are involved in fish drying process which belong to “Average” category of livelihood conditions. Study also found value 0.55 for Human capital (Age 0.85, Experience 0.60, Training 0.32, Educational status 0.41 and Secondary occupation 0.59) which was belong to “Average” category, 0.65 for Physical capital (Housing condition 0.50, Total land size 0.64, Sanitary condition 0.66, Drinking water source 0.70, Light/energy facility 0.78) which was belong to “Average” category, 0.64 for Natural capital (Respondent perceptions on resource health 0.64, Respondent perception on resource longevity 0.64, Respondent perception on adaptation of modern technologies/ methods 0.63) which was belong to “Average” category, 0.39 for Financial capital (Total household income 0.55 and Household savings 0.23) which was belong to “Average” category and 0.54 for Social capital (Networks & connectedness 0.63, Membership in fishers association 0.88, Membership in different organizations 0.06, family type 0.58) which was also belong to “Average” category.

Table 8: Livelihood capital of Dry Fish Sector

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.8476	0.55422	0.554061
	2.Time of involvement / Experience (Year)	0.6035		
	3.Training	0.32		
	4.Educational status	0.41		
	5.Secondary occupation	0.59		
Physical capital	1.Housing condition	0.4995	0.65446	
	2.Total land size(own)	0.636		
	3.Sanitary condition	0.6594		
	4.Drinking water source	0.6974		
	5.Light/energy source facility	0.78		
Natural capital	1.Respondent perception on resource health/ environment	0.6361	0.6372	
	2.Respondent perception on resource longevity/ sustainability	0.6423		
	3.Respondent perception on adaptation of modern technology/ methods	0.6332		
Financial capital	1.Total HH income (tk)	0.5459	0.38795	
	2.HH savings (tk)	0.23		
Social capital	1.Networks & connectedness	0.6259	0.536475	
	2.Membership in Fishers Association	0.88		
	3.Membership in different organizations	0.06		
	4.Family type	0.58		

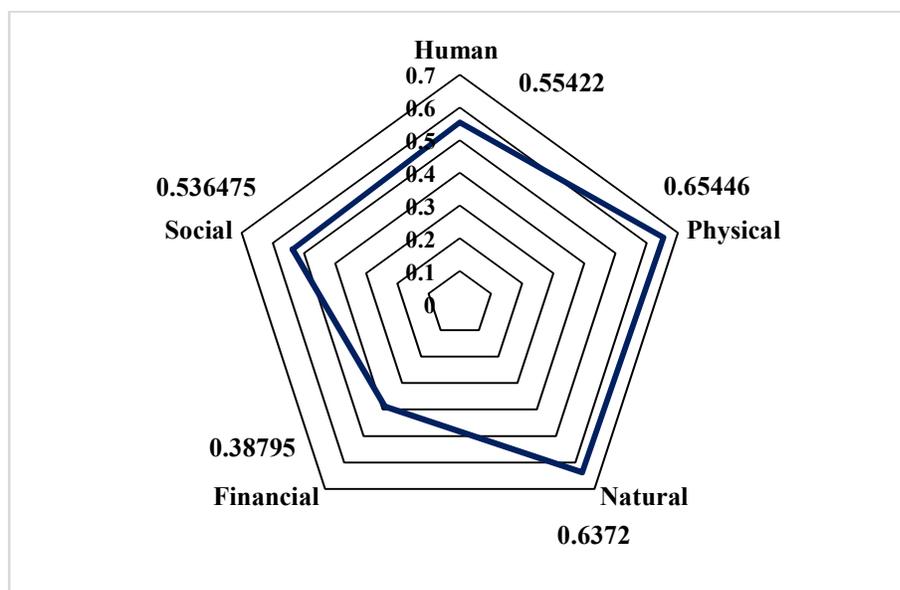


Figure 7: Livelihood pentagon of Dry Fish Sector

The Hilsa Fishery

The study found that (Table 9, Figure 8) the total value of livelihood assets was 0.49 for the Hilsha fishers which belong to “Average” category of livelihood conditions. Study also found value 0.48 for Human capital (Age 0.81, Experience 0.65, Training 0.30, Educational status 0.38 and Secondary occupation 0.24) which was belong to “Average” category, 0.57 for Physical capital (Housing condition 0.42, Total land size 0.59, Sanitary condition 0.55, Drinking water source 0.71, Light/energy facility 0.57) which was belong to “Average” category, 0.67 for Natural capital (Respondent perceptions on resource health 0.67, Respondent perception on resource longevity 0.67, Respondent perception on adaptation of modern technologies/ methods 0.67) which was belong to “Good” category, 0.40 for Financial capital (Total household income 0.47 and Household savings 0.33) which was belong to “Average” category and 0.34 for Social capital (Networks & connectedness 0.53, Membership in fishers association 0.00, Membership in different organizations 0.38, family type 0.44) which was also belong to “Average” category.

Table 9: Livelihood capital of The Hilsa Fishery

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.8146	0.4761	0.490780333
	2.Time of involvement / Experience (Year)	0.6459		
	3.Training	0.3		
	4.Educational status	0.38		
	5.Secondary occupation	0.24		
Physical capital	1.Housing condition	0.4191	0.56856	
	2.Total land size(own)	0.5946		
	3.Sanitary condition	0.5515		
	4.Drinking water source	0.7076		
	5.Light/energy source facility	0.57		
Natural capital	1.Respondent perception on resource health/ environment	0.6691	0.670166667	
	2.Respondent perception on resource longevity/ sustainability	0.6688		
	3.Respondent perception on adaptation of modern technology/ methods	0.6726		
Financial capital	1.Total HH income (tk)	0.4719	0.40095	
	2.HH savings (tk)	0.33		
Social capital	1.Networks & connectedness	0.5325	0.338125	
	2.Membership in Fishers Association	0		
	3.Membership in different organizations	0.38		
	4.Family type	0.44		

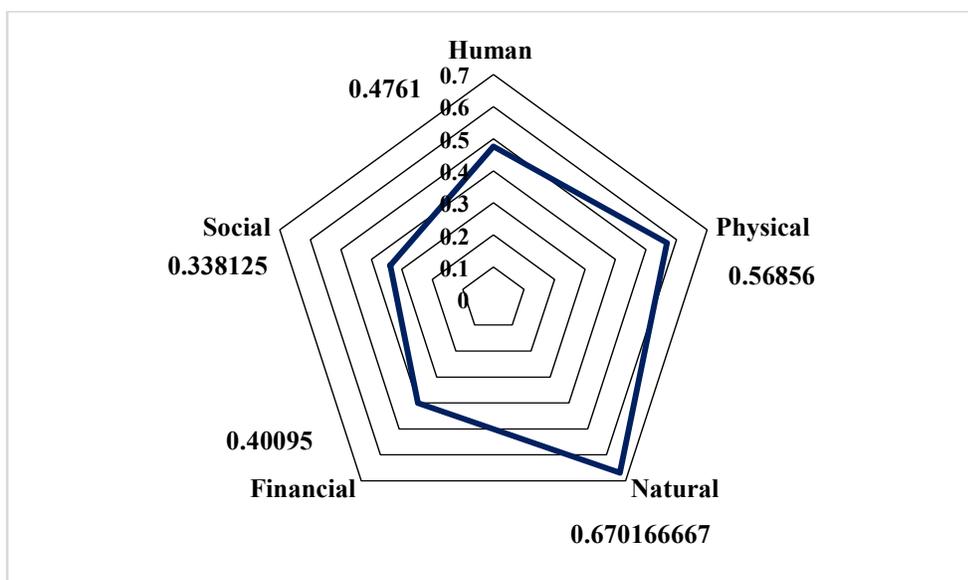


Figure 8: Livelihood pentagon of The Hilsa Fishery

Fish Feed Industry Worker

The study found that (Table 10, Figure 9) the total value of livelihood assets was 0.57 for the people who were worked in different feed industries which belong to “Average” category of livelihood conditions. Study also found value 0.56 for Human capital (Age 0.85, Experience 0.71, Training 0.00, Educational status 0.65 and Secondary occupation 0.62) which was belong to “Average” category, 0.73 for Physical capital (Housing condition 0.58, Total land size 0.68, Sanitary condition 0.85, Drinking water source 0.79, Light/energy facility 0.77) which was belong to “Good” category, 0.64 for Natural capital (Respondent perceptions on resource health 0.59, Respondent perception on resource longevity 0.55, Respondent perception on adaptation of modern technologies/ methods 0.80) which was belong to “Average” category, 0.54 for Financial capital (Total household income 0.55 and Household savings 0.52) which was belong to “Average” category and 0.36 for Social capital (Networks & connectedness 0.73, Membership in fishers association 0.00, Membership in different organizations 0.00, family type 0.72) which was also belong to “Average” category.

