BANGLADESH FLOOD ACTION PLAN

PILOT SURVEY REPORT

FLOOD RESPONSE STUDY (FAP 14)

Prepared for

The Flood Plan Coordination Organization (FPCO)
of the
Ministry of Irrigation Water Development and Flood Control

Preliminary Draft September 1991

Draft Final Report December 1992

ISPAN
IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST
Sponsored by the U.S. Agency for International Development

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IRRIGATION SUPPORT PROJECT FOR ASIA
AND THE NEAR EAST

ISPAN Technical Support Center
Room 1001
1611 North Kent Street
Arlington, Virginia 22209-2111
USA
Phone: (703)243-7911
FAX: (703)525-9137
TELEX: 276532 ISPAN UR

TABLE OF CONTENTS

LIST OF TABLES

ACRONYMS

BBS	Bangladesh Bureau of Statistics
BIWTA	Bangladesh Inland Water Transportation Authority
BWDB	Bangladesh Water Development Board
EPWAPDA	East Pakistan Water and Power Development Authority
FAP	Flood Action Plan
FFW	Food for Work
FPCO	Flood Plan Coordination Organization
GOB	Government of Bangladesh
HFWC	Health and Family Welfare Clinic
MDPA	Meghna Dhonagoda Project Area
NGO	Nongovernmental Organization
TOR	Terms of Reference
USAID	United States Agency for International Development

Chapter 1

INTRODUCTION

1.1 Background

When disastrous floods hit Bangladesh in 1987 and 1988, donors from all over the world asked what they could do to help. In mid-1989 the Government of Bangladesh (GOB) asked the World Bank to help coordinate these international donors into an effective flood-related project. The result was the Flood Action Plan (WB, 1990), a plan that was endorsed at two donor meetings in December 1989 and January 1990. The Flood Action Plan (FAP) consists of 26 distinct projects to be undertaken between 1990-1995: 11 main activities and 15 supporting activities. The Flood Response Study (FAP 14) is one of the latter and is one of four supporting activities supported by the United States Agency for International Development (USAID).[1] All 26 FAP programs are coordinated by the Flood Plan Coordination Organization (FPCO) of the GOB.

1.2 Study Goals

As noted in the terms of reference (TOR) (FPCO 1990a), this study has four major aims:

- To assess the existing flood response of people living in floodplain areas.
- To evaluate flood response practices at selected sites in specific floodplain agro-ecological zones.
- To assess the possible impacts of flood protection infrastructures such as embankments or polders.
- To formulate guidelines and recommendation for enhancing the design and operation of other FAP projects, especially FAP 23.

Chapter 2 will describe the methodology used in this study including site and household selection methods. Chapter 3 will present some preliminary findings of both the Household and Institutional Surveys and some conclusions.

1.3 Study Purpose

FAP 14 was designed to raise questions about the current and potential impacts of flood interventions on the social and economic welfare of people in rural Bangladesh. A secondary purpose is to suggest possible public policies to improve flood response in the country.

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[1]The other three USAID-supported project are the Environmental Study (FAP 16), the Geographic Information Systems (FAP 19), and the Flood Proofing Study (FAP 23). These four FAP activities are all contracted to the Irrigation Support Project for Asia and the Near East (ISPAN).

The study involves two phases divided by a workshop held in August 1991. Phase one or the Pilot Survey has three components:

- Two household surveys: the first is short but extensive and covers all the 7,520 households in 24 villages of the 12 selected upazilas. The second is an intensive survey that focuses on 1,852 of total households in detail (see Annex 1 and Annex 2).

- An institutional survey of flood response at village, union, upazila, and district level in all 12 locations.

- A literature review of flood response research in Bangladesh.

The second phase essentially will explore questions and issues in detail that emerge in the Pilot Survey and at the August 1991 workshop. A final workshop and report are scheduled for June 1992.

Chapter 2

METHODOLOGY

2.1 Introduction

The Pilot Survey employed two major approaches: a detailed household questionnaire survey administered in 12 upazilas and an institutional survey aimed at the flood response strategies and behavior of communities, local and national government agencies, and nongovernmental organizations (NGOs) in those same areas. The first approach was more quantitative in nature, while the second was more qualitative and valuational. The activities after the phase one Pilot Survey can only be comprised of the follow-up surveys and/or studies, guidelines for assisting future planners in formulating flood response measures and recommendations for future interventions, and a final workshop and report.

Flexibility was build into FAP 14 in order that interim results at successive stages can guide future activity. For one thing, the Household Survey was consciously conceived to comprise two waves, with the second being directed and guided by the first. Phase two of FAP 14 was designed to respond to what emerges from the first phase. It also was anticipated that flexibility and adaptability could be built into the study by integrating the Household and Institutional Survey personnel into single teams, with the idea of encouraging them to share ideas with each other.

Although the 1987 and 1988 floods were disastrous for Bangladesh as a whole, some areas suffered more than others and the most severely affected places differed significantly between the two floods. Therefore, before the sample villages were chosen, places most affected by the 1987 and/or 1988 floods in each of the sample upazilas were identified. In general, the sample contained an approximately proportional distribution of villages more and less severely affected.

In rural Bangladesh there is a wide variation between villages with respect to their access to the outside world. Some lie astride or next to metalled roads, while others are accessible only by foot and even that for only a part of the year under normal flooding. This differential access surely has a significant impact on flood response. Villages located near good transportation arteries can take more risk in their cropping practices if they are not in danger of being cut off from markets. They need not be so concerned about food storage, since they will not be cut off from outside supplies except in abnormal floods. By the same token, these normally more secure villages may have been more affected by the extraordinary floods of 1987 and 1988. Experience has taught those vulnerable villages that they must take strong precautions every year.

To the extent possible, one sample villages in each upazila was chosen to represent good access and another to represent poor access. A list of the sample villages, unions, upazilas, total number of households, and number of sample households is given in Annex 2.

2.2 Upazila Selection

Although the TOR provided for study of at least six locations, presumably in six upazilas on the three main rivers (Jamuna, Padma, and Meghna), the study leaders of FAP 14 with the project manager of

ISPAN/Arlington and one member of the FPCO panel of experts, selected 12 upazilas. The reasons for the selection were to:

- Adequately cover the geographical distribution called for in the FAP 14 TOR.
- Represent the varied elevation, existing flood protection infrastructure, and flood tendency of the areas.

The selected upazilas are spread across the country and include all the floodplains and flood regions: the northwest, the right and left bank of the Brahmaputra, the Ganges plain to the north and south of the river, the area of the coastal cyclone protection embankment in the southwest, the confluence of the Padma and Meghna in the central area, and various flood situations in the northwest between the Meghna River and India and in the Sylhet region.

The upazilas also reflect a wide range of flooded areas: areas that are flooded annually, flash flood areas, the deep depressions of chalan beels, haors, areas intruded by salt water, areas with drainage congestion, and areas with extraordinary flooding in 1987 and/or 1988. (For other details about the selected upazilas see Annex 1.)

2.3 Village Selection

In each sample upazila two villages were selected for the Household Survey except where smaller populations warranted picking three villages. The villages selected were meant to represent the flood vulnerability of the upazila as a whole. This flood vulnerability has two dimensions: that of the village in an overall sense, and that of fields and families within it. That is, in some areas, households within a village may face similar flood dangers where land levels and situations do not vary greatly. In other areas, there are great differences within villages. Some land is relatively high or low, and some families may have holdings concentrated at one level or another. In any event, given the numerous categories possible in village selection, it is not possible to get a complete range in all dimensions with a sample size of two or three.

In the Bangladesh floodplain, most of the land lies between 20-60 feet above mean sea level. Within many individual villages, the difference in elevation between the highest and the lowest land is more than half of this. On the whole, the variations in land level within villages are at least as important as differences in elevation across the entire country when establishing a family's flood susceptibility and the measures they must take to prepare or respond. It is not surprising that most movement in response to the annual water cycle and its aberrations are within local areas rather than across them.

2.4 Household Selection

Once the villages were chosen the households were given a comparatively simple two-page questionnaire known as the 100 Percent Survey. It asked about the number of people in the household, the education and occupation of the head of the household, the income and expenditures per month, number of fields held, and the area held and used at different elevation levels under each major type of landholding arrangement.

On the basis of this work, a stratified random sample was then drawn for the detailed Household Survey. The exact proportion depended on the overall size of the village, but was essentially constant for all strata-defined groups except that each occupational group was represented by at least two households (unless there was only one in the village). To the extent possible, households within villages were selected to represent at least the following groupings:

- Households cultivating their own land (for each of the groups holding land, an attempt was made to include representative proportions of large, medium, and small landowners).
- Sharecropper households.
- Landless households—those that have a homesite but no operable landholdings.
- Fishing households.
- Merchant/shopkeeper households—includes a broad range of income levels.
- Households with substantial income from members employed out of the area.

2.5 Sample Selection

It was anticipated that the average village surveyed had about 300 households to be surveyed in two weeks. Thus the total number of households surveyed was expected to be about 7,200. As it turned out, the 100 Percent Survey yielded some 7,520 households.

