BANGLADESH FLOOD ACTION PLAN

FAP 16 Environmental Study

Special Studies Program

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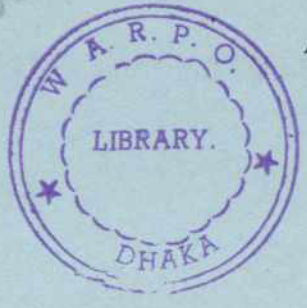
NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES



PILOT STUDY REPORT

July 1992

ISPAN IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST

Funded by the U.S. Agency for International Development

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The field work for the pilot study was conducted by the following team of research assistants: Safiuddin Ahmed, Kazi Rozana Akter, Rabeya Khatun, Md. Yousuf Howlader, Mostafa Karim Khan, Shirin Sultana, Alya Khatun, Gazi S.M. Alamgir, Md. Faruque, Nazmun Nahar, Sadiqa Akhter, S.M. Iqbal Hossain, Md. Azizul Hoque Molla, Ferdus Ara and Farida Easmin. The report was extensively edited and improved through the efforts of Sachindra Halder and Jeanne Pfirman.

Steve Minkin
Study Director

EXECUTIVE SUMMARY

The purpose of this pilot study was to design and develop the framework and survey instruments for a comprehensive study of the role of fish bio-diversity on human health and nutrition in rural areas of Bangladesh. In addition, the impact of flood control projects on various aspects of floodplain fisheries was assessed.

The study was conducted from mid-September to mid-October 1991 in three villages in each of four selected areas as a special study of FAP 16. The villages were in the project areas of Surma-Kushiyara, Sylhet; CPP-Tangail; Gumti Phase-II, Comilla and Brahmanbaria; and the Meghna-Dhonagoda Project in Chandpur. The villages were chosen according to three zones based on access to floodplain fisheries: riverside, low lying (beel) or highland. Meghna-Dhonagoda villages were chosen in relation to the embankment. It was believed that fish activities and consumption would vary according to these zones.

The objectives were to test and develop research methods; evaluate field staff performance; understand the different dimensions of fishing by rural families and the nutritional importance of various fish species; develop the logistical systems required for the main study; ascertain a statistically valid sample size and determine appropriate intervals for data collection during the main study.

The study collected data from surveys of fish consumed by groups of school children and by households. Information was recorded on fishing rights and heritage, catches of fishermen at fishing sites and markets.

The findings of this pilot study were used to construct the currently ongoing year long study. The objectives of the main study are to establish baseline data on fish consumption and use; study fisheries resources in selected FAP project areas; develop methods of fish consumption and species composition assessment; determine impacts of flood control projects on fisheries; ascertain the role of subsistence fisheries; and study the life cycle of fish in the floodplain.

Tangail-CPP; Surma-Kushiyara; Chalan Beel, Singra; and Meghna-Dhonagoda, Matlab were selected as the study areas to obtain a wide distribution over the three fish ecological zones. Households were selected by a random sampling technique and are being surveyed for seven consecutive days, three times a year. Detailed surveys are also being administered at fishing sites and in the markets to determine species composition, distribution, life cycles, fish catch data, fish migration information, etc.

Results of the pilot study showed that capture fisheries provided a very high percentage of the protein consumed by families studied. Small fish, some rich in vitamin A, were consumed by 85 percent of the families. Flood control projects that would decrease water levels and negatively impact capture fisheries would have a very damaging affect on these types of households.

1. BACKGROUND DISCUSSION

1.1 Nutrition and Bio-diversity

Bangladesh, the eighth signatory to the 1992 International Treaty for the Protection of Bio-diversity of Flora and Fauna, has one of the richest inland fisheries in the world. The country is blessed with a rich aquatic fauna reported to consist of more than 260 fish species (Rahman 1989). Recently it has been suggested that the actual number of fish species is over four hundred. Bangladesh has more fish species than all the states of Europe combined (Rainboth 1991). This resource is dwindling and should negative trends continue both species and production declines seem inevitable. The adverse consequences for people is evidenced by lessening fish consumption.

The diversity of species plays an important role in the nutritional profile of the people living here. Bangladesh is renowned for the varieties of fish eaten and for the diversity of preparation. The relative contribution of different species to the diet has received little attention from scientists. In the absence of such information, the benefits of flood control projects may be inflated while social and economic costs are overlooked. Attempts at mitigation, which restrict species diversity, can further reduce fish consumption through the production of costly varieties, and the erosion of fishing rights by encouraging tightly controlled leasing systems.

Historically the availability of fish had been a boon to Bangladesh. Production, however, has been declining rapidly over the past two decades (Bangladesh Bureau of Statistics 1992). A partial list of reports attributing losses of fish to flood control and irrigation projects appears in Appendix 1. The need for quantitative assessments of the role of subsistence fisheries has recently been stressed at the Second Annual Conference of The Flood Action Plan and in the Guidelines for Project Assessment.

The information obtained in this FAP 16 special study will provide information about the impact of flood control and drainage projects on various aspects of floodplain fisheries, including employment and nutrition. The study provides an assessment of the contribution of species to the diet in areas where projects have been planned or executed.

The contribution of open water capture fisheries to fish production is prodigious. Hundreds of thousands of metric tons of fish are produced annually (see table 1). According to data from the Bangladesh Bureau of Statistics (BBS), inland fish catches once accounted for nearly 90 percent of all fish production (BBS 1987). Pond culture and lakes account for less than 20 percent of inland production. The inland catch has declined both in absolute and relative terms. According to BBS data, fish production has been falling rapidly and recent production is well below levels reported during the 1970's (BBS 1987).

Table 1. Quantity of Fish Caught by Source
(thousands of metric tons)

Year	Inland	Marine	Total
1972-73	729	95	818
1973-74	723	88	820
1974-75	733	89	822
1975-76	545	95	640
1976-77	541	100	646
1980-81	525	125	724
1983-84	589	165	754
1984-85	586	188	774
1985-86	587	207	794
1986-87	597	217	814
1987-88	599	228	827
1988-89	607	233	840
1989-90	613	234	847
1990-91	654	239	893

During the past 22 years fish consumption has fallen at the rate of 4.66 percent per annum, compared with a population growth rate of about 2.5 percent (Minkin 1989). In 1986, the Master Plan Organization (MPO) forecasted a 35 percent reduction of per capita fish consumption by the year 2005 (MPO 1986). According to the MPO most of the reduction will be due to partial loss of the areas available to floodplain fisheries. Capture subsistence fisheries provide the principal source of animal protein consumed by agricultural laborers and their families. The 1980-81 Nutritional Survey of Bangladesh found that of 28 grams of animal protein consumed per capita, 22 grams came from fish. The loss of fisheries has obvious health, economic and equity implications.

1.2 Flood Control and Fish Losses

Press reports indicate that importation of fish from India is occurring which is a partial reversal of the traditional trade relationship (Daily Ittefaque 1992). Cattle are another source of animal protein which are imported on a large scale into Bangladesh. Ironically as exports of fish are growing the country could import more fish because of declining yields and face a negative balance of payments in this sector.

Figure 1, adapted from the MPO, shows projected relationships of demand and production from 1985 to 2005. The two demand lines are based on constant per capita availability and increasing per capita availability, based on 5% GNP. The current Bangladesh GNP is growing at about 4 percent annually. It is clear that fish stocks will decline in the absence of a radical rethinking about the role of fisheries in the sustainable development of Bangladesh.

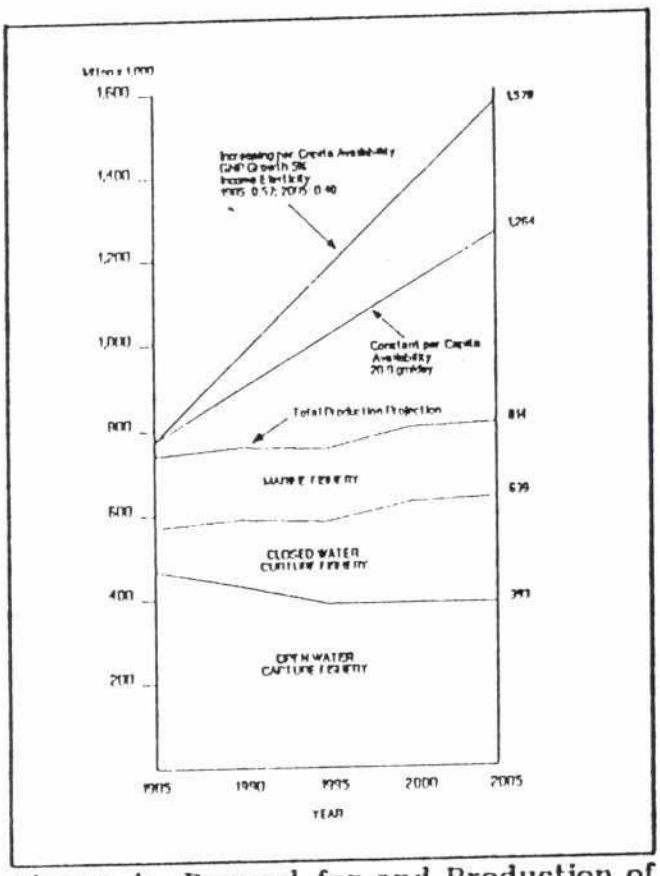


Figure 1: Demand for and Production of Fish

The negative impact of flood control projects on fisheries has been well documented and analyzed. While demand for fish is increasing, habitats are being systematically destroyed and migration routes blocked by embankments and roads. A MPO report summarizes the long term impacts of Flood Control, Drainage and Irrigation (FCD/I) projects (MPO 1987, 27):

> "The major constraint to the maintenance or increase in the open water capture fishery is flood control, drainage and irrigation activities. Open water fisheries production potential has been reduced and is being reduced every year as more and more fish production areas are removed and/or altered for food grain production. It must be understood that the open water fishery (i.e., capture fishery) has been estimated to give 80 percent of the country's total inland fish production. Removal of the water or production areas in one location will not only reduce local fish production but also will harm fish production in all the components of the system from rivers and beels to the estuaries and the sea."

It is in the context of rising demand, declining yields, habitat destruction and the obstruction of migration routes that the impact of flood control projects on future fish production should be assessed. The falling production trends suggest that it will become increasingly difficult for the natural process of replenishment to occur (see figure 2). In this context, the facilitation of fish production by increasing access to the floodplain should be viewed as a preferred planning priority. Elimination of drainage congestion, by reopening and desilting canals, is generally beneficial to fish populations. Drainage problems have caused both crop and property damage in areas where embankments have been constructed.

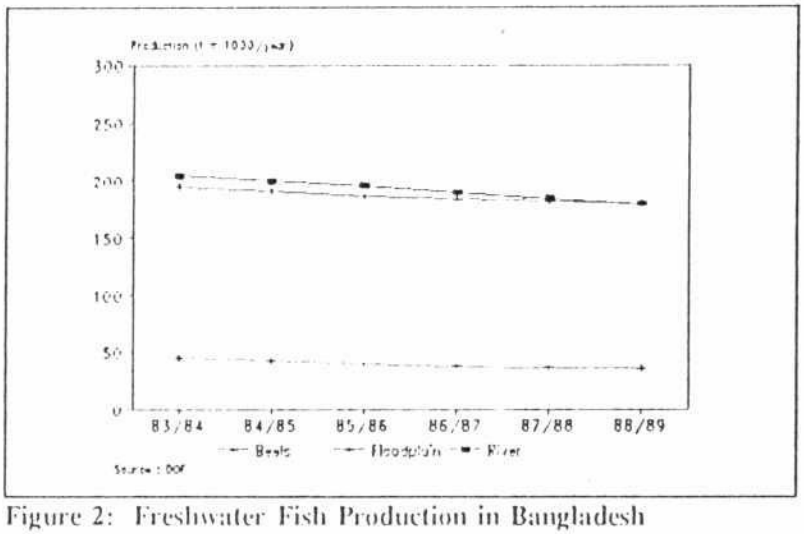


Figure 2: Freshwater Fish Production in Bangladesh

Under natural circumstances the intrinsic reproductive capacity of fish is very high. The Flood Action Plan should consider not only actual losses to fish production, but losses of opportunities to enhance production, as a result of project designs and implementations. The elasticity of fish populations, including the potential for rapid growth or decline with the enhancement or loss of habitats, makes the comparison of this self-sustaining biological resource different from calculations based on rice cultivation or the protection of durable goods.

1.3 Project Appraisal

The Flood Action Plan has a stated commitment to the "standard widely accepted techniques for the economic appraisal of investment projects used by the World Bank" (FPCO 1992). This presents the opportunity for a departure from previously unbalanced approaches which tended to ignore the impact of flood control projects on fish and the environment. Project Assessment Guidelines are directed to insure that projects are evaluated according to their environmental, economic and social impacts (FPCO 1992). Adherence to what has been termed as "multi-criteria analysis" could be a positive departure from the time worn practice of concentrating on a limited number of economic parameters.

The Flood Action Plan proposes to give due consideration to what could be termed as effective resource management in the pre-feasibility and feasibility stages of project formulation. The ability of the FAP to obtain these objectives depends on the will of planners, and on the political commitment to ensure that social, environmental and nutritional issues will be duly considered before projects are funded or implemented.

Conceptual differences concerning the standard economic evaluation used by the World Bank, and concepts derived from environmental economics need to be resolved. This is particularly true with respect to fisheries where concern has been expressed by several FAP experts about the usefulness of the project assessment guidelines for evaluating negative impacts on fisheries (Chisholm & Smith 1992).