Table 10: Livelihood capital of Fish Feed Industry Worker

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.8474	0.56456	0.568071667
	2.Time of involvement / Experience (Year)	0.7054		
	3.Training	0		
	4.Educational status	0.65		
	5.Secondary occupation	0.62		
Physical capital	1.Housing condition	0.5757	0.73254	
	2.Total land size(own)	0.6774		
	3.Sanitary condition	0.8504		
	4.Drinking water source	0.7892		
	5.Light/energy source facility	0.77		

Natural capital	1.Respondent perception on resource health/ environment	0.5918	0.644733333
	2.Respondent perception on resource longevity/ sustainability	0.5453	
	3.Respondent perception on adaptation of modern technology/ methods	0.7971	
Financial capital	1.Total HH income (tk)	0.5522	0.5361
	2.HH savings (tk)	0.52	
Social capital	1.Networks & connectedness	0.7297	0.362425
	2.Membership in Fishers Association	0	
	3.Membership in different organizations	0	
	4.Family type	0.72	

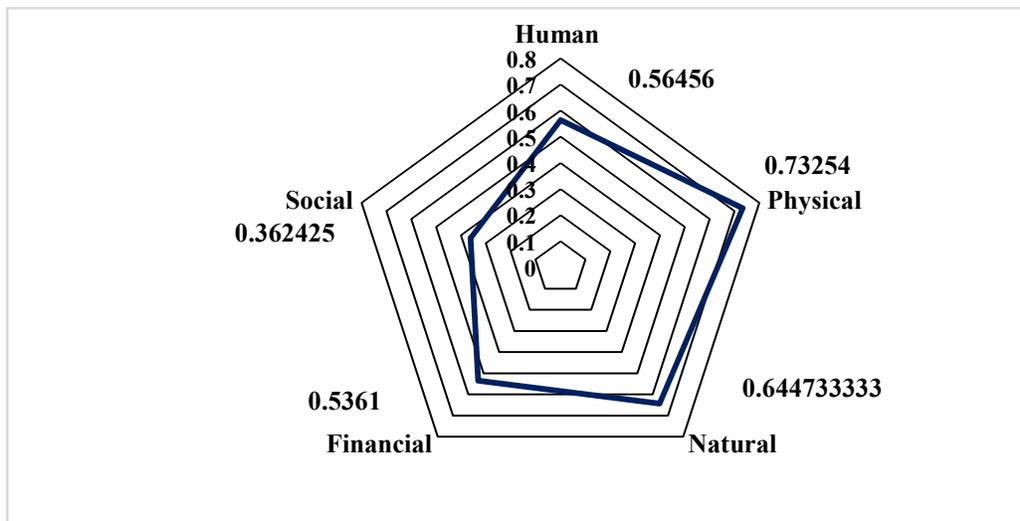


Figure 9: Livelihood pentagon of Fish Feed Industry Worker

Fish Processing Industry Worker

The study found that (Table 11, Figure 10) the total value of livelihood assets was 0.61 for the people who were worked in different fish processing plant which belong to “Average” category of livelihood conditions. Study also found value 0.63 for Human capital (Age 0.58, Experience 0.84, Training 0.56, Educational status 0.41 and Secondary occupation 0.74) which was belong to “Average” category, 0.78 for Physical capital (Housing condition 0.60, Total land size 0.76, Sanitary condition 0.77, Drinking water source 0.80, Light/energy facility 0.99) which was belong to “Good” category, 0.68 for Natural capital (Respondent perceptions on resource health 0.67, Respondent perception on resource longevity 0.74, Respondent perception on adaptation of modern technologies/ methods 0.63) which was also belong to “Good” category, 0.44 for Financial capital (Total household income 0.49 and Household savings 0.39) which was belong to “Average” category and 0.53 for Social capital (Networks & connectedness 0.73, Membership in fishers association 1.00, Membership in different organizations 0.23, family type 0.16) which was also belong to “Average” category.

Table 11: Livelihood capital of Fish Processing Industry Worker

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.5827	0.62746	0.612216333
	2.Time of involvement / Experience (Year)	0.8446		
	3.Training	0.56		
	4.Educational status	0.41		
	5.Secondary occupation	0.74		
Physical capital	1.Housing condition	0.5997	0.78308	
	2.Total land size(own)	0.7592		
	3.Sanitary condition	0.7671		
	4.Drinking water source	0.7994		
	5.Light/energy source facility	0.99		
Natural capital	1.Respondent perception on resource health/ environment	0.6722	0.681266667	
	2.Respondent perception on resource longevity/ sustainability	0.7393		
	3.Respondent perception on adaptation of modern technology/ methods	0.6323		
Financial capital	1.Total HH income (tk)	0.4889	0.43945	
	2.HH savings (tk)	0.39		
Social capital	1.Networks & connectedness	0.7293	0.529825	
	2.Membership in Fishers Association	1		
	3.Membership in different organizations	0.23		
	4.Family type	0.16		

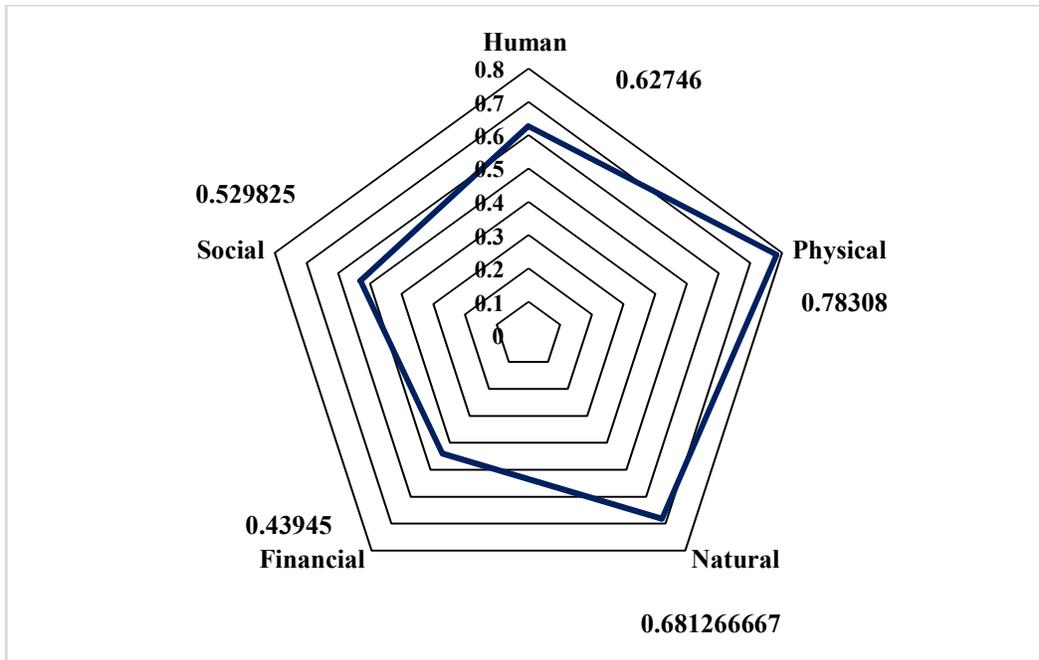


Figure 10: Livelihood pentagon of Fish Processing Industry Worker

Artisanal fishery

The study found that (Table 12, Figure 11) the total value of livelihood assets was 0.59 for the people who were involved in artisanal fishing which belong to “Average” category of livelihood conditions. Study also found value 0.59 for Human capital (Age 0.73, Experience 0.67, Training 0.68, Educational status 0.31 and Secondary occupation 0.57) which was belong to “Average” category, 0.65 for Physical capital (Housing condition 0.59, Total land size 0.64, Sanitary condition 0.62, Drinking water source 0.73, Light/energy facility 0.66) which was belong to “Average” category, 0.72 for Natural capital (Respondent perceptions on resource health 0.71, Respondent perception on resource longevity 0.76, Respondent perception on adaptation of modern technologies/ methods 0.70) which was belong to “Good” category, 0.53 for Financial capital (Total household income 0.63 and Household savings 0.43) which was belong to “Average” category and 0.46 for Social capital (Networks & connectedness 0.64, Membership in fishers association 0.06, Membership in different organizations 0.83, family type 0.31) which was also belong to “Average” category.