The sample chosen for the detailed household interviews came to 1,852 households, or just under 80 for each of FAP 14's 24 villages. Actual variation (which was largely a function of village size in that the samples were chosen to be representative of their respective villages) ranged between 33 and 128 household units.

The combination of the purposive selection of upazilas, villages, and a special effort to include a diversity of occupational categories for each village means that the FAP 14 household sample is not an accurate statistical representation of the entire country. Any of the three conditions mentioned above would have invalidated a claim of strict representativeness, and all three conditions do so definitively. But then the purpose of the study itself is not to be representative, but rather illustrative of the various flood conditions faced by the rural population of Bangladesh. And that goal should be more than adequately realized through the sample design described earlier.

2.6 Surveys

Broad-based rural flood response surveys and analysis of the results are the heart of FAP 14's first phase. Designing the surveys, recruiting and training the staff to administer them, analyzing the survey results, and distilling the initial harvest of that analysis for the August 1991 workshop are the principal tasks of this pilot phase.

It is quite possible that the second phase will include some survey work as well, but such activity

probably will comprise more narrowly focused efforts. Thus while FAP 14 will quite likely be collecting further material from the field in the form of survey data, its major quantitative database will be what has been put together in the project's first phase.

The phase one survey employs three instruments: an initial questionnaire administered to all the households in the survey villages, a formal household level survey for the sample selected from the 100 Percent Survey, and a more open-ended Institutional Survey to be administered to key persons at villages, unions, upazilas, and district levels.

2.6.1 The 100 Percent Survey

This is the relatively simple two-page survey instrument. It was designed to be completed quickly, but, at the same time, to be comprehensive enough to facilitate selection of the household sample for the intensive phase one survey.

Later in the analysis, some of the items from this survey will be integrated into the results of the intensive survey, so that questions on such items as religion and farm size will not have to be repeated in the second survey. That is to say, results from the 100 Percent Survey for those particular households included in the later survey will be carried over and merged in with the results from that later survey.

2.6.2 The Household Survey

The Household Survey is the principal data source for FAP 14's statistical analysis. Its development has been an iterative process, extending over a number of months through various reviews, revisions and a field-testing exercise that was incorporated into the training program set up for the FAP 14 field enumerators.

The Household Survey has four purposes:

- To determine household needs that shape agricultural and employment strategies, including land use or employment requirements.
- To survey the major strategies currently employed to mitigate the danger of floods and exploit the floodplain water regime.
- To determine the various dangers posed and benefits provided by ordinary and extraordinary water inundations/floods.
- A determine assessment of the benefit or difficulty presented by existing institutional and infrastructural arrangements and of those which might be proposed.

The extended questionnaire was then prepared and translated into Bangla by the study team leaders, and again pretested with the trainee enumerators. It was thought important that they be familiar with the survey instrument and the way in which people responded in a field situation. It also was considered important that trainees modify it until they were confident that it would indeed show how families plan for their subsistence needs and how this planning responds to and is affected by the flood regime. The

leadership team developed extensive instructions for the enumerators, and provided codes for possible answers to a number of questions (still allowing for other options and explanations from respondents) to smooth data entry and analysis.

It was anticipated that the extended questionnaire would take a total of about one-half day to administer per household. The total time allowed was 30 days. As the enumerators and those in their study villages became familiar with the routine of administering the questionnaire, they were able to speed up. In the expectation that this could happen (as well as to provide alternative households for those that could not be interviewed), a secondary list was supplied to each field supervisor. Some of the teams were able to interview extra households, and, so in the end, the total for all study areas was 1,852, instead of the 1,820 expected.

The Household Survey is detailed, but it was also intended to be somewhat open ended. Allowance was made for the enumerators to record explanations of answers where appropriate, and they were encouraged to do so in their instructions. In general, priority was placed on letting the respondents speak for themselves through the survey, rather than imposing alien categories on them.

Conceptually, the Household Survey has two parts. The first part focuses on the needs and flood response by the household as a unit. It addresses successively, household composition (humans and animals), physical description of buildings, moveable property, market access, flood preparation and response, and household perception of institutional measures of flood protection and response.

The second component of the Household Survey is an analytic extension to the first and is concerned with the household subsistence budget and cropping pattern. It asks about the household food/fodder consumption budget, the amounts of food and fodder that are produced on the farm, and the disposal of surpluses or measures taken to make up deficits. This will be related to plot by plot elicitation of cropping cycles and periods flooded, which includes yields. The household consumption figures, together with yield figures, can be used to calculate the cropping pattern that would be required to provide what the household needs to eat. This can, in turn, be compared to the actual crop pattern and the reported pattern of work and/or sales of farm surpluses to provide important checks for internal consistency and validity.

2.6.3 The Institutional Survey

The second major aspect of the FAP 14 study focuses on institutional responses to flooding. This Institutional Survey has four principal aims:

- To determine the state of the local economy.
- To understand the normal and extraordinary flood situations.
- To obtain local feedback and response to the Household Survey.
- To determine the local institutional flood response capability and identify changes that could enhance that capability.

The Institutional Survey used a series of structured interviews with a purposively selected group of locally knowledgeable persons, both official and nonofficial, at the village, union, and upazila levels. The overall

aim was to elicit local opinions and perceptions of what governmental and nongovernmental institutions do in response to flood problems and what could be done in future. More specifically, the institutional survey was designed to determine respondents' views of:

- The danger and benefits of normal and abnormal inundations for the community as a whole, and of the traditional methods for dealing with them.
- The institutional or infrastructural measures that might improve the situation (under conditions of current cost and of increased dependence on local maintenance and cost).
- The Household Survey responses.
- Possible cost-effective measures, such as flood preparation, protection, or recovery that might be undertaken locally. This would include their views on organizational reforms that might be necessary to make these measures effective.

2.6.4 Analyzing the Survey

In the Household Survey, statistical analysis has been used to show general aggregate patterns as well as identify particular constellations of household interests that may be linked with particular types of flood responses or with specific preferences in regard to actual or possible flood control measures. For example, early survey analysis focussed on respondents' evaluations of various flood problems and of the benefit or difficulty offered by raised roads, water control structures, and nonstructural measures. More detailed analysis permitted concentration on such issues as the connection between cropping strategies and flood response for the sample households, or the link between losses suffered in one year's floods and the plans employed for the flooding year's cropping regime. It is anticipated that this analysis will yield a general portrait of the main problems faced by rural families in the floodplain. Those problems include subsistence needs, measures taken to meet these needs, flood response measures taken, and evaluations of those measures and others which might be possible.

The primary methodology used in the Institutional Survey was to develop case studies of villages, unions, upazilas, and NGOs as they have responded to flooding. Although this method did not statistical analyze quantifiable results as in the Household Survey, some of the statistical aspects of the Household Survey will be germane to the institutional effort, particularly the measures of householders' perceptions of institutional response to floods. In this way FAP 14 will distill and refine an overall picture of institutional response to flooding. Each of the 12 areas selected. The analysis of the Institutional Survey will focus on the connections between flood situation and institutional response in each of the 12 locales, as well as to compare and contrast the 12 areas with each other. Presumably, union parishads, upazila parishads, and NGOs respond to flood problems differently in Dinajpur (Chirirbandar Upazila) than they do in the Sylhet region (Sunamganj Upazila). But how do they do so differently? How does flood conditions and flood response relate in one place as opposed to another? These are the kinds of questions to be addressed in the institutional analysis.

Chapter 3

PRELIMINARY FINDINGS

3.1 Summary Results of the Sample Villages

In order to draw the sample for the Household Survey, the study team conducted a house by house survey of all houses in the 24 selected villages (Annex 2). The survey concentrated on economic and social parameters that influence the way families adjust to the flood regime: occupation, education, landholding, and income.

Analysis of this data underline the extent of regional diversity, and it also indicates some common features on which the diversity is based. For example, the dominant landholding pattern everywhere is self-cultivation. There is no class of large landowners living off rents, while another class of landless farmers work only on rented land. Self-cultivators have many incentives to adjust their activity closely to their surroundings. Because of this, sizes of landholdings vary in different circumstances. Farm sizes are more equal in the deeply flooded areas restricted to growing one intensive rice crop a year than in the highlands where there is more diversity and orchard farming is possible. In the deeply flooded rice areas, labor supplies are a crucial constraint on how much land one can manage; on the higher rice land, capitalization is more important. More diversity in farming strategy goes along with diversity in holding size.

Overall levels of formal education are low and there is diversity in occupational classes from one place to another.

Although occupational patterns and landholding patterns both vary greatly and reflect local circumstances, they are not closely associated with one another. Several types of farmer were among the initial occupational categories, but that did not readily predict which occupation a person would claim from his or her landholdings. Since both landholding and occupation appear to be important, it was decided to draw the household sample from strata defined by the four Bangladesh Bureau of Statistics (BBS) landholding classes (landless, small, medium, and large) crosscut by the declared occupation.[2] The results of that survey will be indicated shortly.

