BANGLADESH FLOOD ACTION PLAN

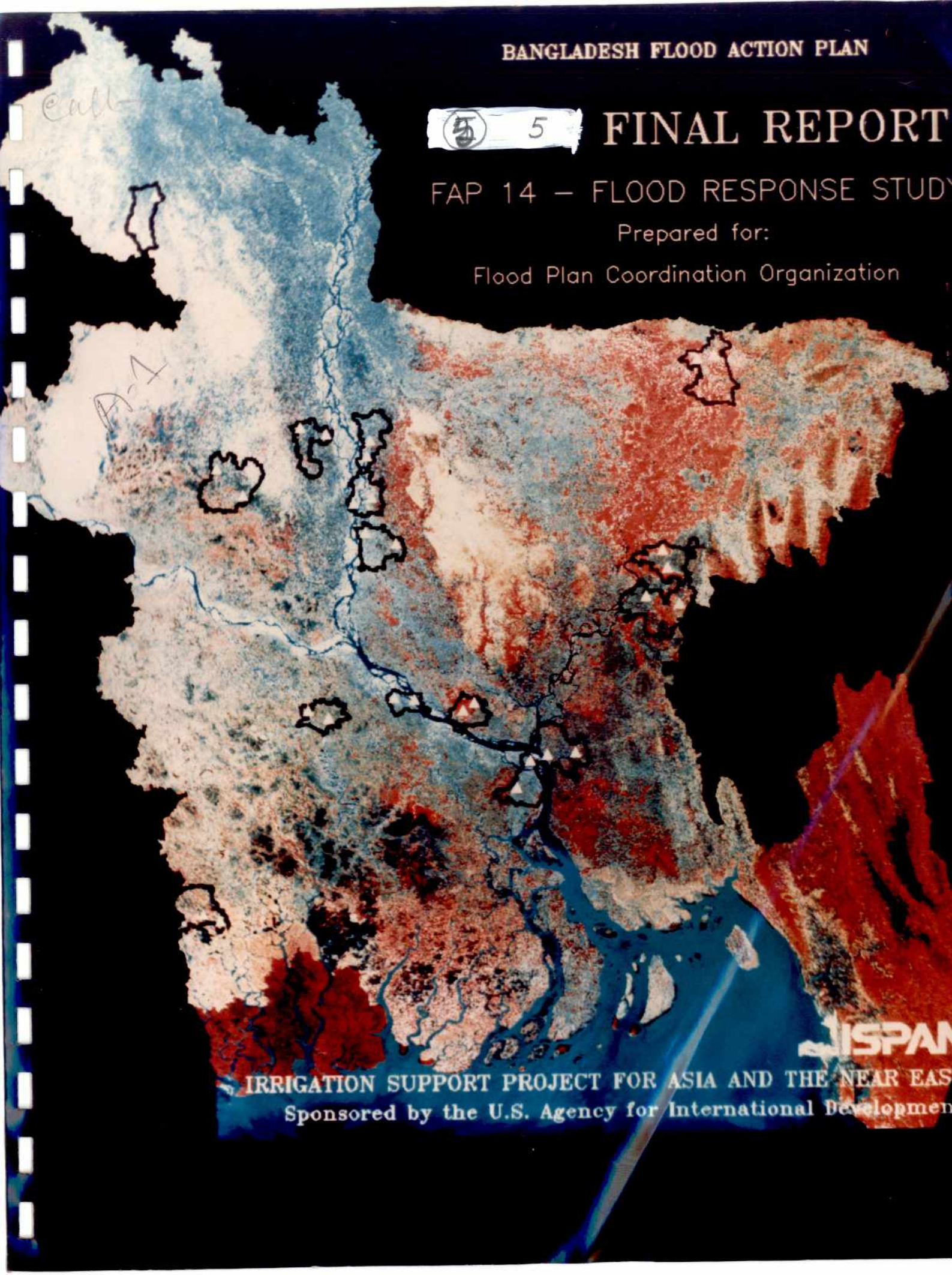
5

FINAL REPORT

FAP 14 – FLOOD RESPONSE STUDY

Prepared for:

Flood Plan Coordination Organization



IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST

Sponsored by the U.S. Agency for International Development

BANGLADESH FLOOD ACTION PLAN

DRAFT FINAL REPORT

and

PLANNING GUIDELINES

FLOOD RESPONSE STUDY (FAP 14)

Prepared for

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

September 1992

ISPAN
IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST
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IRRIGATION SUPPORT PROJECT FOR ASIA
AND THE NEAR EAST

c/o United States Agency for International Development
Office of Food and Agriculture
Baridara, Dhaka

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

Cover Photo

The cover photo is a standard false color composite of Landsat Multispectral Scanner satellite images. A total of 11 images acquired during February-March 1984 constitute the mosaic. The image was digitally processed and produced by the Geographic Information System (FAP 19). Study area boundaries, outlined in black, are superimposed on the image.

FOREWORD

This report is the result of a team effort coordinated by Dr. Keith Pitman, Chief of Party, ISPAN, and Dr. Muhammad Alamgir, Team Leader. Richard E. Aten, Chief of Party through February 1992, provided important support and guidance during the first phases of the project.

Other senior staff took responsibility for specific parts of the study and report. The overall strategy for the study was initially designed by Dr. Murray Leaf in collaboration with Dr. G. T. Keith Pitman and Dr. Harry Blair. Dr. Pitman took primary responsibility for the selection of study sites. The Bangladeshi leadership group formally joined in March and April, 1991. The core team was made up of Dr. Muhammad Alamgir; Dr. Mustafa Alam, Senior Socio-Economic Advisor; Mr. Mujibul Huq, Senior Agronomy Advisor (through June 1991); and Dr. Shamsul Alam, Field Survey Supervisor. After the team was assembled, Dr. Mustafa Alam took responsibility for developing the institutional study. Dr. Blair left the project in January of 1992, but continued to advise informally. Dr. Leaf continued with intermittent input, and maintained primary responsibility for preliminary analyses of household survey data and for data base and data management for the household surveys. In April 1992 Dr. David Schuy joined the team, and Dr. Paul Thompson joined in May. Dr. Thompson took particular responsibility for analyzing the household level flood preparation, response and evaluation data and Dr. Schuy, for agricultural cropping data. Dr. Suzanne Hanchett, Senior Advisor in Social Anthropology, joined the project full-time in October 1991. She assisted with general study coordination and also took direct responsibility for the study of gender issues and women in development.

The Draft Final Report presents study findings in a summary form. Full details are in a separate volume, the Main Survey Report.

ACKNOWLEDGEMENTS

The Flood Response Study has benefitted from continuous discussion with USAID, the FPCO, and colleagues on other FAP studies, particularly within ISPAN. Many more people have contributed than can be adequately acknowledged. It is, however, necessary to personally acknowledge the initial advice and guidance of Ray Renfroe, USAID Project Officer, Helen Gunther, who succeeded him, and Peony Chaudhury, Program Specialist. In FPCO, those who have a material influence on the study have included Mr. M. Nurul Huda, Chairman, Local Panel of Experts, Mr. M. H. Siddiqui, Chief Engineer, and Mr. A. M. Shafi, Superintending Engineer.

In associated organizations, the study has particularly benefitted from the advice and experience of Steve Jones and Hugh Brammer (POE), Ross Wallace (World Bank), Harold Rice (IFPRI), and Monowar Hossain (MARC, FAP-15). SPARRSO provided facilities for staff training.

The field staff of fifty seven men and women, selected and trained by the senior staff, did consistently excellent work often under very difficult conditions. By the time field studies had begun in May 1991, in the aftermath of the Chittagong cyclone, many of the areas selected were already deeply flooded.

After the field work, four of the Institutional Surveyors : A.T.M. Shamsul Alam, M.Sc., Md. Atiquzzaman, M.Sc., Subrata Kumar Mandal, M.S.S., and Md. Jakariya, M.Sc., continued as Research

Assistants for collation and processing of miscellaneous data.

The gender study benefitted greatly from the analytic and field work of Mrs. Jesmin Akhter, M.S.S., Anthropological Research Associate, Mrs. Kazi Rozana Akhter, M.Sc., Sociological Research Associate, and Mrs. Hosne Ara Alam, B.A., Field Investigator.

Computer Programming Specialists were Mr. A. S. Biswas (from October 1991), Mr. Abdul Matin Miazi (from November 1991), and Mr. Q. A. B. M. Salimullah (from May 1992).

Production of the draft final report was coordinated by Suzanne Hanchett, Carol Jones, and Jeanne Phirman with assistance from Mrs. Shamsun Nahar and Mrs. Hena Rosline D'Rozario.

Finally, the Team acknowledges with deep appreciation the whole-hearted cooperation it received from all the respondents. Special gratitude is due to the heads of the sample households numbering 2264 who took the time to answer a long and difficult set of questions for the household survey. The officials in different government and non-government institutions deserve special mention for providing valuable information and sharing their ideas with the Team.

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EXECUTIVE SUMMARY

The goals of the Flood Response Study (Flood Action Plan Study Number 14, or FAP 14) were:

- To assess the existing flood response practices of people living in different flood plain agroecological zones.
- To assess the possible impacts of measures to mitigate flood impacts.
- To formulate guidelines that will be useful to other Flood Action Plan projects.

Flood response was defined as any activity that either prepares for, copes with, or recovers from flood, within the constraints of the society, its technology, and the environment. This study was closely related to the Flood Proofing Study (FAP 23). Both were intended to identify measures that would reduce adverse flooding effects on the social and economic activities of the Bangladesh population. The Flood Response Study encompassed a broad analysis of flood response problems and potentials of rural households and the various institutions that are supposed to serve them. In the course of this study information on rural flood proofing needs was gathered to supplement the FAP 23 study.

The study used household questionnaire interviews (the Household Survey) and less structured, group interview methods (the Institutional Survey) in 30 villages of 15 different upazilas (now, thanas). The study investigated people's opinions of various mitigation measures, existing governmental or other service provision, household preparation and coping measures, gender and other social factors influencing flood response, and agricultural adjustments to the water regime. Of a total of 8,090 households in the villages, a sample of 2,264 (2,178 flood affected) were selected for intensive study, with a small subsample of 86 covered in follow-up interviews with senior women (the Gender Study). In addition to the 30 main villages, the Institutional Survey covered another 51 in surrounding areas. Study sites were selected to represent diverse types of flood plain water conditions, with an emphasis on relatively flood-prone places.

The study analyzed responses to three types of water situations. One was normal monsoon inundation (*shabhabik borsha*). The second was average flood (*bonna*), which normally covers fields but rarely homesteads. The third was severe flood (*marattak bonna*), which covers fields and also many homesteads.

Each village was classified for analysis as being in one of eight possible flood environments (plus one hitherto flood-free area) according to its predominant flood response characteristics. The concept of flood environment was based on a combination of normal monsoon conditions, with which cropping patterns were closely aligned, and frequency and duration of average and severe flood events. The study populations of the flood environments had distinctive patterns of flood response, with additional variations associated with differences in flood experience or socioeconomic status.

The eight flood environments which form the basis of the analysis are: (1) main river areas; (2) secondary river areas; (3) empoldered villages in the semi-saline, tidal southwest; (4) chars, large, mostly new land masses within the major rivers; (5) haors, tectonically formed depressions prone to annual water accumulation; (6) beels, former river channels that are deeply flooded seasonally and may be fed by either

rivers or rainfall; (7) flash flood areas; and (8) areas protected by embankments but which have suffered from floods caused embankment breaches.

General Flood Response Problems

Although many problems created or worsened by floods are common across flood environments, their relative importance varies, as does the need for interventions to improve people's capacity to cope with flood. Already there are many public sector and NGO services, such as relief, flood forecasts, emergency health care, and structural flood protection, to help people. However, the study found major gaps in service provision; most needs had not been adequately met in recent severe floods. Nor has there been sufficient planning to develop combinations of mitigation measures appropriate to specific flood situations.

Protection from floods, but not from normal inundation, was a common desire among study respondents. Those who were protected by embankments, however, opinions about them often were highly divided. When asked to evaluate certain other, nonflood control measures, even those with recent experience of severe flood expressed interest in such measures. Roads in particular were rated as especially beneficial. The study did not fully investigate local opinions about how flood control and mitigation should rank among various possible rural development priorities, although this is an important policy issue.

There are common and widespread measures to help the rural population cope with flood. Improved flood and storm warning systems are much needed, as, currently, most information is disseminated by word-of-mouth or, for some areas, on the radio. The timing and use of warnings should differ between flood environments. For example, flash flood areas need short-term, rapidly spread warnings, while those subject to more gradual but extensive flooding need to be warned differently. Obtaining cooking fuel and fodder supplies was generally a problem during monsoon. Competition for such supplies was found to be seriously aggravated by floods. The work of men and women was affected differently by flood, and female assets were more likely than men's to be sold or mortgaged to meet basic needs. A large percentage of families found it necessary to borrow money or risk important productive assets in recent floods. Any programs that would increase the rural poor's access to appropriate resources (including food and employment) would increase resilience of the majority and reduce suffering. Those with more frequent flood experience were more adequately prepared, raising concern about the possible vulnerability of those without such experience should they be affected by flood in the future.

Agricultural production systems are closely adjusted to monsoon cycles, with depth and duration of normal inundation or average flood dictating the choice of crops during the kharif-1 and kharif-2 growing seasons. A common agricultural response to severe flood was to increase production of dry season (rabi) crops, such as boro rice, that depends upon irrigation, fertilizers and other inputs. This response indicates that there is a general need for policies to increase access to irrigation facilities, inputs such as seeds and fertilizer, and credit or other financial support for those suffering crop losses.

Another widespread agricultural problem in flood was the protection of animals, especially those used as draft animals. Not only does severe flood threaten animals' health, it also can force distress sales by poor families of these very important productive assets.

Problems of Specific Flood Environments

More specific findings and recommendations relate to differences between flood environments.

In general, the lesser rivers tended to flood more than others from local rainfall. Because most radio announcements applied only to the main rivers and had little relevance to lesser river areas, improved localized warnings are needed. Another problem on the lesser rivers was flash flooding, which was somewhat unpredictable, rapid, and destructive. This indicates a need for house repair and other flood recovery assistance programs. In secondary river villages and empoldered, semi-saline villages drainage congestion can be a problem, often more serious than flooding, and it requires further investigation and action.

In beel and haor areas, deep and prolonged annual floods allow limited scope for changing agricultural practices, although submersible embankments were regarded as potentially beneficial. Warnings of flash floods, storms, and breaches would help residents of such areas to harvest crops early when possible. Safe places to store and dry soaked paddy were of great interest to beel and haor respondents. These areas have some prosperous large landowners who might be in a position to initiate some projects on their own and contribute to costs of facilities benefitting a wider public.

Within areas already protected by FCD/I projects, such as those along the main rivers, there is a need for wide dissemination of warnings about embankment breaches. Breaches may affect people living far from the breach locations or those who may have a false sense of security because an embankment is present. One way to reduce this problem would be to increase flood risk awareness and preparedness through educational programs in schools or NGO projects. Embankments are very important refuge sites for flood affected families who live outside protected areas. It is advisable to consider targeting services and/or creating some facilities to such families.

In the char areas, a combination of frequently flooded homesteads and loss of land to river erosion meant that households often moved. They moved either to seek temporary shelter during floods or to settle for a long period while awaiting a char to re-emerge. Homes in the chars are already movable, but access to boats can be a problem. Needs of the char population are many, ranging from warnings to assist people in evacuation, to provision of shelter and public support services, to income generation opportunities for those who are displaced.

Service Provision Options

Funds to help people recover from a severe flood are scarce, especially for economically marginal families who may be forced to mortgage or sell important assets. While relief services are popular among flood plain residents, employment creation would help directly and would result in increased purchasing power for the poor. Institutional credit programs also could increase purchasing power if funded through progressive taxation.

At the village or union level there is potential for expanded support of the flood affected population. Neighbors already help each other in flood crises. Therefore, neighborhoods may be suitable foci for structured programs to coordinate and improve such activities as emergency crop harvesting, community animal rescue and protection, or other forms of emergency assistance. Local government offers an appropriate framework for developing many flood coping and flood proofing measures. Thus, union

parishads could play an important role if they had the authority to handle more resources, and improve skills and direction in coordination with higher levels of government. They would be very suitable agents for development of locally useful warning systems or infrastructure development.

The upazilas had more resources than the lower government levels. Changes in the use of those resources, along with improved coordination, were recommended to help people coping with floods. In particular, redirecting Food for Work resources towards flood proofing activities, such as raising homes and public grounds or creating emergency shelters, would leave people better prepared for flood. Formal and informal education programs that incorporate disaster preparedness could reduce flood risks.

Officers representing various line ministries or agencies are the most suitable providers of important services such as medical or veterinary care. It is recommended that such services be provided in places where flood affected families seek emergency shelter as well as in villages of residence.

It is strongly recommended that future plans for flood proofing or other mitigation measures be developed in a participatory manner. Men and women who are most affected by flood, and who best understand their own needs and interests, should be consulted in such plans. The flood environment concept or other findings of this study cannot substitute for such detailed, local planning efforts, although they may guide them by providing a general framework for future investigation and discussion.

Conclusion

People would be better able to cope with flood and thereby improve their general welfare by integration of specific flood response measures within structural and non-structural projects or programs being formulated in the Flood Action Plan. Further, where no structural projects are feasible, people of unprotected areas would be greatly helped by locally designed flood preparedness and flood proofing programs developed in ways that suit local resouces and conditions, as recommended in the guidelines of the Flood Response Study (FAP 14) and the Flood Proofing Study (FAP 23). A prerequisite for such action planning is of course the political will and policy direction to encourage many different public service providers to include public flood resilience among their various programs.