Table 12: Livelihood capital of Artisanal Fishery

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.7268	0.59114	0.590915333
	2.Time of involvement / Experience (Year)	0.6689		
	3.Training	0.68		
	4.Educational status	0.31		
	5.Secondary occupation	0.57		
Physical capital	1.Housing condition	0.5928	0.64942	
	2.Total land size(own)	0.6413		
	3.Sanitary condition	0.6182		

	4.Drinking water source	0.7348	
	5.Light/energy source facility	0.66	
Natural capital	1.Respondent perception on resource health/ environment	0.7122	0.722466667
	2.Respondent perception on resource longevity/ sustainability	0.7593	
	3.Respondent perception on adaptation of modern technology/ methods	0.6959	
Financial capital	1.Total HH income (tk)	0.632	0.531
	2.HH savings (tk)	0.43	
Social capital	1.Networks & connectedness	0.6422	0.46055
	2.Membership in Fishers Association	0.06	
	3.Membership in different organizations	0.83	
	4.Family type	0.31	

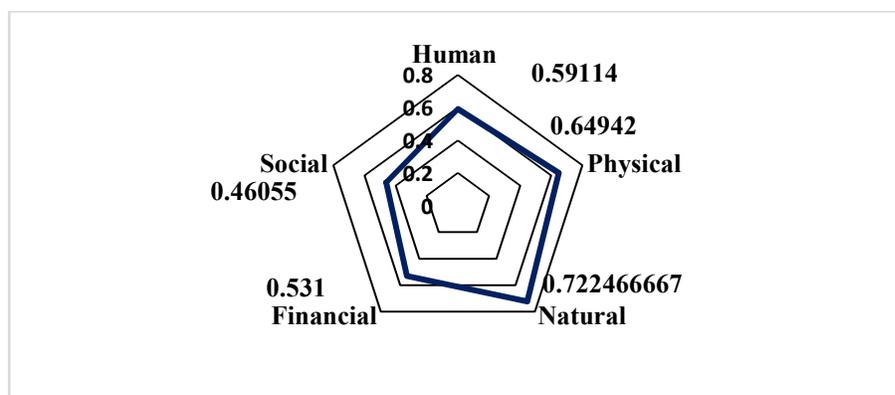


Figure 11: Livelihood pentagon of Artisanal Fishery

Kaptai Lake Fishery

The study found that (Table 13, Figure 12) the total value of livelihood assets was 0.49 for the Kaptai lakefishers which belong to “Average” category of livelihood conditions. Study also found value 0.66 for Human capital (Age 0.70, Experience 0.59, Training 0.96, Educational status 0.64 and Secondary occupation 0.39) which was belong to “Average” category, 0.51 for Physical capital (Housing condition 0.44, Total land size 0.65, Sanitary condition 0.60, Drinking water source 0.64, Light/energy facility 0.24) which was belong to “Average” category, 0.57 for Natural capital (Respondent perceptions on resource health 0.53, Respondent perception on resource longevity 0.56, Respondent perception on adaptation of modern technologies/ methods 0.64) which was belong to “Average” category, 0.40 for Financial capital (Total household income 0.45 and Household savings 0.35) which was also belong to “Average” category and 0.32 for Social capital (Networks & connectedness 0.56, Membership in fishers association 0.00, Membership in different organizations 0.14, family type 0.59) which was belong to “Poor” category.

Table 13: Livelihood capital of Kaptai Lake Fishery

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.7006	0.65662	0.494046667
	2.Time of involvement / Experience (Year)	0.5925		
	3.Training	0.96		
	4.Educational status	0.64		
	5.Secondary occupation	0.39		
Physical capital	1.Housing condition	0.4425	0.51478	
	2.Total land size(own)	0.6519		
	3.Sanitary condition	0.5979		
	4.Drinking water source	0.6416		
	5.Light/energy source facility	0.24		
Natural capital	1.Respondent perception on resource health/ environment	0.5255	0.574833333	
	2.Respondent perception on resource longevity/ sustainability	0.5626		
	3.Respondent perception on adaptation of modern technology/ methods	0.6364		
Financial capital	1.Total HH income (tk)	0.4521	0.40105	
	2.HH savings (tk)	0.35		
Social capital	1.Networks & connectedness	0.5618	0.32295	
	2.Membership in Fishers Association	0		
	3.Membership in different organizations	0.14		
	4.Family type	0.59		

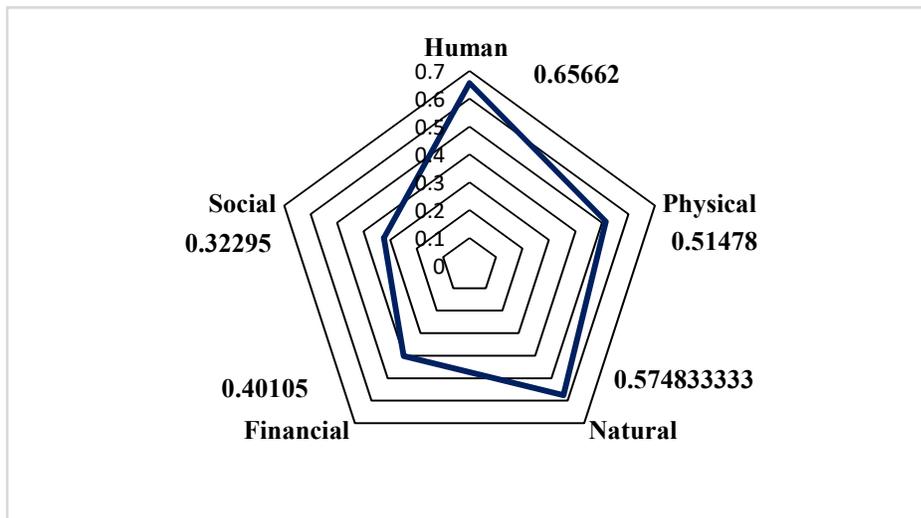


Figure 12: Livelihood pentagon of Kaptai Lake Fishery

Fish Retailers of Value Chain

The study found that (Table 14, Figure 13) the total value of livelihood assets of the fish retailers was 0.60 belonging to “Average” livelihood conditions. However, in the studied area, the Human capital value was 0.46(Age 0.74, Experience 0.71, Training 0.31, Educational status 0.52 and Secondary occupation 0.0) belonging “Average” category, Physical capital 0.84 (Housing condition 0.63, Total land size 0.84, Sanitary condition 0.79, Drinking water source 0.92, Light/energy facility 1.0) which was belong to “Good” category, Natural capital 0.67(Respondent perceptions on resource health 0.67, Respondent perception on resource longevity 0.66, Respondent perception on adaptation of modern technologies 0.68) which was belong to “Good” category, 0.70 for Financial capital (Total household income 0.67 and Household savings 0.72) which was belong to “Good” category and 0.34 for Social capital (Networks & connectedness 0.60, Membership in fishers association 0.0, Membership in different organizations 0.23, family type 0.52) which was also belong to “Average” category.

Table 14: Livelihood pentagon of Fish Retailers of Value Chain

Capitals	Indicators	Indicator weights	Capital value	Livelihood asset value
Human capital	1.Age distribution (Year)	0.7359	0.45512	0.598248333
	2.Time of involvement / Experience (Year)	0.7097		
	3.Training	0.31		
	4.Educational status	0.52		
	5.Secondary occupation	0		
Physical capital	1.Housing condition	0.6347	0.83738	
	2.Total land size(own)	0.8412		
	3.Sanitary condition	0.7892		
	4.Drinking water source	0.9218		
	5.Light/energy source facility	1		
Natural capital	1.Respondent perception on resource health/ environment	0.6658	0.666866667	
	2.Respondent perception on resource longevity/ sustainability	0.6561		
	3.Respondent perception on adaptation of modern technology/ methods	0.6787		
Financial capital	1.Total HH income (tk)	0.6711	0.69555	
	2.HH savings (tk)	0.72		
Social capital	1.Networks & connectedness	0.5953	0.336325	
	2.Membership in Fishers Association	0		
	3.Membership in different organizations	0.23		
	4.Family type	0.52		

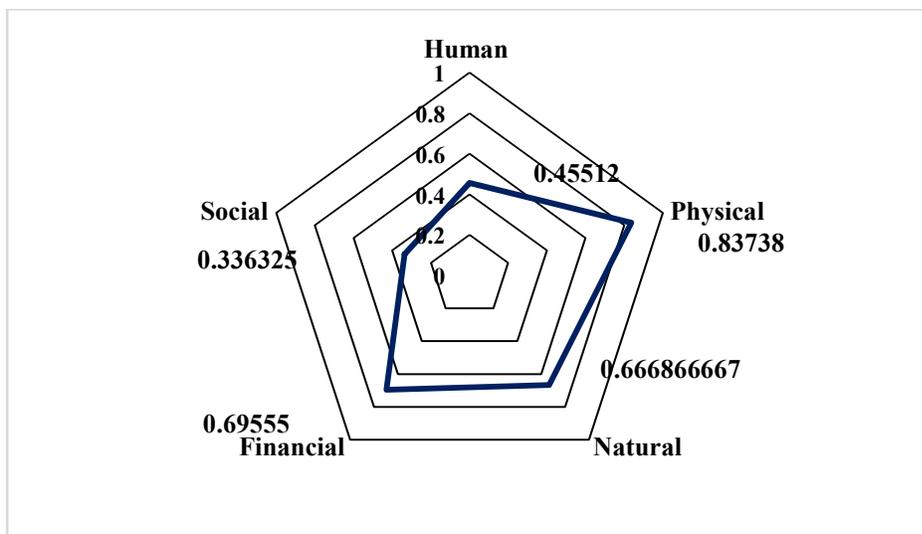


Figure 13: Livelihood pentagon of Fish Retailers of Value Chain

11. c. Recommendations from different stakeholders

Baor Fishery Sector

i. Need absolute Jalmahal Policy:Jalmahal is a one kind of water body or wetland where having water throughout the year or few time of the water that are known are haor, baor, beel, small water body, river etc. it is open water body or closed water body. In case of open water body have no boundary and for closed water body have boundary. The people who catch fish and sell in the market for maintain livelihood is called fisherman. If the fisherman member of local cooperative directorates so that they lease the jalmahal. Bangladesh have many baor but production of these baor less due to proper management. If maintain all policy for management for baor that production of fish are increasing. All problems are management jalmahal policy such as if full fill the Jalmahal by soil that excavation local committee or responsible committee. Fish are releasing in definite time and fish harvesting are in definite time. So more production of fish need absolute Jalmahal Policy.