3.1.1 Landforms

The simplest and most direct diversity category is variation in landforms. This is captured qualitatively in the physical disposition of households and fields, whether along ridges, on isolated hills, on individual mounds, and so forth. It is captured quantitatively in the sharply differing portions of land classified, within a village by the people themselves, as high, medium, and low.

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[2]BBS definitions: small, 50 to 249 decimals; medium, 250 to 749 decimals; and large, 750 decimals and above. In this study, small included households with less than a half decimal of land. There was no category for "marginal" farmer based on landholding size for two reasons. One, it was difficult to define marginal and two, it would have given a large number of strata (marginal farm size taken together with each occupation) with very few members, making it more difficult to achieve randomness.

The basic data is from the household level: each farmer reported how much land he held at each level. The sum of land was compared at each level held under self-cultivation or on tenancy, and then calculated as a proportion of all the land in the village so reported.

In interpreting this it should be remembered that the terms of reference require a sample of the active floodplains of the major rivers, seeking a representation of the various conditions found there. The areas chosen were naturally biased toward those which had persistent problems with flooding. But, even so, it is surprising how much of the land is classified as low and how much variation there is. In total, about 12,000 acres were described as high, about 9,000 as medium, and about 40,000 as low. In individual villages, the portion of highland ranges from almost 100 percent to almost nothing, as does the low. Correlational analysis, using the same data, indicated that there was no tendency for larger farms to cluster in land of different levels. Larger farmers do not have proportionally more highland, for example. The size of holdings correlates 0.95 with the total amount of lowland held, 0.34 with the total medium land held, and 0.30 with the total highland. Land of different levels is represented in individual holdings in about the same proportions as in the area as a whole.

3.1.2 Holding

The second basis for diversity is the landholding pattern. There are few large landowners who rent their land. Only 10 of the surveyed households rent out a net area of 700 decimals. By contrast, 149 with holdings of the same size cultivate their land. Those who rent generally are of the same group that rents land. The amount of land rented has about a 0.11 correlation with the total amount owned, and the total land actually farmed has a 0.65 correlation with the total owned. Thus farmers and landowners are one class. The main differences are in the sizes of farms, not contrasting legal and social relations to the land.

3.1.3 Income and Occupation

The average monthly income by village ranges from Tk.1,368 to Tk. 3,289. This emphasizes that these people must make precise adjustments to their surroundings to eke out their livelihoods. They have few resources and must use them efficiently. Projects which add to those resources will be welcome; those that destroy resources or disturb the system for employing them will not be. The average mean income in the 24 villages ranges from Tk.1,083 to Tk.4,134.

The occupational structure of each village, in broad terms, composes groups in business and service, including government workers and private business people. Farmers included anyone who owned land and rented it out land, self-cultivators, or tenant farmers and sharecroppers. This was not cross-checked against actual landownership or use, and generally does not bear a close connection to it, which is why the sample was drawn on landholding strata divided by occupations. The landless laborer or other laborer included specialists such as *bidi* workers, and boat and truck workers; rickshaw pullers; and a few artisans. There also were about seven medical practitioners of various kinds.

It is obvious on comparison that no class bears a clear correlated relationship to any one. Although there are some underlying reasons behind the concentrations of some occupations in each area, the most general point that this diversity occurs is that the occupations are rather generalized and flexible. The pattern it reflects is one of opportunism than of rigid specialization.

3.1.4 Education

The educational makeup of the villages is not uniform, but it is consistently low. Overall, 62 percent are illiterate. This has implications in how people respond to floods and what protection measures they take. Formal education is not the only way people obtain knowledge, but it is the basis of standardized knowledge that is required for participation in the wide labor market and in institutions of more than local scope. The uneducated may be knowledgeable, but their knowledge will be less portable and their opportunities more restricted to the area where they obtained it.

This appears to be reflected in the degree of confidence people have in village and union level institutions compared to upazila and higher levels in almost all matters relevant to flood preparedness and protection. There was a great deal of discussion in the workshop about involving the people; what this suggests is that such involvement needs to be considered in terms of villages and union parishads, not upazilas and districts.

3.2 Household Survey

Data from the Household Survey was combined into a single set of files by topic. The topics are:

- Household demography.
- Household inventories and capital.
- Sources of flooding, warning system, household flood preparation and response measures, and desired changes in flood regime.
- Household evaluations of structural and nonstructural protective measures, and institutional preparation and response measures, with suggestions.
- Household food and fodder consumption and production, in relation to surpluses or deficits.
- Household seasonal crop planning and its adjustments to floods.
- Crop planning and land use by elevations.

3.2.1 Background

The survey covered 1,852 households comprising over 10,000 individuals. It is a massive amount of data, and time has not permitted an analysis in any depth. But some preliminary results are suggestive of the need for some adjustment of beliefs and of further enquiries. This section discusses some of the broad findings of the household response and institutional evaluation sections.

The portion of the Household Survey that was concerned with flood preparation and response followed a uniform format for all questions: there were 18 items of preparation and 22 of response measures specifically mentioned, as well as opportunity for open ended responses. In each case, we asked if the

measure was taken under conditions of normal inundation, average flood, or severe flood.

Normal inundation was defined as the usual and expected annual rise of water, when homes are not expected to be flooded. Average flood is recurring high water wherein the house-site may be threatened. Severe floods are notably more threatening than the average flood. Since each flood preparation item could be done or not done under each flood scenario, the possibilities form a matrix of seven mutually exclusive patterns. These patterns and the code for each are given in Table 1.

Table 1
Permutations of Preparation and Response

Code	Inundation	Average Flood	Severe Flood
0	No	No	No
1	Yes	No	No
2	No	Yes	No
3	No	No	Yes
4	Yes	Yes	No
5	Yes	No	Yes
6	No	Yes	Yes
7	Yes	Yes	Yes

Source: Household Survey

With this coding, the measures that are taken more often and under more extreme conditions obtain the highest code numbers. In that sense, the code numbers give a rough sense of the importance of the measures.

3.2.2 Findings on Households

Following roughly the order of the questionnaire, one of the first results concerns the sources of flooding. About 51 percent of the households report that river water is the main source of flooding in their area, another 21 percent list rainfall, and another 23 percent report flow from higher land. The percentage of flooding from breaches may be low because only a few villages are subject to breaches. It should be noted that water logging and flow from higher area are also closely related to rainfall—one represents the accumulation from local rainwater, and the other local accumulation from rain relatively nearby, so the categories are not sharply distinct. Regional differences are profound, and those difference should have bearing on national protective measures to consider. These results are shown in Table 2.

Table 2
Reported Sources of Flooding

Source	Frequency	Percent
River Water	947	51.1
Flow from Hill	426	23.0
Rain Water	389	21.0
No Response	33	1.8
Water Logging	23	1.2
Embankment Breach	18	1.0
Other	15	0.9
Total	1852	100.0

Source: Household Survey

Warning systems could be greatly improved. Questions about flood warning indicated that while about 59 percent of the population considered radio useful for warning of more severe conditions, 90 percent rated their neighbors as important. Upazila microphone warnings and television were considered unimportant.

The responses to the questions regarding household protection suggests that rain and wind are greater problems than rising water. Most people have made successful adjustments to the general rise and fall of the water but respond to rain and wind on a more *ad hoc* or emergency basis. Twenty percent reported building barriers of water hyacinth, and 14 percent built soil barriers under severe or near-severe conditions, while 50 percent reinforced their walls, corner posts, and roofs under similar conditions.

There is a widespread opinion in the literature that food is a severe problem in floods and that distress sales are common. But this survey suggests that fuel shortages and, under severe conditions, water shortages are the most serious problems. When making preparation before flood, about 19 percent said they stored food, and about the same number reported storing fodder. Fifty-five percent reported storing fuel.

Once flooding is actually under way, the most widely reported responses do not involve sale or purchase of food or animals, but rather collecting fuel (51 percent), redrying grain (45 percent), storing pure water (36 percent), and fetching water from distant sources (45 percent). Thirty-one percent of the families reported building a macha in severe floods, and 15 percent reported building one under both severe and average flooding conditions. About 17 percent reported having to buy fodder. About 52 percent reported taking advantage of all types of flooding to fish for home consumption, but only 10 percent fish for sale.

The inundation cycle is known to affect population movements. But there is little documentation of how such movement normally is organized. A rather surprising finding was that very few families or family members responded to floods by taking a temporary profession—only about 8 percent in all, and only 2.4 percent reported doing so under all flood conditions (which probably would be for the rainy season,

whatever the flood circumstances). This, however, was consistent with a number of other of results. First, families try to stay together (29 percent reported that their entire family leaves during severe, or average and severe floods). Under similar circumstances, only 10 percent reported that some, but not all, of their family members leave. Second, almost all movement is within the community. And third, about 17 percent of the families reported that the family leaves, but the household head (or someone close, such as a brother) stays. This suggests that the family must work as a unit to provide for itself, and\or they desire to stay as close as possible to their houses in order to protect their property. Such measures reflect the extent to which they can rely on local arrangements for support and, also, of the need for improvement in wider scale protection for persons and properly.