In Bangladesh flood response has so far been mainly a matter of relief and structural protection. There is a need for formulation of a national policy in the context of overall national development objectives, a policy facilitating an integrated policy process to which all-- from the most humble village up to the top government levels -- are committed. Such a planning process, that would include all parties' information and views about the water regime and flood impacts, should proceed in a way that will produce a synergistic, and generally beneficial, balance between multiple development needs of Bangladesh.

Chapter 1

INTRODUCTION

The Flood Action Plan (FAP) is under way because of widespread concern over the hardships suffered by the people of urban and rural Bangladesh in the exceptionally severe floods of 1987 and 1988. Well reported by the media, these floods caused widespread dislocation and distress to the population as well as crop damage in the growing seasons when they occurred. In mid-1989 the Government of Bangladesh (GOB) requested the World Bank to help coordinate the international donor interest and activities. Accordingly, the Bank in cooperation with GOB prepared a Flood Action Plan (1989; 1990b) that was endorsed at two donor meetings with GOB in December 1989-January 1990. The Flood Plan Coordination Organization (FPCO), under the Ministry of Irrigation, Water Development and Flood Control (MIWD&FC), was established for coordination with the GOB. The Flood Action Plan (FAP) lays out 11 main components and 15 supporting activities to be undertaken between 1990 and 1995. The Flood Response Study is one of the latter. It is one of the four supporting activities that have been funded by the United States Agency for International Development (USAID).

The Flood Response Study has investigated the views and actions of a broad group of rural Bangladeshi people, many of whom were much affected by the floods of 1987 and 1988. The primary objective of the study is enhance understanding of how ordinary people deal with flood, how flood affects their lives and livelihoods, how social groups and local government can or could help mitigate negative effects, and, most importantly, what changes, if any, rural people feel are needed.

Under the Terms of Reference (See Appendix A), this study has four major aims:

- To assess the existing flood response of people living in flood plain areas.
- To evaluate flood response practices at selected sites in different flood plain agroecological zones.
- To assess the possible impact of infrastructural flood protection efforts such as embankments or polders.
- To formulate guidelines and recommendations on ways of enhancing effective flood response measures that will be useful in planning, design and operation of other FAP projects, especially the regional studies and FAP-23 (flood proofing, which has since been formally concluded and in substance absorbed into other activities, including this study).

Although the study area was defined as the major river flood plains, the scale of the study was left largely unspecified, except that the terms of reference called for at least six upazilas/study sites.

This study is an initial exercise in one type of participatory planning. The study population, ordinary men and women who are the target of much concern and attention, have had an opportunity to react to some proposed ideas. They have expressed an interest in change and in contributing to projects that they feel are worthwhile. They have given information about their past experiences and their flood response

practices. Most importantly, the study has shown that there is so much variation in practice, that planning for change must be localized.

The whole flood action planning process itself is occurring in the context of the economic development process of Bangladesh. The kinds of problems, response activities and mitigation measures discussed in this report cannot be neatly subsumed in the purview of any one type of public service. An integrated approach to rural development is strongly suggested as the best framework in which to implement the flood action programs and policies recommended in this report.

1.1 Study Sites

Villages differ in their overall land levels and their positions relative to water bodies. Figure 1.1 shows the comparative elevations of village fields and homestead areas in lowland, medium land and highland villages. As the figure shows, homesteads usually are built on elevated land that is less likely to be flooded than are fields. This study covered all three types of village.

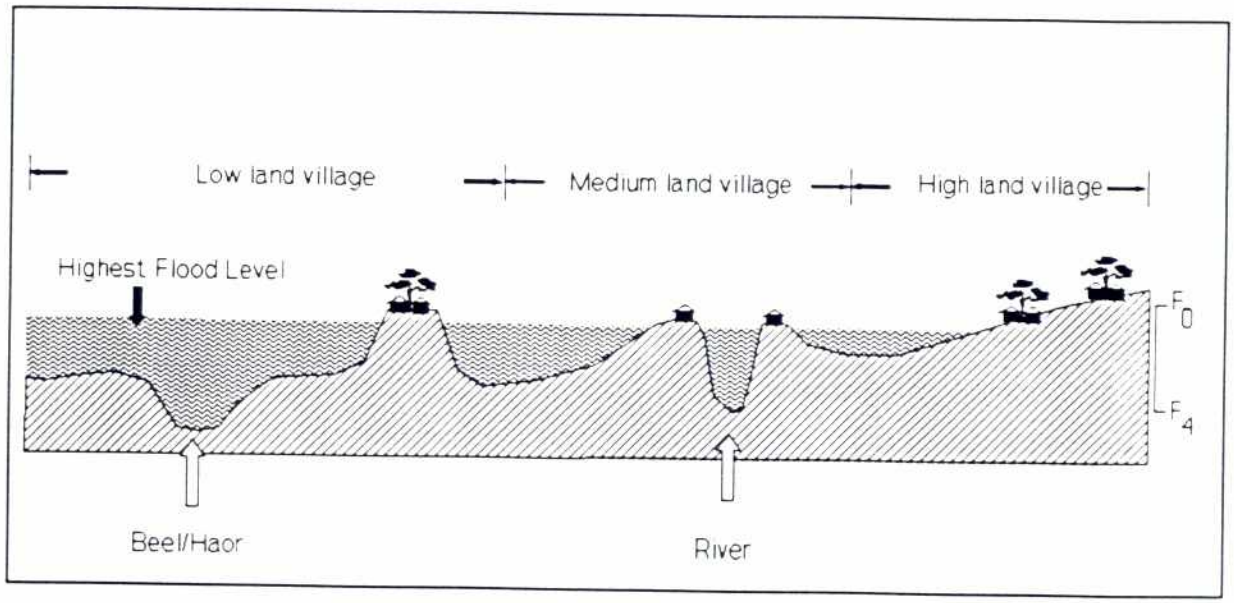
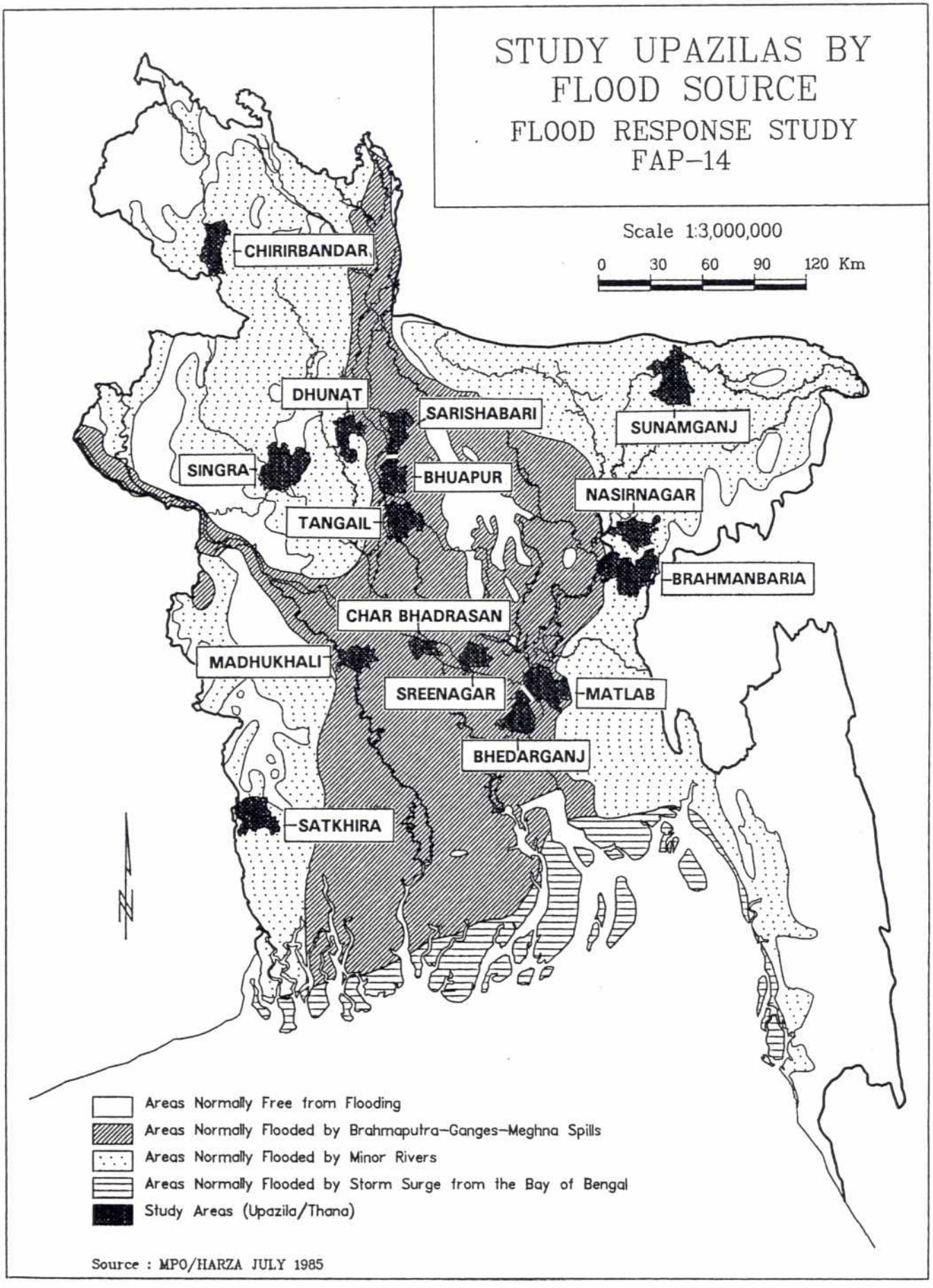


Figure 1.1. Village Topography

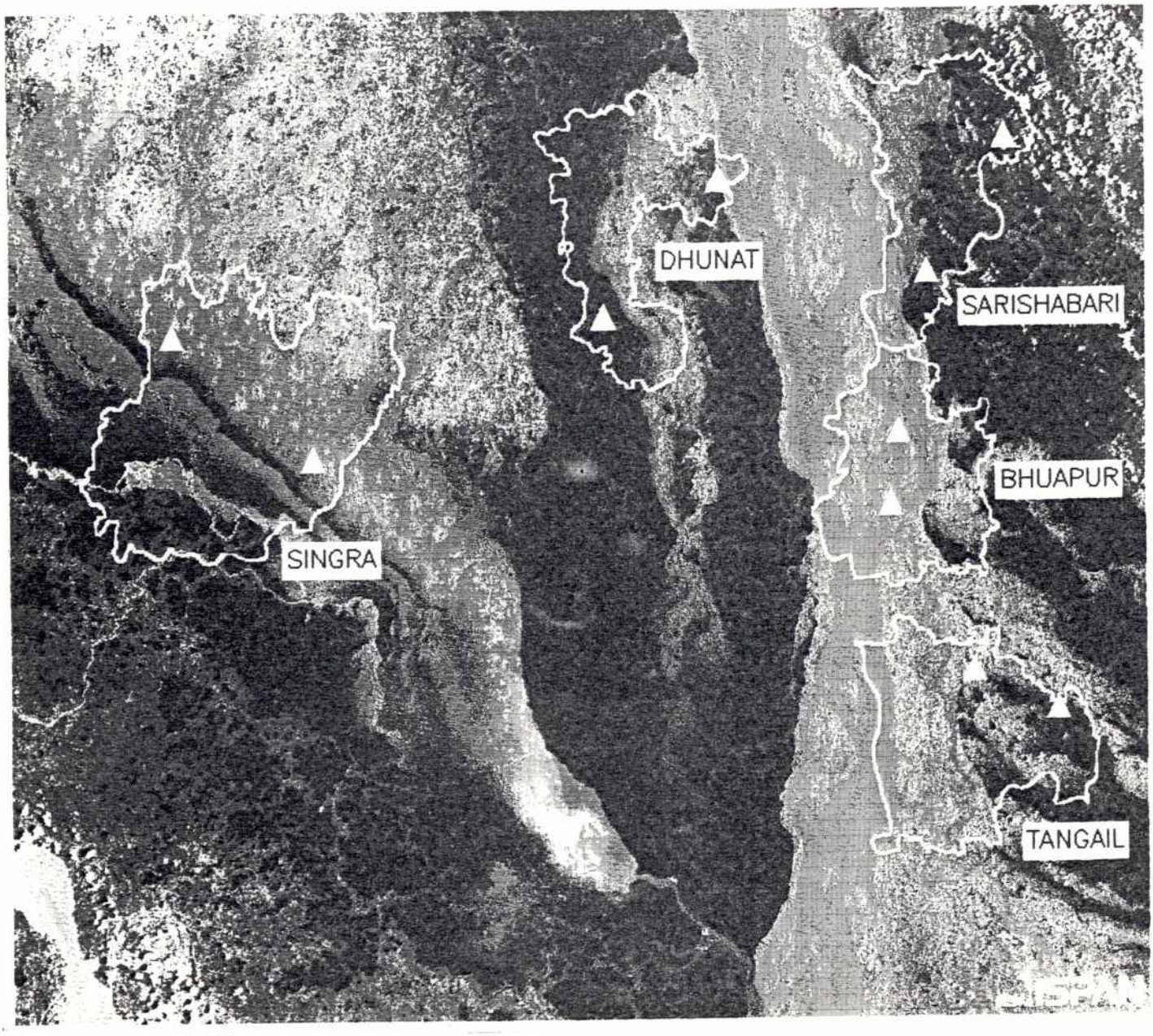
Map 1.1 shows the locations of study sites (upazilas and villages) in the flood plain. As is clear from the map, most of these sites were flooded in 1987 or 1988. This is even more evident in Maps 1.2 and 1.3, which give two views of one region, showing the positions of several study sites superimposed on a satellite image of the 1987 flood. This Landsat MSS (Multi-Spectral Scanner) image was acquired on August 18, 1987, and corresponds to near peak water levels. The image shows areas of bright blue color which indicates total inundation with turbid water. Areas of bright red color are covered with vegetation and not inundated. Dark red indicates areas of vegetation which are saturated or under shallow flood. From this image it is obvious that a large proportion of the four study upazilas depicted were flooded in 1987. It also is interesting to observe areas of overland flow and breaches in embankments.

Map 1.1


STUDY UPAZILAS BY FLOOD SOURCE
FLOOD RESPONSE STUDY
FAP–14
Scale 1:3,000,000
0 30 60 90 120 Km
CHIRIRBANDAR
DHUNAT
SARISHABARI
SUNAMGANJ
SINGRA
BHUAPUR
NASIRNAGAR
TANGAIL
BRAHMANBARIA
CHAR BHADRASAN
MADHUKHALI
SREENAGAR
MATLAB
BHEDARGANJ
SATKHIRA
Areas Normally Free from Flooding
Areas Normally Flooded by Brahmaputra–Ganges–Meghna Spills
Areas Normally Flooded by Minor Rivers
Areas Normally Flooded by Storm Surge from the Bay of Bengal
Study Areas (Upazila/Thana)
Source : MPO/HARZA JULY 1985

Map 1.2

FIVE STUDY UPAZILAS IN THE 1987 FLOOD



Note: This map will be reproduced in multi-color in the final report.

△ SAMPLE VILLAGE

VEGETATION

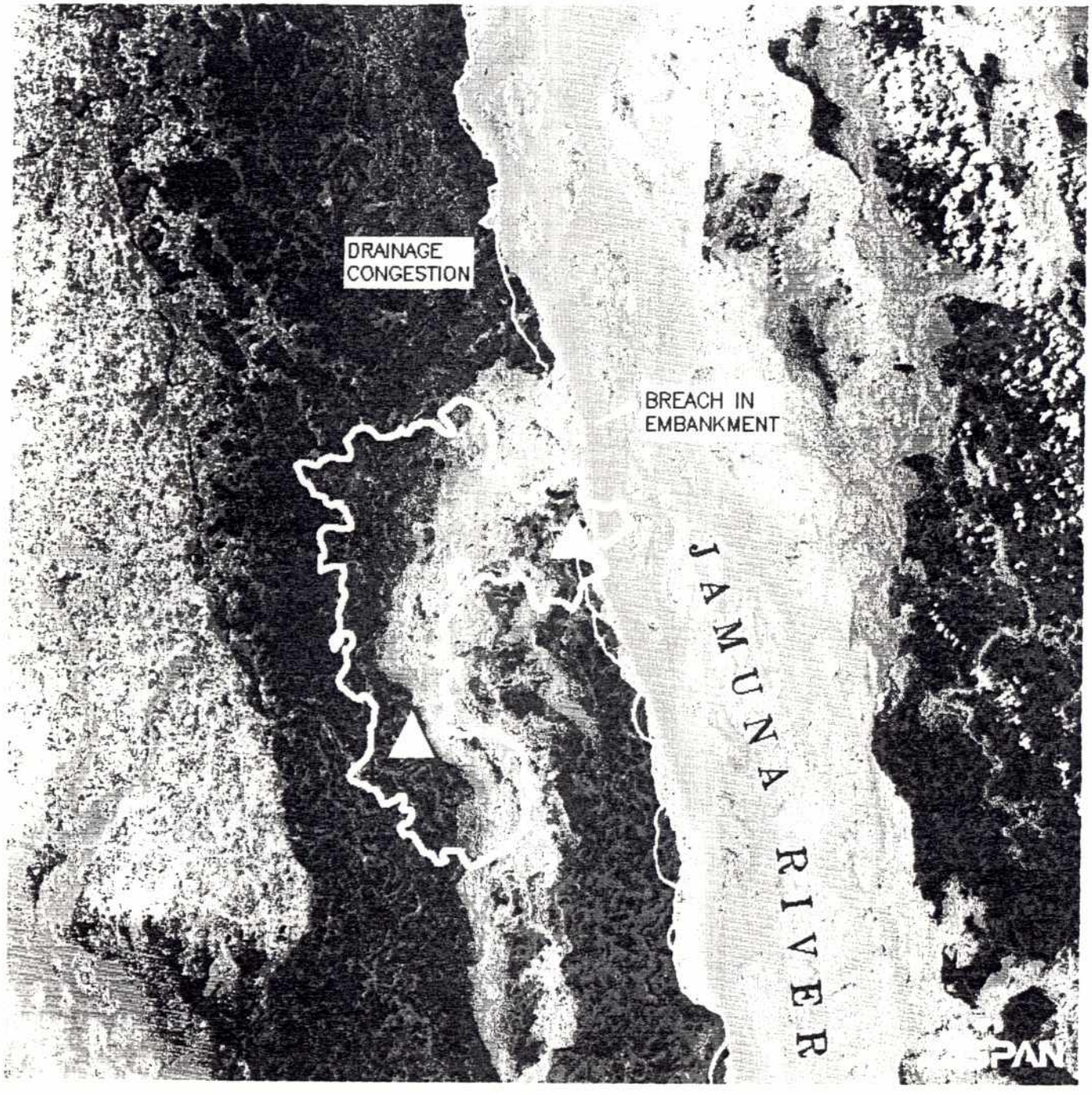
WATER

10 km.