ii. Need based fishermen profile:Need all fishermen profile for proper management of baor. From fishermen profile know all characteristic of fishermen, livelihood status, family condition can easily be retrieved etc.

iii. Ideal Baor management technique: The suggestions includedirectly manage of government assistance through Department of Fisheries, manage by fisheries themselves under license to group off listed member of definite time, continuance of old system of license out to private bidder thus singly manage by the lease holder, many government and non-government organization can also play important role for haor management.

iv. Control overdoses uses of pesticide:Chemical pesticides in agriculture have created serious environmental effects. These pesticides used in producing vegetables and fruits or agriculture purpose. Ultimately these pesticides go to water body and deteriorate water quality then all aquatic organism are destroyed due the action of pesticide and day by day production of baor are reducing. For control of pesticide, need optimum use in agricultural sector or bio-pesticides that are not harmful for aquatic organism. Control agriculture waste water that are washed away in river, haor, baor, pond and other water body.

v. Re-excavation of baor and connected canal with adjacent natural open waterbodies: Day by day water level are reduce in baorspatially water body even dry out many water body. Beside upstream water carries on siltation in many water body like baor and day by day the bottom of the water body high. So water capacity is reduced and necessary to Re-excavation for live on aquatic organism beside need regularly water flow and connected other large water bodies with adjacent natural open waterbodies. Due to Re-excavation of haor water holding capacity and biodiversity are increasing.

vi. Establish several fish sanctuaries:Fish sanctuary means to establish and maintain a particular area in the water body as a permanent shelter for protection of fish for natural propagation. Fish sanctuary is a risk free shelter of fishes. Size/Area of fish sanctuary is positively related with the size of target fish sp. So we should have established fish sanctuary in the river for river fishes and in the Beel for Beel fishes. Place size of fish sanctuary should be selected by considering opinion of local fishermen and their livelihood. Fish sanctuary is established in such a place where fishing can be prohibited or restricted seasonally or round the year. fish sanctuaries Increase fish production, Protect the fish from genetic pollution, Provide breeding and feeding ground, Enhanced and a preserving aquatic biodiversity, It helps protect breeding and nursery ground and helps produce brood fish and other fish and enhance fish diversity, Increasing the abundance of threatened fish species, Full fill the demand of fish seed, Protect many other aquatic fauna and flora etc.

vii. Maintain Biodiversity:Biodiversity is the variety and variability of life on Earth. Maintain Biodiversity is very necessary for baor ecosystem. Because baor aquaculture depend on biodiversity. If biodiversity are degraded in baor water body then ecosystem may face imbalance. Biodiversity helps fish culture in baor water body like provide natural habitat. Biodiversity is often used as a measure of the health of biological system. Bangladesh is very rich in fish diversity. Due to over exploitation, excessive use pesticide, polluted water damage biodiversity. So it is needed to proper maintenance of biodiversity for good aquaculture.

Haor Fishery System

Haor is a wetland ecosystem which is physically a bowl or saucer shaped shallow depression in the north eastern part of Bangladesh. Haor is a demanding sector for aquaculture development. We can assure development of haor area by following some moves-

- i. Research on Indian coal mining effect on flora and fauna of Bangladesh haor region:The Shari-Goyain River is a trans-boundary river in the north-eastern region of Bangladesh, come from the hilly areas of the Meghalaya State of India. The river enters into Bangladesh through northern part of Jaintiapur upazila in Sylhet district and flows south-westward of Sylhet district through Jaintiapur, Gowainghat, Sylhet Sadar and Chhatak upazilas. The river meets the Surma River near Satak upazila of Sunamganj district. Thus, the river supplies water in the *haor* region of Bangladesh. In Meghalaya, several large mine projects are currently running, ranging from open-pit, hard rock mines to strip mines for extracting coal. These large-scale projects release coal mine drainage which finds their ways into the Shari-Goyain River and flows downstream. Thus the river transports various types of contaminants into Bangladesh from India through northern part of Jaintiapur upazila which possibly have the potential to impact fish and wildlife resources through chemical and heavy metal pollution of vast areas of aquatic habitat in the *haor* region of Bangladesh.
- ii. Participation of genuine fisherman:There are full time and seasonal fishermen present in every fishing community. Water body should be leased out to real fishermen. In management program,real fisherman's participation should be ensured.

- iii. Controlled use of insecticide and pesticide: Insecticides and pesticides are harshly used in cropland of haor area which is critical for haor ecology. It is our duty to use herbicides instead of harmful pesticides in within acceptable limit.
- iv. Effective implementation fish laws and regulations: There are sufficient laws and regulations for protection and conservation of fish and fisheries resources. Now, proper application of these laws and regulations is the burning issue.
- v. Co-ordination between the haor development partners: There should be strong linkage among different partners (MoFL, MoL, BWDB and beneficiaries of the haor). All management and development activities and plan should be done with the active participation of all stakeholders.
- vi. Dewatering must be prohibited: Dewatering even second time dewatering is done by the lease holder which is very dangerous for biodiversity. It should be strictly prohibited.
- vii. Siltation problem: Need regular excavation to improve the siltation problem.
- viii. Re-build haor embankment efficiently: During flash flood, most of the years embankments are cut down, flash flood occurs in the haor, crops become damaged. As a result, gasses harmful to aquatic lives increase abruptly and aquatic lives including fish die. So, embankment should be made efficiently.

Beel Fishery System

- i. Habitat fragmentation should be stopped: Land owners in the beels make ponds with high embankment for getting more fish. This makes the original beel fragmented, normal fish migration hampered, grazing field area reduced. Such habitat fragmentation should not be done in the beel fishery system.
- ii. Fully dewatering of the beel/floodplain for Agriculture should be stopped: When underground water level goes down, some farmer use boring pipe to let the beel/floodplain water to go down underground which is deadly to aquatic organism. It should be stopped.
- iii. Indiscriminate use of pesticides should be prohibited to prevent from aquatic environmental degradation: Indiscriminate use of pesticides should be prohibited for aquatic organism because more use of pesticide in land or water destroy beneficial organism. Pesticides consume crop human cause many disease and ultimately destroy our ecosystem over use of pesticides.
- iv. Sluice gate should be monitored by the joint management committee: Sluice gate is used to control water level in beel. Water is beneficial to fish and other aquatic organism but excess water is harmful to crops. Previously, there was no embankment or sluice gate in the beel. Due the embankment and sluice gate, water channel is blocked and siltation is occurred. For the benefit of both sector, sluice gate should be operated and monitored by the joint management committee.
- v. Proper research is needed to find out the pros and cons of the feral species in the floodplain area: Somehow, some feral fish entered into the beel/floodplain. We do not know their food and feeding behavior, breeding behavior and whether it has negative effect to food ecosystem or not. It should be found out through good research.
- vi. Re-excavation of beel is essential: Due to siltation, most of the beel are silted up. Many of them have been disappeared and converted into agricultural crop land changing their category. So, re-excavation programme should be done and revive the lost beels or young stage of beels.

Aquaculture Sector

i. Seasonal ponds should be excavated to convert perennial ponds to increase fish production:To meet the future demand of increased population, fish production should be increased through aquaculture. As we cannot expand water resource horizontally, we have to expand it vertically through converting seasonal ponds into perennial.

ii. Motivational programme should be taken for cooperative aqua farming of multi ownership pond:Multi-ownership is an important problem aqua resource utilization properly leading the waterbody derelict or underutilized. Such owners should be motivated to bring their water body under cooperative aqua farming.

iii. New technologies suitable for semi-intensive and intensive fish culture should be invented and adopted:Science is growing fast and changing the world dynamically. To survive in the competitive globe, we should increase fish production through semi-intensive and intensive fish culture. To achieve the goal, we must be serious to develop new fast growing/ climate adaptive variety fish and technology for aquaculture as well as protection and conservation of open water bodies.

iv. Soft loan should be arranged for fish farmer:Most of the fish farmer and fishermen are landless or having marginal land. So they do not have sufficient money to be an entrepreneur or wealth to keep mortgage for taking loan. Environment should be created to make aquaculturist having sufficient loan easily with nominal or without interest.

v. Training and extension services must be provided effectively to enhance aquaculture knowledge and efficiency of pond farmers: It is very difficult to provide sufficient training and extension service to aquaculturist and fishers of whole upazila with the Upazila Fisheries Officer's team. So, present structure should be reformed and sufficient training and extension service should be given to the beneficiaries to boost up sustainable fish production.

vi. Good quality fry should be ensured for culture: Good quality fry is one of the major concern of the success of aqua farms. So, hatchery owners should be sincere to produce and supply good quality fish fry and fingerling to fish farmer.

vii. Low cost good quality fish feed should be ensured: About 70% of the operational cost is the feed cost of an aqua farm. Now a days, fish feed price has been increased but fish price has not been increased accordingly. So, fish farmers are not getting benefits according to investment. Low cost good quality fish feed should be developed through research and be available to fish farmer.