There also were a series of questions that asked directly if people wanted a change in their water regimes, and, if so, what sort of change they wished to have. The results are in Table 3.

Table 3
Desire for Changed Flood Conditions

Condition	Code	Frequency	Percent
Average and severe flood	6	1166	63.0
Severe flood only	3	289	15.6
All conditions	7	258	13.9
Not under any condition	0*	118	6.4
Average flood only	2	11	0.6
Normal inundation only	1	6	0.3
Inundation and average flood	4	4	0.2
Total		1852	100.0

Source: Household Survey
*The answer was no under all circumstances.

The table shows that 6.4 percent of the households wanted no change under any circumstances. Of those desiring some change, 15.6 percent indicated they wanted only severe flood conditions changed. Some 63 percent would like a change in the conditions of severe and average floods only, while 13.9 percent would like a change in all three conditions.

Table 3 shows the results of asking whether people wanted a completely flood-free condition. Just over 10 percent of the families said no under any circumstance. Some 3.2 percent indicated they wanted to be free of average floods, 28.9 percent wanted to be free of severe floods only, 45 percent of average and severe, and about 12 percent wished to be free of all inundation or flooding.

Further questions were asked on specific changes desired. If there is a consensus in answers, it probably is that most people would like to postpone the onset of flood about 30 days and have it end a little sooner. About 40 percent would like lower flood levels, but not a lower level than the normal inundation. These results are in Table 4.

Table 4
Desire for Flood-Free Condition

Condition	Code	Frequency	Percent
Average and severe flood	6	840	45.4
Severe flood only	3	536	28.9
All conditions	7	221	11.9
Not under any condition	0	190	10.3
Average flood only	2	59	3.2
Inundation only	1	5	0.3
Inundation and severe flood	5	1	0.1
Total		1852	100.0

Source: Household Survey

In short, although there are many regional differences, the general conclusion appears to be that most householders consider they successfully adjust to the water regime and are not distressed by the usual and predictable cycle of water rise and fall. Like all people, they have problems with the unpredictable and that beyond their control—things such as better water supplies, fuel, refuge, and security.

3.2.3 Institutional Findings

The evaluation of institutional response was based on a scaled answer. The scale was: 1, very helpful; 2, moderately helpful; 3, neutral; 4, moderately harmful; and 5, very harmful. To avoid making answers appear artificially favorable by averaging in "0" values, it is necessary to exclude people who did not answer the question. This number people who did not answer ranges substantially from one question to another. Although overall evaluations range significantly, it should be kept in mind that the variation from village to village is generally much greater than the variation between overall average values. What this means, is that local needs vary and, in consequence, major public policy for flood protection must be diverse and flexible.

Respondents were asked to evaluate embankments located between their property and the usual sources of flooding, and then to evaluate embankments that were situated on the far side of them, away from the usual flood source. Unfortunately, there was some initial confusion in the translation of the question from English, and part of the results from the first 12 villages cannot be used. Therefore, until the forms can be checked individually to see which had the corrected translation, the results summarized in Table 5 have been confined to only the second 12 villages.

Table 5
Evaluation of Embankment Between House and Flood Source

	Mean	Std. Dev.	Cases
Entire Study Population	1.84	1.13	848
Panchthupi	1.10	0.30	94
Bararia	1.11	0.56	83
Shingjala	1.03	0.17	33
Pakisha	2.74	1.48	72
Rukuni	3.82	0.89	73
Fenibeel	1.12	0.33	41
Bhitidaudpur	2.38	0.71	97
Shanakoir	1.96	0.51	128
Chatipara	1.00	0.00	1
Uttar Sankibhanga	2.06	1.39	69
Bakchara	1.22	0.42	107
Auliapukur	1.00	0.00	50

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

Thus, the overall evaluation is just a little more favorable than moderately helpful. As in all other evaluations, however, the range varies greatly from place to place.

Expectedly, embankments located on the far side of the house from the source of flooding was considered less favorable than for those between the house and the flood source. But perhaps surprisingly, embankments on the exposed side of the house were not dramatically, and not always, favored. Overall, the evaluation was still slightly positive, and it was highly favorable in Auliapukur and Pakisha (Table 6).

Table 6
Evaluation of Embankments on Far Side

	Mean	Std. Dev.	Cases
Entire Study Population	2.79	1.46	729
Panchthupi	1.01	0.10	94
Bararia	4.82	0.76	84
Pakisha	1.00	0.00	26
Rukuni	4.38	0.76	73
Fenibeel	2.10	0.96	40
Bhitidaudpur	2.36	0.72	58
Shanakoir	2.80	0.91	128
Uttar Sankibhanga	3.45	1.55	69
Bakchara	3.00	0.14	107
Auliapukur	1.04	0.28	50

Source: Household Survey
1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

The village studied in Auliapukur is about in the center of an island between the Atrai and Kakra Rivers. The island is currently protected by a Food for Work (FFW) embankment on the upstream side. The embankment is slated for repair by the Bangladesh Water Development Board (BWDB), and a second BWDB embankment is scheduled for construction on the remaining, downstream exposed side. Obviously, the householders have registered approval of the scheme.

Since there was an active debate on the relative benefits in relation to cost of high and low (submersible) embankments, two questions were included to seek a relative evaluation of each. The evaluation of high embankments is presented in Table 7, and of submersible embankments in Table 8.

Table 7
Evaluation of High Embankments

	Mean	Std. Dev.	Cases
Entire Study Population	1.78	1.17	1838
Baraitali	1.60	0.69	62
Panchthupi	1.64	0.72	94
Chhoto Bashalia	2.37	1.42	93
Bararia	1.75	0.82	83
Shibsen	1.04	0.19	103
Shingjala	1.03	0.17	33
Lalua & Others	1.12	0.38	57
Pakisha	2.76	1.75	72
Kamaldia	1.12	0.33	92
Rukuni	3.21	0.63	72
Muradpur	1.12	0.36	100
Fenibeel	1.08	0.27	39
Budhal	1.33	0.47	80
Bhitidaudpur	2.30	0.79	98
Goalbathan	1.49	0.70	59
Shanakoir	1.60	0.68	128
Rampur	1.00	0.00	79
Chatipara	1.05	0.23	56
Paschim Durgapur	3.88	1.17	73
Uttar Sankibhanga	2.17	1.44	70
Goalpota	1.10	0.30	52
Bakchara	1.06	0.27	105
Kismat	3.93	1.02	86
Auliapukur	1.00	0.00	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

The general pattern is that submersible embankments received slightly less favorable evaluations overall than high embankments, but in five of the villages the relationship is reversed: Kismat, Chhoto Bashalia, Bhitidaudpur Muradpur, Budhal, Uttar Sankibhanga. The gap between the evaluations of the two types varies from almost nothing to over one full grade. The greatest gap is in Paschim Durgapur, in the Meghna Dhonagoda Project Area (MDPA), where the preference for a submersible embankment is especially strong. In that area difficulties in drainage, fish supply, transport, irrigation, and other matters consequent on the enclosure of the project and disruption of normal drainage and flushing caused disappointment with the high surrounding embankment that was completed there in 1986.

Table 8
Evaluation of Submersible Embankment

	Mean	Std. Dev.	Cases
Entire Study Population	1.87	0.85	1841
Baraitali	1.92	0.81	63
Panchthupi	3.09	0.56	94
Chhoto Bashalia	1.55	0.56	93
Bararia	1.73	0.47	83
Shibsen	1.67	0.49	103
Shingjala	1.55	0.62	33
Lalua & Others	1.67	0.48	57
Pakisha	1.71	0.46	72
Kamaldia	2.01	0.73	89
Rukuni	3.29	0.57	72
Muradpur	1.29	0.48	100
Fenibeel	2.00	0.55	41
Budhal	1.08	0.26	80
Bhitidaudpur	2.14	0.50	98
Goalbathan	2.12	0.72	59
Shanakoir	2.01	0.81	128
Rampur	1.00	0.00	79
Chatipara	1.07	0.26	56
Paschim Durgapur	2.49	0.88	74
Uttar Sankibhanga	1.78	0.57	69
Goalpota	1.71	0.91	52
Bakchara	1.76	0.98	108
Kismat	2.59	0.85	86
Auliapukur	1.02	0.14	52

Source: Household Survey
1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

Embankments are not the only structures that can impede rising water or block drainage. Elevated roads often do this, and roads are the subject of much attention as well as many public cuts. Respondents highly favored elevated roads situated between the household and the source of flooding, more so than for a proper embankment (Table 9).