Source: 18 August 1987 Landsat MSS image provided by SPARSSO.
Processing by Geographic Information System/FAP 19, ISPAN.

Map 1.3

DETAIL: TWO DHUNAT VILLAGES IN THE 1987 FLOOD



Note: This map will be reproduced in multi-color in the final report.

△ SAMPLE VILLAGE

VEGETATION

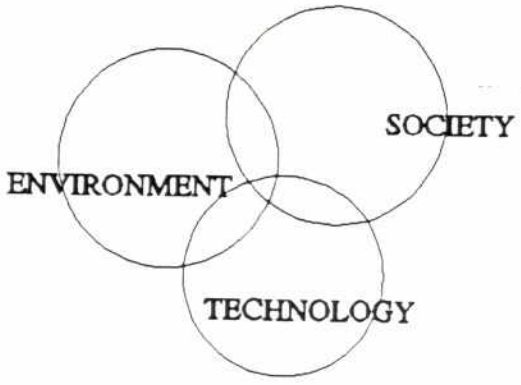
WATER

10 km.

Source: 18 August 1987 Landsat MSS image provided by SPARSSO.
Processing by Geographic Information System/FAP 19, ISPAN.

1.2 Environment, Society, and Technology: The Study Model

Flood response consists of all the things people do to prepare for, cope with and recover from floods of various types. It also includes long-term planning to either change the flood situation or prevent excessive loss from future floods. This study analyzes the former in order to make recommendations about the latter. In its most general sense flood response is a process that is both technical and social, because it requires not only physical survival protection measures but also mobilization of social resources such as family networks, other helpers, jobs and credit, and so on. Indeed, the latter are often as essential as the former to family survival of any crisis, including a severe flood. Flood response then, reflects the interaction between an environment, human society, and its technology. No one of these three can be seen as entirely determining the others. In fact, they all influence each other greatly[1] in ways that could be represented as e intersection of three circles:



The environment, or flood plain, has its own (hydrological) characteristics. To some extent, however, these are both cause and effect of multiple human actions both technical and social. Rather than being passively affected by the environment to which it adjusts, a household or neighborhood, a social network or group of any size, up to and including even the nation itself, mobilizes itself to cope with certain environmental situations according to the constraints of its own internal logic and its technology. Human communities living in the flood plain adapt, adjust or respond to environmental conditions, such as rainfall, overbank spill, waterlogging or erosion, while intentionally (through flood control projects, e.g.) or unintentionally (with road building, e.g.) modifying those conditions in the process. The profound environmental effects, positive or negative, of society and its technology are increasingly clear as the world thrusts itself into the twenty-first century.

[1]This approach to flood response is based in part on a model of human ecology models first developed by Julian Steward (1955) and expanded in both geography (flood hazard research) and anthropological studies (cultural ecology).

Table 1.1

Geographical Match-up for Survey Upazilas

Upazila (District)	Flood Plain Agroecological Zone	Flood Class (Percent) *					FAP Region
		F_0	F_1	F_2	F_3	F_4	
Dhunat (Bogra)	Brahmaputra Right Bank	35	52	12	1	-	NW
Singra (Natore)	Ganges Left Bank	25	-	-	40	-	NW
Chirirbandar (Dinajpur)	Old Tista Drainage	56	43	01	-	-	NW
Sunamganj (Sunamganj)	Surma and Mahasingh	-	-	30	56	4	NE
Tangail (Tangail)	Brahmaputra Left Bank	19	44	28	9	-	NC
Sarishabari (Jamalpur)	Brahmaputra Left Bank	48	37	13	2	-	NC
Sreenagar (Munshiganj)	Dhaleshwari Floodplain	14	20	23	43	-	NC
Bhuapur (Tangail)	Active Jamuna Floodplain	34	39	21	6	-	NC
Bhedarganj (Shariatpur)	Padma/Meghna Right Bank	29	46	20	5	-	SC
Char Bhadrashan (Faridpur)	Active Padma Floodplain	16	40	38	6	-	SC
Brahmanbaria (Brahmanbaria)	Meghna Left Bank	15	17	24	19	25	SE
Nasirnagar (Brahmanbaria)	Meghna Left Bank	-	-	56	19	22	SE
Matlab (Chandpur)	Meghna Left Bank	10	24	41	24	1	SE
Madhukhali (Faridpur)	Ganges/Padma Right Bank	16	56	22	5	1	SW
Satkhira (Satkhira)	Old Ganges Floodplain	12	86	2	1	1	SW

* F_0 -30 cm
F_1 30-90 cm
F_2 90-180 cm
F_3 >180 cm
F_4 >180 cm (B. Aman cannot be grown in wet season)

The way in which human society manages to meet its physical needs in any environment depends on the level of its technology. In this case, technology includes knowledge and its applications -- from the simple ox-drawn plow to the diesel-powered irrigation pump, from an agricultural invention such as deep-water paddy to a formally engineered embankment. Because technology depends on both knowledge and supplies, and society distributes these very differently among its various groups, different groups have varying capacities to cope with the environment or modify it to their purposes.

Analyzing flood response thus requires some analysis of social dynamics, since different social categories or groups affect and are affected by the environment in different ways. The overall 41 percent increase in the person-land ratio in less than 20 years (from 1,364 per square mile in 1974 to 1,928 per square mile in 1991)[2] has, of course, increased pressure on the nation's limited land masses and inhabited areas prone to regular flood and erosion. This fact creates flood problems for a population that would not have them if it did not occupy such areas.

1.3 Relationship to Flood Proofing Study (FAP 23)

This study is closely associated with FAP 23, the Flood Proofing Study. Both were mainly intended to support planning to assist the Bangladesh population to better cope with flood, FAP 23 studying small urban areas and FAP 14, rural areas. A common assumption of the two studies is that there always will be unprotected areas where flood control is nonexistent or not even feasible. Thus, it is important to understand what the main effects of flood have been in order to develop meaningful plans for any needed public flood assistance programs. The FAP 23 statement of purpose applies in general to that of FAP-14 as well:

> The overall objective of the Flood Proofing Study (FAP 23) is to identify and implement effective flood proofing measures to avoid or reduce the adverse effects of flooding on the social and economic activities of communities, and on infrastructure, particularly in those areas which are not protected by more comprehensive flood protection measures. (Flood Action Plan 1992e:E-i)

Most of the flood response issues covered in this report also are addressed in the FAP-23 study, although the latter included a greater emphasis of the impact of flood on urban institutions, such as government offices. Some common points covered are: domestic water supplies, agriculture, livestock and fisheries, roads, boats, and the overall impact of flood on local economies.

The two studies, however, are not completely identical in their objectives. Whereas the two share a common goal of reducing disruptive effects of flood, the Flood Response Study also has taken a broader look at the ways in which flooding has or has not caused problems in various types of environments in order to support multi-faceted regional planning efforts of several other projects.

1.4 Methodology

As required by the terms of reference, the study focussed on flood prone areas rather than attempting to cover a representative sample of the national population. All of the designated FAP regions are

[2]Bangladesh Bureau of Statistics 1991.

represented, however, as Table 1.1 shows. One study village in the northwest region (Kismat, in Chirirbandar Upazila) that had been unaffected by flood as of the date of the survey (May-July 1991) is excluded from parts of the analysis that deal with preparation for and coping with flood. Appendix D presents basic information on each study village and upazila.

The study was conducted in three parts. The main activity was a house-to-house questionnaire survey of 30 villages (29 flood-affected and one flood-free), two each in 15 different upazilas selected to represent different flood plain agroecological zones. The second part of the study was an institutional level survey of village representatives and local government officials on the general characteristics, and group or organizational support needs, of each village and its region. This second part expanded the group of study villages from 30 to 81. This survey used more open-ended interview techniques to gather information on perceptions of local trends, history and the efficacy (actual or hoped-for) of specific neighborhood, village or governmental institutions during recent floods. It also gathered some information through the household survey questionnaire. A third, gender survey of a small subsample of senior women in 86 study households, was intended to supplement information on household flood experience and gain insight into the sexual division of labor and other gender-related issues in flood response. Survey research of these three types was supplemented by the collection of case studies on specific issues or people.

The house-to-house survey occurred in two phases. The first was a 100 percent survey (the Full Survey) of all households in the group of 30 villages, a total of 8,090, to gather the basic demographic and other information needed for sampling. Once the sample was selected, a second, more intensive questionnaire interview (the Household Survey) was done in 2,264 sample households drawn from the population of each village.

The sample was drawn in the following manner. After the Full Survey was done, households in each village were sorted into landowning categories according to Bangladesh Bureau of Statistics (BBS) categories: landless (own no land at all), small (own up to 249 decimals), medium (own 250 to 749 decimals), and large (over 750 decimals). Within each landholding category households were sorted further into occupation groups. Thus, a combination of land ownership and occupation defined strata. Households were selected randomly according to identification numbers from each strata.

This report combines findings from all three surveys--Household (two interviews), Gender, and Institutional--plus, information from site visits and case studies. This approach makes use of a broad range of information, but it has the disadvantage of producing occasional inconsistencies on some points. For example, data on household land ownership, cultivated or otherwise, was gathered first in the Full Survey, and again for cultivated land only in the Household Survey chapter on cropping patterns. These two surveys involved household interviews that were one to two months apart. When gathering cropping data, more precision was needed to know which plots were planted with which crops throughout the year than the Full Survey required. For these reasons, and possibly because of individuals' wariness about disclosing information, land ownership figures from the two sources showed some difference. When data are presented below, survey sources are indicated to account for these kinds of differences.

Further details on study methodology are presented in Appendix C.

1.4.1 Economic Stratification of Study Households

After the initial sample was drawn, the two lowest land owning categories were combined for some analytic purposes into a single, functionally landless group (owning either no land or less than 50 decimals). Those owning very small amounts of land are considered functionally landless. Small land ownership was redefined (50 to 249), with medium (250-749) and large (over 750) landowners still defined according to BBS standards. In all sections of the report except those on agricultural practice this scheme is used: the discussion of cropping patterns covers practices of owners of less than 50 decimals if they grow-crops, although they are identified as "landless" elsewhere in the report.

As some households do not own land but still may be prospering through business activity, household income data were combined with land ownership data to define subgroups within each landholding category. The information used was average monthly taka income and expenses as reported by each household head in the Full Survey. (Expenses were named first, then income.) Because people may not have been fully truthful in their reporting, these reports are considered only rough, general estimates. It was decided, therefore, not to emphasize the actual amounts in classifying households. Rather, the total expense amount given was subtracted from the total income amount to determine whether a household, by its head's own report, had a monthly surplus, a balance or a deficit of taka. A surplus or balance was taken as a relatively good income situation whatever the actual amounts declared.

1.4.2 Key Questions

The two basic questions of the study according to the terms of reference are: (1) What are the flood response practices of different flood plain agroecological zones? (2) What would be the possible impact of any infrastructural flood protection efforts on the populations of those areas? The organizing approach formed the basis of the study design intended ultimately to answer this general question. Assuming that most response decisions ultimately are made at the household level based on available resources and economic needs, the Household Survey questionnaire was organized to give a sort of overall inventory of household resources and practices that might be associated with either the monsoon season or floods. (Social networks and important groups outside the household were partially investigated in the Gender Study and open-ended interviews during site visits.)

Interview questions distinguished three types of inundation on flood condition and sought information on household or village responses to each type. The three conditions were: (1) normal inundation (*shabhabik borsha*) caused by monsoon rains, (2) "average flood (*bonna*) covering fields but only rarely reaching the house level, and (3) "severe flood" (*marattak bonna*) that covers both fields and the house floor or even the whole houses.

Though done with the environment-society-technology model as a framework, the Household Survey was not structured to test any specific hypotheses. It was intended rather, to provide a broad information base which might include enough data to allow for later formulation and testing of hypotheses. Data from this survey about flood experience focussed on homestead flooding only, although an agricultural chapter investigated previous flood-related crop damage.

The Institutional Survey addressed issues of political, technical, or environmental relevance beyond the household. This centered on: (1) the flood patterns and histories of whole villages and their lands, and (2) the actual or potential role that various local groups and governmental institutions had played or could

play in severe flood. Unlike the Household Survey, the Institutional Survey used checklist questions that were open-ended. Like the Household Survey, the goal was to gather information that could refine understanding of what flood means to a rural community, and develop new solutions for problems identified, rather than to test specific hypotheses.

Early during the data analysis phase of the study, it was asked what the environmental, social or technical factors are that most strongly determine household flood response patterns. This led to an *ex post facto* detailed examination of data on the 30 study villages (the one flood-free village was soon dropped from most analyses). Then, by grouping according to certain characteristics, an examination was made of which characteristics produced the most contrast between household flood responses and attitudes. The flood environment concept was the main result of this exercise.

1.5 Flood Environments

The idea of a flood environment first evolved within the FAP-14 study as a simple list of distinct, loosely organized, flood characteristics. The key characteristics were:

- **Flood source** categorized as overbank spill, rainfall congestion, flash flooding, and embankment breaches. The categories found to have some explanatory validity for peoples' flood responses were: overbank spill (including flooding within the active floodplain), combinations of overbank spill and rainfall back-up, simple rainfall or drainage congestion, flash flooding, flash flooding plus later prolonged overbank spill, and embankment breaches.

- For the village in general, **flood frequency** categorized as never, rare (one to two years in the last 10), occasional (three to seven years in the last 10) and frequent (eight to 10 years in the last 10).

- **Flood duration**, categorized as short (up to two months), medium (two to four months) and long (over four months).

- Overall **land level** of the village categorized as mainly high, mainly medium, or mainly low.

- Whether **protected from flooding** categorized as fully protected, partly protected (by infrastructure such as roads and railway embankments), and not protected.

These environmental and technical factors are logically separate, although they also would logically interact. But, while looking for patterns in the FAP-14 responses, it was found that treating them separately was of little value and very complex. Basically, it led to a unique characterization for each of the 30 villages in the sample. Instead, they were categorized into nine flood environments that consistently showed and explained much of the variation[3].

[3] This categorization follows lines that already are broadly accepted in Bangladesh by specialists and nonspecialists alike. Accepting this classification, however, does not mean that environmental characteristics alone will always provide insight into particular issues. Other factors (e.g. socioeconomic group differences) have still been considered directly in this report where they seem to provide insight.

Of the nine environments, the eight affected by floods were identified based on characteristics of flooding and geography. They also were associated with substantial differences in flood experience, adjustments, responses and preferences for interventions. Both normal monsoon conditions, and the nature and frequency of unusual floods were considered in developing the categories. The survey villages have each been allocated to an environment. In a few cases, however, the distinction is difficult because the environments grade into one another.

1.5.1 Chars

Chars are located within the active floodplain of the major rivers on relatively recently accreted land (the five sample villages are on a mixture of new and older chars). None are protected from flooding. The flooding derives from the main rivers. Severe floods are more frequent (every year to some extent) and deeper on average than in other environments. Normal monsoon inundations tend to be shorter than in the beels and haors. In the char environment, river erosion appears to be just as important a hazard as flooding. Households are collectively the most marginal. Land is often officially public *(khas)* land, and for physical and socioeconomic reasons tenure is insecure. Homesteads are less permanent, and evacuation is a relatively frequent response (resulting in problems of temporary or semi-permanent settlement in adjacent areas).

1.5.2 Main River Locations

The eight main river location villages are flooded from one of the three major rivers: Jamuna, Padma and Meghna. Despite greater diversity in conditions, it was important to keep villages with a similar flood source together. These eight are an example as they are typically located close to the river but are not wholly within the active flood plain, and erosion is a problem in some. In half of these villages there is some form of flood protection (mostly major embankments), an important factor given the interest in strengthening these embankments. Flooding is typically of moderate duration (weeks to months) during the June-September period, but the flood frequency ranged from frequent to rarely flooded in these villages. Being more permanently settled with less risky agriculture and a wider range of businesses and nonfarm enterprises, households potentially have more to lose than people living on chars. Economic diversity and better communications, however, probably make post flood recovery less of a problem.