Fish Hatchery sector

Hatchery is a controlled and enclosed environment used to cultivate and breed a large number of fish. Hatchery is known as "restoration aquaculture" which provides importance on stock enhancement. Some recommendation for hatchery enrichment as well as higher commercialization in aquaculture is as follows-

i. Separating male and female brood fish: Brood fish pond should be separated for both male and female to ensure sex ratio. It helps to avoid difficulty of accurate identification of species and provides further artificial propagation or technique during breeding.

- ii. Pedigree of the brood fish: Pedigree is the phenomenon of origin or stock recording. A specific format should be established to get all kind of genetical information in hatchery with a view to get quality seeds.
- iii. Hybridization: Hybridization should be allowed only for research purpose.
- iv. Ensuring surface water pipe line: surface water pipe line has a great contribution in aeration for fry or fingerling tank and also for brood tank.
- v. Skilled man power: No farm can be improved without providing skill, trained or experienced worker. Productivity also depends on skilled manpower.
- vi. Hatchery sanitation: Hygiene of worker and hatchery environment is must to establish as first priority for fish production.
- vii. Golda hatchery reconstruction: Though prawn culture is a demanding sector, it is important to update constructing manual for prawn farm with higher technical addition with storage facilities.
- vii. Work plan and act regulation: Yearly work plan should be approved by the senior DoF officer where fish hatchery act implementation should be maintained properly.
- viii. Accurate hormone selection: Farmers use hormone and inducing agent for breeding of fish. It is essential to select proper agent and accurate dose.

Dry Fish Sector

Dry fish is a great source of protein than raw fish. Fish drying process is very sensitive issue as it has health impacts. There is some recommendation to follow-

- i. Sanitation Hygienic improvement: Fish drying yard, worker, storage process, marketing structure, pure water source, toilet for worker and farm construction area should be hygienic and controlled accordance with public health consideration.
- ii. Training: Training is essential for worker to ensure proper management and marketing system. Ensuring training and proper surveillance of DoF is needed to develop fish drying performance.
- iii. Use of pesticides: Farmers use harmful and banned pesticides for dried fish storage which is detrimental to public health as well as products quality. Measurements should be taken to control banned pesticides use by implementing rules and regulations.
- iv. Good Aquaculture practice (GAP): Good Aquaculture Practices (GAP) can be defined as a practices which are effective and practical to minimize negative impact on the environment, health and social consideration. Dry fish market can be developed through GAP.
- v. Aratdar syndicate: There are few markets in which dried fish is sold. Aratders of those market make syndicate to get more benefit. Government can take step to develop dry fish selling centre in each market or patronize the fish dryer to get good price of their dry fish.

The Hilsa fishery

- i. Ecosystem based fisheries management: Ecosystem-based fisheries management is a holistic approach that recognizes all the interactions within an ecosystem rather than considering a single species or issue in isolation. Hilsa shad (*Tenulosa ilisha*) is considered as national fish in the country and contributes to

the national economy, employment and export. It has the highest contribution in the country's fish production as the single fish species. Some of the important factors that are considered to be responsible for Hilsa fishery resources degradation are: low water flow in our rivers; construction of dams upstream and downstream rivers; deforestation upstream and downstream enhancing river siltation; construction of roads, embankments and flood control structures resulting in partial obstacles to the regular river flow; river pollution from human settlements, industries, fertilizers and pesticides. So, for reducing these, Ecosystem based fisheries management should be established.

ii. Incentive program during banned seasons:The hilsa fish has been the subject of a government conservation program offering fishers economic incentives or payments for ecosystem services (PES). The government put several protection and conservation measures in place, including closing some areas to fishing, restrictions on fishing gear, restrictions on the fishing season and regulations for fishing vessels. Under the PES scheme the fishers are given direct incentives during the fishing ban period: they receive food as well as some support for alternative income generation. Sometimes, subsidies are not equally distributed among them. In that case, the supports of incentive-based hilsa conservation measures consider it an effective way to increase fish production, while those against it point to the socioeconomic losses to fishers, who mainly come from poorer social backgrounds.

iii. Providing cash incentives and support for alternative occupations: The alternative income generation program is already introduced, but the outreach is limited to a small number of households. Government should provide cash incentives and also support for alternative occupations such as cage or pen culture, mud crab fattening and live marketing in domestic and export markets, small scale aquaponics, homestead vegetable gardening, boat making, bamboo and cane works, rickshaw or van pulling etc. during fishing ban seasons.

vi. Introduce co-management system for hilsa fisheries management:Co-management is a partnership between government, resource users (in these case fishers) and other stakeholders to share the responsibility and authority for managing resources. It is an alternative to traditional government regulated fisheries management. The potential benefits of a co-management approach are many such as-

- Food grain distributed to fishing households
- Awareness raising program on conservation
- Supporting alternative income generating activities
- Law enforcement to prevent jatka and brood.

ix. Revise the duration and timing of fishing ban:Imposed ban season to increase production through consultation with fishing communities and other stakeholders. In that case government authority should check either the fishermen obliging the rules during the ban season. It should be noted that the duration of fishing ban season is properly maintained or not in fishing communities.

x. Enforcement of fishing laws:Destructive fishing practices devastate the marine environment and include bottom trawling, by catch, the use of poison and explosives and ghost fishing. When fishing techniques have been universally recognized as destructive, the only solution is to ban them. There are at least 130 by catch agreements, regulations and legislations for reducing by catch worldwide which include legal measures on net mesh sizes, fishing areas, rules for discarding fish, requirements for by catch mitigation measures, recovery plans for specific fish species, and international standards and best practices for fishing operations.

- xi. Awareness and communication strategy: It is very mandatory that mitigation of destructive fishing methods (i.e. monofilament net, mosquito net and small mesh net used for shrimp fry collection), education of fisher communities, awareness and communication strategy must be needed for conserving fisheries resources and increasing fish production.
- xii. Necessary steps for improving infrastructure: Infrastructure facilities (such as ice, cold storage, sorting areas and processing facilities of landing sites) which are the core of the fishing industry should be under monitoring. Development and improvement of fisheries landing sites and post harvesting processing facilities (process and/or activities immediately after catch, handling and transportation, processing and distribution of fish and fishery products) must be needed.
- xiii. Mitigating the negative impacts of existing dadon sytem: It's a big and common problem found in every marketing channel. To mitigate the negative impacts of existing dadon, we should access to credit in the fishing sector through schedule and revolving funds. Financial support should be ensured to prevent syndicate problem.
- xiv. Capacity building of fisheries institutions: To achieve deserving target, it needs to develop a long term plan and built institutional capacity with proper monitoring, control and surveillance of estuarine fisheries.

Fish Feed Sector

- i. Better feed ingredients: Improvement in ingredient quality and sustainability of local protein requirements is required, specifically in terms of consistently availability and protein digestibility
- ii. Feed formulation and processing: Feed formulation and processing improvements can contribute to more efficient operation of feed processing plants and better feeds available for farmers, specifically Improving commercial feed mills
- iii. Better farm-level feed utilization: Improving management of feeds to reduce feed wastage, improve farm profitability and reduce environmental impacts.
- iv. Improving access of farmers to financial and technical services: Build partnerships/establish linkages with financial institutions to give farmers access to suitable credit systems, enabling them to purchase better feeds and make use of technical services.
- v. Improving collaborations: Improve communication to avoid duplication and overlapping activities. Strengthen Feed Industries Association of Bangladesh (FIAB) as an initiative for making a collaborative agency. Collaborate on various activities of different organizations through FIAB and Animal Health Companies Association of Bangladesh (AHCAB).
- vi. Feed Act and Public Policy: The Feed Act provides an important basis for regulation of aquaculture feeds, but requires stronger implementation.

Sea food industry

Bangladesh has a great potentiality in sea food sector but these sector is not developed yet. Seafood industry can make a high demand in foreign country by assuring some management-

i. Effective prerequisite programs: Decorated and planned program manual with overall surveillance of responsible management body is a prerequisite for sea food industry development.

ii. HACCP plan: Hazard analysis and critical control point is an effective survey for quality assurance of products. Proper quality of seafood products can be assured by maintaining HACCP plan during harvesting, storing and marketing.

iii. Labor Acts and Rules: Need to comply labor acts and rules. Also have to comply with buyer's countries rules and regulations.

vi. Approval: Approval and compliances from authorized governing body is needed for industry. Approval is also needed for certificate-inspection and auditing, sampling, testing etc. Have to comply many standards and achieve certificates for industry development.