A special study on economic prices produced by Shahabuddin and Rahaman for FPCO discussed some key issues which are related in our study. They recognize capture fisheries as a depletable resource, requiring some form of scarcity premium to reflect the dimension of fish population (Shahabuddin & Rahman 1992). In addition, capture fisheries are a source of protein for the poorer subsistence households. They may not otherwise purchase fish from the market. In the absence of the opportunities of capture fisheries, there is need to include some form of cost to account for this loss of income. A weight based on income loss multiplied by the marginal utility of income may be used. This loss of food could be reflected by the income value of fish based on the cost of providing equivalent food value and nutrition.

The multi-criteria project analysis, adopted by the Bangladesh Flood Action Plan, requires the input of taka values, along with other quantitative indices for estimating the costs and benefits of proposed interventions. The sensitivity of this approach in evaluating the contribution of the diverse species comprising subsistence fisheries, (or other environmental assets such as available waterways for transport, or the relative absence of mosquitoes) is unclear. While the taka price of commonly consumed species of fish may be seasonally low, these fish are highly useful to rural families and provide the bulk of fish caught and marketed in the country (BBS 1992). Both the prices of fish and the cost of labor for most commonly consumed species are low, often approaching zero. Data on seasonal abundance, species diversity, consumption and market information are required to understand the effects of water management schemes, both individually and in aggregate, in order to construct meaningful impact assessment criteria.

The multi-criteria analysis is also vulnerable to shortcomings relating to both data requirements, and their interpretation. Data collection requires sufficient concentration of resources and efforts on information gathering. Even in the presence of resource allocations, conceptual misunderstandings or a general insensitivity to the food intake requirements of large segments of the population would undermine the credibility of the exercise. The study on the Nutritional Consequences of the Bio-diversity of Fisheries will improve future project preparation by quantifying the contribution of diverse fish species to various social classes. It will also contribute to our understanding of the population dynamics, life cycles and migration requirements of commonly consumed species.

In the past, estimates of the impact of FCD/I projects on subsistence fisheries suffered from the absence of data. Most findings were based on large aggregated estimates of production and consumption. Loss of fisheries caused by FCD/I were assessed independently of basic information on the structure of fish communities and their relationship to human consumption patterns. As a result, planners even with the best of intentions, lacked the tools for understanding the economic importance of subsistence fisheries in Bangladesh. They tended to underestimate environmental impacts, and failed to consider the nutritional implications of species bio-diversity in sustaining the rural poor of the country.

1.4 Labor Participation

This major food source is often consumed in the absence of intermediate market mechanisms, and often without monetary costs to families. Capture fisheries effectively subsidize grain production by allowing laboring families to obtain requisite levels of protein despite low and intermittent wages. Free and cheap fish sustain agricultural laborers during times when agricultural work is not available. Any loss of opportunities for poor people to catch fish must be incorporated in project impact assessment.

The rate of participation of families in subsistence fisheries must be known before losses and benefits can be estimated. Therefore knowledge about who is fishing, and seasonal catch and consumption data is required. This demands a minimum of one year's data from an in-depth household study to assess seasonal variations. Projections of the long term impact of fisheries require detailed baseline information on productivity of the diverse fish species caught and consumed in Bangladesh.

Fish captured for domestic consumption or for small local markets are commonly undervalued or ignored in project evaluations. Recently prepared guidelines on economic evaluation for FPCO suggest that while detailed assessment of negative impacts on fisheries is valuable, it should be optional for project assessment because of the amount of work required (FPCO 1992). This special study provides detailed methodologies for assessing both fish stocks and their nutritional contribution. It is hard to understand why a studied evaluation of project impacts on fisheries should not be compulsory under the Flood Action Plan.

1.5 Women and Children

Fishing is often carried out for short periods during the day. Children and sometimes women are also involved in fisheries, and bias against valuing their economic contribution pervades the current guidelines for analysis of project cost and benefits. This special study will quantify the involvement of women and children in fisheries and related agricultural sectors.

During the pilot study our researchers found that interviewed families themselves often designated members engaged in subsistence fishing as "bekar" or "unemployed", even on days when no other work was available to the family. Large numbers, perhaps millions of so called "unemployed" individuals enter a wageless labor system and produce food for their families by catching fish. Women and children observed fishing during the pilot study, were effectively involved in a shadow economy whose impact is yet to be incorporated into project impact assessments.

In terms of food production, such labor makes a significant contribution to the national economy. The absence or presence of free or low cost fish have important implications for population stability in the vast rural society. If subsistence fisheries play a vital role in the diet of landless, marginal and small farmers, would not their loss compel many to leave their homes for a pathetic journey to the city?

2. PILOT STUDY

2.1 Introduction

The pilot study reported below was a preliminary exercise designed to support a more detailed year long study. The pilot study was an early requirement for the development of the framework for a comprehensive study of the role of fish bio-diversity on human health and nutrition in Bangladesh . The pilot study was both a training and assessment tool for the research team. The output of which was the development of the study framework and many of the survey instruments used in the year long study.

Therefore new research methodologies had to be developed. The core of the study was a seven day fish consumption survey of six households in each of 12 villages during September and October 1991. Other activities are detailed below. The experience gained from this exercise facilitated the formulation of survey and statistical parameters. Three villages in each of four study areas of interest under the Flood Action Plan were investigated for seven days (see Appendix 2 for a list of villages). Three study areas were divided into three zones based on access to flood plain fisheries. In the fourth study area villages were selected outside and inside of a completed flood control, drainage and irrigation project. The assumption behind these criteria was that the relative availability or absence of surface water or river water would affect fishing participation rates.

2.2 Objectives

The objectives of the pilot study were to:

- test and then further develop research methodology.
- evaluate the performance of field workers.
- understand the social, economic and environmental dimensions of fishing by rural families.
- further understanding of the nutritional importance of various fish species.
- develop the supportive, logistical system required for the successful completion of a year long research project.
- determine a statistically valid sample size.

- determine appropriate intervals for data collection.

2.3 Study Components

The various components of the pilot study are as follows:

- Household Fish Consumption among Rural Families
- School Children Fish Consumption
- Fish Market Dynamics, Species Composition, Fish Sources and Fish Prices
- Interviews with Subsistence Fishermen
- Fishing Rights and Heritage
- Fish Catch and Aquatic Environment Survey.

The principal activity of the pilot study was the household survey. Interviews with subsistence fisherman, and studies of fish markets were also carried out. While these activities were underway an additional survey method was introduced: School Children Focus Groups. Information on fishing rights and heritage was obtained and this component was later incorporated into the study design.

2.4 Study Areas

Four study areas were selected in consultation with the FPCO. Three study area were originally planned to coincide with FAP 16 case studies. Meghna-Dhonagoda was selected as an example of a fully functioning Flood Control Project. The pilot study sites were as follows:

- Surma-Kushiyara Project Area, Sylhet
- Compartmentalization Pilot Project Area, Tangail
- Gumti Phase-II Project Area, Comilla and Brahmanbaria
- Meghna-Dhonagoda Flood Control, Drainage and Irrigation Project, Chandpur

2.5 Organization of Work

The team was comprised of various professionals including a statistician, fish biologist and economist, and headed by a Study Director. The pilot study benefitted from inputs by members of the FAP 16 team including specialists in agriculture, anthropology, biology, fisheries, nutrition, and hydrology. The initial training program, household selection activities and personnel selection were supervised by FAP 16 co-team leader, Mr Mujibul Huq.

Field investigators were mostly individuals with previous rural research experience. Each of the four study teams was composed of four members as follows:

2 household survey specialists
1 fisheries specialist
1 geographer/map specialist

During the pilot survey the activities of the field research personnel were as follows :

Household Survey Specialists: The household specialists visited three families for three meals a day, on seven consecutive days. During the visits fish were counted, weighed, and identified by species. Interviews were conducted according to a detailed, structured questionnaire concerning demographic and nutritional information. Any pertinent observations not covered in the questionnaire, were recorded in a notebook.

Fisheries Specialist: The fisheries specialist visited fishing sites and markets and interviewed seven people who were engaged daily in fishing (both professional and subsistence) to determine the sources of different species.

Geographer/Map Specialist: The geographer/map specialist prepared a detailed baseline map of the areas under study showing flooding, fish habitats, etc.

2.6 Training

All staff members participated in a week long training conducted by the ISPAN integrated environmental team. Researchers were tested and evaluated on their ability to identify fish. The field questionnaires and interview methodology were tested during day visits to several villages.

3. METHODS

3.1 Household Survey

Selection of Sample Villages: Sample villages in three study areas were selected according to three zones based on assumptions regarding access to floodplain fisheries. It was believed that fish activities and consumption would vary according to these zones.

Zone 1: Riverside - settlement nearest to river.

Zone 2: Beel or low lying - settlement close to beel or low lying areas.

Zone 3: Highland - settlement located in higher elevations.

The Meghna-Dhonagoda study villages were simply classified as inside or outside the embankment.

Selection of Sample Households: six households were selected from each of the sample villages.

The household survey was predicated on physical verification of fish preparation, as well as a detailed interview protocol. Fish were counted and weighed.

Each of the household specialists visited three selected families in each zone for three meals a day, on 7 consecutive days. Thus each family was observed during meal preparation 21 times.

One study objective was to assess the numbers of household visits required and verify the distribution of meals eaten. The information gained would then help determine both the number of days required for the household survey, as well as the schedule of interviews by research assistants.

During the visits, fish were counted, weighed and identified by species. Interviews were conducted according to a detailed, structured questionnaire concerning demographic and nutritional information. Information about food items was numerically coded. A detailed code list for all fish species was provided. A sample of the species numerical code list appears in Appendix 3.

3.2 Fish Catch and Aquatic Environment Survey

Collection of data on the species distribution during fish catch assessments helped define issues which need to be addressed in the long term investigation of fish migration and life cycles.

3.3 Fishing Rights and Heritage

Through discussions and observations information regarding the heritage of fishing rights was obtained. Legal issues were discovered and a review of the practices of the local Department of Fisheries agencies in relation to the subsistence fishermen was made.

3.4 Notebooks

Notebooks were used by the household survey specialist to record any pertinent observations not covered in the questionnaire. These observations will be incorporated into later reports.

3.5 Adaptation of New Components due to Field Experience

The support staff closely monitored and observed the pilot survey. As a result three additional components were developed to enhance understanding of the nutritional and economic implications of bio-diversity and to cross check results. These components are described below.

3.5.1 School Children Focus Groups

School children were interviewed to assess the contribution of various fish species in their diets. They were interviewed about their food intake for breakfast that morning and during the previous evening. Basic socio-economic data was collected along with foods consumed including fish species. Information on fish capture and fish purchase was also elicited. (The school focus groups are now integrated into the full year study.)

Wherever possible, the focus groups were held among children reading in class III. In some schools, older and younger children were also interviewed.

3.5.2 Fish Market Survey

Market surveys were conducted by the supervisory team and field staff. The objectives of the market surveys were to:

- develop a market assessment methodology
- determine the sources and types of water bodies contributing fish to the markets
- provide further data on species distribution in the area.

3.5.3 Additional Fishing Site Survey

The supervisory study team members also conducted detailed interviews with fishermen at their residences, at fishing sites and at markets. Fish were classified and counted. Information on the local heritage of fishing rights was ascertained.

4. FINDINGS

The findings presented here are pedagogical in the sense that what we learned from these exercise was primarily used to construct the currently ongoing study. The tables and discussion below are presented with the aim of informing readers of potentially important issues arising during the pilot study but which require further research. Nonetheless this information will be useful for understanding the relative contribution of various species to consumption production and markets as required in the FPCO Guidelines for Project Assessment (FPCO, May 1992). The methodologies presented in the subsequent sections regarding species composition in the diet, conforms with information collected during the 1981-82 Nutritional Survey of Rural Bangladesh (Ahmed and Hassain 1983).

4.1 Household Survey

Each pilot village selected was studied for a period of one week. The study results therefore only reflect the situation in those households prevailing during that particular observation period. Eighteen households were selected in each study area including a number of female-headed households. Female-headed households accounted for 16.7 percent of the families studied. Table 2 shows the distribution of households by sex of the household head in each of the study areas.

Table 2. Area-wise Distribution of Household Head by Sex

Area	Female	Male
Surma-Kushiyara	2 (11)	16 (89)
Tangail CPP	7 (39)	11 (61)
Gumti Phase II	1 (6)	17 (94)
Meghna-Dhonagoda	2 (11)	16 (89)
Total	12 (17)	60 (83)

72 households were surveyed. Percentages are in parentheses.[1]

[1]For all applicable tables in this report, 72 households were surveyed and percentages are in parentheses.

The study was conducted before the peak fishing season in most areas. A certain number of female-headed households were selected, some of which consisted of a mother and young children. The follow-up study, in contrast, will employ a random selection of mouzas, and households stratified by landholding and economic variables. The large stratified random sample will be conducted for one full year in order to capture full seasonal dimensions.

A primary objective of the pilot household survey was to understand the role of floodplain fisheries on nutrition. Capture fisheries provided most of the protein food consumed during the period under study. Several species of fish alleged to be rich in vitamin A were also consumed. These include the small fish mola and dhela. Aquatic vegetables like arum (kachu) and water lily (shapla), also rich in vitamin A, were commonly consumed. Consumption of eggs and meat was negligible. Pulses (dal) was not commonly consumed.

Table 3 below shows the relative consumption of various non-rice food items by household in the four pilot study areas. More than 93 percent and 89 percent of families did not consume meat and eggs, respectively during the study week. Ninety-four percent of families consumed fish and vegetables during the study week. In contrast more than 56 percent of families consumed fish 5 or more days during the study week.