1.5.3 Secondary River Locations

These are three flood-prone villages affected by other rivers or tributaries. Erosion is not a problem in these three villages that are characterized by a mixture of river flooding and rainfall induced drainage congestion. Flooding is not as sudden as in the flash flood locations, but is still of relatively short duration (under two months). The particular villages studied are not flooded so frequently or deeply as other environments, and all had some form of local infrastructure which afforded partial flood protection. Drainage improvements were regarded as a higher priority than embankments.

1.5.4 Semi-saline Locations

These are two villages in areas prone to tidal flooding from fresh water during the monsoon and from saline water during the dry season. Most of this area, including the study villages, lies within polders of the Coastal Embankment Project, and are, therefore, protected from river floods. Normal monsoons

and average floods are characterized by drainage congestion. Floods are typically short and infrequent in the study villages. The worst recent flooding was in 1987.

1.5.5 Major Beels

Beels are former river channels that are deeply flooded seasonally, and that may be fed by rivers and/or rainfall. Only three villages within the larger beels have been included in this category, but some in the main river group adjoin smaller beels. In addition, one breach location is in a beel environment. Flooding tends to have been frequent (affecting agriculture in at least seven of the last 10 years), and normal monsoon inundations last over four months on average. Although heavily dependent on winter season *(boro)* cultivation, these villages also have more occupational diversity than most. Respondents were the least in favor of embankments.

1.5.6 Haor Locations

Haors are deeply flooded tectonic depressions adjacent to Bangladesh's northern and eastern borders. Three haor villages were surveyed where average flooding is similar to the beel areas. Flooding is deep and for a long period, typically for six or more months. In addition, early floods from the nearby hills pose a risk. The long duration of flooding prevents cultivation during the monsoon season. The three villages had been flooded relatively frequently. Unlike other environments, early harvesting is an important agricultural adjustment, and submersible embankments are favored by respondents. Seasonal labor migrations are common, and households take relatively more flood preparation and coping measures. Settlements are strongly nucleated and form village islands during the monsoon.

1.5.7 Flash Flood Locations

The two villages surveyed are located close to rivers flowing from the hills adjacent to Bangladesh. These rivers tend to flood suddenly for a few days, and there may be several flash floods in one monsoon. Respondents in these villages differed in flood experience. For example, houses in one village had been flooded several times but houses in the other village had not been flooded. While warnings would be of some use, there are few responses people can make during an event.

1.5.8 Breach Locations

These three villages are protected by embankment projects but have suffered from breaches in recent years. These villages were not included in their natural flood environments because they all have distinct flood experience based on the unpredictable sudden inundation that results from embankment breaches. Such inundations are more prolonged than a flash flood. Flood responses are limited in these circumstances, but attitudes to flood protection are still quite favorable considering their experience. Two villages are in main river locations while the third is in a major beel area near a secondary river (consequently the latter is similar to the haor villages).

The flood environment has been found to be a robust working concept, though not a completely precise one. The two locations in Arial Beel (Gadighat and Laskarpur) have some flood characteristic similarities with the char and main river locations, while agriculturally they are virtually identical with the haor villages. A separate category for villages in Arial and Chalan Beels (major beels) was created since they are geographically distinct from the haors. The haor and breach locations show similarities because of

sudden but relatively prolonged flooding, and they are very distinct from the other environments. Likewise the flash flood locations and semi-saline villages are rather distinct. The secondary river locations also show general similarities. For example, they are less frequently flooded, and are flooded by both rainfall and river waters. Main river locations, however, are more diverse and have close hydrological similarities to the char and beel locations. Geomorphologically this makes sense with the transition from currently active floodplain to old river courses that connect to the river system during the monsoon. Despite this geomorphological fact, the distinctive characteristics of their agriculture, settlement patterns, and economic conditions require that chars and beels be regarded as distinct flood environments.

Table 1.2 identifies the study villages according to their flood environments along with their general flood characteristics. This table is based on an overall assessment following site visits, discussions with relevant officials and interviews with villagers.

A cluster analysis of the villages based on hydrological factors (flood source, protection, flood duration and flood frequency) tended to confirm the environment categories used. It most clearly grouped together the same villages for the char, semi-saline, haor, flash flood and breach categories. However, there was less homogeneity within the main river, secondary river and beel categories where the hydrological characteristic divisions are not so clear. Distinctions between categories begin to blur as one moves across the flood plain between contiguous areas affected by main river overbank spills to areas affected by secondary rivers or local rainfall.

1.6 Flood Protection

Since villages in each flood environment (except chars) may or may not be protected from flood, and because that level of protection influences flood response, a second classification is needed in addition to flood environments. Table 1.3 classifies villages into three types: (1) full protection, meaning FCD and FCD/I those with embankment projects of BWDB; (2) partial protection, meaning that people believe some protection or those with flood moderation is achieved by other means such as a non-BWDB local embankment, a road or railway embankment, or some distant embankment; and (3) unprotected.

The survey first asked several questions about the presence or absence of different kinds of embankments. Then respondents were asked to evaluate such embankments (as discussed in Chapter 4). They were asked whether there was a high embankment between the homestead and river, behind the house (countryside embankment), surrounding the homestead or a submersible embankment. Because these could be interpreted as formal embankments (built by BWDB or LGEB to protect against flooding) or informal embankments (local community initiatives or roads and railways), some interviewers and respondents may

Table 1.2

Categorization of Sample Villages Showing Flood Characteristics

Flood Environment/ Village	Upazila	FAP Region	Flood Source	Flood (1) Duration	Elevation (2) (Main)	Flood (3) Frequency
Char						
Shibsen	Bhedarganj	SC	overbank	medium	low	frequent
Gopalganj	Bhuapur	NC	overbank	medium	low	frequent
Jangipur	Bhuapur	NC	overbank	medium	low	occasional
Gopalpur	Char Bhadrasan	SC	overbank	medium	low	frequent
Char Salehpur	Char Bhadrasan	SC	overbank	medium	low	frequent
Main River						
Baraitali	Dhunat	NW	overbank	medium	low	occasional
Chhoto Bashalia	Tangail	NC	overbank + rain	medium	low	frequent
Bararia	Tangail	NC	overbank + rain	short	high	occasional
Singjala	Bhedarganj	SC	overbank	medium	low	occasional
Budhal	Brahmanbaria	SE	overbank	medium	low	occasional
Goalbathan	Sarishabari	NC	overbank + rain	medium	low	frequent
Shanakoir	Sarishabari	NC	overbank + rain	short	medium	rarely
Uttar Shankibhanga	Matlab	SE	overbank	medium	low	occasional
Secondary River						
Kamaldia	Madhukhali	SW	overbank + rain	medium	low	occasional
Rukuni	Madhukhali	SW	overbank	short	high	rarely
Auliapukur	Chirirbandar	NW	overbank + rain	short	high	occasional
Semi-Saline Polders						
Goalpota	Satkhira	SW	rain	short	low	rarely
Bakchara	Satkhira	SW	rain	short	low	rarely
Major Beel						
Lalua etc.	Singra	NW	overbank + rain	long	low	occasional
Laskarpur	Sreenagar	NC	overbank + rain	medium	low	frequent
Gadighat	Sreenagar	NC	overbank + rain	long	low	frequent
Haors						
Muradpur	Sunamganj	NE	flash + overbank	long	low	frequent
Rampur	Nasirnagar	NE	flash + overbank	long	low	frequent
Chatipara	Nasirnagar	NE	flash + overbank	long	low	occasional
Flash Flood						
Fenibeel	Sunamganj	NE	flash	short	high	occasional
Bhitidaudpur	Brahmanbaria	SE	flash	short	high	occasional
Breaches (otherwise Major River or Beel locations)						
Panchthupi	Dhunat	NW	breach	short	medium	rarely
Pakisha	Singra	NW	breach	long	low	occasional
Pashim Durgapur	Matlab	SE	breach	short	low	rarely

[Kismat in Chirirbandar Upazila (NW) is flood free and omitted from the analysis.]

Notes: (1) Duration categories : Short (up to 2 months); Medium (over 2 to 4 months); Long (over 4 months).
(2) Elevation categories: High (F_0); Medium (F_1); Low (F_2, E_3, F_4).
(3) Frequency categories: Rarely (1-2 of last 10 years); Occasional (3-7 of last 10 years); Frequent (8-10 of last 10 years).
Flood was defined as most agricultural land being submerged.

Source: Institutional and Household Surveys.

have been confused. For example, 97 percent of the residents of Bhitidaudpur (that is subject to flash floods a village in Brahmanbaria) reported that they had a submersible embankment. What they actually have, however, are locally built bunds along streams (khals) that flow down from the adjacent hills, rather than by formal submersible embankment project.

Nevertheless, in most villages the answers to questions about a household's location relative to any embankments were unambiguous. In locations where a village was bisected by an embankment, household data in fact helped to clarify the position of a house.

1.7 Summary

The Flood Response Study has as its goal the investigation of current household, village and local government activities to prepare for, cope with, or recover from flood in rural areas of Bangladesh. The study is based on an interactive model of the relationship between environment, society and technology. "Technology" is defined here as any cumulative body of knowledge and material equipment, including so-called folk methods.

Study methodology included questionnaire surveys and other methods of data collection. The main method was a house-to-house survey which occurred in two parts: the Full Survey and the Household Survey. The Full Survey covered 100 percent of the households in all 30 villages in the study (a total of 8,090). It also provided the basis of a sampling process from which 2,264 households were selected for the more detailed Household Survey. The Household Survey was supplemented by a small subsample survey of 86 women (the Gender Study). Another major project activity that paralleled the Household Survey was the Institutional Survey. It consisted of structured but open-ended interviews with people of the study villages plus 51 other villages in the same areas, as well as with local government representatives. Economic stratification of sample households was based on amount of land owned and whether the monthly self-estimated cash income-expense balance was in surplus, balanced or in deficit.

Responses to three inundation or flood conditions were studied: (1) normal monsoon inundation, (2) average flood -- which covers most fields but few homestead floors; (3) severe flood -- which affects both fields and homesteads. The bulk of the flood response analysis is done according to flood environment. The flood environment categories are: char, main river, secondary river, semi-saline (tidal), major beel, haor, flash flood and breach. Each village is classified primarily according to its overall pattern of flood source, frequency and duration. Thus, the villages with embankment breaches as their main source of flooding were grouped together rather than with others in similar geographical situations. The distinctive characteristics of their human settlements required that chars and beels be separated despite the fact that their hydrological characteristics are similar. Alongside this classification is another that distinguishes villages according to whether they are fully protected (by embankments designed by government agencies), partially protected (incidentally by structures built for other purposes), or unprotected.

1.8 Outline of the Report

Chapter 2 will present information on the social and economic characteristics of study villages and the households surveyed. Chapter 3 will give an overview of respondents' ideas about flood sources and a summary of information on flood experience. Chapter 4 will review findings on whether respondents want change in the water regime, and review their evaluations of various mitigation measures, both flood

Table 1.3

Villages According to Flood Protection

Flood Environment/ Village	Level of Protection
Char	
Shibsen	none
Gopalganj	none
Jangipur	none
Gopalpur	none
Char Salehpur	none
Main River	
Baraitali[1]	full = 13 households none = 50 households
Chhoto Bashalia	none
Bararia[2]	full = 63 households none = 11 households
Singjala	none
Budhal	partial
Goalbathan[3]	full
Shanakoir	full
Uttar Sankibhanga	none
Secondary River	
Kamaldia	partial
Rukuni	partial
Auliapukur	partial
Semi-Saline	
Goalpota	full
Bakchara	full
Beel	
Lalua etc.	none
Laskarpur	none
Gadighat	none
Haor	
Muradpur	none
Rampur	none
Chatipara	partial
Flash Flood	
Fenibeel[4]	none
Bhitidaudpur	none
Breach[5]	
Panchthupi	full
Pakisha[6]	full
Pashim Durgapur	full

Notes: 1 Brahmaputra Right Embankment passes through village.
2 Mostly behind embankment, which is regarded as too low.
3 Protected by embankment along Jhenai River.
4 Nearby road does not offer any real protection.
5 By definition locations in FCD projects but which suffer from breaches.
6 Inside Nagor River Project, regular cuts/breaches make this ineffective.
Source: Institutional and Household Surveys

control and others. Chapter 5 will give an overview of the Institutional Survey findings on what rural people expect of neighborhood, local and government groups, particularly in coping with severe flood or recovering from it. Chapter 6 will discuss the various techniques and measures adopted by study households to prepare for and cope with either average or severe floods. Chapter 7 will present the Gender Study findings on the sexual division of labor in the homestead. It also will describe the social and economic resources and risks of a subsample of both female-headed and male-headed households. Chapter 8 will discuss the ways in which agricultural practice is adapted to the water regime in various flood environments, and the agricultural aspects of flood response. The Conclusion will discuss program and policy recommendations based on the findings of this study. Planning Guidelines comprise the final section of this report as per the Terms of Reference.

Chapter 2

SOCIAL AND ECONOMIC CHARACTERISTICS OF THE STUDY POPULATION

As mentioned earlier, socioeconomic forces are as much a part of flood response as the environment and technology. This section is an overview of social characteristics of the study villages and their populations.

2.1 Village Social Organization

A village in Bangladeshi is organized into certain well-known social groupings. At the most basic level is the household, defined here as a group that shared a common stove (*chula*), and who eat daily meals together[4]. Most households occupy a homestead (*bari*) that might include more than one related family. If so, they shared occupy a common courtyard and some facilities such as wells. A household is likely to have many ties to others in the village through marriage or patrilineal descent (the lineage is called *gushti* or *bangsho*). Women typically move to their husbands' homes at marriage, although men may move in with their wives' families under some circumstances. Networks of relations through married-in women can be very important in crises[5].

A grouping of homesteads usually makes up a village neighborhood, or *para*. This neighborhood is an important social resource during crisis. Village studies showed that the neighborhood often center around patron-client ties to a prominent man, a leader referred to as a *matabbar*. Relationships beyond the neighborhood level tend to be organized along factional lines, with the followers of competing leaders forming groups referred to as *samaj*. Social control beyond the family level tend to be in the hands of a village council made up of the various *matabbars*. These councils resolve conflicts or try to regulate the villagers' behavior through council meetings known as *salish*. Locally elected officials usually play a prominent role in the council and are likely to be *matabbars* in their own right.

Other important local groups are: religious congregations, Hindu castes, and voluntary organizations of several types such as cooperatives, credit associations, or youth clubs.

The government, possibly some nongovernmental organizations and social institutions beyond the village were seen as potential agents of change by planners and villagers alike. The structure and capabilities of these entities in flood response are discussed in Chapter 4.

Though still oriented mainly toward subsistence agricultural production, most of the study villages are increasingly integrated into the market economy and political structure of the nation. The economy affects the market demand for male and female labor, the availability of goods not produced by families

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[4]Another term for household is *paribar*. This refers only to the related persons who share meals, not servants or other employees.

[5]Indra and Buchignani (1992) demonstrated the importance of non-patrilineall ties by studying the relocation decisions of women in erosion displaced *(uthuli)* families of Sirajganj. Most women of all ages maintain contract with their natal homes, where they may or may not have property ownership rights.

themselves, and many other facts of contemporary rural life which have impact on flood response either directly or indirectly.

2.2 Village and Upazila Development Levels

Paired villages in the same upazila were chosen because they contrasted in important ways. One for example, was remote while the other had better access to communication routes; or one was more affected by flood and was generally poorer than the other. Such contrasts mean that the two sites in each upazila would likely have different flood response patterns and different needs during floods or inundation. For example, a more accessible village might receive more relief than a less accessible one in the same upazila, but the proportion of households that actually need such relief may or may not be greater. It may depend upon whether the village had a food surplus. To consider such issues, the villages were categorized according to a number of access-infrastructure and socioeconomic parameters: distance to an urban center, distance to a periodic rural market (*hat*), seasonality of transport ease and difficulty, numbers of public facilities in general, availability of a primary school, percentage of eligible children in school, percentage of landless households, and whether the village had an overall food deficit or surplus.

Based on these factors the villages were grouped into four main categories. These were confirmed in a cluster analysis, although two villages (Goalbathan and Auliapukur) proved to be distinctive in some parameters from the main groups. They were included with the other villages most similar to them. The validated groupings are:

- Very remote, relatively poor villages with many landless, and a food deficit (eight villages in four FAP regions).
- Relatively remote villages with fewer landless, but with a food deficit (seven villages in four FAP regions).
- Villages with better facilities and infrastructure that are near an urban center, but that have a food deficit (three villages in two FAP regions).
- Villages with good access and facilities, and with a food production surplus (12 villages in all five FAP regions).

Table 2.1 compares the village groupings according to flood environment, and infrastructure and socioeconomic characteristics. It was found that while overall development levels are important, they were less clearly associated with the kinds of flood response investigated (especially agricultural practices) than were differences between flood environments. There was, however, some association between the two dimensions. For example, villages in similar flood environments had similar development characteristics in some cases. All the char villages fell into, and dominated, the remote, food deficit, many-landless category. Villages of the other environments, however, were more varied in their infrastructure facilities and their socioeconomic characteristics.