Artisanal fishery

i. Implementation of fisheries legislation: Implementation of fisheries rules and regulations with authorized management of fisheries resources that incorporates climate change considerations- including review of national programs and strategies related to climate change and the integration of fisheries sector.

ii. Establishing more Marine Protected Areas: Marine Protected Areas (MPAs) involve the protective management of natural areas so as to keep them in their natural state. MPAs can be conserved for a number of reasons including economic resources, biodiversity conservation, and species protection. They are created by delineating zones with permitted and non-permitted uses within that zone. So, in the coastal critical habitat and migration routes, Marine Protected Areas should be established.

iii. Promoting alternative occupations: For better livelihood of fishermen, the alternative diversification of fishers' income can be promoted through cage or pen culture, mud crab fattening and live marketing in domestic and export markets, small scale aquaponics, homestead vegetable gardening, boat making, bamboo and cane works, rickshaw or van pulling etc.

iv. Improving fisheries value chain for pro-poor growth: There are full time fishermen and seasonal fishermen present in every fisher community. During financial support, subsidy in optional occupation for livelihood, true fishermen is always deprived because of false fisher folk. So there should be facilities of fair distribution of fisheries benefits.

V. Enhancing resilience and capabilities of fishing communities: Fishermen livelihood better different strategies follow to enhance resilience and capabilities of fishing communities, provision of suitable fishing equipment and support infrastructure such as schools, health centers and processing facilities. It also protects the fishing communities against natural disaster such as storms, flood, cyclones etc.

vi. Monitoring small scale coastal fishing: Sustainable conservation of small scale fisheries should be under monitoring, control and surveillance (MCS). The operations of ESN should be banned in less than 10 m deep and mesh size (14-18cm) should also control strictly.

vii. Disseminate legal instrument: In coastal and marine area most of the fishermen use illegal fishing vessels, crafts, nets and other banned instrument to catch fish. A policy framework should be established to monitor, control and surveillance mechanism for distributing legal instrument to fishermen for coastal and marine fisheries.

viii. Adopting economically viable alternative fishing methods:For sustainable resources and better livelihood, alternative fishing methods such as crab-fattening, hook-and-line fishing and other non-farm occupations should be adopted which are economically viable. The perpetual inventory *method* to the Finnish *fishing* fleet can be applied. It is needed to adopt every fisher communities as they have to go through off season period.

Lake Fishery: Kaptai Lake

i. Overfishing, illegal gear fishing, brood and fry fishing during breeding season should be controlled:During breeding season, brood fish and fry become vulnerable to be caught and the greed people take this chance and aggressive to catch more fish. Some fishermen use illegal gear to catch more fish. Moreover, fishing pressure is increasing day by day with population increase. For all above, stocks are under threat. To save the natural stock, overfishing,illegal gear fishing, brood and fry fishing during breeding season should be controlled through implementing fish act and awareness.

ii.Waste dumping and open defecation in the lake should be stopped:Kaptai Lake is the largest man-made lake in Bangladesh. Indiscriminate dumping of waste and rubbish anddefecation into a portion of the Kaptai Lake heavily pollutes it'swater as well as its environment and damage natural beauty.These misshapen must be stopped to save lives of the catchment area of the lake.

iii.Seasonal banning of fishing should be strengthened and affected fishers should be taken under VGD/VGF support or AIGA:For more sustainable production seasonal banning of fishing in the lake should be properly imposed and strengthened. Affected fishermen should be taken under VGD/VFF or AIGA programme.

iv. Community based management may be developed to control siltation through agricultural activities and deforestation and also to make conscious about fisheries biodiversity and fish production:Agricultural activities and deforestation are the main cause of siltation in the Kaptai lake water body. It can be minimized through CBFM (Community Based Fisheries Management).

v. Water level fluctuation should be minimized: The water level of Kaptai Lake is fluctuated for hydroelectric purpose and sudden rainfall which is harmful to aquatic organisms and also for erosion. It is essential to minimize the fluctuation.

Fish Marketing System in Value Chain

- I. Sufficient physical facilities should be developed:Road, Toilet, Restroom, Bathroom should be developed and shops should be at higher level from the floor. Market should be under any shade.
- II. Ice mills should be established in each fish market and pure water must be ensured in making ice: For supplying good quality fish to the consumer, good quality ice is essential. Sufficient amount of good quality ice and chilled water should be ensured for preservation and maintaining quality of fish.
- III. Continuous electricity supply should be ensured: Un-interrupted electricity supply is needed to supply ice and good marketing of fish.

- IV. Overall sanitation and hygienic conditions should be maintained: Hygienic and sanitation condition of fish market of Bangladesh is not good. General sanitation and hygiene should be maintained in all stages of fish market channel.
- V. Vehicle parking facilities should be improved: In most of the fish market no or insufficient vehicle parking facilities are there in fish market of the country. These facilities should be created.
- VI. Modern weighing system should be introduced and scrupulously maintained: Due to some weighing machine limitations, customers are being deprived. So, modern weighing system should be introduced for transparency.
- VII. Comprehensive monitoring system by the government should be developed: For proper management and controlling fish price, such type of monitoring system is needed.
- VIII. Establishment of improve drainage and transportation system: Drainage system is a burning issue in fish market. To maintain quality of fish, continuous chilled is essential and these used water needs to be drained out properly.

Marine fishery

Marine fisheries are conducted in all the oceans and seas of the world, including bays and estuaries. The capture and culture of aquatic organisms in salt water accounts for the bulk of the fishery products that reach world markets. Bangladesh has huge prospects in marine fisheries sector. We can utilize the marine area by proper guidelines-

- i. Stock assessment: Stock assessments provide fisheries managers with the information that is used in the regulation of a fish stock. Stock assessment is important to understand the dynamics of fisheries because biological resources, fishermen and the environment are changing entities. Determination of Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY) needs to be done for all commercially important species.
- ii. Strategy: Strategies need to be developed to exploit untapped pelagic fishery resources, like tuna and other nontraditional fishery resources, such as squid, cuttlefish and octopus to their sustainable limit. Sustainable exploitation needs to provide better output in the future.
- iii. Incentives: It means providing some stimulus or inspiring activity for developing fishing fleet for demersal and open ocean fish harvesting. Similarly, undertake artisanal fishery with efficient technology.
- iv. Establishing deep sea marine protected area: Without materializing protected area in selected estuarine and coastal habitat we can't conserve marine ecology and biodiversity. To achieve this target, it needs to develop a long-term plan and building institutional capacity with proper compliance monitoring in place. The affected communities by fishery closures should be adequately supported by subsidy, alternative occupations.
- v. Preventing illegal fishing: Monitoring, controlling and surveillance mechanisms implemented to prevent illegal fishing. Implementing fishing act is a need.
- vi. Policy framework: Develop a comprehensive policy framework by revising the constraints of the existing laws and regulations (i.e. The Marine Fisheries Ordinance 1983; The Territorial Waters and Maritime Zones Act, 1974 etc. for improved governance of territorial waters and 'High Seas')

fisheries of the Bay Bengal. Strict measures should be established to prevent foreign vessels to use the Sea as dumping place of wastes. Spatial mapping of the marine resources with possible projections needed for future fisheries resource extraction in a sustainable manner.

- vii. Enhancing institutional capacity:Steps should be taken to enhance cooperation with the regional countries and international organization under the framework of the UN Convention on the Law of the Sea (UNCLOS).Enhance institutional capacity and establish coordination among governmental institutions to control illegal and illicit activities in the high seas.
- viii. Mariculture development:measures and technological innovation for mariculture in the continental shelf of the Bay of Bengal.Export-oriented mariculture of non-conventional species such as mollusk could be introduced.
- ix. Human resource:Invest in human resource capacity building in diverse fields of marine economic activities as well as environmental and biodiversity issues which needs to address through appropriate training and skill development.

11.d. Fisheries laws and regulations

In Bangladesh, a number of legislation measures are in operation for the preservation and sustainable use of inland and marine resources. These measures permit the translation of the objectives of policy into specific legal provisions affecting the use of living inland and marine fisheries resources, the way these resources affect the development of fishing communities and the nation as a whole. These were analyzed, found a number of causes for non-compliances. Some most important causes and the ways for making the available fisheries regulations compliance are listed below;

Reasons for non-compliances of fisheries regulation

- a. Poverty
- b. Indebt and patron-client relationship with middleman
- c. Irregularities in incentive distribution during ban season
- d. Limited opportunity of alternative occupations during ban season
- e. Availability of illegal and or destructive gears
- f. Greed for more fish
- g. Corruptions of few member of law enforcing agencies
- h. Habitually
- i. Multiple ownership of the resource (inland waterbodies)

Considerations for improved compliance of regulation

- a. Effective ban using illegal fishing gears
- b. Ban production of monofilament gill net
- c. Check corruption
- d. Inclusive and fair incentive supports during fishery closures
- e. Improve the logistic support of UFO
- f. Create opportunities for alternative livelihoods
- g. Increase logistic supports to law enforcing agencies
- h. Increase fishers' awareness about the benefits of abiding laws