Table 3. Item-wise Consumption of Food by Household During the Study Week

No. of days during a week	Total Household				
	Fish	Pulse	Meat	Vegetable	Egg
0	4	21	67	4	64
	(6)	(29)	(93)	(6)	(89)
1	6	16	3	8	2
	(8)	(22)	(4)	(11)	(3)
2	4	16	1	11	2
	(6)	(22)	(1)	(15)	(3)
3	7	10	0	7	3
	(10)	(14)	(0)	(10)	(4)
4	10	5	1	8	1
	(14)	(7)	(1)	(11)	(1)
5	13	1	0	11	0
	(18)	(1)	(0)	(15)	(0)
6	14	2	0	16	0
	(19)	(3)	(0)	(22)	(0)
7	14	2	0	7	0
	(19)	(3)	(0)	(10)	(0)
Mean days	5	2	0	4	0
Median	5	1	0	5	

Fish and vegetables were the main food items consumed in addition to a staple grain. Fish was the leading source of protein consumed during the study period. The median number of days a household consumed fish was five. Close to 40 percent of the households consumed fish 6-7 days during the study week. In contrast, six percent of households did not consume fish during the study week and 8 percent of families consumed fish one day during the week. These finding are illustrated below in table 4.

Table 4. Fish Consumption by Household During Study Week

No. of days	Total Household	
0	4	(6)
1	6	(8)
2	4	(6)
3	7	(10)
4	10	(14)
5	13	(14)
6	14	(18)
7	14	(19)
Mean days	5	
Median	5	

The basic unit of measurement is the number of fish meals consumed, with a maximum of three meals daily. As the number of meals per family on a given day may vary, data was analyzed in terms of the number of days when household consumed fish meals. Table 5 shows the number of days fish meals were consumed for each of the study areas.

Table 5. Household Weekly Frequency of Fish Consumption

Fish Consumption by Days	Surma-Kushiyara N = 18	Tangail CPP N = 18	Gumti Phase II N = 18	Meghna-Dhonagoda N = 18	Total N =72
Never Consume in a week	1	1	1	1	4 (6)
One day in a week	2	0	2	2	6 (8)
Two days in a week	1	3	0	0	4 (6)
Three days in a week	3	3	1	0	7 (10)
Four days in a week	2	3	2	3	10 (14)
Five days in a week	6	1	3	3	13 (18)
Six days in a week	1	4	3	6	14 (19)
Seven days in a week	2	3	6	3	14 (19)
Median	4	4	5	6	

N is the number of households surveyed.

The number of days in which fish meals were consumed varied according to zones, and relevant to the Meghna-Dhonagoda embankment. The distribution of meal consumption according to zones was as follows:

Table 6. Distribution of Fish Meal Consumption by Zone

Area	Mean Days		
	Riverside	Beel	Highland
Surma-Kushiyara	4.7	2.0	5.2
Tangail CPP	3.5	5.7	3.7
Gumti Phase-II	3.8	3.3	5.8
	Inside	Outside	
Meghna-Dhonagoda	3.6	4.8	

The higher frequency of meals consumed in the highland villages suggests that late monsoon fish catching was already underway in these areas during the study period, whereas lower lying areas were still fully inundated with high water. Highland fisheries are most vulnerable to reductions in surface water as the result of flood control or beel drainage interventions. In Tangail, which has a higher elevation than the other study areas, the highest levels of consumption during this period was in the beels and highland consumption was low. This suggests that measurement of the impact of hydrological changes caused by controlled flooding should be incorporated into an analysis of fish consumed by land elevation or what we term Fish Ecological Zones (FEZ). The use of FEZ classification as a stratification tool in sample design is discussed in detail in the section on survey methodology for the year long study.

An interesting methodical problem identified during the pilot study was the tendency of households to report less fish meals during the last two days of the study week. Such a relationship was independent of factors such as market days. This could suggest less compliance on the part of the households. The impact of such a declining trend in fish meals would be to slightly underestimate household consumption. The distribution of fish meals in all four study areas according to day of observation is shown in table 7.

Table 7. Number of Households Consuming Fish

Observed Days	No. of Households
1st	46
2nd	53
3rd	46
4th	52
5th	45
6th	41
7th	40

Small fish, which are usually not valued in economic terms because of their relative abundance, played a central role in the diet of the families interviewed. Eighty five percent of families consumed small fish which are usually classified as "miscellaneous". Snake heads and cat fish are also regularly found in the subsistence fisheries basket. Major and minor carps made up 2 percent of fish consumed. The ranking of species by levels of household consumption in all four study areas is shown in table 8. Figure 3 shows the proportion of species consumed by grouped classifications.

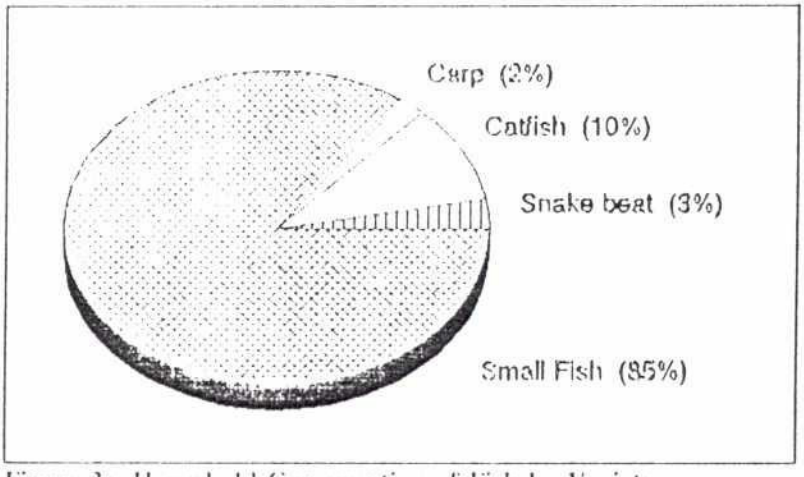


Figure 3: Household Consumption of Fish by Variety

Table 8. Ranking of Species by Households During Study Week

Species	Total Household		Species	Total Household	
Puti	52	(72)	Soil	2	(3)
Small chingri	43	(60)	Silver carp	2	(3)
Chanda	39	(54)	Rui	2	(3)
Mola	21	(29)	Potka	2	(3)
Gutum	21	(29)	Narkili	2	(3)
Khalisa	19	(26)	Mrigel	2	(3)
Bailla	18	(25)	Gulsa	2	(3)
Hilsa	16	(22)	Gajar	2	(3)
Kai	15	(21)	Chotka chingri	2	(3)
Dankina	14	(19)	Cheoa red	2	(3)
Tengra	13	(18)	Thai sarputi	1	(1)
Dhela	10	(14)	Telapia	1	(1)
Chapila	10	(14)	Shar puti	1	(1)
Veda	8	(11)	Poa	1	(1)
Taki	8	(11)	Magur	1	(1)
Sing	8	(11)	Kuli buish	1	(1)
Kaikka	7	(10)	Khalla	1	(1)
Kachki	7	(10)	Katla	1	(1)
Guchi	7	(10)	Katkati	1	(1)
Chala	7	(10)	Kali bous	1	(1)
Baim big	7	(10)	Kakra	1	(1)
Bojri	6	(8)	Guchi baim	1	(1)
Kajali	4	(6)	Gaura	1	(1)
Black chingri	4	(6)	Foli	1	(1)
Tara baim	3	(4)	Faissa	1	(1)
Pabda	3	(4)	Cheoa white	1	(1)
Galda chingri	3	(4)	Boal	1	(1)
Betrongi	3	(4)	Batasi	1	(1)
Tatkini	2	(3)			

Major carp were rarely eaten because of high price, investment requirements, market structure and leasing systems. Major carp capture is tightly controlled by leases in many regions. Families dependent on subsistence agriculture or on subsistence fishing have limited access to carps. These costly fish are largely exported out of rural areas as high priced fish for urban markets.

Pond culture fisheries had little impact on the diet of the families under study. The research to date suggests that negative impacts on fisheries are not easily ameliorated by either pond culture or by the stocking of major carp or exotic species. Fish stocking programs in many parts of the

country have resulted in further erosion of common property rights in favor of stronger leasing systems. They also potentially expose wild stocks to diseases occurring in hatcheries.

Table 9 shows the number of species consumed in each of the four areas during the study period. The number of species in an area indicates the fauna richness in the diet and is a partial reflection of the fish abundance. More comprehensive indications of the levels of species diversity is obtained from fish catch assessment and market surveys.

Table 9. Number of Fish Species by Area

Area	No.of Species
Surma-Kushiyara	18
Tangail CPP	31
Gumti Phase-II	39
Meghna-Dhonagoda	27

A total of 57 species were consumed during the pilot study. The most important species were Puti, small shrimps and Chanda which ranked first, second and third respectively. Silver carp, Rui and Mrigel ranked 17 in importance to households during the study period.

Substantial, non-monetary earnings result from subsistence fisheries, often during periods when agricultural employment is scarce. In addition, capture fisheries provide some cash income. Fourty-four (61%) families caught fish during the study week. Other families bought fish from capture sources. The distribution of households according to capture and purchase categories is shown in table 10. None of the families studied exclusively sold fish without consumption.

Table 10. Number of Households Consuming Fresh Fish by Source

Source	Surma-Kushiyara	Tangail CPP	Gumti Phase-II	Meghna-Dhonagoda	Total
Only caught	10 (56)	9 (50)	8 (44)	9 (50)	36 (50)
Bought & caught	1 (6)	5 (17)	1 (6)	1 (6)	8 (11)
Only bought	6 (33)	3 (28)	8 (44)	7 (39)	24 (33)
No Consumption	1 (6)	1 (6)	1 (6)	1 (6)	4 (6)
Total	18 (100)	18 (100)	18 (100)	18 (100)	72 (100)

It is important to note the age and sex distribution of persons catching fish during the study period. The involvement of children was prominent. The relative participation of children may vary with the season. Field observation in February and March, 1992 for example, found the participation of children higher than adults with a notable prominence of girls accounting for perhaps 60 percent or more. During the pilot survey period, 20.3 percent of persons providing fish to the household were between the ages of 5-10 years and 24.7 percent between 11-17 years. 49 percent of persons providing fish to the households were between 18-55 years, and 10 percent were over 55 years of age (refer to table 11).

This remarkable range of labor participation, i.e., nearly 60 percent, of families catching fish during the study period crossed a wide spectrum of ages and was of both sexes. The age distribution of families involved in fishing is shown in table 11.

Table 11. Sex and Age Group of Persons Fishing

Age Group	Male	Female	Total	
5-10 Years	13	1	14	(20)
11-17 Years	15	2	17	(25)
18-55 Years	29	2	31	(45)
>55 Years	6	1	7	(10)
Total	63	6	69	(100)

The involvement of children in fish production activities is infrequently considered when quantifying both income and employment losses and benefits with and without project scenarios. The tendency to ignore the productivity of women and children would result in underestimation of the economic and social consequences o%wobstruction of fish into a project area, or a reduction of fisheries through loss of surface water during peak periods of fisheries growth. Work by Smith and others suggest that the volume of water is crucial to fish growth and population densities (Smith 1991). Reductions in total fish stocks mean greater effort is required to catch fish. This would impact the contribution of different age groups to total household food production in fishing.

Knowledge of the seasonal variation in employment, and contribution of different age groups and sexes to the total household food and cash economy, is critical in assessing project impacts.

4.2 School Children Survey

Benefits and costs to children should be separated in assessing the nutritional impact of bio-diversity of fisheries. Children catch and consume fish. They are also most vulnerable to malnutrition and have higher demands for specific nutrients found in fish. Between 30,000 to 50,000 children reportedly go blind in Bangladesh each year as a result of vitamin A deficiency. Nutritional problems can arise both from the lack of diversity in the diet, as well as undernutrition.

To help focus attention of the special needs of children, and to support an assessment of their current food consumption patterns, school children focus groups were incorporated into the study. This will complement information derived from the household survey and allow us to cross-check our findings in the areas under study.

During the pilot study, surveys of school children's food consumption in three areas under study were carried out. The findings are reported below. Around 30 children reading in Class III were interviewed. When that was not possible children in adjacent age groups were recruited. Social background information of these children suggests that a broad distribution of children, according to family landholding size and occupation, were in attendance at schools. The year long study will provide seasonal data on fish consumption among children at 52 schools. Information from the pilot study focus groups appears in tables 12, 13 and 14 below.

Table 12. Number of School Children Eating Fish by Species

Species	Breakfast (N = 77)		Dinner (N = 111)	
Puti	22	(28.6)	38	(34.2)
Khalsha	3	(3.9)	5	(4.5)
Koi	5	(6.5)	7	(6.3)
Tengra	8	(10.4)	23	(23.7)
Mola	2	(2.6)	4	(3.6)
Singi	1	(1.3)	6	(5.4)
Small Chingri	7	(9.1)	18	(16.2)
Taki	3	(3.9)	16	(14.4)
Guchi Baim	-		6	(5.4)
Chanda	-		7	(0.9)
Chapila	-		4	(3.6)
Hilsha	1	(1.3)	2	(1.8)
Baicha	1	(1.3)	2	(1.8)
Kaikya	3	(3.9)	6	(5.4)
Dried fish	2	(2.6)	1	(0.9)

N is the number of children interviewed.