Table 9
Evaluation of Elevated Road Between Source of Flooding

	Mean	Std. Dev.	Cases
Entire Study Population	1.19	0.42	1850
Baraitali	1.18	0.38	63
Panchthupi	1.61	0.49	94
Chhoto Bashalia	1.06	0.25	94
Bararia	1.07	0.26	84
Shibsen	1.03	0.17	103
Shingjala	1.00	0.00	33
Lalua & Others	1.04	0.19	57
Pakisha	1.01	0.12	72
Kamaldia	1.09	0.32	92
Rukuni	1.03	0.23	74
Muradpur	1.04	0.20	100
Fenibeel	1.00	0.00	41
Budhal	1.76	0.43	80
Bhitidaudpur	1.87	0.55	98
Goalbathan	1.07	0.25	59
Shanakoir	1.14	0.37	128
Rampur	1.00	0.00	79
Chatipara	1.38	0.70	56
Paschim Durgapur	1.30	0.46	74
Uttar Sankibhanga	1.26	0.44	70
Goalpota	1.02	0.14	53
Bakchara	1.00	0.00	108
Kismat	1.26	0.56	86
Auliapukur	1.00	0.00	52

Source: Household Survey
1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

Again, evaluation is far from uniform. In several villages roads were evaluated as very helpful (standard deviation = 0), but in others, most notably Bhitidaudpur and Budhal, it was rated only moderately helpful with a relatively high amount of disagreement.

An elevated road, like an embankment, can be used for travel or as a temporary refuge. To sort out these functions, the next question asked for the evaluation of a public high ground.

Table 10 shows that public high ground was considered slightly less useful overall than the elevated road, but more useful than an embankment of either kind, again with some variation. The three lowest evaluations came from Paschim Durgapur (which is now in a polder), Bhitidaudpur, and Kismat, where the main problem is short-term flash floods. People in these villages take few protective measures of any kind.

Table 10
Evaluation of Public High Area

	Mean	Std. Dev.	Cases
Entire Study Population	1.30	0.60	1848
Baraitali	1.11	0.32	63
Panchthupi	1.19	0.40	94
Chhoto Bashalia	1.17	0.38	94
Bararia	1.13	0.34	84
Shibsen	1.20	0.43	103
Shingjala	1.52	0.57	33
Lalua & Others	1.12	0.33	57
Pakisha	1.06	0.23	72
Kamaldia	1.20	0.43	91
Rukuni	1.04	0.20	74
Muradpur	1.13	0.42	100
Fenibeel	1.83	0.54	41
Budhal	1.56	0.50	80
Bhitidaudpur	2.74	0.55	97
Goalbathan	1.10	0.36	59
Shanakoir	1.09	0.28	128
Rampur	1.00	0.00	79
Chatipara	1.45	0.57	56
Paschim Durgapur	1.34	0.48	74
Uttar Sankibhanga	1.16	0.40	70
Goalpota	1.06	0.23	53
Bakchara	1.01	0.10	108
Kismat	2.08	0.98	86
Auliapukur	1.00	0.00	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

Embankments block drainage, and both embankments and roads are often cut to allow drainage. To evaluate drainage in comparison with other measures, householders were asked to evaluate provisions for quick drainage: culverts, alignment of structures to minimize drainage blocking, and all other measures of like kind that placed a high priority on not blocking the natural lines of flow. Table 11 shows drainage measures were more favored than embankments and only slightly less favored high ground. Auliapukur gave the highest score probably because it is crossed by a railroad embankment that blocks drainage. But, according to the people in the area, it was not much of a problem until recently when an elevated road was built perpendicular to it on the downslope side, thus greatly increasing congestion. The people there have a precise idea of the problem and its causes, and know how much benefit improved drainage would provide.

Table 11
Evaluation of Provisions for Quick Drainage

	Mean	Std. Dev.	Cases
Entire Study Population	1.45	0.61	1848
Baraitali	1.35	0.51	63
Panchthupi	1.51	0.60	94
Chhoto Bashalia	1.44	0.52	94
Bararia	1.62	0.49	84
Shibsen	1.74	0.58	103
Shingjala	1.27	0.45	33
Lalua & Others	1.18	0.38	57
Pakisha	2.03	0.75	72
Kamaldia	1.11	0.35	92
Rukuni	1.04	0.20	73
Muradpur	2.19	0.63	100
Fenibeel	2.73	0.50	41
Budhal	1.85	0.39	80
Bhitidaudpur	2.00	0.25	98
Goalbathan	1.14	0.39	59
Shanakoir	1.17	0.42	128
Rampur	1.03	0.23	79
Chatipara	1.36	0.52	56
Paschim Durgapur	1.26	0.53	74
Uttar Sankibhanga	1.35	0.48	69
Goalpota	1.15	0.36	53
Bakchara	1.06	0.28	108
Kismat	1.24	0.63	86
Auliapukur	1.00	0.00	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

Another obvious needed service is that of accurate storm warnings. People were asked whether they obtained information from various sources for normal inundation, average flood, and severe flood, and how they evaluated such warnings whatever the source. Warnings were more favored than embankments, but less than good drainage overall (Table 12). People in Auliapukur again gave the highest ratings.

Table 12
Evaluation of Storm Warning System

	Mean	Std. Dev.	Cases
Entire Study Population	1.64	0.59	1849
Baraitali	1.90	0.43	63
Panchthupi	2.04	0.39	94
Chhoto Bashalia	1.45	0.52	94
Bararia	1.60	0.49	83
Shibsen	1.90	0.43	103
Shingjala	2.06	0.35	32
Lalua & Others	1.54	0.50	57
Pakisha	1.32	0.47	72
Kamaldia	1.90	0.54	92
Rukuni	1.83	0.67	75
Muradpur	2.04	0.57	100
Fenibeel	1.66	0.57	41
Budhal	1.54	0.50	80
Bhitidaudpur	1.61	0.51	98
Goalbathan	1.69	0.70	59
Shanakoir	1.88	0.50	128
Rampur	1.01	0.11	79
Chatipara	1.79	0.76	56
Paschim Durgapur	1.46	0.55	74
Uttar Sankibhanga	1.73	0.56	70
Goalpota	1.30	0.46	53
Bakchara	1.50	0.50	108
Kismat	1.23	0.57	82
Auliapukur	1.00	0.00	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

A parallel question on breach warnings received a similar overall score (Table 13), but different scores in the several villages. For example, Kismat, subject to flash floods, gave a relatively high evaluation to storm warnings, but gave the lowest scores for breach warnings. This is probably because they are not subject to that danger. Among other things, this suggests that the respondents were answering the questions seriously and carefully.

Table 13
Evaluation of Warning of Breaches

	Mean	Std. Dev.	Cases
Entire Study Population	1.77	0.75	1831
Baraitali	1.75	0.51	63
Panchthupi	1.87	0.47	94
Chhoto Bashalia	1.64	0.74	92
Bararia	1.45	0.50	83
Shibsen	1.82	0.46	103
Shingjala	1.88	0.49	32
Lalua & Others	1.58	0.50	57
Pakisha	1.08	0.33	72
Kamaldia	2.18	0.59	91
Rukuni	2.90	0.34	72
Muradpur	2.25	0.58	99
Fenibeel	1.85	0.61	41
Budhal	1.53	0.53	80
Bhitidaudpur	1.46	0.52	98
Goalbathan	1.59	0.53	59
Shanakoir	1.91	0.48	128
Rampur	1.01	0.11	78
Chatipara	1.98	0.82	56
Paschim Durgapur	1.16	0.37	73
Uttar Sankibhanga	2.30	0.72	61
Goalpota	1.34	0.48	53
Bakchara	1.55	0.52	108
Kismat	3.01	1.09	86
Auliapukur	1.00	0.00	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

Questions in the preparation and response portions of the survey asked if households took measures to obtain pure water. In this section, questions were included to evaluate possible pure water sources. The most obvious provision that could be made is for tubwells that would be relatively flood proof and that would provide safe water under flood conditions. Evaluations were consistently quite favorable (Table 14). Many households indicated that they took measures to store pure water or to fetch it from a source farther than that which they normally did.

Table 14
Evaluation of Tubewell for Drinking Water

	Mean	Std. Dev.	Cases
Entire Study Population	1.17	0.45	1847
Baraitali	1.40	0.66	63
Panchthupi	1.89	0.74	94
Chhoto Bashalia	1.27	0.47	94
Bararia	1.15	0.36	84
Shibsen	1.09	0.28	103
Shingjala	1.00	0.00	33
Lalua & Others	1.05	0.23	57
Pakisha	1.08	0.33	72
Kamaldia	1.08	0.27	91
Rukuni	1.01	0.12	74
Muradpur	1.08	0.31	100
Fenibeel	1.01	0.37	41
Budhal	1.11	0.32	80
Bhitidaudpur	1.21	0.44	98
Goalbathan	1.20	0.41	59
Shanakoir	1.25	0.45	128
Rampur	1.05	0.35	79
Chatipara	1.09	0.29	57
Paschim Durgapur	1.04	0.20	74
Uttar Sankibhanga	1.19	0.39	69
Goalpota	1.02	0.14	53
Bakchara	1.01	0.10	107
Kismat	1.35	0.82	86
Auliapukur	1.10	0.41	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

As a comparison, respondents were asked to evaluate tubewells for irrigation. This was considered to be of value for three different reasons. First, if embankments completely block inundation, providing irrigation water would be (and has been) a major problem. Second, it is possible that people were actual evaluating a drinking water well as a possible source of irrigation water. And third, it seemed quite likely that, without an application that would produce increased income, few families would be able to afford tubwells simply for drinking water. Evaluations were less favorable (Table 15) than for drinking water wells. This is possibly because, in Bangladesh, wells conveniently placed for agriculture would be more difficult to reach in flooded conditions than wells on higher ground nearer the houses.