Table 2.1

Survey Villages (and Upazilas) by General Development Characteristics and Flood Environment

Characteristics	Char	Main River	Sec. River	Semi-Saline	Beel	Haor	Flash Flood	Breach
Remote, poor food deficit, many landless	Shibsen (Bhederganj) Gopalganj (Bhuapur) Jangipur (Bhuapur) Gopalpur (Char Bhadrasan) Char Salehpur (Char Bhadrasan)	Baraitali (Dhunat)				Muradpur (Sunamganj) Rampur (Nasirnagar)		
Relatively remote food deficit, few landless		Uttar Shankibhanga (Matlab) Goalbathan (Sarishabari)		Goalpara (Satkhira)	Lalua etc (Singra) Laskarpur (Sreenagar)		Bhitidaudpur (Brahmanbaria)	Pashim Durgapur (Matlab)
Near urban area, good facilities, food deficit		Singjala	Rukuni (Madhukhali)		Gadighat (Sreenagar)			
Good access and facilities, surplus food		Chhoto Bashalia (Tangail) Bararia (Tangail) Budhal (Brahmanbaria) Shanakoir (Sarishabari)	Kamaldia (Madhulhali) Auliapukur (Chirirbandar)	Bakchara (Satkhira)		Chatipara (Nasirnagar)	Fenibeel (Sunamganj)	Panchthupi (Dhunat) Pakisha (Singra)

Note: Goalbathan and Auliapukur are distinctive in their own right, in that the former is near an urban area but otherwise conforms to the group (remote) shown, while the latter has no school but otherwise conforms to the group shown.

Source: Institutional Survey

2.3 Occupations of Adult Males and Females

Village-by-village, the patterns of occupation were found to vary between business, specific crafts, fishing or agriculture. The sites selected for study, however, created a situation in which agriculture was the main livelihood of respondents. Similarly, different flood environments had some distinctive social characteristics that were partly cause and partly effect of the environmental conditions.

Table 2.2 presents occupation data from the FAP-14 Household Survey on the full study sample of 7,202 adult males and females. Because of the rural area focus, agriculture production was the main occupation of men. There were several villages in which no women are involved in agriculture production as an occupation. Female landowners, especially if there were no adult males in their households, usually rented their land to renters or sharecroppers, although a small number cultivated land on their own as owners or sharecroppers.

Most women were occupied with one of two types of housework: (1) paid household service, primarily performed by poorer people in others' houses, and (2) homestead-based housework performed by family members. It is important to note that merging these two into one occupational category effectively hides the bulk of female paid employment and precludes analysis of it in the larger FAP study. A few females were engaged in crafts (weaving and pottery) or fishing, but many more males than females, overall, named these as a main occupation. Similarly, day labor, though an important source of income for female household heads (see Chapter 7), was predominantly a male occupation in the sample as a whole. Details on occupations by village are presented in Appendix D, and on female work, in Chapter 7.

Table 2.2

Adult (Age ≥ 15) Occupations by Sex

	Total		Percent of Occupation		
Occupation	Number	Percent	Male	Female	Ranking
Household Worker	3065	42.6	4.1	95.9	1
Agriculture*	1207	16.8	96.9	3.1	2
Day Laborer	838	11.6	95.6	4.4	3
Student	438	6.1	76.7	23.3	4
Teaching and Service	369	5.0	94.0	6.0	5
Business Person	270	3.7	98.9	1.1	8
Fisherman	191	2.7	7.0	0.1	9
Weaver	32	0.4	81.3	18.8	10
Potter	16	0.2	87.5	12.5	11
Blacksmith	6	0.1	100.0	-	12
Unemployed	290	4.0	55.2	44.8	7
Other	352	4.9	77.0	23.0	6
No Information	28	0.4	0.2	0.6	9
Total	7202	98.5	-	-	

* Agriculture includes those who live from renting out agricultural land, as well as self-cultivators and sharecroppers.

Source: Household Survey

Table 2.3 gives the occupational breakdown for household heads by flood environment. The main river and char areas had the lowest percentages of farmers but for different reasons. In the chars there were a high percentage of fishermen (equal with laborers at 30 percent of household heads). In the main river locations there was a great diversity of occupations as indicated in the "other" category. Virtually all of those engaged in handicrafts came from the main river locations. In the beel and breach areas there were relatively high percentages with salaried occupations, possibly due to proximity to urban centers. Otherwise the occupational patterns were very similar between environments.

Table 2.3

Occupation of Household Heads Only, Percentages by Flood Environment

Occupation	Char	Main River	Second River	Semi-Saline	Beel	Haor	Flash Flood	Breach	Total Percent	Total No.
Service	1	8	8	3	12	2	5	11	7	525
Business	4	10	4	7	9	7	12	6	8	586
Farmer	25	31	46	47	43	48	45	41	38	2945
Day Laborer	30	30	34	37	24	32	24	31	30	2323
Fishing	30	1	2	-	5	5	0	2	6	439
OTHERS*	10	20	6	6	8	6	15	9	12	905
Total Percent	100	100	100	100	100	100	100	100	100	-
Total	960	2298	656	595	986	899	509	820	-	7723

* Includes unemployed.

Source: Full Survey

2.4 Educational Status

Formal education levels for the sample population aged 15 and older showed some contrasts between flood environments. On average, the lowest levels were in the chars (88 percent with no formal education) and haor villages (82 percent with no formal education). The secondary river, semi-saline, flash flood and main river villages were somewhat better (72, 71, 66, and 66 percent, respectively, with no formal education). The highest overall education levels were found in the beel and breach villages (55 and 54 percent, respectively, with no formal education). The breach and beel villages were the only groups in which more than 20 percent of the population were educated beyond the sixth grade level. Further details are presented in the Main Survey Report, and by village in Appendix D (Village and Upazila Profiles).

> *"In the good old days we never thought of educating ourselves or our children because we had plenty of land. Now I feel I should have done the other way round as education could not have been subjected to river erosion."* Statement by a farmer of Baraitali, a badly eroded Dhunat village. Mustafa Kamal, interviewer.

2.5 Land Ownership

The household sample was selected to reflect as much as possible the same proportions of main occupations and landholding sizes as in each village as a whole. Land ownership was recorded in the Full Survey by total areas under each type of tenancy and at each land level.

The sample breakdown according to the landholding categories was in aggregate: 54 percent in the landless category (under 50 decimals of own land), 30 percent in the small category (50-249 decimals), 13 percent medium (250-749 decimals), and three percent large (750 decimals and over). Eighteen percent of the landless households farmed on others' land. Many household heads with occupations other than agriculture operated substantial farms.

Comparing sample data with that from the Full Survey showed that in each environment the mean land area owned per household is somewhat higher in the sample than for all the households in those villages. The overall means were: 156 decimals (0.63 ha.) for the sample and 123 decimals (0.50 ha.) for the total population. This was because the stratified sample had slightly higher percentages of larger landowners than in the population, and they tended to have slightly larger landholdings than average for their landholding category[6].

The land distributions in the sample were also compared to those in the FAP-12 studies (HTS, 1992 FR vol 4). The main differences were that more of the FAP-14 sample were in the smallest landholding category (compared to an average of about 30 percent in FAP-12), and fewer are in the 101-250 decimal category. However, the FAP-12 sample survey data came from only five study areas. It included more from protected areas and did not cover all of the flood environments. Overall, the land ownership distribution in the two samples were broadly similar. It is notable that in the haors, however, FAP-14 did not find as high a percentage of larger farmers as FAP-12 did in its haor area (Flood Action Plan 1992c).

As Table 2.4 shows, there was a higher percentage of landless and small land owning households in the chars and main rivers. In contrast, there was a higher percentage of owners of larger holdings in the secondary river, beel and semi-saline flood environments.

The largest landowners in the haor areas owned and operated considerably larger holdings than elsewhere. In general, the smallest landholding category averaged only homestead land. But, since some were sharecroppers, this category had operated holdings greater than their own land. Whereas, in the largest landholding category, in almost all environments (except semi-saline areas), the average operated holding was considerably less than the land owned per household. This reflected ownership of noncultivated land and net land leasing. Additionally, there was a larger number of plots per household in the secondary river and semi-saline environments. This indicated that holdings were more fragmented in those areas, particularly as compared with the chars and flash flood areas, where the largest landowners had fewer plots for similar average areas. Average landholding size was also lower in the char and main river areas than in other environments, probably reflecting greater landlessness and possibly river erosion. (further details are in the Main Survey Report.)

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[6] Otherwise there are no significant differences in the sample in terms of house value, income and expenditure, net income per capita, or in household size.

Cross-tabulations showed that reported occupations were largely independent of land ownership for small land owners (less than 249 decimals). Some small land owners reported that they were unemployed. Out of 1,501 people who said they owned small amounts of land, only 779 (52 percent) also said their occupation was self-cultivating farmer. Another 102 (seven percent) said they were cultivating on tenancy, while 339 (23 percent) reported their occupation as day laborer. The rest reported a variety of other occupations.

2.6 Cash Income and Asset Values

Income was estimated on the basis of monthly cash flow in the Full Survey. It was not possible in these brief interviews to impute annual net household income from direct production expenses. Similar efforts have produced unreliable results in one-time surveys because of recall problems. While the absolute values mentioned above were only roughly approximate, they were assumed to fairly indicate the economic standing of households in different categories. They also indicated the overall tendencies to maintain a surplus, balance or deficit.

While the cash income-expenditure balance did not cover all consumption and effort flows for the households, it was an important indication of household economic viability. Presumably, those in deficit had fewer reserves and would more likely face financial problems during a flood. Table 2.4 shows that cash income, expenditure and net income all increase with increasing land holding in each of the environments. Apart from the beels, where there were more salaried households, there was little cash surplus on an average household level in any of the flood environments. Average household size increased as the landholding category increased, making it appropriate to consider per capita incomes and expenditures. Perhaps surprisingly, household size was consistent between environments (except for being higher in the beels).

Comparing farm (owned, sharecropped or otherwise) and nonfarm households, it was found that the proportion of nonfarm households in the FAP-14 sample was broadly similar between environments (28-38 percent of the sample). There were slightly more nonfarm households along the main rivers (44 percent) and notably more in the char sample (56 percent). However, this was partly because 30 percent of the char households named fishing as the head's main occupation (and 22 percent of all persons' occupations). The nonfarm status of fishermen reflected that they lived in the most flood prone environment. An average of 70 percent of households were found to be in deficit on their average monthly cash income and expenditure. Between environments this average ranged from 62 percent in the secondary river areas to 82 percent in flash flood areas.

Households were asked to indicate the value of their houses and other assets. The Main Survey Report presents findings on responses by flood environment and land ownership category. While such figures should be regarded as indicative rather than highly accurate, the asset values were clearly associated with land holding size. It also was apparent, however, that there were fewer house and other asset values in the chars than in other types of flood environments, and comperatively more homogeniously between landholding categories. This was probably a consequence of this environment's vulnerability to both flooding and erosion.

Table 2.4

Analysis of Declared Monthly Income and Expenditure*

Flood Environment	Land Ownership Category**	Mean Family Size	Per Capita Monthly Expenditure (Tk)	Per Capita Monthly Income (Tk)	Per Capita Net Monthly Income (Tk)	Number of House-holds	Percent of Environment Households
Char	Landless	5.39	357	350	-7	696	72.5
	Small	6.41	406	416	10	184	19.2
	Medium	7.09	470	503	33	64	6.6
	Large	10.94	294	331	37	16	1.7
Char Mean		5.79	373	372	-1	960	100.0
Main River	Landless	4.86	314	323	9	1503	65.2
	Small	6.02	403	444	41	631	27.4
	Medium	7.07	579	659	81	150	6.5
	Large	8.86	959	1228	269	21	0.9
Main River Mean		5.36	361	386	25	2305	100.0
Sec. River	Landless	5.00	264	275	11	278	42.2
	Small	5.65	343	367	24	237	36.0
	Medium	7.27	387	495	108	124	18.8
	Large	8.85	490	629	139	20	3.0
Sec. River Mean		5.78	322	360	38	659	100.0
Semi-Saline	Landless	4.98	297	301	3	306	51.2
	Small	6.42	325	353	28	177	29.6
	Medium	8.00	440	467	28	90	15.0
	Large	11.50	453	574	122	24	4.2
Semi-Saline Mean		6.13	333	352	19	597	100.0
Beel	Landless	5.54	427	463	36	554	55.8
	Small	6.50	520	734	214	236	23.8
	Medium	7.43	698	1196	498	157	15.8
	Large	10.91	831	1391	560	45	4.6
Beel Mean		6.31	510	686	175	992	100.0
Haor	Landless	5.33	311	294	-16	502	55.5
	Small	6.09	335	330	-5	266	29.4
	Medium	8.27	403	415	12	102	11.3
	Large	10.00	710	970	260	35	3.8
Haor Mean		6.07	343.54	345	1	905	100.0
Flash Flood	Landless	5.17	381.33	342	-39	251	49.2
	Small	6.54	418.85	437	18	196	38.4
	Medium	8.32	480.43	544	64	53	10.4
	Large	13.70	648.21	741	93	10	2.0
Flash Flood Mean		6.19	411.28	407	-4	510	100.0
Breach	Landless	4.83	337.61	325	-13	411	49.6
	Small	5.96	447.77	476	29	271	32.7
	Medium	7.12	569.67	719	150	121	14.6
	Large	7.80	982.69	1426	443	25	3.1
Breach Mean		5.62	427.03	465	38	828	100.0
Total		5.79	384.52	423	38	7756	

*Source: Full Survey data on 29 villages, rather than sample. Cash values are estimated in 1991 takas.
**Definitions of landownership categories are in decimals: landless (0-49 dec.), small (50-249 dec.), medium (250-749 dec.), large (>750 dec.).

The semi-saline areas were found to have the next lowest average in asset values, although they and the main river locations were within FCD polder projects and thus not so flood vulnerable. The reason for low asset values in the semi-saline areas may be that drainage congestion and the inequitable distribution of benefits from the region's shrimp cultivation industry have kept asset levels low among the poor. Farmers, however, reported benefit from excluding (by polders) saline water.

2.7 Summary

An overview of the social and economic characteristics of the study population and sample began with the village. The Bangladeshi village was typically organized into several social units that did or could play a part in flood response. Each household (*chula* or *khana*) was part of a homestead (*bari*). Homesteads were clustered into neighborhoods (*para*). Relations to the wider community followed lines of either patrilineal kinship (*gushti/bangsho*) or links through marriage. Patronage ties to competing local leaders (*matabbar*) were the basis of informal groupings (*samaj*). Village councils (*salish*) made up of these leaders and elected officials (ward or union members or chairmen) were expected to perform social control functions. Other village groups of importance were religious congregations, Hindu castes, tribal communities and various voluntary organizations. Background data on the social and economic characteristics of the study population reflected the major contrasts in overall development between villages, which were chosen for study in part because of these differences.

Occupational patterns varied from village to village, with 31 percent of adult males overall naming agriculture as their main occupation. Another 24 percent named day labor. Thus, combining these two groups, more than half of all adult males in the study sample depended on agriculture for their livelihood. There was variation among flood environments, however, with the main river and char locations having the lowest percentages of farmers among household heads. Only 59 percent of small land owners said that agriculture was their main occupation. Twenty-three percent of this group earned their livelihoods from day labor. Adult female occupations mostly (87 percent) were classified in the broad category of household work. This category merged paid and unpaid labor. In beel and breach villages there were relatively high percentages of household heads with salaried occupations. Otherwise, occupational patterns were found to be similar between flood environments.

The economic status of much of the study population was weak, with some variation between villages and flood environments. More than half were landless. Some 70 percent were found in deficit on their self-reported average monthly income-expenditure balance. On average, there was little cash surplus at the household level in any of the flood environments except for the beels. In the beels there were more household members with salaried employment. Average cash income increased with size of landholding, as did average value of assets. One exception was in the chars, where less difference in asset values between landholding categories was found. As Chapter 8 will show, food deficits also prevailed in the study population. The study population could be characterized as living on the margins of survival.

Chapter 3

FLOOD EXPERIENCE OF STUDY HOUSEHOLDS

3.1 Respondents' Characterization of Flooding

Respondents were asked to indicate the sources of the floods they experienced. This permits cross checking of the flood environment classification.

Not surprisingly, sample households reported that rivers were the main flood source, but there were some important differences between the flood environments. Table 3.1 shows the main flood source reported by households against the village flood environment categories. The char, main river, secondary river and beel locations all gave very similar responses. While there was little difference between the main and secondary river categories in the first mentioned flood source, households could name up to three flood sources in the survey. When multiple responses were taken into account 22 percent of respondents in the main river category reported both river and rain as flood sources. In the secondary river environment, this increased to 58 percent. Beel households were more similar to those in main river locations: 76 percent give only rivers as a flood source and 15 percent reported flooding from both rivers and rainfall. The residents of the semi-saline areas reported flooding almost entirely from rainfall and waterlogging.

Table 3.1

Household Perceptions of Main Flood Source, by Flood Environment

Source or Problem	Char	Main River	Sec. River	Semi-Saline	Beel	Haor	Flash Flood	Breach	Total Percent	Total House-holds
None	-	0	1	1	-	12	1	-	2	32
River	99	88	88	4	81	17	6	33	62	1344
Rain	-	17	11	80	11	1	10	6	15	313
Drainage Blockage	1	-	-	14	-	-	-	-	1	27
Flow from Hill	-	9	-	-	7	70	82	58	20	428
Breach	-	2	1	-	0	-	-	3	1	18
Total Percent	100	100	100	100	100	100	100	100	100	-
Total Houses	339	611	219	161	233	235	125	239	-	2162

Source: Household Survey

The responses from the haor and flash flood villages were consistent with the categorization. In both cases the source of water was from the adjacent hills. The breach category responses were odd. Very few of the householders there actually reported breaches as a source of their flooding. This may reflect a reluctance to point out the failure of the embankments protecting them. Of course, rivers were the immediate source of their flooding. But highland was very distant from all three villages; in this case it may have been a way of referring to the embankment.