12. Research highlight/findings:

- I. Baor re-excavation and permanent sanctuary is very essential for sustainability of biodiversity and MSY.
- II. During flash flood, in most of the year, crop protection embankments are cut down, flash flood occurs in the haor, crops become damaged. As a result, gasses harmful to aquatic lives increase abruptly and aquatic lives including fish die. So, embankment should be made efficiently.
- III. Stock assessment as well as determination of Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY) needs to be done for all commercially important species.
- IV. Due to siltation, most of the beel are silted up. Many of them have been disappeared and converted into agricultural crop land changing their category. So, re-excavation programme should be done and revive the lost beels or young stage of beels.
- V. About 70% of the operational cost is the feed cost of an aqua farm. Now a days, fish feed price has been increased but fish price has not been increased accordingly. So, fish farmers are not getting benefits according to investment. Low cost good quality fish feed should be developed through research and be available to fish farmer.
- VI. During breeding season, brood fish and fry become vulnerable to be caught and the greed people take this chance and aggressive to catch more fish. Some fishermen use illegal gear to catch more fish. Moreover, fishing pressure is increasing day by day with population increase. The stocks are under threat. To save the natural stock, overfishing, illegal gear fishing, brood and fry fishing during breeding season should be controlled through implementing fish act and awareness.
- VII. Pedigree is the phenomenon of origin or stock recording. A specific format should be established to get all kind of genetical information such as captivity of brood stock, offspring condition and gene share which can avoid inbreeding and line breeding problem in hatchery with a view to get quality seeds.
- VIII. Fish drying yard, worker, storage process, marketing structure, pure water source, toilet for worker and farm area should be hygienic and controlled accordance with public health consideration.
- IX. Ecosystem based fisheries management should be done to protect and conserve hilsa fishery.
- X. Implementation of fisheries rules and regulations with authorized management of fisheries resources that incorporates climate change considerations- including review of national programs and strategies related to climate change and the integration of fisheries sector.

B. Implementation Position

1. Procurement:

Description of equipment and capital items	PP Target		Achievement		Remarks
	Phy ()	Fin (Tk)	Phy (#)	Fin (Tk)	
(a) Office equipment	Desktop computer (1), Laptop Computer (1), Scanner (1), UPS (1), Black & White Laser Printer (1), Digital Camera (1)	185000	Desktop computer (1), Laptop Computer (1), Scanner (1), UPS (1), Black & White Laser Printer (1), Digital Camera (1)	184500	
(b) Lab & field	-	-	-	-	

equipment					
(c) Other capital items	Executive Table (1), Executive chair (1), Half Secretariat Table (2), Chair for staff (4), File Cabinet (1), Steel Almira (1), Visitor Chair/Front Chair (2), Computer Table (1), Computer Chair (1), Bicycle (2)	161500	Executive Table (1), Executive chair (1), Half Secretariat Table (2), Chair for staff (4), File Cabinet (1), Steel Almira (1), Visitor Chair/Front Chair (2), Computer Table (1), Computer Chair (1), Bicycle (2)	161300	

2. Establishment/renovation facilities:

Description of facilities	Newly established		Upgraded/refurbished		Remarks
	PP Target	Achievement	PP Target	Achievement	
-	-	-	-	-	

3. Training/study tour/ seminar/workshop/conference organized:

Description	Number of participant			Duration (Days/weeks/ months)	Remarks
	Male	Female	Total		
(a) Training	-	-	-	-	-
(b) Workshop				1	Inception workshop

C. Financial and physical progress

Fig in Tk

Items of expenditure/activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
A. Contractual staff salary	354104	354104	354104	0	100	-
B. Field research/lab expenses and supplies	2568000	2568000	2568000	0	100	-
C. Operating expenses	389526	384598	389698	-5100	100	GOB due
D. Vehicle hire and fuel, oil & maintenance	315550	311300	315550	-4250	100	GOB due
E. Training/workshop/seminar etc.	250000	258725	100000	158725	50	Final workshop not done
F. Publications and printing	240000	33200	40000	6800	100	GOB due
G. Miscellaneous	27420	27045	27420	-375	100	GOB due
H. Capital expenses	345800	345800	345800	0	100	-

D. Achievement of Sub-project by objectives: (Tangible form)

Specific objectives of the sub-project	Major technical activities performed in respect of the set objectives	Output(i.e. product obtained, visible, measurable)	Outcome (short term effect of the research)
i. To unfold the technological change and modernization which have taken place	One project inception workshop conducted with the stakeholders	Invitation letter, attendance sheet, workshop proceeding, report and voucher of expenditure	l. A report on people's socio-economic profile,

<p>in the fisheries sector;</p> <p>ii. To assess how far technological changes and modernization affected the socio-economic condition of the fisherfolk as well as the sustainability of the fishery resources;</p> <p>iii. To assist stakeholders (government, private sector, and civil society) in designing and implementing specific policy-oriented activities to shift towards more sustainable fish production through modernization the sector.</p>	Collection and review of literature completed, shared and research methodology finalized	Collected published report, information from resource person interview Finalized research methodology	<p>existing fisheries and aquaculture technologies, assessment of technology needs as well as evaluation of existing legal and policy framework with respective recommendations has been produced which may serve as a guideline for policy maker, manager and researcher;</p> <p>II. Awareness of stakeholders has been developed</p> <p>III. Results would be excellent academic information for students.</p>
	Identification of problems and issues	Identified sector specific problems/ issues, cross-cutting problems and issues, reports Tentative solution of problems derived from local demand through reviewing collected literature, reports	
	Policy analysis for future directive	Information on mandate and functions of DoF and MoFL Established link between MoFL objective and national policy, plan and strategies Documented policy directive for MoFL and preparation of the modernization plan	
	Present status and environment setting	Resource baseline Development potentials Report	
	Review of past and ongoing development initiatives	Reviewed documents on past development initiatives Reports	
	Project sites identified and finalized	Half yearly report PCR	
	Inventory of sample based and location specific fisheries related stakeholders completed	Half yearly report PCR	
	Strategy for future development	Half yearly report PCR	
	Formulation of plan	PCR	
	Development of policy brief	PCR	

E. Materials Development/Publication made under the Sub-project:

Publication	Number of publication		Remarks (e.g. paper title, name of journal, conference name, etc.)
	Under preparation	Completed and published	
Technology bulletin/ booklet/leaflet/flyer etc.	-	-	-
Journal publication	14	1	International Journal of Fisheries and Aquatic Studies (accepted), 14 are under processing
Information development	-	5	MS Thesis
Other publications, if any	-	Note book	-

F. Technology/Knowledge generation/Policy Support (as applied):

i. Generation of technology (Commodity & Non-commodity)

ii. Generation of new knowledge that help in developing more technology in future

iii. Technology transferred that help increased agricultural productivity and farmers' income

iv. Policy Support

The research findings generate knowledge on present status of fisheries, documented successful interventions, collected perspectives from different fishery stakeholders for possible transformation in current fisheries management systems. The suggestions presented in this report could inform policy makers to develop/revise policy and management approach for further improvement of fisheries sector.

G. Information regarding Desk and Field Monitoring

i) Desk Monitoring [description & output of consultation meeting, monitoring workshops/seminars etc.):

There were one inception workshop and 12 consultation meeting. The output are recommendations through consultation meeting given by different stakeholders, policy analysis result, present and past technology intervention analysis results

ii) Field Monitoring (time& No. of visit, Team visit and output):

The principal investigator, Co-principal investigator, 6 data enumerator and 5 facilitators all visited field of different hotspot area frequently during the project period (July 2017 – September 2018). The visits were some in a team. The total number of visit were about 1250. Resource and livelihood status of stakeholders of different discipline are obtained and presented in the report.

I. Lesson Learned (if any)

- I. Cross-sectoral collaboration among all government agencies for overall sustainability of the fisheries sector
- II. Community involvement for fisheries management
- III. Ecosystem based management approach for open water fisheries management
- IV. Social dimension of fisheries system should get similar attention in case fisheries management

J. Challenges

- V. Capacity building of implementing agencies in terms of financial resources, manpower and expertise
- VI. Co-ordination with other agencies beyond fisheries sector
- VII. Transboundary collaboration for river basin management and straddling species such as Hilsa fisheries
- VIII. Time constraints
- IX. Arrange to make different stakeholder present in consultation meeting
- X. Availability of specialist in different discipline for consultation meeting
- XI. Availability of respondent for interview
- XII. Data collection from people

Signature of the Principal Investigator
Date
Seal

Counter signature of the Head of the
organization/authorized representative
Date
Seal

Some picture of project activities



ADC (revenue) is answering to fishermen's questions



A fisherman giving his opinion on haor fisheries development



Principal Investigator of the project giving speech in the workshop



DFO Sunamgonj commenting on haor fisheries development



World fish centre representative giving his opinion on haor fisheries development



SAU professor giving his opinion on haor fisheries development



A social activist raising his concern on how coal transportation affecting haor ecosystem



A fisherman leader association expressing his opinion for haor fisheries development



Workshop on Baor fisheries at Jhenaidah DFO office



Honorable Vice Chancellor, Sylhet Agricultural University delivering his speech as the chief guest of the inception workshop