Table 15
Evaluation of Tubewells for Irrigation

	Mean	Std. Dev.	Cases
Entire Study Population	1.50	0.66	1848
Baraitali	1.75	0.54	63
Panchthupi	1.65	0.70	94
Chhoto Bashalia	1.40	0.57	94
Bararia	1.39	0.49	84
Shibsen	1.79	0.64	103
Shingjala	1.85	0.51	33
Lalua & Others	1.09	0.29	57
Pakisha	1.11	0.32	72
Kamaldia	1.19	0.40	91
Rukuni	1.37	0.56	75
Muradpur	2.02	0.65	100
Fenibeel	1.66	0.79	41
Budhal	1.59	0.67	80
Bhitidaudpur	1.64	0.66	98
Goalbathan	1.27	0.45	59
Shanakoir	1.34	0.47	128
Rampur	1.03	0.16	78
Chatipara	1.75	0.72	56
Paschim Durgapur	1.73	0.80	73
Uttar Sankibhanga	1.93	0.62	70
Goalpota	1.30	0.64	53
Bakchara	1.08	0.34	108
Kismat	1.73	0.94	86
Auliapukur	1.73	0.93	52

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

To further test the underlying favoritism toward roads, two questions were included which ignored their relation to source of flooding. The first concerned the value of a metalled connecting road, while the second concerned a metalled connecting road on an embankment. These are the most favored items (Tables 16, 17) on the questionnaire and the questions most answered.

Table 16
Evaluation of Metalled Connecting Road (Level Unspecified)

	Mean	Std. Dev.	Cases
Entire Study Population	1.09	0.32	1849
Baraitali	1.17	0.38	63
Panchthupi	1.01	0.10	94
Chhoto Bashalia	1.22	0.42	94
Bararia	1.13	0.34	84
Shibsen	1.05	0.22	103
Shingjala	1.00	0.00	33
Lalua & Others	1.00	0.00	56
Pakisha	1.00	0.00	72
Kamaldia	1.08	0.31	91
Rukuni	1.11	0.42	76
Muradpur	1.03	0.22	99
Fenibeel	1.00	0.00	41
Budhal	1.13	0.37	80
Bhitidaudpur	1.05	0.26	98
Goalbathan	1.07	0.25	59
Shanakoir	1.20	0.40	128
Rampur	1.00	0.00	79
Chatipara	1.21	0.46	56
Paschim Durgapur	1.20	0.44	74
Uttar Sankibhanga	1.13	0.34	70
Goalpota	1.00	0.00	53
Bakchara	1.12	0.45	108
Kismat	1.17	0.44	86
Auliapukur	1.00	0.00	52

Source: Household Survey
1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

On average, a metalled road received substantially highly evaluations than the metalled road on an embankment. The apparent reason is that embankment raises
drainage and alignment questions. The next question asked for the recommended height of the embankment.

Table 17
Evaluation of Metalled Road on Embankment

	Mean	Std. Dev.	Cases
Entire Study Population	1.42	0.72	1825
Baraitali	1.17	0.38	63
Panchthupi	2.20	0.76	94
Chhoto Bashalia	1.51	0.62	93
Bararia	1.20	0.43	83
Shibsen	1.05	0.22	103
Shingjala	1.00	0.00	33
Lalua & Others	1.04	0.19	57
Pakisha	1.03	0.17	72
Kamaldia	1.18	0.50	78
Rukuni	2.88	0.69	73
Muradpur	1.27	0.45	100
Fenibeel	1.12	0.33	41
Budhal	1.20	0.40	79
Bhitidaudpur	1.08	0.28	98
Goalbathan	1.12	0.33	59
Shanakoir	1.71	0.50	128
Rampur	1.00	0.00	78
Chatipara	1.27	0.52	56
Paschim Durgapur	1.30	0.49	74
Uttar Sankibhanga	1.49	0.78	69
Goalpota	1.06	0.23	53
Bakchara	1.16	0.46	107
Kismat	3.01	0.74	84
Auliapukur	1.12	0.33	50

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

About 50 percent of the respondents chose (Table 18) a value of six feet or less. Of these, 39.5 percent chose zero. Another 25 percent recommended heights between six and 10 feet, and 10 percent recommended heights over 18 feet. In this tabulation, nonresponses are not counted as zero.

Table 18
Mean Recommended Road Embankment Heights

	Mean	Std. Dev.	Cases
Entire Study Population	9.27	13.67	1306
Baraitali	6.73	6.98	52
Panchthupi	13.26	2.00	19
Chhoto Bashalia	11.00	3.64	53
Bararia	2.78	0.81	64
Shibsen	25.08	31.05	98
Shingjala	16.06	3.25	33
Lalua & Others	17.22	4.51	55
Pakisha	13.16	3.09	70
Kamaldia	4.77	4.71	82
Rukuni	2.56	3.09	9
Muradpur	0.22	1.31	73
Fenibeel	0.00	0.00	36
Budhal	6.02	5.65	64
Bhitidaudpur	13.49	16.26	90
Goalbathan	5.77	7.47	52
Shanakoir	16.15	32.53	40
Rampur	11.60	10.16	79
Chatipara	11.07	3.16	43
Paschim Durgapur	7.55	8.26	53
Uttar Sankibhanga	5.70	8.38	46
Goalpota	6.64	2.02	50
Bakchara	2.96	3.72	95
Kismat	0.00	0.00	4
Auliapukur	5.22	1.85	46

Source: Household Survey

The recommended heights naturally differ by village, according to circumstances. Table 18 gives the average heights recommended in each of the sample villages, taking only the responses of those who evaluated the idea of a road on an embankment as moderately or very helpful. In four of the 24 villages, the average recommended height is less than one foot. In three, it is between one and three feet, and in another seven it is between three and about six feet. The remainder are above 6.7 feet. There are wide differences of opinion in the villages that recommended the higher levels.

The measures discussed thus far are considered structural. The survey also covered nonstructural items—services that could be provided. One of these was a public facility for redrying grain. With Bangladesh's energy resources, it should be possible to make such facilities (and others of similar type) available at a low cost. The measure was evaluated as moderately helpful. The details are in Table 19.

Table 19
Evaluation of Public Grain Drying Facility

	Mean	Std. Dev.	Cases
Entire Study Population	1.93	0.80	1840
Baraitali	2.17	0.52	63
Panchthupi	2.36	0.53	94
Chhoto Bashalia	1.49	0.67	93
Bararia	1.54	0.65	84
Shibsen	2.53	0.56	102
Shingjala	2.36	0.55	33
Lalua & Others	1.02	0.13	57
Pakisha	1.04	0.20	72
Kamaldia	2.27	0.67	91
Rukuni	2.96	0.58	76
Muradpur	1.13	0.34	100
Fenibeel	2.00	0.87	41
Budhal	2.05	0.65	80
Bhitidaudpur	2.62	0.55	98
Goalbathan	1.58	0.59	59
Shanakoir	1.62	0.53	127
Rampur	1.01	0.11	79
Chatipara	1.95	0.64	56
Paschim Durgapur	2.11	0.69	74
Uttar Sankibhanga	2.60	0.58	66
Goalpota	1.72	0.63	53
Bakchara	1.67	0.49	105
Kismat	2.41	0.77	86
Auliapukur	2.25	0.91	51

Source: Household Survey

1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

As with the other service-related questions, the variation between and within villages was less than with some of the structural measures. A householder can usually ignore a service that is of no use, but he or she cannot ignore something that alters the physical environment.

The final item asked about credit for building a *pucca*. In view of the great importance of solid shelter and the great demand for credit in rural areas, it is surprising that this was rated only moderately helpful (Table 20) overall, although the variation between areas is substantial. It may be that the present system is more or less adequate, or that those who had good housing rated the item poorly. More analysis and further field work is needed for an explanation.