Combining flood environments together reveals an expected difference in reported flood source according to whether the village was protected from flooding. Fully protected households reported rivers and rainfall to be equally important sources (36 percent and 37 percent respectively), whereas five percent of households in the partial and unprotected locations reported rain as a main source of flooding. In many cases, particularly in the semi-saline polders, those who were protected from flooding were referring to drainage congestion when they reported responses to flooding (except in the case of breaches).

3.2 Flood Experience

Past experience influences both expectations of flooding and flood preparations. It also varies significantly by flood environments.

The severity of the 1988 flood, which in most of the villages was the most severe flood experienced in recent memory, was reported in terms of whether flood water came over the floor of the main house or up to the roof. Table 3.2 shows some important differences in experience in 1988 between flood environments.

Table 3.2

Flood Depth in Houses in 1988
Percentage Houses in Each Flood Environment

Flood Source	Char	Main River	Second River	Semi-Saline	Beel	Haor	Flash Flood	Breach	Total Percent	Total House-holds
Total	321	611	219	160	233	235	139	240	-	2158
Not Flooded	16	12	30	54	9	9	76	23	22	482
Above Floor	52	78	68	46	88	86	27	76	69	1489
Above Roof	32	10	2	-	3	4	-	1	9	187
Total Percent	100	100	100	100	100	100	100	100	100	100

Source: Household Survey

The char households were the worst affected with 32 percent of houses flooded to the roof, and, hardly any, free of flooding. Since the category severe flood in this study (Chapters 4 and 6) broadly means

flooding above floor level, the analysis obscures variations from a few centimeters inside homes to complete inundation. However, the actual depth of flooding in 1988 was only recorded in the later surveys in the char and beel areas[7].

In the main river, beels and haor environments, over 80 percent of homes were flooded in 1988. The breach and secondary river environments were only slightly less affected. Flood protection appeared to have a limited effect. Fifteen percent of the unprotected households did not have flooding in their homes (mostly in the flash flood villages), 24 percent of partly protected households were not flooded, and 26 percent of fully protected households were not flooded[8]. In the two semi-saline area polder villages, 54 percent of homes were not flooded. These are FCD projects that were not overtopped or breached, and that flood because of drainage congestion. Moreover drainage congestion was reported to be worse there in 1987. Finally, the flash flood villages suffered relatively little homestead flooding as only 24 percent of homes flooded. Also, since these latter villages are affected by very localized rainfall patterns, 1988 was not necessarily their worst recent flood.

Responses to flooding and preferences for loss mitigation measures are also likely to be affected by the frequency of flood experience. Across all 29 flood-affected villages the households interviewed had flooding in their homes 1.6 times during the last 10 years, but there were wide variations even within single environments. For example, none of the households in Bhitidaudpur (a flash flood village) had their homes flooded in the last 10 years, and they were unable to estimate whether they would be flooded in the future. Yet in Fenibeel, the other flash flood village, homes had been flooded on average 3.7 times in 10 years. In the most frequently flooded village in the chars (Gopalganj) homes were flooded on average 4.3 times in the same period. In both these areas, a few homes had been flooded up to eight or nine times and a few not at all.

Table 3.3 shows the frequency of over-floor (*mejhe*) floods by flood environments. Not surprisingly the chars had more frequent floods while the households in semi-saline, flash flood and breach locations experienced the fewest. But even there, households, on average, had their floors flooded once in the last 10 years. Because few flood environments as defined here had both protected and unprotected villages, it is not possible to give a meaningful overall comparison of in-home flood frequency by level of protection. But in the main river category it would appear that frequency increases as protection decreases: the mean number of floods in the home in the last 10 years was 1.1 in fully protected, 1.5 in partly protected, and 1.9 in unprotected households[9].

3.2.1 Flood Expectations

The flood related preparations and adjustments undertaken by households logically should be based on the household's expectations concerning future flooding. Those expectations, in turn, should reflect past

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[7]For comparison FAP 12 (Flood Action Plan 1992a) in interview surveys in five project and control areas found mean depths of water in the home of 1.6-3 feet (maximum 5 feet) in 1988, but this did not include any char areas.

[8]This is consistent with the findings of FAP 12: Some projects had moderate flooding, but in several damages were higher inside the project areas than in the unprotected comparison areas nearby.

[9]The difference between means for protected and unprotected households is significant: $t=9.81$, $df=528$, $p<.001$.

flood experience together with an assessment of any structural measures that might have been implemented.

Although it is generally regarded as very difficult for people to estimate the future likelihood of flooding, which is often put down to the will of God (for Bangladesh see Paul 1984 and Thompson 1990), a high

Table 3.3

Frequency of Flooding in House by Flood Environment

Flood Environment	Number of Times House Floor Flooded in Last 10 years	Actual Return Period of Over-floor Flood(years)*	Flood of 1988 Magnitude Estimated Return Period (years)	Percent Households Estimating
Char				
No. Households	339	293	244	72
Mean	2.70	4.60	5.60	
Std. dev.	2.06	3.09	4.02	
Main River				
No. Households	610	539	482	79
Mean	1.50	7.30	11.60	
Std. dev.	0.99	2.81	10.49	
Secondary River				
No. Households	220	157	211	96
Mean	1.20	6.70	11.60	
Std. dev.	0.93	2.51	5.22	
Semi-saline				
No. Households	161	73	157	98
Mean	0.90	6.10	6.60	
Std. dev.	1.24	3.00	3.13	
Beels				
No. Households	233	212	87	37
Mean	1.50	7.10	14.20	
Std. dev.	0.81	2.65	10.07	
Haors				
No. Households	235	214	180	76
Mean	1.70	6.50	7.40	
Std. dev.	0.99	3.00	5.69	
Flash Flood				
No. Households	139	33	129	93
Mean	1.10	2.80	6.50	
Std. dev.	2.16	2.08	4.95	
Breach				
No. Households	240	188	222	93
Mean	1.10	7.70	9.70	
Std. dev.	0.76	2.52	10.91	

* Underestimates number of years before another over-floor flood by ignoring homes flooded less frequently than once in 10 years (i.e., estimates floods to be more frequent than they are).

Source: Household Survey

percentage (37 to 98 percent) of households in this survey were willing to give an indication of their expectation of future severe flooding (Table 3.3). They were asked to say how many years they expected to pass before a flood, similar to the one in 1988, would occur again. The expected return periods were most similar in the char, semi-saline, and haor environments, and most dissimilar in the beel, secondary river and main river environments. In all, respondents viewed a flood of the 1988 severity as a very unlikely and very serious event[10]. In general, answers were in agreement with the reported frequency of flooding in the previous 10 years. Respondents, however, expected fewer future problems than the record would warrant, particularly in the secondary river, beel, and flash flood environments.

Since the experience of flooding varies so greatly between villages, even within some villages, and within flood environments, household flood experience (over floor in the past ten years) has been taken as an independent measure with three categories of experience: not flooded, flooded once or twice, and flooded three or more times (in each case this refers to severe, or over-floor, flooding). Although 22 percent of the sample households had not experienced a severe flood in the previous 10 years they do live in flood prone villages and may simply have been fortunate or well prepared enough to have homes above flood level. Hence, responses from all households in the 29 flood prone villages are important to the study.

THIKNA KARA

The people of Chhoto Bashalia depend on a few of their old men to predict the next year's flood. Each man binds up with thread, rope or straw a leaf of each of six different aram plants in his fields during the last evening of the month of Ashwin, an occasion called Gashwi Rat. The six aram leaves represent the six Bengali months of Jaishtha, Ashar, Sraban, Bhadra, Ashwin, and Kartik, the months when they expect flooding to occur. He marks on each leaf a sign for the month it represents. There is no water on the leaves when they are bound.

In the early morning of the next day, the first day of Kartik, the men open up their bundles of leaves and examine them. If a man sees water on the leaf marked with the sign of one month, then he predicts that flood will occur next year during that month. If he sees water in more than one leaf, he measures the amount of water and predicts that flood will come in the month of the leaf with the most water. After doing this each man goes to his house and gives his flood forecast to family members and neighbors.

One educated boy (S.S.C. passed) said he had not believed in the practice but the old men had asked him to do it. This was in 1987, and his aram leaves indicated that in 1988 flood would occur. After that the boy started to believe in thikna kara.

-Interviewer, Rozana Akhter

For most floodplain residents, it is alien thinking to consider how many years might pass before a severe flood, such as the one in 1988, occurs again. Expectations appeared more closely linked to the normal range of monsoon flooding, to which cropping patterns, floor levels and institutional arrangements are adjusted. As will be discussed in Chapter 6, in some flood environments more measures were taken on an annual basis in anticipation of floods than in others. These tended to be environments where flood levels were on average higher and where problems such as erosion were a greater risk to homesteads. People do have traditional or folk methods for making medium term predictions, as the case of **Thikna Kara** illustrates, but it is not clear to what extent such beliefs influence the disposition of resources.

[10]The beels had the lowest proportion of householders willing to make an estimate.

3.3 Flood Information

Short-term flood information sources have not been of great importance to date, but is worthy of consideration. Such information, also, varied by flood environment.

Household heads were asked where they obtain information if flooding seemed likely under three circumstances: normal monsoon, normal/average flood, and severe flood. Information choices included the radio, television, Upazila Parishad (loudspeakers), neighbors and other sources. They were not asked to specify what kind of information they received or to rate its usefulness. The other source category, however, was open-ended and respondents were asked to specify the source. As might be expected, the percentages using different information sources varied little between flood scenarios. In any monsoon there is always a risk of flooding and, therefore, a need to pay attention to the media and local conditions. Table 3.4 shows the main information sources for each flood environment in a normal and severe flood respectively.

Very few households appeared to lack flood information sources during an average flood, except for 30 percent of households in the secondary river locations. The most important information source were neighbors, indicating that local community sharing of information was well developed. In most areas, the radio was the only important formal media source. One exception was in the secondary rivers areas, presumably because radio carried little information about the latter. Television was less widely available to most people. A higher use of television in the semi-saline area sample reflected the fact that there are more wealthy households located there.

Although 70 percent of the sample overall did not indicate any other information source, those who did mainly referred to their own observations in one form or another. They watched the rivers, observed flood water approaching or watched the weather. In chars, secondary rivers, haors and flash flood locations about 35 percent of households were warned of flooding by their own observations. In the semi-saline polders, where flooding is mainly from localized drainage congestion, almost 60 percent used direct observation. In the main river locations, beels and breach locations, however, only around 10 percent of households got flood information by their own observations.

In the case of breaches, flooding is sudden and there is little chance to see the breach for oneself. Word of mouth (from neighbors), appears to be the main information source. In beels, direct observation of the source is difficult, as most affected households were some distance from the main rivers. In the char areas a substantial minority (19 percent) of households said they heard of flooding from people other than neighbors (for example, from boatmen), which probably reflected the greater physical mobility within this environment. The potential for improved breach warnings is taken up in Chapter 4.

Questions about information sources revealed that union parishads do not play an effective role in information and warning dissemination, despite being the local representative government body. Obviously efforts to improve flood information should make best use of the media and information sources to which people currently refer. If local communities are to have a greater role, however, a considerable effort in improving the capabilities and credibility of union parishads as a flood information source might be called for (see Chapter 5).

Table 3.4

Percentage Households Using Flood Information Sources, by Flood Environment and Flood Type

Flood Environment	No Info. Sources Mentioned	Flood Information from				
		Radio	TV	Loud-speaker	Neighbor	Other Source
Char (n=339)						
Average Flood	2	60	0	1	81	49
Severe Flood	11	66	0	1	80	13
Main River (n=611)						
Average Flood	7	58	9	0	90	18
Severe Flood	5	71	11	1	91	18
Sec.River (n=220)						
Average Flood	30	6	0	1	64	28
Severe Flood	2	27	1	4	93	35
Semi-Saline (n=161)						
Average Flood	1	89	44	2	98	66
Severe Flood	1	89	44	3	99	66
Beel (n=233)						
Average Flood	1	59	24	1	96	17
Severe Flood	0	73	33	1	96	12
Haor (n=235)						
Average Flood	3	49	1	0	86	34
Severe Flood	9	49	1	1	89	31
Flash Flood (n=139)						
Average Flood	1	34	0	0	61	37
Severe Flood	1	48	4	0	73	38
Breach (n=240)						
Average Flood	10	38	12	0	83	10
Severe Flood	11	43	15	0	85	11
Total (n=2178)						
Average Flood	7	51	10	0	84	29
Severe Flood	6	61	12	1	88	24

Source : Household Survey

3.4 Summary

Analysis of flood experience and perceptions showed that the great majority of homesteads had been flooded in 1988 (69 percent over the floor and nine percent over the roof), but that the severity of this flood varied from one flood environment to another. The chars were the most affected (32 percent flooded above the roof of the house), and the semi-saline and flash flood areas the least affected.

Household flood experience affected respondents' ideas about local change and flood response activities. Across all 29 flood-affected villages, homesteads had been flooded over the floor (*mejhe*) on an average of 1.6 times in the last 10 years, with differences between villages and within flood environments. The

range was from no floods in the last 10 years (in one flash flood village) to an average of 3.7 times in the last 10 years in one char village.

Respondents' estimates of the return period before another flood of the 1988 magnitude generally agreed with the frequency of over-floor flooding in chars, semi-saline environments, haors, and breach villages. Such estimations, however, were much more optimistic in main and secondary river villages, beels, and flash flood villages. For example, even though they had experienced over-floor floods on average every 7.3 years, respondents estimated the return period of a 1988 magnitude flood at approximately 12 years. Flood information was obtained mainly from neighbors, the radio and personal observations in all flood environments except secondary rivers. In those areas, there was less use of the radio, presumably because of less media attention to flood conditions away from the major rivers.

Chapter 4

ATTITUDES TOWARD FLOODING AND EVALUATIONS OF MITIGATION MEASURES

4.1 Introduction

This chapter analyzes the way various flood loss mitigation measures are viewed, and the actual measures people desire, compared with the measures that currently exist in certain villages, the way such measures are viewed, and the actual measures people desire. To some extent, each village situation is unique, in that no two have identical geographical or social characteristics. The following analysis highlights some of the complex factors that may determine why rural people find a given measure helpful or not. The analysis shows that particular flood environments and flood protection are strongly associated with how people feel about the water regime and possible changes in it, although socioeconomic factors and flood experience also apparently influence opinions on other measures that would help during floods. It is important to note (as explained in the previous chapter) that most sample households have experienced flooding in the last 10 years, although the exact frequency and character of the flooding varied considerably between environments.

This chapter analyzes responses to a series of questions concerning two issues. First, it considers people's desire for changes in the water regime they face during the normal monsoon, average floods and severe flood conditions. Secondly, it considers the perceived usefulness of possible infrastructural investments that might mitigate flood losses, including both traditional structural measures such as embankments, nonstructural measures and more general investments. Within some villages local experience and socioeconomic distinctions produce divergent opinions over some of the measures discussed--particularly structural measures used to modify flood risk as the case studies will show (see Main Survey Report).

In Household Survey questionnaire interviews respondents were presented with a list of structural and non-structural measures which might be relevant to flood response. They were asked to assign to each measure an evaluation score between one and five, with one indicating that the measure was or would be very useful and five, very harmful. Scores of one and two thus indicated generally positive evaluations; four and five, generally negative; and three, neutral or indifferent. Patterns of evaluations are the basis of the discussion in Section 4.3 and those following it.

4.2 Desired Changes in the Water Regime

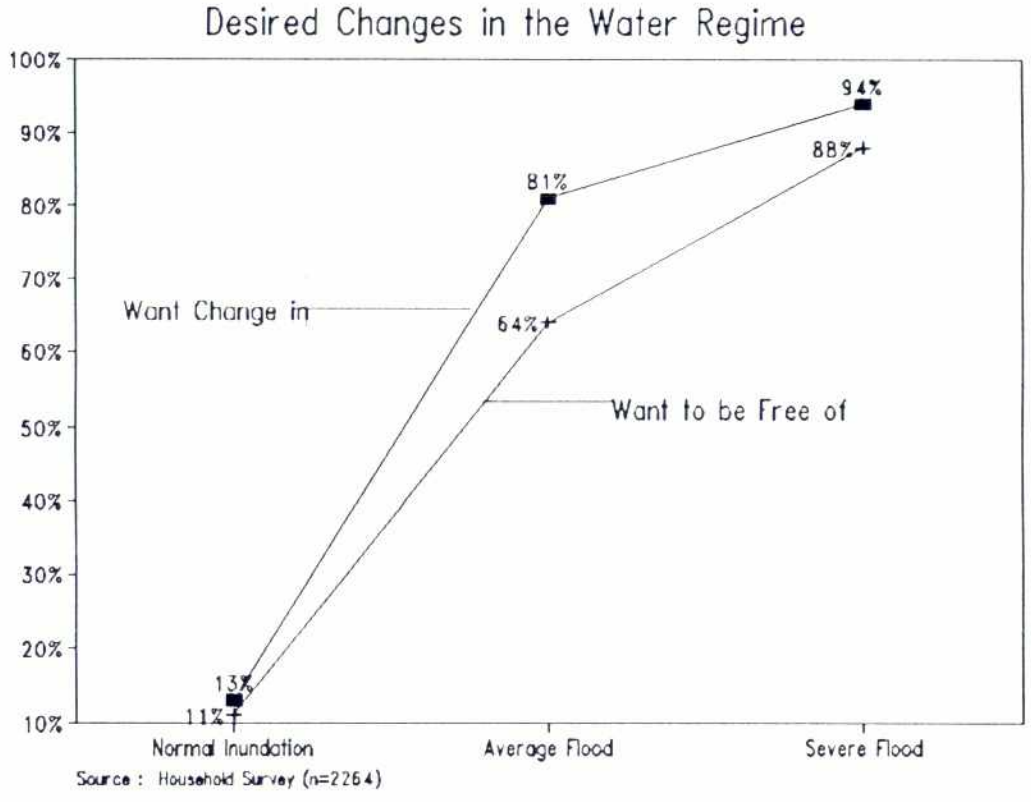
4.2.1 General Findings

In general, respondents desire to have floods reduced or eliminated, especially severe floods, but they accept normal monsoon conditions. This appears to support the FAP concept of controlled flooding rather than reducing normal monsoon water levels. The importance that people attach to such investments in water and flood management compared with other alternatives is addressed in sections 4.3 and 4.4.