Table 13. Distribution of School Children Focus Group by Sex

Name of School	Male	Female	Total
Hatirdahar Primary, Zakiganj	15	19	34
Lamchari Primary, Matlab	16	15	31
Gram Chowbaria Primary, Tangail	26	20	46
Total	57 (51.3)	54 (49.7)	111 (100)

Table 14. Distribution of School Children According to Fish Meals

Meal time	Zakiganj	Matlab	Tangail	Total
Breakfast	(missing)	21	17	38 (35.0)
Dinner	29	26	17	72 (65.0)

4.3 Fish Market Survey

Fish market surveys were used to study the range of species diversity and to assess the contribution of various water bodies to commercial production. The markets also provided life cycle information and an indication of the commercial importance of various fish. In mid November, 1991 during the field visit in Matlab, it was observed that 250 grams of fish were exchanged for 200 grams of rice. The market price of small fish at times in Surma-Kushiyara area was also cheaper than rice for several weeks. Fish were often inexpensive during the pilot study period and most families ate fish 4-7 days a week. The follow up study will provide detailed information on seasonal variation of fish prices by species, and prices of other foods for comparison purposes. The market survey will be related with other information to get a more complete picture of the resources and habitats of fish species .

The following is a list of distribution of fish species observed while interviewing fisherman in markets during the pilot study.

Table 15. Species Observed during 13th Sept-10th Oct. 1991

Species	Surma-Kushiyara Total = 38	Meghna-Dhonagoda Total = 39	Gumti Phase-II Total = 40
1. Puti	✓	✓	✓
2. Chanda	✓	✓	✓
3. Shar-Puti			✓
4. Tintputi	✓	✓	✓
5. Koi	✓	✓	
6. Magur	✓	✓	✓
7. Singi	✓	✓	✓
8. Donkina	✓		✓
9. Taki	✓	✓	
10. Rita	✓	✓	✓
11. Pabda	✓	✓	✓
12. Boal	✓	✓	✓
13. Tengra	✓	✓	✓
14. Fali	✓	✓	✓
15. Baila	✓	✓	✓
16. Kaikaya	✓	✓	✓
17. Chapila	✓	✓	
18. Baiem	✓	✓	✓
19. Tara Baiem	✓	✓	✓
20. Gochi Baiem	✓		✓
21. Gotum	✓	✓	✓
22. Fatka	✓		✓
23. Rui	✓		✓
24. Chital	✓	✓	✓
25. Katal	✓		✓
26. Mrigal	✓	✓	
27. Gainna	✓		✓
28. Tatkini	✓		✓
29. Kali-Baush	✓		✓
30. Telapia	✓	✓	
31. Gora chingri	✓	✓	
32. Rani	✓	✓	
33. Kakila	✓	✓	
34. Dot-Kari	✓		✓
35. Tapa	✓	✓	✓
36. Chatka Chingri	✓	✓	✓
37. Baicha	✓	✓	✓
38. Mola	✓	✓	✓
39. Khalla		✓	✓
40. Khalisa		✓	✓
41. Sail		✓	
42. Ghaura		✓	
43. Bacha		✓	
44. Talepia		✓	
45. Nailatika		✓	
46. Galda Chingri		✓	✓
47. Chaua		✓	✓
48. Kataira		✓	✓
49. Bhaugla		✓	✓
50. Kwchki			✓
51. Btashi			✓
53. Naftani			✓
54. Bajari			✓
55. Hilsha			✓
56. Kankara			✓
57. Dhela			✓

Sources of fish in the market were ascertained from sellers. The following is a breakdown of species information according to capture habitat between September 13 and October 10, 1991 in Jukijanj market in Shylet.

Table 16. Distribution of Species According to Wetland Habitat

Wetland	Nos. of Species	Type of Species
1. River	5	Rita, Chital, Boal, Kali Boush & Foli.
2. Canal	26	Foli, Tengra, Chapila, Boal, Kalira, Punti, Mola, Gochi-Baiem, Baiem, Katal, Mrigal, Donkini, Kakila, Baila, Bora Bi-aiem, Fatka, Chanda, Gora- Chingri, Taki, Pabda, Golsa Tengra, Rani, Meni, Gainna, Tatkini & Telapia.
3. Beel	14	Magur, Boal, Foli, Kalira/Boush, Mola, Punti, Chanda, Tatkini,Gora-Chingri, Taki, Pabda, Chapila, Mola & Katal.
4. Haor	22	Tengra, Boal, Mola, Punti, Ruhita, Gochi-Baiem, Meni, Koi, Donkini, Kalira/Boush, Dot-kari, Fatka, Chanda, Kakila, Chala, Gora-Chingri, Singi, Kaikka, Foli, Pabda, Bora-Baiem & Baila.
5. Paddy Field	11	Gotum, Donkini, Punti, Baila, Gora-Chingri, Gichi Baiem, Tengra, Dhala, Chanda, Bajari, Telapia.
6. Pond	15	Foli, Tengra, Punti, Gochi Baiem, Koi, Singi, Gotum, Gorachingri, Dokini, Mola, Chanda, Pabda, Mrigal, Kalira & Katal.
7. Nala	7	Punti, Gotum, Baila, Chanda, Gora Chingri, Gichi-Baiem & Baicha.
8. Doba	20	Punti, Gotum, Mola, Chanda, Gora Chingri, Baila, Tengra, Gochi-Baiem, Tintpunti, Taki, Bajari, Foli, Magur, Tara, Singi, Donkini, Bara-Baiem, Koi, Tara Baiem & Telapia.

4.4 Fishing Rights and Heritage

It was found that fishing rights and heritage schemes practiced according to laws and those practiced through informal customs/understanding can be roughly categorized into: (a) Formal lease systems; (b) Traditional/customary practice; and (c) A mixture of both lease system and traditional system depending on the extent of material understanding among the formal lessee, the influential rural coteries and the common village people. The issue of fishing rights and heritages is critical because fishing has become to a very large extent a profitable commercial proposition in the context of prevailing socio-economic circumstances both in the rural and urban areas. Changes in relationships as the result of flood control and fish project interventions often undermine existing informal rights which had acted as a buffer against extreme hunger and famine. This area will be covered in more detail in the main study.

5. CONCLUSIONS

While the pilot study findings are preliminary, they indicate that reductions in the availability of fish stocks result in serious adverse nutritional and social consequences. They also indicate that an adequate understanding of the importance of species bio-diversity in food production is essential for understanding the costs and benefits of proposed flood control interventions.

The primary conclusion of the pilot study was the development of the main study design explained below in section 6. Field workers were trained and their performance assessed during the pilot study phase. Investigations into the social, economic and environmental dimensions of fishing in rural areas resulted in the development of additional components to the main study: school children focus groups, fish market surveys, additional fishing site surveys and a study of fishing rights and heritage. Nutritional studies indicated that capture fisheries provided most of the protein food consumed by the families studied as the consumption of meat and eggs was negligible.

It was determined that a random sample of ten households in each selected mouza will be chosen for the main study. The appropriate interval for fish consumption data collection would be three visits per day to each selected household for three to seven consecutive days.

6. DESIGN OF THE MAIN STUDY PHASE

A major drawback in interpreting the pilot study results was the lack of systemic, random procedure for household selection during the early implementation stage. In this respect the information gathered was similar to that obtained through Rapid Rural Appraisals (RRA). The selection of households was not proceeded by a census. These problems are addressed in the formal study design. An overview of the complete study methodology follows.

6.1 Study Area

Four study areas will be selected to distribute the sample effort as widely as possible over various ecological zones. Time, budget and personnel availability are limitations to the number of target areas selected. Wherever possible, target areas were selected to coincide with ongoing Environmental Impact Assessment (EIA) case studies so as to maximize interchange of fisheries, social and other resource information between the various studies. Selected study target areas and their characteristics are:

Tangail	Compartmentalization Pilot Project	Brahmaputra floodplain
Zakiganj	Surma-Kushiyara Project	Surma-Kushiyara floodplain
Singra	Chalan Beel Project	Ganges-Atrai floodplain
Matlab	Meghna-Dhonagoda Flood Control & Irrigation Scheme (Completed Project, not a FAP 16 case study)	Meghna floodplain

6.2 Objectives

1. To establish baseline data on fish consumption and use by poor people within the floodplain.
2. To determine the status and distribution of fisheries resources in selected FAP project areas.
3. To measure the extent of community participation and utilization of fisheries resources.
4. To develop methods for assessing household fish consumption and species composition which could be applied in other FAP studies.
5. To provide guidance on the determination of impacts of various flood control and water management schemes on fisheries, fish consumption and nutrition.
6. To determine the role of subsistence fisheries.
7. To determine the life stages of fish; quantify the fish biomass and identify the possible spawning sites.

6.3 Methods

1. General: The study will collect detailed information on annual fish capture and consumption by small farm and landless families over a one year cycle. The fishing activities of samples of small farm and landless families will be collected monthly over the same cycle. Species will be identified according to local names, and verified through the collection of samples and photographs. Sizes and weights will be measured. Local beliefs about qualities attributable to the consumption of these species will be obtained. Information on consumption will include quantitative assessments of the distribution of fish among family members according to age and sex, and information on how fish are prepared and consumed.

2. A three-stage stratified random sampling technique will be used. In the first stage all mouzas within the study area will be stratified according to their appropriate FEZ classification. At the second stage of stratification, the classified mouzas will be arranged according to the number of households: a 10% random sample will then be drawn from small, medium and large mouzas within the respective FEZ. At the third stage of stratification, all the households within the sampled mouzas will be inventoried and the households will be stratified on the basis of five socio-economic criteria defined by land ownership. All the mouzas in identified FEZs of the target areas constitute the Primary Sampling Units (PSU), the sampled mouzas will constitute the Secondary Sampling Units (SSU) and the sampled households will be the Ultimate Sampling Units (USU). A proportionate number of mouzas will be selected on the basis of the number of households living within and outside of the Meghna-Dhonagoda embankment in Matlab Upazila.

3. Fishery Ecological Zones will be identified within each target area on the basis of the following criteria:

- FEZ-1 Beel or depression where water is available most of the year and has link with canals/rivers.
- FEZ-2 Mouzas within one and a half miles of river.
- FEZ-3 Highland or flood free area.

All beels or depressions will be identified from available maps (i.e. contour, topographic and Police Station maps) and cross checked with records of upazila fishery offices and Bangladesh Water Development Board (BWDB) offices.

4. Stratification and Sampling of Mouzas: The mouzas in each FEZ will be grouped into three categories (small, medium and large) on the basis of total number of households.

The mouzas with 1-150 households will be considered small, mouzas having 151 to 300 households medium and above 300 households large. The required number (i.e. 10 percent) of sample mouzas will be randomly selected from each category with minor adjustment for fractional number without replacement. The objective is to ensure that sample mouzas are representative of the size of the mouzas in each FEZ. At this stage of selection of samples only mouzas having more than 40 households will be considered.

5. Stratification and Sampling of Households: For selection of households which will form the Ultimate Sampling Unit a complete census of all the households in the sampled mouzas will be made using a simple census form covering the following information:

- Household identification (name of household head, father's name)
- Family size
- Type and size of land ownership, and size of operational land
- Main and secondary occupation of household head

Based on this household census, the households will be grouped into socio-economic strata:

- Absolutely Landless - having no cultivable land
- Functionally Landless - having up to 0.50 acres of own land
- Marginal farmer - farmers having own cultivable land between 0.51 to 1.50 acres
- Small farmer - farmers having own cultivable land between 1.51 to 2.50 acres
- Medium farmer - farmers having own cultivable land between 2.51 to 5.00 acres
- Large farmer - farmers having own cultivable land above 5.0 acres.

These lists of households will be used as the framework for selection of sample households where detailed study will be conducted using structured questionnaires. At the household sample selection stage the large farmer stratum will be discarded. A sample of households in each selected mouza will be chosen by random sampling techniques proportionately from each of the four remaining strata.

6. Household Surveys: Household surveys of social class and fish consumption by species will be made according to the ecological zone. Each of the selected households will be

surveyed three times a year.

- Mid December to Mid April (Push-Chaitra)
- Mid April to Mid August (Baishak-Sraban)
- Mid August to Mid December (Bhadra-Agrahayan)

Relevant social information on employment and agricultural activities will be obtained during the survey. Consumption measurements will include information on number of fish meals eaten by species, according to amount and weight.

Each selected household will be visited three times per day (morning, afternoon and evening) for seven consecutive days per season to complete the survey cycle. After completion of the first survey operation for the first season, the second seasonal household survey will start and the third household survey will follow thereafter. A requirement of three visits per day was determined through an analysis of daily variation of household consumption during this pilot survey.

The questionnaire to be used for the household surveys will collect data on the following parameters :

- Demographic Data - family composition, sex, age, occupational structure, employment pattern.
- Data on daily food intake - no. of meals, fish consumed by species, other food intake.
- Sources of fish: (i) capture fish: catch amount, sources of catch, time of catch, place of sale and sale value by species. (ii) purchase from market: source, distance of market, quantities and value by species.
- Nutritional data for pregnant, nursing women and children: data on staple food, pulses, meat, vegetables, fruits and others for three consecutive meals.
- Information on hunger.
- Preparation of fish item: data on fish cooking methods by species for children as well as for pregnant and nursing women.

7. Surveys of School Children: Dietary information, household fishing activity, and species consumption information will be obtained in classrooms in sampled mouzas during three seasons. This will provide a cross reference and further information to supplement household and fish resources environmental surveys. School children reading in class 3 will be used as a focus to assess the importance of local fisheries resources on child nutrition. School children in 1-2 schools in each mouza will be questioned about their diets on the morning of the interview and during the previous day. Specific

information on fish consumption, and the participation of family members in fishing will be elicited. The techniques used for this survey were discussed above in section 3.5.1.