Table 20
Evaluation of Credit for Pukka Building

	Mean	Std. Dev.	Cases
Entire Study Population	2.12	0.81	1835
Baraitali	2.43	0.56	63
Panchthupi	2.64	0.50	94
Chhoto Bashalia	1.51	0.54	93
Bararia	1.82	0.52	84
Shibsen	2.71	0.48	103
Shingjala	2.42	0.61	33
Lalua & Others	1.40	0.53	57
Pakisha	1.39	0.52	72
Kamaldia	2.71	0.76	91
Rukuni	3.03	0.23	76
Muradpur	2.30	0.73	99
Fenibeel	1.98	0.69	41
Budhal	1.98	0.81	80
Bhitidaudpur	2.12	0.74	98
Goalbathan	1.91	0.65	59
Shanakoir	2.08	0.59	124
Rampur	1.03	0.23	79
Chatipara	2.05	0.70	56
Paschim Durgapur	2.41	0.95	74
Uttar Sankibhanga	2.36	0.70	64
Goalpota	1.58	0.60	53
Bakchara	1.62	0.66	104
Kismat	2.65	0.70	86
Auliapukur	2.38	0.87	52

Source: Household Survey
1 = very helpful; 2 = moderately helpful; 3 = neutral;
4 = moderately harmful; 5 = very harmful

3.2.4 Provisional Findings

It is convenient and informative to be able to quickly obtain the views of a large number of individuals in a variety of villages. But the greatest power of the computer system in which these data are now stored is that such items can easily be interrelated, in as many ways as the mind can suggest. For example, it can be determined if the landless have different preferences from landowners, or if the women have different preferences from men. Evaluations can be related to different flood characteristics sources, onset, frequency, and to each other. Villages or groups that score one or more items similarly can be selected to determine what other characteristics they may share. And, continuous variables, such as recommended embankment height and average reported flood depth, can be correlated.

It is much too soon to draw conclusions about the best types of flood protection or even the relative costs and benefits of the many options that seem to be available. It is clear that there is a great need for further evaluation of the data already collected and for follow-up studies to clarify the issues. Different measures will have various impacts regionally, as well as socially. Embankments are of little help against flooding

created by rainfall, and it is difficult to design embankments which will not impede drainage. Thus, they will only be useful where the major danger is rising river waters. On the other hand, while tubewells are popular, they primarily will be of use to landowners only. The FAP studies were never intended to consider only structural interventions. These results, as intended, allow us to see what other options there are, and how they interact in the lives of families on the floodplain.

Priority for further investigation appears to be:

- Interactions of embankments and rainfall flooding.
- Requirements for providing local high ground on an economical and sustainable basis.
- Water supplies.
- Providing reasonable credit to solve flood related problems.
- Cost effective ways to lengthen the usable crop season, reducing the inundation period, and to allow more cropping.
- Improve road alignments so they do not interfere with drainage, and maintain submerged roads and embankments while keeping costs low. Possible systems of local responsibility that will assure public accountability for alignments and the efficient use of funds.
- Improve household protection during the flood period.
- Provide cooking fuels and technologies appropriate to flooded conditions (such as bottled gas).
- Require public flood forecasting as it is reliable and attuned to local variations in flood dangers.
- More details on flood providing fish for home consumption.
- Local measures for providing temporary shelter to flood victims, and publicize and perhaps assist successful examples.
- Seasonal response to floods as part of the normal occupational pattern within villages rather than looking primarily at interregional migration.

All of these investigations can begin with the current data, but it also will require additional field investigation. The solution is not to select one or another intervention, but rather to provide a many sided and flexible package that will integrate flood protection with other development concerns, and will encourage and support local initiatives while providing the benefits of national support and coordination.

3.3 Institutional Survey

3.3.1 The Approach

The Institutional Survey was conducted in the same villages and at the same time as the Household Surveys. The work of the two surveys was integrated to a significant extent, such that the institutional surveyors were trained along with the household survey staff and, in the field, did some household interview work. For their part, household surveyors (in particular, the survey supervisor) conducted a number of the institutional interviews and wrote up some of the institutional case studies. Thus, there was mutual reinforcement and interchange between the two activities.

The basic objective of the Institutional Survey has been to develop a profile and to analyze institutional response to flood-related problems in rural Bangladesh. Institutions included both formal and informal organizations, governmental and NGOs. Thus, the study concentrates on the family, neighborhood, village, union, upazila, and district levels, as well as NGOs.

The institutional surveyors worked with an interview schedule similar to that of the Household Survey, but different methodologies were employed in both data gathering and analysis that were congruent with the underlying purpose of the Institutional Survey. The survey schedule or protocol used by the surveyors was quite comprehensive, but instead of seeking out quantifiable answers from a specific sample of rural families as the Household Survey did, it asked more open-ended questions before a less-structured sample of knowledgeable people in the study areas. For this survey, the target audience was village elders and notables, officials, and other knowledgeable people (e.g., businessmen, professionals, and teachers) at the union, upazila, and district level. In conducting their interviews, the surveyors sought to build a picture of how the various institutions in the locality responded to both normal and severe floods and how people on the scene thought that response might be improved.

After the survey ended in late July, the surveyors from the 12 upazilas worked in ISPAN's office, where they assembled their findings, working collectively to discern common and divergent patterns in the data they had collected during their field work. A complete analysis of this material will not be finished for some time to come, but the work has progressed sufficiently to put some tentative findings from several of the upazilas before the workshop participants. Specifically, a brief synopsis of Institutional Survey results from four representative locales are presented to illustrate the approach taken and findings developed thus far.

3.3.2 Village Profiles

Four upazilas are presented: Sarishabari (Jamalpur District) on the Jamuna left bank, perennially flood-prone; Chirirbandar (Dinajpur District) on the Atrai and Kakra Rivers of the Ganges floodplain, partly flood prone and partly flood free; Bhedarganj (Shariatpur District) at the confluence of the Padma and Meghna Rivers, partly a char area and vulnerable to floods in ways quite different from other area; and Satkhira (Satkhira District) in the coastal area, tidal area with saline water. Study locations and sketches of the above four upazilas are in
Annex 3.

Sarishabari. Goalbathan, the more flood vulnerable of the two villages studied in the upazila, lies near the east bank of the Jamuna, about 15 km south of the upazila headquarters. A railway line runs from the upazila headquarters passing quite closely to Goalbathan and on southward to Jaganathganj ferry ghat

some two miles away, a major Jamuna River crossing to Sirajganj. In addition, Goalbathan is adjacent to an officially designated growth center at Pingna that provides a ready market for its produce. The village is thus well connected to the outside economy.

Shanakoir, the second study village, is also favorably situated in terms of connections to the outside, lying astride a brick-surfaced road several kilometers from the nearest market center. It is less favored economically, with fully half its households completely landless (compared to about one-fourth in Goalbathan). The median monthly expenditure per household there is less than half that enjoyed in the other village (TK. 1,200 vs. Tk. 2,450). On the other hand, it is on higher terrain and more flood free, although it sometimes receives water runoff from the Madhupur Tract to the east.

Goalbathan lies in an area protected by part of the East Pakistan Water and Power Development Authority (EPWAPDA) Brahmaputra left bank embankment of the 1960s. Normally the 10-foot embankment is effective, but in both 1987 and 1988 water flowed over it, as well as backing up around the embankment's end several kilometers to the south. Shanakoir also enjoys embankment protection in normal years, as a result of a BWDB project constructed in the early 1970s along both sides of the Jhinai River. In 1988, the village did flood, however, and in the process the BWDB project's sluice gate was damaged to the extent that it became nonfunctional. As a result the canal draining the Shanakoir area now has silted up. Thus, drainage problems constitute a major constraint on agriculture in Shanakoir and in Goalbathan where similar silting problems exist.

Two other issues relate to floods here. One involves FFW roads that are widely regarded as the cause of drainage and waterlogging problems. In fact, villagers breached them in several places to let water through in 1987 and 1988. The second concerns BWDB engineers' concern that dredging should be done in the Jamuna and Jhinai Rivers to help with erosion problems. The Bangladesh Inland Water Transportation Authority (BIWTA) would have to do it.

Families and animals in both Sarishabari villages faced health problems both during and after the 1987 and 1988 floods. Diarrhoea is not normally a serious health matter in the area, but in 1987 it became so. The upazila Health and Family Welfare Clinic (HFWC) distributed oral rehydration thearpy tablets and alum *(fitkari)* during and after the flood. Perhaps more importantly, after the flood it undertook a motivational program to promote greater awareness about water purity. The program was apparently effective, for when the 1988 flood came, people were concerned about drinking water. In the absence of fuel and dry places to boil water, and the insufficient distribution of oral rehydration thearpy tablets and fitkiri, this increased awareness was of little value and diarrhoea became prevalent again. Livestock also suffered from disease in the floods of 1987 and 1988, but no vaccination program was undertaken here.

Flood warning was ineffective and haphazard in the two big flood years, and many respondents at all levels thought things could be improved significantly. Union parishad members were especially interested in developing better ways to inform people of impending floods.

Chirirbandar. Kismat, the higher of the two villages surveyed in this locale, is the only one among the 24 study sites that was virtually flood free over the last decade. Auliapukur, the lower village, was severely affected in both 1987 and 1988, and, in addition, is subject to flash floods washing down from the Himalayan foothills in India. The central flood-related problem here is drainage, for three reasons. First, the clayish Barind Tract soils of the area, while more resistant to erosion than the sandy alluvial soils that are more widely found in Bangladesh, are at the same time much more subject to water logging

as water slowly percolates through it. Second, there is a deforestation problem. The sal climax forest, that used to be characteristic of the area, has been stripped to the point that it is almost completely denuded of cover. The clayish soil makes reforestation (as well as revegetation generally) more difficult to sustain than elsewhere. The result is more rain water runoff and more waterlogging. Finally, a railway track (dating from the British colonial period) that runs from east to west through the middle of Auliapukur serves as a significant deterrent to the north-south drainage path that flood water would take in its absence. Breaching in this main line that connects Dhaka with the northwest was considered a serious enough threat in 1987 and 1988 that police pickets were stationed to protect it. People in the area are quite anxious for more and bigger culverts to run under the railway track.