Overall only 1.6 percent of all households did not want any change in their water regime. However, as shown in Figure 4.1, only 10.7 percent said they wished to be flood free in all conditions. The majority,

53.5 percent, want to be free of average and severe floods, and 27.2 percent wish to be free of severe floods only. Another 14.7 percent wish to eliminate severe floods but only modify average floods. These results are consistent with the view that households and communities are adjusted to normal monsoon conditions **(barsha)** (as reported by Paul (1984) in an earlier study), but would like to exclude flood peaks **(bonna)**.

Figure 4.1



4.2.2 Influence of Flood Environment and Experience

Households fall into three categories in their desire to change their flood environments. In the first category, over 90 percent of households want change in both flood and severe flood conditions, but not during the normal monsoon. This first category includes people living on chars, and near beels and flash flood areas. Farmers in all three areas desire a three to five week delay in normal flooding. It is notable, however, that in one beel area, Lalua Village, 90 percent want slower drainage, suggesting that water

retention for the winter boro crop is just as much a problem as flooding. In addition, those in the haor areas agree that postponing floods would help, but they also prefer normal monsoon to be delayed.

In the second category, which includes those living in main and secondary river locations, over 30 percent of households only want to change severe floods. The remainder want to change floods and severe floods. Desire for change appears to be linked with past flood experience in the main river areas, but not the secondary river locations.

Those living in the semi-saline and haor areas comprise the third category of whom over 30 percent wish that all monsoon conditions could be changed. Such a response reflects severe drainage problems in those areas. The remainder of the third category would not change the normal monsoon. Households living in breach locations fall between the three categories. Seventy-six percent of these households want to change flood and severe flood conditions but 19 percent also would like to change the normal monsoon water regime.

4.3 Evaluations of Flood Control and Drainage Measures (FCD) and Roads

4.3.1 Issues Investigated

Respondents were asked to comment on the usefulness of five types of embankments as well as drainage structures and embankments used as local roads. Different protective embankment options were generally rated as helpful by respondents as were drainage improvements. Road options were given the more favorable assessments overall. The five types of embankments are:

- An embankment between a house and the flood source (a linear riverside embankment).
- An embankment behind the house (a countryside embankment).
- A high embankment surrounding the village (a full protection polder).
- A submersible embankment that would postpone the onset of floods but not prevent later flood peaks.
- An embankment topped with a metaled road.

Table 4.1 summarizes the mean evaluation scores (on the 1 to 5 scale, from positive to negative) for the eight infrastructure options considered. Roads, particularly surfaced roads, consistently were rated as the most useful investment with drainage systems not far behind. The three protective embankment options were also given generally positive assessments but with considerable variations between environments and within environments. Living on the outside of an embankment rated a neutral score on average but prompted the greatest divergence of opinions.

4.3.2 Presence of Infrastructure and Overall Scores

There was a broad consensus among respondents as to the presence of embankments in their area. Although the reports are not definitive, people's **perceptions** of protection are important in understanding their responses. Overall 32 percent of respondents reported having an embankment between their home and the main source of flooding while 23 percent reported having a countryside embankment. Ten percent reported having a high embankment surrounding the village and seven percent reported having a

submersible embankment around the village. Although few households reported a surfaced road by their village, 46 percent are near some form of raised road, while 23 percent reported some provision for drainage in their area.

Table 4.1

Mean Household Evaluations of Desirability of Infrastructure*

Flood Environment	Eval of Riverside Embkt	Eval Country-side Embkt	Eval High Polder	Eval Submer-sible Embkt	Eval High Road	Eval Embkt + Surfaced Road	Metalled Rd from Village	Eval Drainage Structure
Char	1.57	3.17	1.14	1.61	1.14	1.31	1.26	1.61
Std. Dev.	1.12	1.82	0.38	0.65	0.34	0.56	0.51	0.62
No. Households	338	275	334	335	336	307	336	335
Main River	1.74	3.14	1.73	1.73	1.20	1.37	1.15	1.40
Std. Dev.	0.94	1.47	1.00	0.70	0.41	0.55	0.36	0.51
No. Households	607	531	608	608	611	607	611	610
Sec. River	2.07	3.13	1.79	2.20	1.05	1.78	1.07	1.06
Std. Dev.	1.41	1.63	1.09	1.05	0.25	0.99	0.32	0.26
No. Households	215	215	216	213	218	201	219	217
Semi-Saline	1.28	2.46	1.07	1.74	1.01	1.13	1.08	1.09
Std. Dev.	0.45	0.82	0.28	0.95	0.08	0.40	0.37	0.31
No. Households	160	160	157	160	161	160	161	161
Beel	2.90	3.34	2.95	1.68	1.02	1.51	1.03	1.31
Std. Dev.	1.52	1.88	1.69	0.86	0.13	0.78	0.17	0.60
No. Households	229	146	232	233	231	123	227	232
Haor	1.21	1.10	1.06	1.14	1.11	1.18	1.06	1.60
Std. Dev.	0.48	0.36	0.26	0.36	0.39	0.41	0.28	0.72
No. Households	163	94	235	235	235	234	234	235
Flash Flood	2.01	2.26	1.95	2.10	1.61	1.09	1.04	2.22
Std. Dev.	0.85	0.83	0.88	0.51	0.61	0.29	0.22	0.48
No. Households	138	98	137	139	139	139	139	139
Breach	2.24	1.58	2.66	2.49	1.33	1.57	1.07	1.59
Std. Dev.	1.42	0.90	1.55	0.86	0.47	0.76	0.27	0.70
No. Households	240	193	239	240	240	240	240	240
Total	1.87	2.76	1.77	1.80	1.17	1.37	1.11	1.46
Std. Dev.	1.20	1.58	1.20	0.84	0.40	0.65	0.35	0.62
No. Household	2090	1712	2158	2163	2171	2011	2167	2169

* Evaluation scores were : (1) Very Helpful, (2) Helpful, (3) Neutral, (4) Harmful, (5) Very Harmful.

Source: Household Survey

4.3.3 Evaluations of Full Protection Embankments

Respondents evaluated the usefulness of an embankment protecting them from their main flood source (riverside embankment) and of an encircling embankment (high polder). Evaluations of these full flood protection measures were similar (Table 4.1), although high polders tended to be viewed more favorably. Overall, 54 percent of households surveyed gave strongly positive evaluations (scores of one) to riverside embankments. Another 24 percent gave generally positive evaluations (scores of two). Overall, there was no significant [11] difference in scores between those stating they have or do not have a riverside embankment.

Although flood environment affects opinions, experience with the protection measure being considered, and experience and frequency of past floods affected the ratings for these measures. Respondents with experience of high encircling polders gave less favorable assessments to embankments than those who do not have such protection. Yet, the most strongly positive evaluations of a high polder (94 percent with scores of 1) came from the **semi-saline environment**, where the villagers do have such projects. The **char** villagers also favored high embankments whatever their flood experiences and irrespective of occupation or landholding size. The greatest percentages of those who believed such embankments were harmful came from the **breach** and **beels** locations. In the breach locations this is not surprising since by definition these respondents have suffered breaches, and in the beels, people seemingly prefer not to change the current hydrology. In both the **secondary river** and **flash flood** areas those who had experienced more floods in the last 10 years were more in favor of a high polder.

My neighbor told me there was an embankment along the left bank of the Jamuna River, so I thought that water would not come to our village. But then at the end of Bhadra (in 1988) I heard from village people that the embankment was going to break. I stored some rice and fuel. When the water came, I put some bricks under the legs of the bed. Our house is on high ground. Those who lived in low levels had to build platforms or move to higher places for shelter. I think the embankment is good for the fertilizer factory, but the part that protects this village is not properly maintained. Interview with a farmer in Goalbathan, a main river village in Jamalpur District, by Rozana Akhter.

In general, inhabitants of the char and haor areas clearly favor flood protection, although in these areas full flood protection is least practical, and there is no experience of flood protection to alter people's opinions. The semi-saline areas, and most of the secondary river areas, currently have flood protection and still favor protection despite drainage problems.

Despite the relevance of flood environment, and other overall factors, some important opinion divergences were found within survey villages. Different local interest groups may have strong differences of opinion over structural measures. These are likely to result in operating problems if projects are

[11] Note that in this, and similar test, a non-parametric test (Mann-Whitney U Test) has been used because the evaluations form an ordering ranking rather than an interval scale measurement.

implemented without first addressing these issues and providing compensating measures.[12] It is important to analyze these cases, since similar differences of interest and opinion are likely to arise in specific floodplain development planning under the Flood Action Plan. Two of the case studies follow in Section 4.3.9; the remainder are found in the Main Survey Report.

4.3.4 Evaluations of a Countryside Embankment

The purpose of this question was to understand the situation of people living outside of embankments, those whose homes are in between the source of flood and an embankment. In general, those with direct experience of being on the riverside, or unprotected side, of an embankment regarded countryside embankments as harmful (mean score of 4). Most of these households were in the char and main river areas. In some locations without embankments, however, such an embankment was considered helpful. This might be because respondents thought it would provide protection from a secondary flood source.

4.3.5 Evaluations of Submersible Embankments

Submersible embankments are intended to delay the onset of floods, thereby protecting crops prior to harvest but without loss of any possible benefits of flood. Such embankments do not provide protection from damages and impacts during high floods. Submersible embankments received less strongly positive or negative evaluations in general than other infrastructures and a slightly less favorable overall score (Table 4.1).

However, evaluations clearly differ between environments. Haor area households responded positively (mean of 1.14) to submersible embankments, reflecting their desire to delay the onset of either normal monsoons or floods (91 percent want to delay floods). In the beels, submersible embankments also would help protect the boro crop, although there is much less risk of an early flood. But, it also is probably because of general ambivalence to high embankments that respondents favored submersible embankments slightly more than alternatives.

4.3.6 Evaluations of Roads

Overall, the evaluations of roads were consistently higher than those for embankments (Table 4.1). In most flood environments respondents generally agreed that any of the three road options were helpful, although for ordinary roads the flash flood and breach locations gave slightly lower mean scores (but still higher than for an embankment). It is notable that people in the secondary river locations, which have direct road experience, rated an embankment-road as no better than an embankment (30 percent rating it as neutral), but regarded their current roads as much more helpful.

4.3.7 Evaluations of Improved Drainage Provisions

Drainage can be as essential to agriculture as flood control and irrigation. Overall, respondents evaluated drainage systems very positively--60 percent very useful and 33 percent useful--giving a mean score of 1.46, a score that falls between those favoring roads and those favoring embankments (Table 4.1).

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[12]These issues are discussed by FAPs 13 and 15 (Flood Action Plan 1992d, 1992e).

Flood environment is obviously an important factor in determining opinions over drainage. The highest percentages (over 90 percent) giving scores of one were in the semi-saline and secondary river areas; the former has serious drainage problems while the later also named rainfall as an important flood source. The beel areas gave the next most positive evaluations, while the flash flood areas gave the least favorable assessments of drainage systems. The flash flood response seems consistent with the flood type, an action of quickly rising and falling waters, in which case drainage is less of an issue.

4.3.8 Willingness to Pay Toward Providing Embankments

A substantial proportion of households who favor embankments, and a few of those who do not, expressed a willingness to share the costs of building embankments (Table 4.2). This suggests that future projects may be designed to include some local contributions, to increase local interest in oversight, and to increase commitment to operation and maintenance.

Table 4.2

Whether Respondent Wants and is Willing to Pay for an Embankment

	Percent Willing to Pay				
Wants Protection	No. Resp.	N	Y	Total No.	Percent
No Protection	23	66	11	12	100
Only Submersible	19	18	64	177	100
Full Protection	33	26	41	1779	100
Total No.	651	568	853	2072	

Number of Missing Observations: 107

Source: Household Survey

Although 99 percent of those who have been flooded three or more times in the last 10 years were in favor of full embankments, only one-third were willing to pay. Therefore, it seems homestead flooding does not appear to directly affect willingness to pay for flood protection.

4.3.9 Case Studies

Pakisha

Pakisha Village, located in Nagor River Project in the Chalan Beel area of the Northwest region, is subject to annual embankment breaches and cuts.[13] The total population is 1,000. Main occupations are agriculture (39 percent) and day labor (27 percent). Business, service and fishing make up another 21 percent. Median household income is Tk. 2,000 per month, and land ownership ranges from landless (31 percent) to large holdings of over 7.5 acres (8 percent).

Evaluations of protective embankments were highly divided in this village. Fifty-five percent gave positive evaluations to riverside embankments, while 42 percent viewed them negatively. With high polders, 52 percent rated them positively, while 42 percent gave negative ratings. There was consensus, however, that a submersible embankment would be useful.

It is notable, however, that those whose homes had been flooded were more opposed (53 percent) to a riverside embankment than those who had not (42 percent). Questions about high polders polarized opinions even more.

There was a large spread of evaluations within Pakisha's socioeconomic or occupational groups, but a general pattern emerges nonetheless. Larger landowners are more in favor of embankments than smaller landowners, and smaller landowners are more in favor than the landless. Comparing occupations, those engaged in service, or business and agricultural laborers, evaluated embankments very negatively (50 percent and 60 percent respectively). Farmers of all types were more positive than non-farmers (61 percent and 28 percent respectively). Fishermen also gave positive evaluations which may reflect that the breach cut is managed to improve fishing opportunities (See also Flood Action Plan 1991b).

Local circumstances, flood experience and agriculture dependence have thus determined opinions. But all agree that a submersible embankment would help. Presumably, it is hoped that it would be more reliable than the current embankment.

Chhoto Bashalia

This low elevation village is affected by overbank spills from the Pungli (and Dhaleshwari) River in the north central region. The village has a total population of 1,897 of which 84 percent of households were flooded in 1988. Ten percent of households own over 2.5 acres of land, and 64 percent farm some land. Main occupations are farming (32 percent), business and service (31 percent), laboring (31 percent), and fishing (4 percent).

Although Chhoto Bashalia currently does not have any flood protection, respondents gave strongly conflicting evaluations to the idea of a high polder (20 percent negative) or a riverside embankment (21 percent negative). In addition, 30 percent favored a countryside embankment, while none opposed a submersible embankment. Those who have been flooded three or more times in the last 10 years are more in favor of a high embankment than those who have not been flooded.

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[13]See Flood Action Plan (1991b) report for a more detailed discussion of the problems of this project.

Moreover, less frequently flooded farmers are more opposed (23 percent) to a high embankment than nonfarmers (12 percent). Yet opinions shift between questions. For example, the largest farmers favor a riverside embankment but not a high polder around the village. However, it is other farmers, agricultural laborers, and businessmen and tradesmen that make up most of those who believe embankments would be harmful. Conversely, the few fishermen interviewed said they thought a full embankment would be helpful in protecting their houses from flood because their homesteads were located near a canal connected to the river.

Opinions about embankments in Chhoto Bashalia were probably influenced by a tense situation in the neighboring village of Borobashalia. In the year preceding the study a proposed riverside embankment in Borobashalia was defeated by local conflict. In general, the embankment was favored by some agriculturalists who lived far from the river and who thought the structure would stabilize crop production. Those most opposed lived near the river and would have been forced to move if the embankment had been built. Both groups mobilized numerous supporters throughout the area, including residents of Chhoto Bashalia.

4.4 Evaluations of Other Mitigation Measures and Infrastructure

In addition to embankments, a number of other public and private mitigation measures were investigated that might prevent flood losses or flood impacts. Key questions in this section concern warnings and shelter, however, domestic hand tubewells are the only measure with which a high percentage of respondents have any direct experience.

4.4.1 Storm and Breach Warnings

Embankment breach warnings are relevant to those with existing flood protection or where natural levees breach (flash flood areas). There is no such warning service currently, and people believe it would be helpful, particularly in the three villages that suffer from breaches. However, those in the FCD/I projects generally did not think there was benefit in informing authorities of breaches. Storm warnings were generally regarded as helpful in all areas (mean score of 1.6), although roads were given higher priority.

4.4.2 Community Grain Drying Facility

Grain stores may become wet during floods or rains may interfere with post-harvest grain drying activity. Although no respondents said public grain drying facilities were currently available, this measure received only moderately positive evaluations (34 percent very positive, 39 percent moderately positive). Most rural people, however, use public roads for drying grain and that may be the reason for the moderate response.

Not surprisingly, public grain drying facilities were regarded as more helpful by farmers, particularly larger farmers (mean landholding of 223 decimals, very positive; 124 decimals, moderately positive). However, the evaluations varied considerably. In the haors and beels 76 percent and 58 percent respectively thought such a facility would be very helpful, which is consistent with their lack of available dry land during flood peaks.[14] In the chars, secondary river, and flash flood locations, high percentages

[14] See for example Flood Action Plan 1991a Halir Haor RRA for examples of problems in drying grain.

(47 percent or more) thought such facilities would not be helpful. This opinion is probably reflected in secondary river and flash flood areas having shorter flood durations and, therefore, places available to dry grain. Such a facility is impractical in char areas.