8. Fisheries Resource Environment Survey: A series of surveys will sample species composition, species distribution, life cycles, fish catch data and landings sites. Surface water distribution will be seasonally mapped throughout the study areas. Information on overall trends in fish production will be collected from various sources.

- *Wetland Geography* - all important beels and connecting canals, river and other depressions will be inventoried and maps will be drawn showing seasonal physical variations on water bodies, link canal water flow, etc.
- *Rainfall, Temperature, Hydrology, Land Use* - data on these parameters will be collected from secondary sources including Bangladesh Water Development Board, Meteorological Department, Department of Fisheries, upazila and district offices.
- *Fish Migrations* - information will be collected on fish migration patterns in the target area twice during the study: April to June, and September to November for migration in and out respectively.
- *Life Cycle of Species* - surveys will be conducted in the target area to collect data on life cycles of species by interviewing individuals and clusters of fishermen or villagers fishing in each season in each FEZ.
- *Capture Fishery* - information will be collected on capture fisheries from daily interviews with fishermen or villagers practicing capture fishery. A diversity of water bodies will be sampled to collect data on species habitats, size, breeding status, and life cycles of fish. Special attention will be focused on peak migration and capture seasons.
- *Fish Markets* - data will be collected from fish markets relating to quantity of fish sold and their procurement sources, number of shops, number of sellers and other relevant information. At least one market will be selected from each sample mouza/hinterland of mouza. Surveys will be conducted at least one day a week in selected markets during three seasons.
- *Species List* - data will be collected to prepare a list of species according to the following classifications:
  - general list of species in the target area, classified according to size, and unit price value and feeding and breeding requirements.
  - source (i.e. beel, rice field, canal, others)
  - endangered species.

Samples of questionnaires used in the main study are in the annex at the end of this report.

9. Fishing Rights and Heritage: Information will be collected in each target area on fishing rights and heritage, types of water bodies, categories of common property rights and leasing arrangements.

10. Data Processing: All questionnaires will be edited and open ended sections will be coded. Emphasis will be given to data quality control. Collected data will be organized and processed using standard software packages (dBase IV). Collected data will be processed and computerized by phases as per collection schedule and by survey seasons.

11. Statistical Analysis: Univariate tables reflecting FEZ, season and area will be prepared; cross-tables for related variables will be constructed along with standard tests of hypotheses using statistical packages (SPSS and dBase Stats). Correlations among the key variables will visualize the relationship and dependency of important parameters. Analysis of variance and multiple regression analysis will be used to test relationships between dependent explanatory variables. Standard statistical tests for sample size and key variables of survey findings will be tested by applying variance, standard deviation, t-tests and other standard statistical techniques.

6.4 Study Outputs

All information collected as described under Methods will be presented in a series of reports:

- Pilot Study Report by January 20, 1992
- Survey Cycle #1 Report by July 15, 1992
- Survey Cycle #2 Report by November 30, 1992
- Survey Cycle #3 Report by January 15, 1993
- Final Report and Seminar on February 15, 1993
- Special reports may also be produced as required.

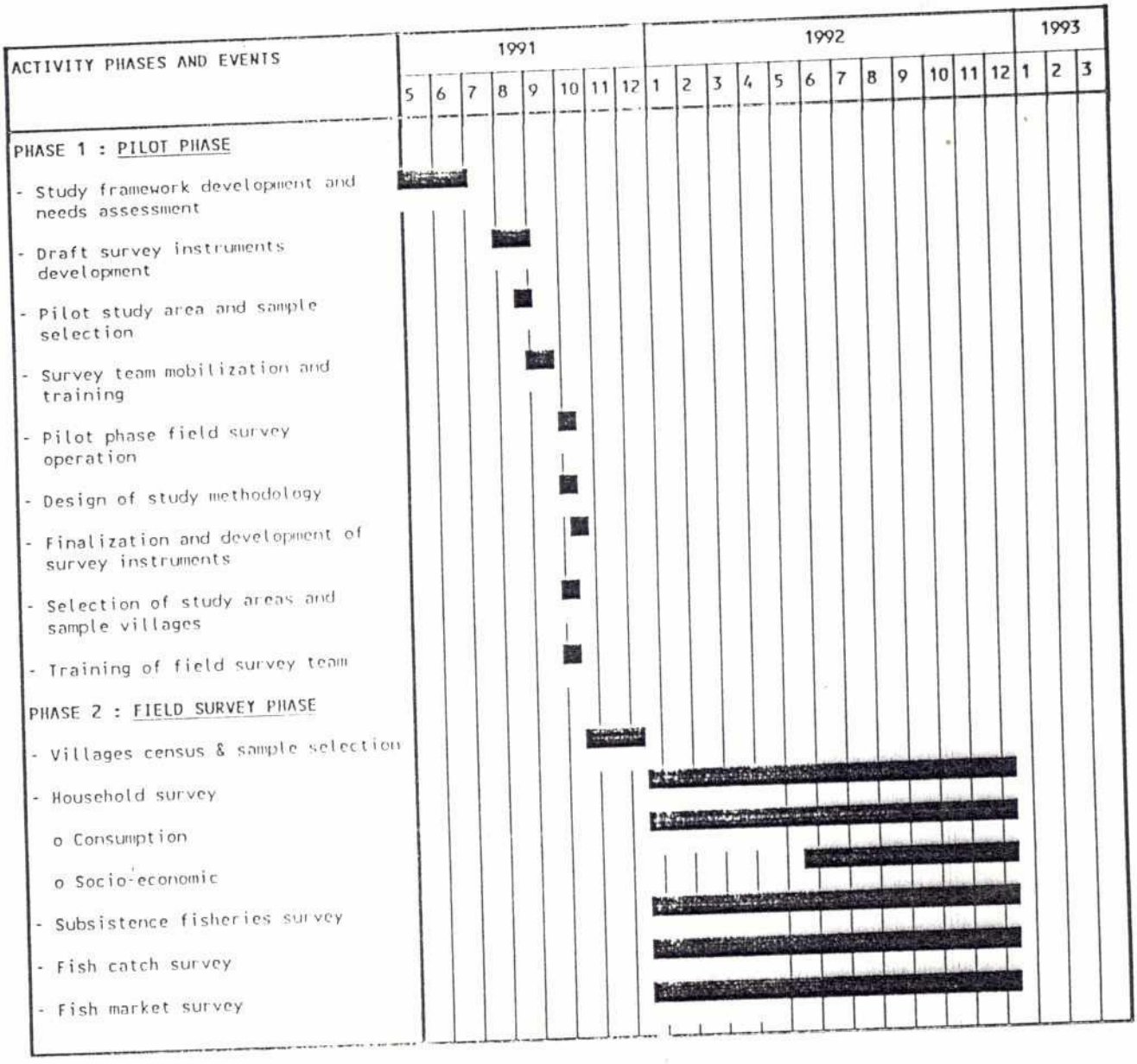
6.5 Study Organization

The study will require a multi-disciplinary team plus close cooperation between participating researchers, advisors and specialists. The organization proposed reflects specificity, complementarity and flexibility and would enable study team members to work on a variety of tasks.

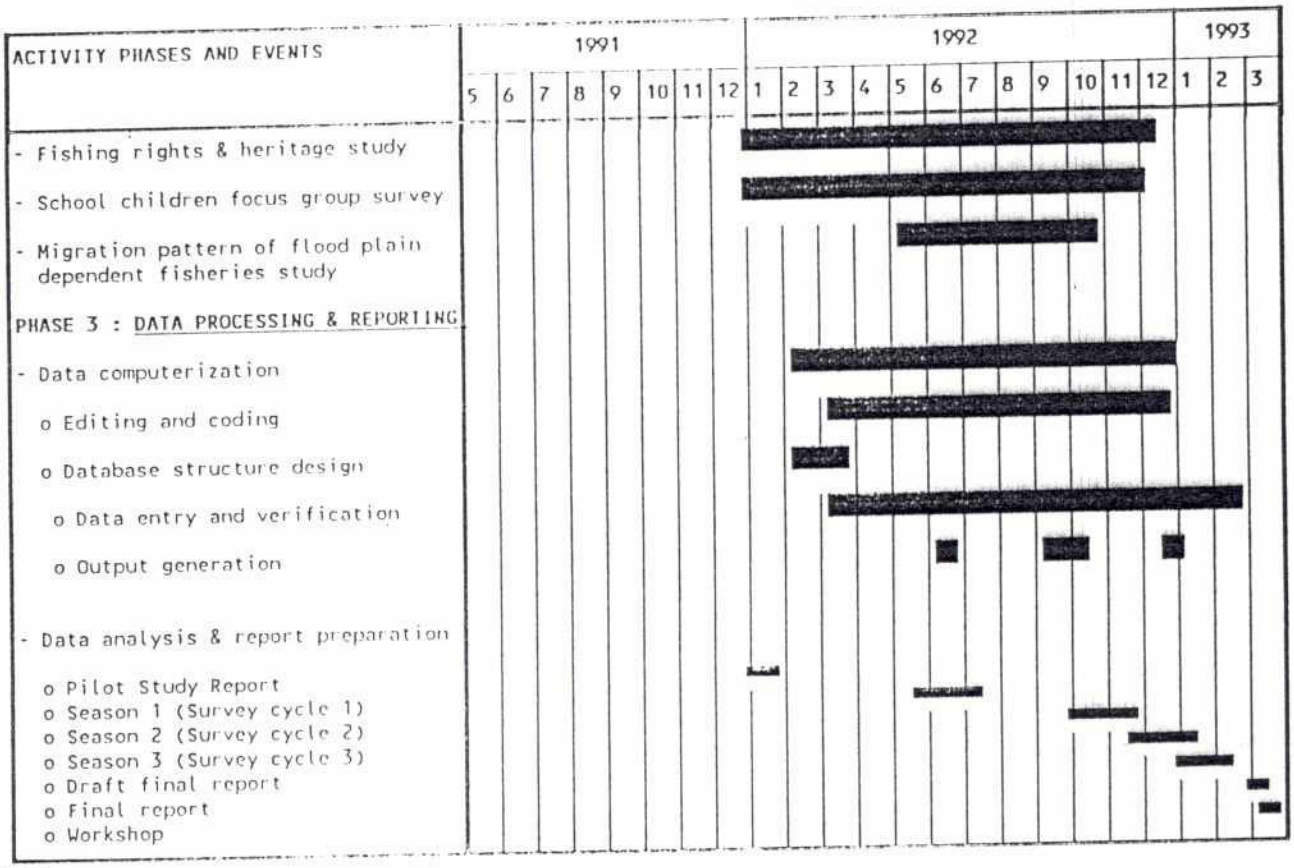
The study team will be coordinated and directed by the Study Director, who will be assisted by a survey specialist/statistician, fishery biologist and a special advisor. Four survey teams will be constituted — one for each target area - with four Research Assistants (two male for fisheries resources environment survey and two female for household surveys). Research Assistants will

receive comprehensive and intensive training. Following the pilot study the Research Assistants are expected to make major contributions to the final design of the study.

6.6 Schedule



Schedule continued



6.7 Staff and Budget Estimates

The study will be undertaken by ISPAN expatriate and local staff, based in Dhaka. The budget for the study will be provided from ISPAN's approved budget under the Eastern Waters Initiative, funded by the U.S. Agency for International Development (USAID).

6.8 Relevance to the Flood Action Plan

Floodplain capture fisheries are a common property and sustainable resource in Bangladesh. The proposed study will help clarify the nutritional impact of changes in the aquatic environment and provide information about the seasonal capture of fish. The study relates to problems of "loses and benefits" for families affected by proposed projects as well as macro-economic issues of "costs and benefits". It compliments the work of FAP 17 by adding a nutritional and public health perspective to the proposed fisheries studies.

APPENDIX 1: Partial List of Reports Comparing Flood Control and Fisheries

1. Master Plan Organization (MPO). 1985. "Fisheries and Flood Control, Drainage and Irrigation Development." *Technical Report No. 17.*

2. Minkin, Stephen F. 1989. "Steps for Conserving and Developing Bangladesh Fish Resources. *Agricultural Sector Review.* United Nations Development Program. Dhaka (Revised).

3. FAP 12. 1991. Rapid Rural Appraisal of Protappur Irrigation Project. pp. 6-1 to 6-5.

4. FAP 12. 1991. Rapid Rural Appraisal of Selimpur-Karatia Regulator Cum Bridges. pp. 6-1 to 6-2.

5. FAP 12. 1991. Rapid Rural Appraisal of Hatir Haor Project. pp. 6-1 to 6-5.

6. FAP 12. 1991. Rapid Rural Appraisal of Improvement of Sakusia Beel. pp. 6-1 to 6-10.

7. FAP 12. 1991. Rapid Rural Appraisal of Komapara Embankment Project. pp. 6-1 to 6-5.

8. FAP 12. 1991. Summary and Recommendations, pp. 20

9. Fap 12. 1992. Summaries of PIE Survey Reports (Final Draft). pp. B1-5, B2-4, B3-4, B4-4, B5-4.

10. FAP 20. 1991. Compartmentalisation Pilot Project (Inception Report). pp. 54-55.

11. Second Small Scale Flood Control Drainage and Irrigation Project. 1990. Polder 4 Subproject (Feasibility Report). pp Annex 4.

12. The Impact of Flood Control Drainage and Irrigation in Bangladesh: Benchmark Survey and Initialization of a Monitoring and Evaluation System. 1987. pp. 63.