Auliapukur Village is situated in the middle of what is in effect a large island between the Kakra River to the east and the smaller Atrai River to the west. A 10-year old FFW embankment on the west side of Kakra (i.e., east of the village), was never much help and now is totally useless. It is scheduled to be replaced by a BWDB subproject that will put a two-meter embankment on the west side of Kakra and a one-meter embankment on east side of Atrai, thus virtually surrounding the island like a polder (see Annex 3).

Housing in this area is primarily mud construction, undoubtedly a technology well suited to the locale previously but now dysfunctional as flooding has become more prevalent in recent years. Collapsing houses were a major problem in 1987 and, in 1988, about 30 percent of Auliapukur's houses collapsed. The figure would have been much higher except that most houses are south of the railway line and thus protected. Tin is replacing the mud construction, but it is considerably more costly. People rebuilt their own houses after the floods, but would like help.

Post-flood diarrhoea was extensive in 1987 and 1988, more than normally. The upazila health office responded with water tablets, but, as was the case elsewhere, most people thought the supplies were insufficient. In addition to human medical problems, after the 1988 flood, cattle diseases also prevailed, including anthrax (rumored to be from India). Upazila officials apparently did well at inoculating cattle, but were criticized for not supplying more fodder as part of the relief effort.

Bhedarganj. Singjala village, close to the upazila headquarters, has been split into three sections for the last 50 to 60 years by natural channel shifting. Shibsen Village lies astride a char formed in the Padma some 70 to 80 years ago. The two have distinctly different flood problems.

The Shibsen char is continually changing shape, with loss and accretion of land from one year to the next, and a significant net gain over the last 30 years or so. Land ownership is adapted to this pattern of change in that people hold long strips perpendicular to the water's edge, such that gain and loss of land affects all the strips more or less equally. Sometimes, as in 1987, however, erosion is so intense that large sections of land (in this case almost the whole village) are eliminated. People disperse, hoping the land will resurface there or elsewhere. Land is titled, however, both above and below the water, so that when it does emerge, owners step forward to take possession. This happened in 1989 when a large area that had disappeared in 1987, resurfaced to the north of the area. The village, which had largely vanished as an entity after 1987, then reassembled itself in the new area in 1989. Meanwhile people had scattered to nearby locales, some elsewhere in Sariatpur District, some in Munshiganj across the Padma River. Flood relief in 1987 and 1988 was worse here than elsewhere. This is because the flood-displaced migrants were not permanent residents in their places of refuge and, thus, were not eligible for relief distribution there.

Social mobility has a unique dynamic here, as yesterday's *bhushwami* (landlord) becomes today's *khet*

majoor (agricultural laborer) when his land disappears. He then hopes to return to *bhushwami* status with tomorrow's river-determined changes. Mostly, though, those holding land in one area also have title to land that comes up elsewhere, so patrons and clients tend to shift together to some extent. In general, the system seems to work more harmoniously here than in other erosion-prone places like Dhunat and Sarishabari, though the land-titling law is the same everywhere. The principal reason for the difference may be that new char land in the Shibsen area more quickly is usable for agriculture, and thus a new microeconomy can be put into place right away. Upstream on the Jamuna, it takes more time to prepare the sandier char land for use, and there is more chance for social acrimony to arise. Many of the residents turned to fishing as a temporary occupation after the 1987 displacement. The Household Survey, in fact, showed that almost two-fifths of the 1991 households reported fishing as their principal occupation, making Shibsen the only one of 24 villages in which agriculture was not the primary means of livelihood.

Housing is also more portable. People can dismantle and move their dwellings quickly. They tend to place their houses in the middle of their long strips of land, and can easily shift them back along their strips if land goes under water.

Singjala village also suffered heavily in 1987 and 1988, even though it is located on ground that is relatively high. Most of its residents live in its larger eastern section. Only a few live across the channel to the west where they have been separated by natural channels for the last 50 to 60 years. In the 1988 flood, there was considerable evacuation from the eastern section to the upazila headquarters. Afterward, a low road that serves as an embankment was erected as a FFW scheme to protect this area, but it is widely regarded as useless.

Flood warning is considered more important here than elsewhere, probably because of the precarious nature of life on the char. The adaptations made to normal flood years are well suited to the contingencies that arise, but people need warning for severe floods. Thus the ordinary practices are totally inadequate.

Diarrhoea and other flood-related diseases are not a serious problem here with normal floods, but they were quite serious in 1987 and 1988. The 1987 experience raised the level of consciousness about drinking water such, that in 1988, people tried to boil water although fuel was a problem. In 1988, Save the Children Fund ran a temporary health camp that was helpful and worked with the upazila HFWC.

While silting and excavation constitute concerns in all the areas, the focus here is on deep excavation, and dredging rivers and natural channels, not on desilting or clearing water hyacinth, etc. The work required is far beyond union-level FFW or even upazila (and probably district) level capabilities as well.

The LGEB has had some infrastructure activities here, though less than elsewhere in the district. There has been some modest work as part of the third Flood Rehabilitation Project, focusing on bridges and culverts. Some tension between the upazila parishad chairman and the LGEB occurred with respect to locating projects, selecting tenders, and adhering to construction standards.

Satkhira Sadar. This upazila lies in the middle of an extensive polder project constructed in the 1960s and covering more than 560,000 acres. It includes 18 polders, 784 kilometers of embankments, and 227 sluice gates.

Goalpota Village is situated northwest of the Betna River and protected by an embankment that is part of the massive polder scheme just mentioned. A canal flowing through the village and into the Betna had

silted up, but was replaced by a new one constructed by the BWDB in 1990. The village is also the site of large scale shrimp culture, which causes considerable tension between the shrimp farmers and cultivators. Shrimp farmers manage to get water through the embankment sluice gates and then build cross dams on the canals to keep it from draining out. This provides the brackish saltwater they need for their shrimp, while creating problems for farmers and their crops.

Over the years Goalpota's canal silted up completely, a process accelerated in recent years by shrimp farming. Shrimp farmers let saltwater, and consequently silt, rush in through the sluice gate at high tide. Then it drains out slowly, dropping its silt and clogging up the canal. In 1990 the BWDB constructed a new canal and sluice gate that appears to work quite effectively, but ironically may cause more problems than it cures for Goalpota. Just to the north of the village, another embankment had protected it against water from that direction, but now that the new canal is in place, villagers from that side have begun breaching their embankment to solve their own drainage problems. The result is overflow and waterlogging on the Goalpota side. Now Goalpota villagers want more culverts to facilitate drainage from their area, as well as an embankment on the canal's south side to protect the village itself.

At the second study site, about four-fifths of Bakchara Village lies in a beel. There is a drainage canal connecting it to a larger channel about 2.5 miles away, but it is totally silted and ineffective: a three hour rain takes three days to drain out. There is no shrimp farming here. The FFW program could have desilted the canal, but drainage here is considered to be a BWDB affair, and FFW has restricted itself to road work (which in turn appears to cause its own water-logging problems). For 1991-92, however, FFW is planning to take on the task of desilting another nearby canal and, therefore, might take up this one in the future.

Rain and cyclones are much bigger problems in this area than river-related floods, and in 1988 neither of the two study villages had flood difficulties. In the 1987 flood, about 30 percent of the upazila's land area was affected, and in both study areas the figure was 85 percent. In the 1987 flood, there were health problems for humans and livestock. The upazila health and livestock offices responded with water tables and vaccinations, though not sufficiently in the perception of the villagers interviewed. Six shelters were opened at the upazila headquarters, and many families evacuated from Goalpota, but none from Bakchara.

3.3.3 Provisional Findings

Tentative findings include:

- The same infrastructural bias characterizes flood response as local level government and planning in general. Upazila parishads tend to spend the great bulk of their funds on physical infrastructure rather than service delivery or human capital investment. To a large extent, they tend to see development itself as a matter of constructing physical objects. Similarly, those who deal with floods, whether officials or citizens, too often tend to see flood problems and solutions in terms of infrastructural aspects.

- All flood responses are scarcely infrastructural, however. Other agencies, such as those involved in health, livestock, and relief, respond and have vital roles to play.

- Flood relief and flood preparedness are needed. While infrastructure is vitally important in responding to flood problems in Bangladesh, particularly in the long run, service delivery is equally and probably more important in the short run. Generally, people in

flood-prone areas have good ideas as to what they need: medicines, warning systems, shelter arrangements, etc. And they are amenable to acquiring knowledge that will be helpful in dealing with future floods, particularly when it relates to hardships faced in floods just past.

Given the scope for improving flood response through these interventions, it would make good public policy sense for the GOB and donors to devote significant energy and effort to building better systems for coping with floods.