ADC (revenue) answering fishers' questions



A fisherman asking question about baor lease system



DFO is delivering his concluding speech in the workshop



DD DoF of Rajshahi division his valuable speech



Key note speaker is giving his speech



Data collection in dry fish sector



Data collection in dry fish area



Data collection from NGO worker



Data collection by Enumerator



FGD at Baluhar village



FGD at Baluhor Baor



Key informant interview



Data collection from Aquaculture



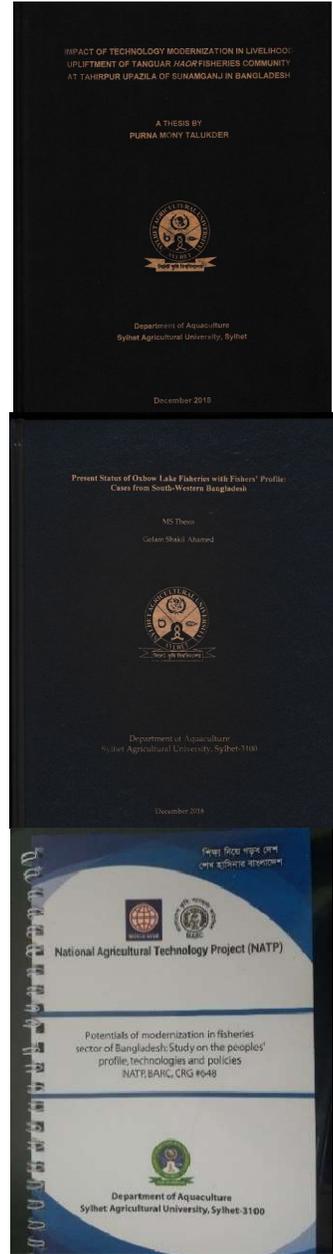
Data collection from Hatchery



Data collection from hatchery

Data collection from artisanal fishery

Publication (Note book and MS Thesis)



মানুষের কল্যাণে সমাজের কথা

যশোর □ শুক্রবার □ ১৬ মার্চ ২০১৮ □ ২ চৈত্র ১৪২৪



বিনাইদহে দিনব্যাপী বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা ও সম্ভাবনা শীর্ষক কর্মশালা অনুষ্ঠিত হয়

দৈনিক নবচেতনা

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বিনাইদহ জেলা প্রশাসনের পৃষ্ঠপোষকতায় বিনাইদহের জেলা মনসা অফিসে বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা শীর্ষক এক কর্মশালা অনুষ্ঠিত হয়েছে। শিক্ষা নিয়ে পড়তে বেশ-শেষ হাদিনার বাংলাদেশ এই প্রোগ্রাম কে সামনে রেখে এক কর্মশালা অনুষ্ঠিত হয়েছে। জেলা মনসা কর্মকর্তা মোঃ আলফাজ উদ্দীন শেখ এর সভাপতিত্বে কর্মশালায় জেলার অতিথি হিসেবে সিলেট কৃষি বিশ্ববিদ্যালয়ের প্রফেসর ডঃ মোঃ তরিকুল আদম। এসময় বিশেষ অতিথি হিসেবে উপস্থিত ছিলেন মডুইল জেলা মনসা কর্মকর্তা (প্রাক্তন) মোঃ মঞ্জুল ইসলাম, সিনিয়র সহকারী পরিচালক মোঃ ফজলুল হক। এসময় আরও উপস্থিত ছিলেন জেলার ৬টি উপজেলার উপজেলা সিনিয়র মনসা কর্মকর্তা, উপজেলা মনসা কর্মকর্তা, বাওড়ের সঙ্গতি, সম্পাদক, ভোগ্যোক্ত, সংবাদকর্মী, মনসাজীবী সমবায় সমিতির সভাপতিগণ। এ কর্মশালায় ৩০ জন মনসাজীবী অংশগ্রহণ করেন। কর্মশালায় সহযোগিতা করেন সিলেট কৃষি বিশ্ববিদ্যালয়ের ছাত্র সাগর দেব ও তাসমীর আহমেদ। প্রধান অতিথি সিলেট কৃষি বিশ্ববিদ্যালয়ের প্রফেসর ডঃ মোঃ তরিকুল আদম কর্মশালায় বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা বিষয়ে সিক নির্দেশনা মূলক আলোচনা রাখেন। এছাড়াও বিনাইদহ জেলার বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা নিয়েও সিক নির্দেশনা মূলক আলোচনা রাখেন। এসময় তিনি শিক্ষা নিয়ে মনসা চাষ করার পরামর্শ দেন।

স্বাস্থ্যের সমানে আণোখবীন দৈনিক বীরদর্পণ

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বিনাইদহে দিনব্যাপী বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা শীর্ষক এক কর্মশালা অনুষ্ঠিত

সমাজিক আয়ের ২ বৃহৎপতির বিনাইদহে বিনাইদহের জেলা মনসা অফিসে বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা শীর্ষক এক কর্মশালা অনুষ্ঠিত হয়েছে। শিক্ষা নিয়ে পড়তে বেশ-শেষ হাদিনার বাংলাদেশ এই প্রোগ্রাম কে সামনে রেখে এক কর্মশালা অনুষ্ঠিত হয়েছে। জেলা মনসা কর্মকর্তা মোঃ আলফাজ উদ্দীন শেখ এর সভাপতিত্বে কর্মশালায় প্রধান অতিথি হিসেবে সিলেট কৃষি বিশ্ববিদ্যালয়ের প্রফেসর ডঃ মোঃ তরিকুল আদম। এসময় বিশেষ অতিথি হিসেবে উপস্থিত ছিলেন মডুইল জেলা মনসা কর্মকর্তা (প্রাক্তন) মোঃ মঞ্জুল ইসলাম, সিনিয়র সহকারী পরিচালক মোঃ ফজলুল হক। এসময় আরও উপস্থিত ছিলেন জেলার ৬টি উপজেলার উপজেলা সিনিয়র মনসা কর্মকর্তা, উপজেলা মনসা কর্মকর্তা, বাওড়ের সঙ্গতি, সম্পাদক, ভোগ্যোক্ত, সংবাদকর্মী, মনসাজীবী সমবায় সমিতির সভাপতিগণ। এ কর্মশালায় ৩০ জন মনসাজীবী অংশগ্রহণ করেন। কর্মশালায় সহযোগিতা করেন সিলেট কৃষি বিশ্ববিদ্যালয়ের ছাত্র সাগর দেব ও তাসমীর আহমেদ। প্রধান অতিথি সিলেট কৃষি বিশ্ববিদ্যালয়ের প্রফেসর ডঃ মোঃ তরিকুল আদম কর্মশালায় বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা বিষয়ে সিক নির্দেশনা মূলক আলোচনা রাখেন। এছাড়াও বিনাইদহ জেলার বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা নিয়েও সিক নির্দেশনা মূলক আলোচনা রাখেন। এসময় তিনি শিক্ষা নিয়ে মনসা চাষ করার পরামর্শ দেন।

দৈনিক নবচিত্র

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বিনাইদহ জেলা প্রশাসনের পৃষ্ঠপোষকতায় বিনাইদহের জেলা মনসা অফিসে বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা শীর্ষক এক কর্মশালা অনুষ্ঠিত হয়েছে। শিক্ষা নিয়ে পড়তে বেশ-শেষ হাদিনার বাংলাদেশ এই প্রোগ্রাম কে সামনে রেখে এক কর্মশালা অনুষ্ঠিত হয়েছে। জেলা মনসা কর্মকর্তা মোঃ আলফাজ উদ্দীন শেখ এর সভাপতিত্বে কর্মশালায় প্রধান অতিথি হিসেবে সিলেট কৃষি বিশ্ববিদ্যালয়ের প্রফেসর ডঃ মোঃ তরিকুল আদম। এসময় বিশেষ অতিথি হিসেবে উপস্থিত ছিলেন মডুইল জেলা মনসা কর্মকর্তা (প্রাক্তন) মোঃ মঞ্জুল ইসলাম, সিনিয়র সহকারী পরিচালক মোঃ ফজলুল হক। এসময় আরও উপস্থিত ছিলেন জেলার ৬টি উপজেলার উপজেলা সিনিয়র মনসা কর্মকর্তা, উপজেলা মনসা কর্মকর্তা, বাওড়ের সঙ্গতি, সম্পাদক, ভোগ্যোক্ত, সংবাদকর্মী, মনসাজীবী সমবায় সমিতির সভাপতিগণ। এ কর্মশালায় ৩০ জন মনসাজীবী অংশগ্রহণ করেন। কর্মশালায় সহযোগিতা করেন সিলেট কৃষি বিশ্ববিদ্যালয়ের ছাত্র সাগর দেব ও তাসমীর আহমেদ। প্রধান অতিথি সিলেট কৃষি বিশ্ববিদ্যালয়ের প্রফেসর ডঃ মোঃ তরিকুল আদম কর্মশালায় বাংলাদেশের বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা বিষয়ে সিক নির্দেশনা মূলক আলোচনা রাখেন। এছাড়াও বিনাইদহ জেলার বাওড়সমূহের বর্তমান অবস্থা, প্রতিবন্ধকতা এবং সম্ভাবনা নিয়েও সিক নির্দেশনা মূলক আলোচনা রাখেন। এসময় তিনি শিক্ষা নিয়ে মনসা চাষ করার পরামর্শ দেন।