13. The Environment and Development in Bangladesh (an Overview and Strategy for the Future). 1989. pp. 21-22.

14. Upper Kushiyara Project (Feasibility Report). 1973. pp. Appendix G.

15. Bangladesh Center for Advance Studies, 1988 Third Quarterly Progress Report. 1988. ENIMOF Project--Department of Fisheries, Ministry of Fisheries and Livestock, GOB, Dhaka.

16. Fallon, Louise. October, 1989. Aquatic Resources and Fisheries in Bangladesh. An Annex of the Bangladesh Environment and Natural Resource Assessment. World Resources Institute, Washington, D.C.

17. IUCN. July, 1987. Fisheries Resources (paper prepared for phase I). National Conservation Strategy Secretariat, BARC, Dhaka.

18. ODA/UK. March 3--May 1, 1990. Report and Recommendations of the ODA Fisheries Project Identification Mission to Bangladesh under Fisheries and Flood Action Plan. ODA, London, UK.

19. Bangladesh Water Development Board (BWDB). 1987. Pabna Irrigation Fisheries Appraisal.

APPENDIX 2: List of Pilot Survey Villages

Study Area	Name of Village	Upazila
Surma-Kushiyara	Sultanpur	Zakiganj
	Rarigram	Zakiganj
	Hamindapur	Zakiganj
CPP - Tangail	Gala	Tangail
	Agbethoir	Tangail
	Baniabari	Tangail
Gumti Phase-II	Montala	Nabinagar
	Majhikara	Nabinagar
	Fardabad	Nabinagar
Meghna-Dhonagoda	Bingabhanga	Matlab
	Ludhua	Matlab
	Char Laksmi	Matlab

APPENDIX 3: Code List for Fish Species

Code No.	Bangla Name	Zoological Name
1.	Chala punti	Puntius chola
2.	Tit punti	Puntius ticto
3.	Punti	Puntius sophore
4.	Sar punti	Puntius sarana
5.	Thai sar punti	Puntius gonionotus
6.	Chanda	Chanda spp.
7.	Katchki	Corica soborna
8.	Batasi	Pseudeutropius atherinoides
9.	Khalla	Rhinomugil corsula
10.	Mola	Amblypharyngodon mola
11.	Koi	Anabas testudineus
12.	Magur	Clarias batrachus
13.	Shingi	Heteropneustes fossilis
14.	Meni	Nandus
15.	Narikeli	Salmostoma bacalia
16.	Bhetki	Lates calcarifer
17.	Darkina	Esomas danricas
18.	Khalisha	Colisa fasciata
19.	Kukur jeeb	Cynoglossus spp.
20.	Chela	Salmostoma phulo
21.	Naftani	Ctenops nobilis
22.	Lal chewa	Odontamblyopus rubicundus
23.	Shada chewa	Trypauchen vagina
24.	Taki	Channa panctatus
25.	Cheng	Channa gachua
26.	Shol	Channa striatus
27.	Gojar	Channa marulias
28.	Chaka	Chaca
29.	Aair	Mystus aor
30.	Guizza air	Mystus seenghala
31.	Bagair	Bagarius
32.	Rita	Rita
33.	Pangas	Pangasius
34.	Shilong	Silonia silondia
35.	Ghaura	Clupisoma garua
36.	Bacha	Eutropiichthys vacha
37.	Choukkani	Aplocheilus panchax
38.	Kuli bailla	Eleotris fusca
39.	Pabda	Ompok pabda
40.	Boal	Wallago attu
41.	Tengra	Mystus vittatus
42.	Bajari tengra	Mystus tengara
43.	Golsha	Mystus cavasius

Code No.	Bangla Name	Zoological Name
44.	Cital	Notopterus chitala
45.	Foli	Notopterus
46.	Bailla	Glossogobius giuris
47.	Kaikka	Xenontodon cancila
48.	Hilsha	Hilsa ilisha
49.	Chapila	Gudusia chapra
50.	Phasa	Setipinna phasa
51.	Kajali	Ailiichthys punctata
52.	Baim	Mastacembelus armatus
53.	Tara baim	Macrognathus aculeatus
54.	Guchi baim	Mastacembelus pancalus
55.	Gutum	Lepidocephalus spp.
56.	Kuchia	Monopterus cuchia
57.	Bamosh	Ophisternon bengalensis
58.	Potka	Tetrodon cutcutia
59.	Poa	Pama
60.	Rui	Labeo rohita
61.	Catla	Catla
62.	Mrigel	Cirrhinus mrigala
63.	Kalibaus	Labeo calbasu
64.	Goinna	Labeo gonius
65.	Tatkini	Cirrhinus reba
66.	Moha shol	Tor
67.	Silver carp	Hypophthalmichthys molitrix
68.	Mirror carp	Cyprinus carpio specularis
69.	Grass carp	Ctenopharyngodon idellus
70.	Carpio	Cyprinus carpio communis
71.	Big head	Aristichthys nobilis
72.	African magur	Clarias gariepinus
73.	Tilapia	Oreochromis mossambicus
74.	Nilotica	Oreochromis niloticus
75.	Galda chingree	Macrobrachium ossenbergii
76.	Gura chingree	Macrobrachium spp.
77.	Chatka chingree	Macrobrachium spp.
78.	Kalo chingree	Macrobrachium spp.
79.	Bang	Rana spp.
80.	Shutki	Dried fish
81.	Dhela	Rohtee cotio

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Minkin, Stephen F. 1989. "Steps for Conserving and Developing Bangladesh Fish Resources." *Agricultural Sector Review*. United Nations Development Program. (Revised) Dhaka.

Rahman, A.K. Ataur. 1989. *Freshwater Fishes of Bangladesh*. Dhaka: Zoological Society of Bangladesh.

Rainboth, W.J. 1990. The fish communities and fisheries of the Sundarbans: development assistance and dilemmas of the aquatic commons. *Agriculture and Human Values* 7(2): 61-72.

Shahabuddin, Q. & Rahman, K.M. 1992. Estimation of Economic Prices of Selected Commodities for use in FAP Planning Studies. *Final Report, Special Study on Economics.*

Smith, M.A.K. 1991. Models of seasonal growth of the equatorial capr Labeo dussumieri in response to the river flood cycle. *Environmental Biology of Fishes* 31: 157-170.

ANNEX: QUESTIONNAIRES

Form 1.	Household Survey Questionnaire
Form 2.1	Subsistence Fishing Household Survey
Form 3.	School Children Focus Group Survey
Form 4.	Market Survey Questionnaire
Form 5.	Fish Catch Survey (Beel)
Form 6.1	Fish Catch Assessment Survey (River)
Form 7.	Fish Migration Record Format

Form-1

ISPAN Flood Action Plan
Environmental Study
(FAP - 16)

Nutritional Consequences of Bio-Diversity of Fisheries
Household Survey Questionnaire

A. Identification

1. Respondent's Name _____ 2. Survey Date | | | |

3. Household's Head Name _____

4. Household No. | | 5. Socio-economic Strata (Code) | | 6. Survey Cycle (Code) | |

7. Fish-ecological Zone (Code) | | 8. Study Area (Code) _____

9. Mauza _____ 10. Village (if different name) _____

11. Union _____ 12. Upazila _____

13. Research Assistant's Name _____

ISPAN - Flood Action Plan Office
House # 26, Road # 34
Gulshan, Dhaka

B. Information of Family Members

(fillup once in each survey cycle)

Sl. No.	Name	Relationship with Head of Hhold	Occupation (Code)	Age (years)	Education (Code)	Sex 1=M 2=F (Code)	Seven days Works *(Code)						
							1st	2nd	3rd	4th	5th	6th	7th
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

Name : Please write only permanent family members

Works : 0. Not Applicable, 2. Agril. Work, 2. Fisheries Work, 3. Other income generating works, 5. Agril. & Fisheries Work, 5. Agril & Other income generating works, 6. Fisheries & Other income generating works, 7. Unemployed, 8. Sick (Casual), 9. Absent.

Relationship with Household Head : Self, 2. Father, 3. Mother, 4. Brother, 5. Sister, 6. Wife, 7. Son, 8. Doughter, 9. Sister-in-law, 10. Daughter-in-law, 11. Brother-in-law, 12. Uncle, 13. Aunt, 14. Grand Son, 15. Grand Daughter, 16. Adopted (Relations), 17. Adopted (Non-relations), 18. Permanent Labour, 19. Made Servent, 20. Others

C. Information on Daily Food Intake

(Fillup of each meal/daily three timely - seven consecutive days in each cycle)

Survey day / Weather (Code)	Morning					Afternoon					Night				
	Fish				Other Food	Fish				Other Food	Fish				Other Food
	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)
1st day															
2nd day															
3rd day															

Weather : 1. Normal, 2. Heavy Rain 3. Rain, 4. Storm, 5. Flood

Source of Fish : 1. Cought, 2. Bought, 3. Past-cooked, 4. Gift

C. Information on Daily Food Intake

(Fillup of each meal/daily three timely - seven consecutive days in each cycle)

Survey day / Weather (Code)	Morning					Afternoon					Night				
	Fish				Other Food	Fish				Other Food	Fish				Other Food
	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)
4th day															
5th day															
6th day															

Weather : 1. Normal, 2. Heavy Rain, 3. Rain, 4. Storm, 5. Flood

Source of Fish : 1. Cought, 2. Bought, 3. Past-cooked, 4. Gift

C. Information on Daily Food Intake

(Fillup of each meal/daily three timely - seven consecutive days in each cycle)

Survey day / Weather (Code)	Morning					Afternoon					Night				
	Fish				Other Food	Fish				Other Food	Fish				Other Food
	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)	Fish Species (Code)	Fish Sources (Code)	No.	Weight (gm.)	(Code)
7th day															

Weather : 1. Normal, 2. Heavy Rain, 3. Rain, 4. Storm, 5. Flood

D. Fish Availability Information

(Fillup once daily at the end of day)

Survey day

1st day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

2nd day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

Soource of Fish Cought : 1. River, 2. Canal, 3. Natural Drain/chara, 4. Beel, 5. Haor, 6. Ox-bowlake, 7. Flood pain, 8. Pond, 9. Ditch/Borapit, others

Sold/Purchase Centre : 1. Fishing gate, 2. Nearest market, 3. Distant market, 4. Fish peddler/peddling.

Purchase Unit : 1. Weight, 2. Number, 3. Lot.

D. Fish Availability Information

(Fillup once daily at end of day)

Survey day

3rd day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

4th day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

D. Fish Availability Information

(Fillup once daily at end of day)

Survey day

5th day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

6th day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

D. Fish Availability Information

(Fillup once daily at end of day)

Survey day

7th day

D1. Cought Fish Information

Fishing Time	Source of Cought (Code)	Species (Code)	Amount of Cought Fish (gm)	Sold Fish Amount (gm)	Sold Fish Value (Tk)	Place of Sale (Code)
Night						
Day						

D2. Bought Fish Information

Place of Purchase (Code)	Name of Market	Distance (Mile)	Species (Code)	Purchase Unit (Code)	Value (Tk.)

E. Mother (Nursing and Pregnent) and Childrens Fooding Information

(Fillup of each meal/daily three timing seven consecutive days in each cycle)

1st Day

Member Class	Yesterday Night (Code)									Yesterday Night (Code)									Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother																											
Pregnent Mother																											
Infant (2-5 years)																											
Infant (upto 2 years)																											

2nd Day

Member Class	Yesterday Night (Code)									Yesterday Night (Code)									Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother																											
Pregnent Mother																											
Infant (2-5 years)																											
Infant (upto 2 years)																											

E. Mother (Nursing and Pregnent) and Childrens Fooding Information

(Fillup of each meal/daily three timing seven consecutive days in each cycle)

3rd Day

Member Class	Yesterday Night (Code)									Yesterday Night (Code)									Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother																											
Pregnent Mother																											
Infant (2-5 years)																											
Infant (upto 2 years)																											

4th Day

Member Class	Yesterday Night (Code)									Yesterday Night (Code)									Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother																											
Pregnent Mother																											
Infant (2-5 years)																											
Infant (upto 2 years)																											

E. Mother (Nursing and Pregnent) and Childrens Fooding Information

(Fillup of each meal/daily three timing seven consecutive days in each cycle)

5th Day

Member Class	Yesterday Night (Code)									Yesterday Night (Code)									Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother																											
Pregnent Mother																											
Infant (2-5 years)																											
Infant (upto 2 years)																											

6th Day

Member Class	Yesterday Night (Code)									Yesterday Night (Code)									Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother																											
Pregnent Mother																											
Infant (2-5 years)																											
Infant (upto 2 years)																											

12

E. Mother (Nursing and Pregnent) and Childrens Fooding Information

(Fillup of each meal/daily three timing seven consecutive days in each cycle)

7th Day

Member Class	Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other
Nursing Mother									
Pregnent Mother									
Infant (2-5 years)									
Infant (upto 2 years)									

	Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other

	Yesterday Night (Code)								
	Main Food	Pulse	Fish	Dry Fish	Meat	Cree-pers	Vegeta-bles	Fruit	Other

F. Fish Cooking Method

(Fillup once daily at the end)

Day	Member	Fish Species (Code)	Cooking Method (Code)
1st Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		
3rd Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		

Day	Member	Fish Species (Code)	Cooking Method (Code)
2nd Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		
4th Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		

Cooking Method : 1. Fry, 2. Curry, 3. Fry (Gravy), 4. Smash, 5. Others

F. Fish Cooking Method

(Fillup once daily at end of day)

Day	Member	Fish Species (Code)	Cooking Method (Code)
5th Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		
7th Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		

Day	Member	Fish Species (Code)	Cooking Method (Code)
6th Day	Nursing Mother		
	Pregnent Mother		
	Infant (up to 5 years)		

Cooking Method : 1. Fry, 2. Curry, 3. Fry (Gravy), 4. Smash, 5. Others

G. Information on Hungryness

(Fillup of each meal/daily three times - seven consecutive days in each cycle)

Survey Day	Information			Breakfast	Lunch	Dinner
1st Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male *			
			Female *			
			Child *			
		Half Fasting	Male *			
			Female *			
			Child *			
2nd Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male			
			Female			
			Child			
		Half Fasting	Male			
			Female			
			Child			
3rd Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male *			
			Female *			
			Child *			
		Half Fasting	Male *			
			Female *			
			Child *			

* Male/Female (Above 6 years of age), Child (upto 5)

Causes of not cooking : 1. Ability (Rice/Flour etc) not available, 2. Scarcity of Fuel, 3. Work Pressure, 4. Having food cooked earlier, 5. Invitation/Having fooding arrangement elsewhere, 6. Natural Calamities, 7. Others

G. Information on Hungryness

(Fillup of each meal/daily three timely - seven consecutive days in each cycle)

Survey Day	Information			Breakfast	Lunch	Dinner
4th Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male *			
			Female *			
			Child *			
		Half Fasting	Male *			
			Female *			
			Child *			
5th Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male			
			Female			
			Child			
		Half Fasting	Male			
			Female			
			Child			
6th Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male *			
			Female *			
			Child *			
		Half Fasting	Male *			
			Female *			
			Child *			

* Male/Female (Above 6 years of age), Child (upto 5)

Causes of not cooking : 1. Ability (Rice/Flour etc) not available, 2. Scarcity of Fuel, 3. Work Prassure, 4. Having food cooked earlier, 5. Invitation/Having fooding arrangement elsewhere, 6. Natural Calamities, 7. Others

G. Information on Hungryness

(Fillup of each meal/daily three timely - seven consecutive days in each cycle)

Survey Day	Information			Breakfast	Lunch	Dinner
7th Day	Have you cooked meal 1 = Yes, 2= No					
	Causes of not cooking (code)					
	No. of members fasting for not having food	Full Fasting	Male *			
			Female *			
			Child *			
		Half Fasting	Male *			
			Female *			
			Child *			

H. Knowledge/Believe and Superstition on Different Fish Species

(Fillup each Survey cycle)

Member Class	Name of useful Fish (code)	Mention type of usefullnes if Respondent mentions himself	Name of harmful Fish	Mention type of harms if Respondent mentions himself
Nursing Mother				
Pregnant Mother				
Teenager (6 - 14) years				
Child (2 - 5) years				
Infant 2 month - 2 years				

Other Comments : _____

* Oncce in each survey cycle

CODE SHEET

Always Yes = 1, No = 2

Socio-Economic Strata : 1. Landless, 2. Marginal Farmer, 3. Small Farmer, 4. Medium Farmer

Survey Cycle : 1. 1st Cycle, 2. 2nd Cycle, 3. 3rd Cycle

Fish-Ecological Zone : 1. FEZ 1, 2. FEZ 2, 3. FEZ 3.

Occupation : 0. Not Applicable (Infant/child, mad, retarded, blind, long time sick, old man, etc.), 1. Agriculture (own farm), 2. Land Lord (shared out), 3. Agriculture (own + others farm), 4. Pure Share Cropper, 5. Agri. Labour, 6. Govt. Service, 7. Non Govt. Service (formal), 8. Non Govt. Service (nonformal), 9. Owner Fisherman (mainly hired labour), 10. Owner Fisherman (mainly family labour), 11. Share Fisherman, 12. Fishery Labour, 13. Fish Paddlers, 14. Potter. 15. Blacksmith, 16. Goldsmith, 17. Oil Crasher/Oilman, 18. Weaver, 19. Barber, 20. Cobler, 21. Washerman, 22. Carpenter/Sawer, 23. Porter, 24. Construction Labour, 25. Other Non Agri. Labour, 26. Bidi Factory Labour, 27. Cottage Industry Labour, 28. Skilled Labour (Mill), 29. Rickshaw/Van Puller, 30. Baby Taxi/Tempo Driver, 31. Bus-Truck Driver/Conductor, 32. Hackney Carriage, 33. Push Cart Labour, 34. Boat Man, 35. Horseman (goods carrying), 36. Advocate, 37. Doctor, 38. Kaviraj, 39. Religious Professional (Imam, Purohit, Priest), 40. Hawker, 41. Petty Businessman, 42. Medium & Big Businessman, 43. Dai (traditional birth attendant) 44. Beggar, 45. Household Work, 46. Servant/Maid Servant, 47. House Tutor, 48. Land Demarketer/. Advocates Clerk, 49. Tom-Tom Beater, 50. Tailor, 51. Mat-maker, 52. Gipsy, 53. Pump Driver, 54. Mechanics, 55. Pension Holder, 56. Student, 57. Unemployed, 58. Others (Specify)

Education : 0. Not Applicable (0-5 years old children, Mentaly sick from birth or something like that.) 1. Illiterate, 2. Only sign Capability, 3. Only reading Capability, 4. Reading and Writing Capability, 5. Primary Education (use to class II). Primary Education (from class III-V), 7. Junior High School Education (from class VI-VIII), 8. Secondary School Education (from class IX-X), 9. S.S.C. Pass 10. Higher Secondary pass, 11. Graduate, 12. Post Graduate, 13. Madrasa (Non-recogniyed), 14. Technical Training, 15. Others. (Sp)

Fish Species :

Fresh Fish : 1. Arir, 2. African Catfish, 3. Hilsha, 4. Kachki, 5. Walking Fish, 6. Cooli Bailla, 7. Kotkoti/Chaka, 8. Kali Walking Fish, 9. Kayoli, 10. Kuicha, 11. Flat Fish, 12. Kali Baosh, 13. Karpio, 14. Black Shrimp, 15. Turtu, 16. Crab, 17. Tora Walking Fish, 18. Kagarat. 19. Dog's Toungh, 20. Kaika, 21. Kheilla, 22. Kholisha, 23. Goyar, 24. Gooyi Aair, 25. Goolsha, 26. Goochi Baim, 27. Gootoom, 28. Goinna/Batka, 29. Grass Carp, 30. Lobster, 31. Shrimp, 32. Ghaora, 33. Chanda, 34. Chela, 35. Chenea (red), 36. Cheaea (white), 37. Cheng, 38. Chokh Khuni, 39. Chital, 40. Chapila, 41. Sotka Shrimp, 42. Taki, 43. Tengra, 44. Tatkeri/Along, 45. Thotha, 46. Dankina, 47. Dhela, 48. Tarabaim, 49. Tapsi, 50. Telapia, 51. Narkeli Fish, 52. Naftari, 53. Nailotika, 54. Pooti, 55. Thi Sarpooti, 56. Pangas, 57. Pabda, 58. Potka Tepa, 59. Pwa, 60. Faisha, 61. Foli, 62. Batasi, 63. Bagha Aair, 64. Bacha, 65. Boal, 66. Boyori, 67. Bailla, 68. Boro Bain, 69. Betrongi/Botia, 70. Baluchata, 71. Baush, 72. Big head, 73. Frog, 74. Bheda, 75. Bhetki, 76. Mola, 77. Bangle Cat Fish, 78. Mrigel, 79. Moha Shail, 80. Mirror Carp, 81. Ritha, 82. Rui, 83. Rani/Bow, 84. Shing, 85. Shoil, 86. Shilong, 87. Sorpooti, 88. Satronga, 89. Silver Carp, 90. Others (Sp)

Dried Fish : 91. Soft Dried Fish, 92. Dried Small Fish, 93. Dried Medium Fish, 94. Dried Big Fish, 95. Salted Hilsha, 96. Dried Sea Fish

Name of Other Food Stafs:

Main Food : 1. Boiled Rice, 2. Bread, 3. Watered Boiled Rice, 4. Cold/Stale Boiled Rice/Telari, 5. Rice Particles Boiled Rice/Bow Khoda, 6. Flowar Gruel, 7. Rice/Rice Particles Gruel, 8. Boiled Rice With Potato, 9. Boiled/Fried Sweet Potato, 10. Boiled Wheat, 11. Hotch Potch, 12. Pilav.

Pigeon-Pea (Dal) : 13. Lintel, 14. Moog, 15. Cow-pea, 16. Kolai, 17. Grum, 18. Pease, 19. Others (Sp)

Meat : 20. Cow/Buffelo, 21. Goat/lamb, 22. Hen/Duck, 23. Pigeon/Bird, 24. Others (Sp)

Cheepers : 25. Pumpkin Chreepers, 26. Esculant Edible Roots Chreepers, 27. Data Chreepers, 28. Jute Chreepers, 29. Pui Chreepers, 30. Kolmi Chreepers, 31. Alencha Chreepers, 32. Dheki Chreepers, 33. Shapla Chreepers, 34. Spinach Chreepers, 35. Radish Chreepers, 36. Potato Chreepers, 37. Shayna Chreepers, 38. Martered Chreepers, 39. Pease/Cow Pea's Chreepers, 40. Others (Sp)

Vegetables : 41. Potato, 42. Egg Plant, 43. Bean, 44. Radish, 45. Bottle Gourd, 46. Pumpkin, 47. Sweet Pumpkin, 48. Bitter Vegetable, 49. Kidney Beans, 50 Esculant Edible Root, 51. Thiaga, 52. Dhundul, 53. Potol, 54. Chichinga, 55. Kakrol, 56. Sayna, 57. Sat kora, 58. Coolie Flower, 59. Cabbage, 60. Paupa, 61. Dala/Danga, 62. Cucumber, 63. Khira, 64. Tomato, 65. Green Banana, 66. Banana Flower, 67. Banana Tree's Kangal, 68. Other Potatos (under ground/saheb), 69. Others (Sp)

Fruit : 70. Mango, 71. Black-Bery, 72. Jack-Fruit, 73. Custard-apple, 74. Orange, 75. Citric/Batabi, 76. Small Cemon, 77. Banana, 78. Guava, 79. Kamranga, 80. Amra, 81. Jujuboy Boroi, 82. Lecchee, 83. Apple/Nashpati, 84. Chalta, 85. Palm, 86. Wood-Apple, 87. Coconut/Breen Coconut, 88. Pine-Apple, 89. Bangi, 90. Water-Meton, 91. Others (Sp)

Other : 92. Egg, 93. Milk, 94. Pitha, Paish, Shemai, 95. Sweet/Yugart, 96. Pressed Rich, 97. Puffed Rick, 98. Khoi, 99. Chili Paste, 100. Others. (Sp)

Form-2.1

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
SUBSISTANCE FISHING HOUSEHOLD SURVEY

Name of Research Assistant : _____

Date : | | | | | 1 | 9 | 9 | |
Day Month Year

Village : _____ Mauza : _____ Union : _____ Upazila : _____

Sl. No.	Name of Household Head and Fathers Name	Village	Objectives of fishing (Code)	Place of Fishing (Code)	Sesoan of Fishing											Comments
					De	Ja	Fe	Ma	Ap	Ma	Ju	Ju	Au	Se	Oc	No	

Objective : 1. Conjumption, 2. Sale

Form- 2.2

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
SUBSISTANCE FISHING HOUSEHOLD SURVEY

Name of Research Assistant : _____

Date : | | | | | 1 | 9 | 9 | |
Day Month Year

Village : _____ Mauza : _____ Union : _____ Upazila : _____

1. Name of the Household head: _____
2. Locality: _____
3. Number of Household Members: _____
4. How many Person Catch Fish: _____
   a) Adult: _____
   b) Children: _____

5. Information of Fortnightly Fish Catch:

Name of the Month: _____

		1st Fortnight (1-15)	2nd Fortnight (16-30)	Total	Comments
Whether cought fish ? (1-Y/2-N)					
How may days you cought fish with in last 15 days					
How many person cought fish					
Type of water bodies (code)					
System of lease (code)					
Fish catching system/right (code)					
Equipment (code)					
How much fish cought in last day (kg)					
Accor-ding to main species (code)					
How much fish sold in last 15 days (kg)					

Lease system: 1. Yes, 2. No

Rights and lease system : 1. lease, 2. sub lease, 3. share system, 4. streallhily of owner, 5. No problem with conjumpted fish, 6. own water body, 7. khas but no lease system, 8. left off, 9. private ownership but no lease system.

Form-2.3

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
SUBSISTANCE FISHING SURVEY
COMMERCIAL FISHING HOUSEHOLD SURVEY

Name of Research Assistant : _____

Date : | | | | | 1 | 9 | 9 |
Day Month Year

Village : _____ Mauza : _____ Union : _____ Upazila : _____

1. Name of the Household Head: _____
2. Locality: _____
3. Number of Members (engaged in fishing): _____
   a) Audult: _____
   b) Children: _____
4. Name of Fishing Equipment: _____
5. Information of Fortnightly Fish Catch:

Name of the month: _____

		1st Fortnight (1-15)	2nd Fortnight (16-30)	Total	Comments
Whether cought fish ? (1-Y/2-N)					
Type of water bodies (code)					
Lease system (code)					
Fish catching system/right (code)					
Equipment (code)					
How much fish cought in last days					
How many person cought fish					
How much fish cought in last day (kg)					
According to the main species (code)					

Lease system: 1. Yes, 2. No

Rights and lease system : 1. lease, 2. sub lease, 3. share system, 4. strealthily of owner, 5. No problem with conjumpted fish, 6. own water body, 7. khas but no lease system, 8. left off, 9. private ownership but no lease system.

Form- 2.4

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
SUBSISTANCE FISHING SURVEY
FISH CATCHING (SUBSISTANCE) SURVEY

Name of Research Assistant : _____

Date : | | | | | 1 | 9 | 9 |
Day Month Year

Village : _____ Mauza : _____ Union : _____ Upazila : _____

1. Total Person Engaged in Fishing in Surveyed Day : _____

a) Audult : _____

b) Children : _____

2. Information of Surveyed Day and Last 7 Days Fish Catching :

		1	2	3	4	5	6	Total
Name of fish catcher								
Type of water Cody (code)								
System of lease (code)								
Right and system of fish catch (code)								
Equipment of fish catching (code)								
How many hours cought fish (hours)								
Weight of fish according to the species (kg)								
Total (Kg)								
Approximate price of cought fish								
How many days cought fish in last 7 days (days)								
How many days cought fish in last 7 days (kg)								
Type of water bodies (code)								

Lease system : 1. Yes, 2. No

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES

FLOOD ACTION PLAN - 16

A.1 MARKET PRICE OF FISH BY SPECIES

Name of Market : _____ Uion : _____ Upazila : _____

Fish species		Unit of weight	Market price of fish according to size and age (Taka/Unit)			
			Fingerling	Juvenial	Young	Adult
Name	Code					

Weight Unit : 1. kg, 2. Sare, 3. Others (Describe)

Form-3

NUTRITIONAL CONSEQUENCE OF BIO DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
SCHOOL CHILDREN FOCUS GROUP SURVEY

(Only Class III)

Name of the School : _____ Union : _____ Mouza : _____

Upazila : _____ Survey Date : [ ][ ][ ][ ][1][9][9][ ]
Day Month Year

1. Total number of students in the school [ ][ ]
2. Total number of students in class- III [ ][ ]
3. Attendence of Students in survey day Total [ ][ ] Boy [ ][ ] Girl [ ][ ]
4. How many student ate fish last night Total [ ][ ] Boy [ ][ ] Girl [ ][ ]
5. How many student ate fish this morning Total [ ][ ] Boy [ ][ ] Girl [ ][ ]
6. How many students ate fish last night and this morning according to fish species

Fish Species		Night	Morning
Name	(code)	No.	No.

7. Source of Consumpted Fish

Source	Night	Morning
Catch	[ ][ ]	[ ][ ]
Purchase	[ ][ ]	[ ][ ]
Both	[ ][ ]	[ ][ ]
Getting from Relatives	[ ][ ]	[ ][ ]

8. How Many Students Cought Fish Themselves Total [ ][ ] Boy [ ][ ] Girl [ ][ ]

9. **How Many Student Ate other Food in Last Night and Morning**

Food	Night	Morning
Rice		
Bread		
Pulse		
Hotch potch (Khituri)		
Meat		
Egg		
Vegetables		
Milk		

10. **Number of Students According to the Main Occupation of the Guardian**

Main Occupation (code)	Number of Students

Form - 4

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
MARKET SURVEY QUESTIONNAIRE

A : MARKET SURVEY

Name of Research Assistant : _____ Survey Period [ ]

Survey Cycle : [ ] Survey Date : [ ][ ][ ][ ][1][9][9][ ] Day Month Year

1. Name of the Project Area : [ ]
   A) Kushiara, B) Tangail, C) Meghna-Dhonagoda, D) Chalanbeel
2. Name of Market/Hat _____
   A) Village : _____ B) Mauza : _____ C) Union : _____ D) Upazila : _____
3. Type of Market (Code) [ ]
   1) Wholesaler, 2) Retailar, 3) Wholesaler & Retailar
4. Description of Fish Saler

Type of Saler	No.
Arotdar/Stockist	
Wholesaler	
Retailar	
Temporary Seller	
Total	

5. Fish Sale Information :

Description of Saler			Fish Species		Weight of Fish			Weight of Egg Fish carring (%)	Age of Fish (Month/ Year)	Source of Fish (Code)	Locality of Source	Equip-ment of Fish Catch (Code)	Fish Cough by Himself Purchage (Code)
Sl.	Type 1 (Code)	Type 2 (Code)	Name	Code	(%)	No.	Wei-ght (Kg)						

Type of Saler : 1. Only Saler (Whole Year), 2. Only Saler (Seasonal), 3. Fisherman (Whole Year), 4. Fisherman (Seasonal), 5. General

Cought/Purchage of Fish : 1. Cought, 2. Purchage, 3. Cought & Purchage

Type of Saler : 1. Arotdar/stockist, 2. Wholesaler, 3. Permanent, 4. Temporary

B : Market Price Survey of Rice, Pulses & Creeper :

Name of Commodity	Price (Tk/Kg)	Name of Commodity	Price (Tk/Kg)
Rice		**Pulses**	
1 High Quality		1 Mosuri (Lentil)	
2 Medium Quality		2 Mug	
3 Low Quality		3 Khesari (Cow pea)	
		4 Kolai	
Creepers		5 Boot (Grum)	
		6 Other	
Vegetables			

C : Dried Fish

Number of Saler	Species (Code)	Weight (Kg)	Price (Tk./Kg)	Weight of Salted Hilsha (Kg)	Price (Tk./Kg)

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES

FLOOD ACTION PLAN - 16

FISH CATCH SURVEY (BEEL)

Work Sheet

Research Assistant Name : _____ Survey Period : ☐

Survey Date : ☐☐☐☐1 9 9☐
Day Month Year

1. Name of Beel : _____ 2. Area : _____ Acre

3. Village : _____ 4. Mauza : _____ 5. Union : _____ 6. Upazila : _____

7. Type of Fish Catching : Katha/Other _____ 8. Type of Used Equipment : _____

9. Number of Total Fishing Unit _____ = N 10. Number of Surveyed Fishing Unit _____ = n

11. Sample Unit : Fishing Unit Raizing Factor = N/n = _____

12. Fish Species	Surveyed Catching Data (13) (Kg)								Total Surveyed Catch (Kg)	Estimated Catch of Surveyed Day (Kg)	Estimated Catch of Last Three Days (Kg)
	1	2	3	4	5	6	7	8			
Total											

Estimated Catch of Surveyed Day = Total Sample Survey (Kg) X Raizing Factor =

18

Form-5.1

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
FISH CATCH SURVEY (BEEL)

Research Assistant Name : _____

Survey Date : | | | | | 1 | 9 | 9 | (Day Month Year)

Survey Period : [ ]

1 General Information on Beel :

1.1 Location A) Name of Beel : _____
B) Village : _____ C) Mauza : _____ D) Union : _____ E) Upazila : _____

1.2 Area & Depth A) Highest Area (Wet Season) _____ Acre B) Lowest Area (Winter) _____ Acre
C) Highest Depth (Wet Season) _____ Feet D) Lowest Depth (Winter) _____ Feet

1.3 Link and Distance with other Water Bodies
A) River _____ Distance (Km) _____ Linkage Yes/No _____
B) Canal _____ Distance (Km) _____ Linkage Yes/No _____
C) Beel _____ Distance (Km) _____ Linkage Yes/No _____

1.4 Condition of Beel A) Clean B) Partly Weeded (%) C) Wholly Weeded

1.5 Lease System A) Fisharman Society _____ B) Other Person _____ C) Owner himself _____ D) Others _____
E) Period of Lease _____ Year F) Lease Value _____ Year/Season

2 Information of Fish

2.1 Who is the owner of fish A) Owner _____ B) Lease Holder _____ C) Sub-Lease Holder _____

2.2 Who Catches fish A) Owner _____ B) Lease Holder _____ C) Sub-Lease Holder _____
D) Fisharman _____ E) Contractwise (Description) _____ F) Villagers _____

2.3 Fish Catching System A) Net & Trap _____ B) Partly Extracttion _____
C) Total Extracttion _____ D) Others _____

2.4 Frequency of Fish Catch (Mainly) A) Once in a Year _____ B) Once in Two Years _____ C) Other _____

2.5 Period of Fish Catch (Mainly) A) _____ from _____ to

2.6 Number of Katha (If available) A) _____ B) Area of each Katha _____

2.7 Fish Sale A) Fish Catching Place _____ B) Fish Landing Place _____ C) Local Market _____
D) Others _____

3. Economical Information :

3.1 Management Cost

A) Lease Value _____ B) Number of Gaurds _____ & Salary _____

C) Number of Katha _____ & Cost _____ D) Expances of Gaurds House _____

E) Quantity of Food _____ KG & Cost _____

F) Quantity of Fertilizer _____ KG & Cost _____ G) Other Expenditure _____

3.2 Cost of Fish Catch

A) Number of Fisherman _____ Wages _____

B) Number of Other Assistant _____ Wages _____

C) Equipment Cost _____

1. Net & Trap _____ Durability _____
2. Boat _____ Durability _____
3. Repearing cost (Net, Boat, Katha etc.) _____
4. Others _____

4. Last Year Production (Source)

Species	Weight (Kg)	Price (Taka/Kg)	Total Price (Taka)

5. Comment

_____

_____

_____

6. Scatch Map of Beel (Map will be made by Research Assistant)

Form-5.2

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
FISH CATCH SURVEY (BEEL)
Fish Catching Equipment List From Surveyed Beel

Name of Research Assistant : _____

Survey Date : [ ][ ][ ][ ][1][9][9][ ]
Day Month Year

Survey Period : [ ]

1. Name of Beel : _____ 2. Area _____ Acre 3. Depth _____ Feet
4. Village : _____ 5. Mauza : _____ 6. Union : _____ 7. Upazila : _____
8. Period of Fish Catch :
9. Fish Catching Equipment :

Sl. No.	Name of the Equipment Unit Leader	Fihs Catch Equipment						Boat				Number of Fisherman According to eatch Equipment	Total Fish Catching day in a Season
		Type	Leo-gth	Wei-dth	Me-ss	Dura-bility	Price (Tk.)	Lean-gth	Wei-dth	Dura-bility	Price (Tk.)		

Sl. No.	Name of the Equipment Unit Leader	Fihs Catch Equipment						Boat				Number of Fisherman According to eatch Equipment	Total Fish Catching day in Season
		Type	Leangth	Weidth	Mess	Duration	Price (Tk.)	Leangth	Weidth	Duration	Price (Tk.)		

Form-5.3

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
FISH CATCH SURVEY (BEEL)

Name of Research Assistant : _____ Survey Period : ☐

Survey Date : ☐☐☐☐1 9 9☐
Day Month Year

1. Name of Beel : _____ 2. Area : _____

3. Village : _____ 4. Mauza : _____ 5. Union : _____ 6. Upazila : _____

Fish Species	Code	Total Fish Cought in Survey Day (A)				Total Fish Cought in Last Three Days (B)			Total Fish Cought in Last Four Days (A+B)		
		Katha Fishing (Kg)	Other Fishing (Kg)	Total (Kg)	Price (Tk./Kg)	Katha Fishing (Kg)	Other Fishing (Kg)	Total (Kg)	Katha Fishing (Kg)	Other Fishing (Kg)	Total (Kg)
Total											

FAP-16 (Form)/01/01

Form-6.1

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
FISH CATCH ASSESSMENT SURVEY (RIVER)
SAMPLE VILLAGE SURVEY AND SURVEY DAY

Sl. No.	District (1)	Upazila (2)	Union (3)	Sample Village (4)	Sample Survey Day of the Month (5)		
					1st Day	2nd Day	3rd Day
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Form - 6.2

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
FISH CATCH ASSESSMENT SURVEY (RIVER)
NUMBER OF FISHING UNIT

1. River _____
2. Village _____
3. Union _____
4. Upazila _____
5. Name of the Research Assistant _____
6. Date | | | | | 1 | 9 | 9 |
   Day Month Year

Name of Used Equipment/Gear			Number of Fishing Unit Engage in Fishing			Number of Sample Fishing Unit Surveyed
Local Name	Type	Code	Local	Outsider	Total	

The total member of fishing unit engage in fishing will be the added number of fishing unit engage in fishing in same day and night.

nD7

Form-6.3

NUTRITIONAL CONSEQUENCES OF BIO-DIVERSITY OF FISHERIES
FLOOD ACTION PLAN - 16
FISH CATECH ASSESSMENT SURVEY (RIVER)
SAMPLE CATCH RECORD

1. River ______________

Name of the Research Assistant ______________

Date | | | | 1 | 9 | 9 | |
Day Month Year

2. Village ______________ 3. Mouza ______________ 4. Union ______________ 5. Upazila ______________

6. Name of Used Equipment ______________ 7. Number of Engaged Fishing Unit ______________ 8. Number of Sample Unit Surveyed ______________

												Fish price (Taka/ Kg)
9.	Name of the Group Leader											
10.	Number of Fisherman in Boat											
11.	Local Name of Used Equipment											
12.	Sl. No. (Tally in Observed Number)	1		2		3		4		5		
13.	Weight of Catched Fish	No.	kg	No.	kg	No.	kg	No.	kg	No.	kg	
	Fish species											

Form. 7

Nutritional Consequences of Bio-Diversity of Fisheries Study

FAP - 16 (Environmental Study)

Fish Migration Record Formal

Name of Research Assistant:----------

Date of sampling:---/----/----- Time of sampling:------to-------hours

Name and location of canal/river:----------

Av. depth of canal:----------m Breadth of canal:---------m

Water flow direction: Towards river/Towards beel/floodplain

Type of gear:----------Size of gear:le.------ br.------ dia.------ Mesh size:------mm

Position of gear setting:----------Direction of gear:----------

Wheather record: Rainfall during the sampling period ----------hours

Rainfall during last 3 days--------hrs/last day1-------last day2-------last day3

Fish species record

Species	Sampled fish To.No. To.kg	Total length of 10-20 sample fish (cm)