4.4.3 Water Supply

Respondents were asked three questions about tubewells (HTW) in relation to domestic water supplies, irrigation and credit to install a tubewell. The questions are relevant to flood impact mitigation for three reasons:

- Drinking water supplies are a problem in floods, particularly for women who may have to travel much further in difficult circumstances to obtain water. Drinking water will be discussed in Chapter 6.
- Small scale irrigation is an alternative investment strategy to FCD for agricultural development (MPO 1991).
- Short term intensified irrigation appears to be a key response to crop losses during floods (Chapter 8).

Virtually all respondents considered tubewells for drinking water as being useful. There was little variation between environments or socioeconomic groups.

Not surprisingly, farmers, especially large landowners, evaluated irrigation tubewells more favorable than nonfarmers. Overall, 59 percent of farmers rated them as very helpful. Availability of irrigation facilities appears to be related to institutional factors such as credit, at least in the riverain environments. In terms of environments, the semi-saline and beel areas gave the most favorable assessments of tubewell irrigation, but it is not a high priority in the char areas where more direct flood mitigation measures are preferred.

4.4.4 Protected Grain Stores: Village, Union, Upazila

The idea of protected grain stores, whose grain would be available for sale or distribution during emergencies, was investigated but was generally not found to be a high priority (mean and median scores of 2). There are none currently in the villages studied. Such public storage could be managed at the village, union or upazila level. Households were asked to evaluate such management and to assess a system of credit based on in-storage grain collateral.

Only in the haors and beels was the idea considered to be somewhat useful, particularly by larger farmers (mean of 1.56 for village grain stores in the haors). Moreover, in the sample as a whole, those dependent on farming, or farmers with other secure incomes, also gave more favorable assessments. In each environment farmers gave more favorable responses, and among the farmers, the largest landowners were most in favor. On the question of management, control by more distant institutions (union or upazila) was less preferable than management by the village community. It should be noted that management at the village level could be dominated by the larger farmers who showed the most interest in the protected grain storage idea.

4.4.5 Other Measures

Other flood loss mitigation measures were also considered. Public high ground for flood shelter was regarded as very helpful (mean score of 1.24), and, in the most flood-vulnerable environments few had access to such shelter. Another measure considered was credit for building a pucca (flood proof) house. Such credit was viewed as more helpful by richer households who might have better access to it. It was not, however, seen as helpful in the chars, perhaps because of erosion risk and poverty.

4.5 Respondents' Suggestions for Local Change

After evaluating the previously mentioned structural and other measures, respondents were invited to offer their own ideas about what was needed in their localities. Many of their ideas confirm interest in embankments, improved drainage and other related measures that have already been considered in this study. Eighteen percent of respondents (416 people) made their own suggestions. The types of suggestions made and the number of people responded were:

Checking river erosion (98)
Re-excavation of a river or canal (85)
New or improved drainage arrangements (71)
Building an embankment (42)
Maintaining an embankment (34)
Electrification of village (31)
Shelter on high land (27)
Not building an embankment (13)
Credit/grants for agriculture or relocation (5)
General rural development (4)
Construction of bridges (3)
Sanitary latrines (2)

The largest percentages of suggestions came from the beel, haor, and breach flood environments, where approximately 30 percent of all respondents had ideas to offer. The fewest suggestions came from flash flood villages, where only nine percent presented any ideas.

> *This village needs electricity very much. If we had electricity, we could use deep tubewells for irrigation.* Comment from resident of Goalbathan, a main river village in Jamalpur District. Rozana Akhter, interviewer.

In addition to revealing unique local concerns, these suggestions underscore the need for overall rural development in many study villages. Even though the topic was the water regime, and this was the subject of most recommendations, more than 10 percent still related to other issues such as electrification, credit, sanitation, and others.

4.6 Summary

In general, respondents would like floods to be reduced or eliminated, but they accept normal monsoon conditions. There were differences between environments, however, such as in the haors where many respondents would like even normal monsoon water to be reduced or at least delayed. Postponing floods also was favored in chars, beels and flash flood areas. Drainage improvements were favored in some areas, but in others, such as the Chalan Beel villages, water retention was favored.

These opinions are associated with respondent's evaluations of structural flood mitigation measures. In general, road investments, public flood shelters, hand tubewells, protective embankments and drainage facilities were rated as very helpful. In addition to variations in opinion between environments, some measures, particularly grain drying, grain stores and credit for pucca buildings, were preferred most by larger farmers. These larger landholders are likely to dominate access to such measures and ought not, perhaps, to be subsidized in gaining such services.

Opinions over flood protection measures also reflected local experience. For example, those living outside embankments regard embankments as being harmful. Practicalities and aspirations also influence opinion. For example, haor residents rated submersible embankments as highly as full flood protection, but char inhabitants rated full flood protection very highly even though it is unlikely to be feasible. In a number of villages, opinions divided over flood embankment options but not other measures depending upon local experience and socioeconomic differences. These findings emphasize the importance of local consultation when planning interventions, and the need to assist those who oppose if they would be adversely affected.

Chapter 5

INSTITUTIONAL RESPONSE TO FLOODS

5.1 Context and Scope

This chapter analyzes various institutional responses to flood. An account of the various measures adopted by these institutions is presented along with the expectations of the local people with regard to flood response. The policy implications which emerge out of the analysis for the different institutions are put together in the concluding section of the chapter. The neighborhood, or *para*, was considered to be an institution at the grass roots level for the purpose of this study. The study looked into the roles of local government institutions in the forms of union parishad and upazila parishad. It also touched on the role of certain district level governmental bodies. In addition, an attempt was made to study the flood response activities of nongovernmental organizations (NGOs) and other nongovernmental local groups.

It was considered pertinent to investigate neighborhood level activities to understand the community based actions and aspirations with regard to flood response. As for the local government institutions, the union parishad, which has long been the lowest tier of local government structure constituted mainly by locally elected representatives, merits special attention. In the recent past, the upazila parishad has figured most prominently in the local government structure which was very much operative during the field work for this study (during late 1991, however, the Government of Bangladesh abolished the upazila parishad and is currently contemplating a two-tier local government structure based in unions and districts). The upazila parishad was responsible for miscellaneous development activities within its locality, most of which were financed by central government grants under the Annual Upazila Development Programme. The results obtained in this study which relate to the upazila parishad should help in formulating policies regarding the flood response role of the new local government institutions. In addition to the union and upazila parishads, various district level governmental offices had their own flood response roles to play which were considered important for the present study. Besides, it was felt necessary to study the flood response roles of NGOs and other nongovernmental local groups to assess their potentials and possible coordination with relevant activities of various governmental bodies.

To examine how responses relate to various physical and socioeconomic categories, a stratified analysis has been attempted in certain sections of this chapter based on flood environment categories and occupational classification developed in Chapters 1 and 2.

5.2 Neighborhood Level Flood Response

Preparing for flood through neighborhood level activities was not common among respondents. An individual household, however, often was unable to effectively cope with flood situations on its own and had asked for assistance from other people within the neighborhood. Various ideas on how to prepare better for floods were suggested.

Table 5.1 shows percentages of respondents that suggested various neighborhood level preparatory measures within each of the seven flood environment categories. Respondents from all locations, except in the semi-saline areas, most often suggested flood warning as a preparatory measure for the

neighborhood. Semi-saline area respondents most often suggested better water drainage, reflecting their serious drainage congestion problems. Reinforcing houses and homesteads was strongly suggested by respondents in the char, main river and haor/beel areas. Haor and beel residents also strongly suggested more cooperation among neighbors to elevate front and back yards, and plinths. Cooperation has also been sought to make water hyacinth barriers against wave-caused erosion. Char and haor/beel area respondents were interested in arranging flood shelters, flood-time transport and better communication during flood. The fact that various preparatory measures which the neighbors suggest for themselves have not been taken up by them in any large degree shows the need for certain external impetus in organizing neighborhood groups. Such organizational activities should be sensitive to the local needs and aspirations.

People in Shibsen, a char village in Bhedarganj upazila, have a special kind of community spirit that inspires them to help each other at the time of flood. This spirit originates mainly in their past experience of having to cooperate with each other in shifting away to other areas when their village is totally flooded. A case study by A.T.M. Shamsul Alam.

Table 5.1

Percentage of Respondents Suggesting Various Neighborhood Level Preparatory Measures by Flood Environment

Flood Environment	Reinforcement of Houses/ Homesteads	Arrangement for Better Drainage of Water	Arrangement for Flood-Time Transport and Communication	Arrangement for Shelter	Flood Warning
Chars	33	0	7	20	43
Main Rivers	23	5	4	11	41
Secondary Rivers	3	3	0	3	48
Semi-Saline Areas	6	60	3	11	15
Haors/Beels	22	6	7	16	26
Flash Flooding	1	5	0	1	3
Breach Locations	10	4	1	9	39

Source: Household Survey

The commonly adopted flood-coping measures at the neighborhood level are presented in Table 5.2. This table, and other tables based on the institutional survey, show responses from the 29 flood affected household survey villages as well as the 51 extra villages surveyed to add diversity. These extra villages were selected to represent diversities in flood hazard and drainage congestion, extent of river erosion, accessibility to urban center and occupational structure. The same institutional surveyors gathered data from the extra villages so that comparability between the data sets was strengthened. In the institutional survey, a village was considered to have adopted a measure when a substantial number of people in the

village reported to have adopted it. A host of measures were adopted at the neighborhood level during flood. Some of the more commonly adopted measures have been related to provision of shelter; provision of drinking water; protection of crops, cattle and fisheries resources; supply of fuel and protection of stored food items. Among the rehabilitative measures, repair and construction of houses and homesteads has been commonly done with the help of each other.

Table 5.2

Commonly Adopted Flood-Coping Measures at the Neighborhood Level

Phases	Measure Relating to	Number of Villages Adopting	
		Out of 29 Sample Villages	Out of 51 Extra Villages
During Flood	Provision of Shelter	20 (69)	20 (39)
	Supply of Drinking Water	15 (52)	22 (43)
	Provision of Emergency Relief	2 (7)	14 (27)
	Provision of Health Care Facilities	5 (17)	3 (6)
	Supply of Fuel	9 (31)	12 (24)
	Protection of Crops, Cattle and Fisheries Resources	12 (41)	13 (25)
	Protection of Stored Food Items	8 (28)	13 (25)
	Provision of Marketing Services	7 (24)	8 (16)
Post Flood	Repair/Construction of Houses/Homesteads	12 (41)	13 (25)
	Provision of Health Care Facilities	7 (24)	7 (14)
	Supply of Agricultural Inputs	10 (35)	7 (14)
	Repair/Construction of Infrastructure	6 (21)	13 (25)

Note: Figures within parentheses are percentages of total number of villages for all tables based on institutional survey.

Source: Institutional Survey

When asked to suggest flood-coping measures at the neighborhood level, 46 percent of households suggested providing relief (mainly food and clothing). Although this measure was adopted to a certain extent at the neighborhood level (see Table 5.2), the finding here suggests that much was left to be desired. The same is true for many of the other measures. Measures relating to provision of shelter; protection of crops, cattle and fisheries resources; and protection of stored food items have also been rather extensively suggested as flood-coping measures. As for the post-flood measures, the more frequently suggested measures include repair/construction of houses/homesteads and supply of agricultural inputs. Case studies indicated that char area residents strongly suggested neighborhood level cooperation in obtaining health care facilities. They expected neighbors to help contact doctors on the mainland, obtain medicines, and transport the ill to distant hospitals. Overall, there seems to be a strong consensus within the neighborhood communities that they need to organize themselves better for more effective flood response. The organizational effort has however not been forthcoming from within themselves.

5.3 Flood Response of Union Parishads

The union parishads were found to be rather limited in their flood preparatory activities. Less than two percent of the household survey respondents reported that they found their union parishads to take effective flood preparatory measures. In addition, the same survey indicated that respondents had various suggestions of flood preparation for their union parishads. Twenty-two percent of respondents suggested that the union parishad should make certain prior arrangements for shelter on some public high ground. It was also suggested that the union parishad could arrange for crop, cattle and fisheries protection. It was suggested that raised platforms could be built for cattle refuges, and for threshing and drying crops. The suggestions included supplying emergency fodder, and raising pond banks to prevent fish from escaping. In addition, flood-affected people felt that the union parishad could aid in reinforcing their houses and homesteads by supplying materials such as bamboo, wood, earth and rope. They felt that such aid should either be free or have only a nominal cost. Two other commonly suggested measures were to repair and construct roads that would be operative during flood. Respondents also suggested that the union parishad excavate or re-excavate canals, and build small culverts in appropriate places, to promote better water drainage.

Kabir, a resident of Panchthupi, a village in Dhunat upazila, was raising fingerlings in his pond. He applied for a loan to invest in raising the banks of his pond. This investment, he thought, would prevent the fingerlings from running away during flood. However, he was yet to learn about the fate of his loan application. A case study by Faisal Habib.

Preparatory measures suggested for the union parishad by various occupational categories of respondents show that those in agriculture have most frequently asked for better drainage of water (see Table 5.3). Day laborers, who were primarily involved in agriculture, also showed considerable interest in water drainage. Day laborers, however, considered repair and reconstruction of roads, and shelter arrangement more important than water

Drainage congestion in the low-lying areas of Bhitidaudpur, a hill-side village in Brahmanbaria upazila, frequently causes substantial damages to agricultural crops. Institutional measures in excavating and re-excavating canals would help to solve the problem. A case study by Zahidul Alam.

drainage. The fact that the business community showed strong interest in better water drainage was probably due to their additional status as landowners. Thirty percent of fishermen wanted their union parishads to play some preparatory role in arranging shelter. It is notable that fishermen were mainly concentrated in the char areas where shelter was a prime concern. Arranging shelter was suggested by more than 20 percent of respondents of the other categories as well. All respondents showed some interest in having union parishads provide flood warnings, although fishermen showed marginally higher interest in this measure.

Table 5.3

Percentage of Respondents Suggesting Various Preparatory Measures for the Union Parishad by Occupational Categories

Occupational Category	Repair/ Construction of Roads	Arrangement for Better Drainage of Water	Arrangement for Shelter	Flood Warning
Agriculture	21	26	22	15
Day Labor	23	18	22	13
Business	22	17	23	17
Fishing	12	3	30	19

Source: Household Survey

About 27 percent of household survey respondents reported that their union parishads provided some flood-coping measures that affected them in one way or another. An overwhelming majority reported that they received only some emergency relief goods from their union parishads. The institutional survey found that the union parishads did adopt certain other flood-coping measures, although the coverage was limited both in terms of geographical area and number of people served. Data on the number of villages where some flood-coping measure was adopted by the union parishad are reported in Table 5.4.

Most union parishads reported providing some emergency relief during flood. Goods distributed, admittedly in rather small quantities, included rice, flour, pulses, cooking oil, salt, matches and cooked food. There also were attempts by union parishads to provide shelter, supply drinking water and make certain health care facilities available to flood affected people. Supplying drinking water involved both distributing water purifying tablets and raising tubewell levels above flood water. The most common health-related measure involved supplying oral saline to prevent an outbreak of diarrhoea. The union parishads reported that they adopted certain post flood rehabilitative measures as well (see Table 5.4).

5.4 Flood Response of Upazila Parishads

Upazila parishads, like union parishads, were hardly involved in flood preparatory activities. Less than two percent of household survey respondents reported any effect from flood-related measures undertaken by the upazila parishad. The institutional survey also found very little flood preparatory action taken by the upazila parishad. It is to be noted that although the respondents were not immediately able to identify

Table 5.4

Flood-Coping Measures Commonly Adopted by the Union Parishad

Phases	Measure Relating to	Number of Villages Adopting	
		Out of 29 Sample Villages	Out of 47 Extra Villages
During Flood	Provision of Shelter	14 (48)	12 (26)
	Supply of Drinking Water	15 (52)	7 (15)
	Provision of Emergency Relief	26 (90)	45 (96)
	Provision of Health Care Facilities	11 (38)	6 (13)
Post Flood	Repair/Construction of Houses/ Homesteads	14 (48)	9 (19)
	Provision of Health Care Facilities	9 (31)	21 (45)
	Supply of Agricultural Inputs	15 (52)	14 (30)
	Repair/Construction of Infrastructure	14 (48)	20 (43)

Note: The number of extra villages from which data pertaining to the union parishad were available totalled 47.

Source: Institutional Survey

the upazila parishad as the source of services provided by it, the surveyors with their knowledge of upazila parishad's scope of work could generate the relevant information.

There were, however, miscellaneous suggestions for the upazila parishad to become involved in flood preparation. Arranging shelters was the most common suggestion, closely followed by repair and construction of roads and embankments. Over one-fifth of respondents who suggested some measure felt the upazila parishad could arrange for better water drainage. They suggested arranging excavation or re-excavation of canals, and river-dredging. Suggestions were also made to construct culverts and other drainage structures for easy flow of water.

Drainage congestion causes lot of problems in Auliapukur, a village in Chirirbandar upazila, as the railway line runs across the village in an east-west direction blocking drainage of water due to insufficient drainage structures in it. A case study by Md. Jakariya.

Table 5.5 summarizes the preparatory measures suggested for the upazila parishads by the respondents in different flood environments. In the flood environment categories of chars, main rivers and haors/beels, which are vulnerable to deep flooding, respondents mostly wanted shelter from the upazila parishad. In the chars, 62 percent of those who made suggestions wanted shelters, followed by 45 percent in the haor/beel locations and 34 percent in main river areas. In the secondary river, semi-saline and flash flooding locations, the most popular demand was for better water drainage. Another measure, commonly suggested in all categories except the chars, was repair and construction of roads and embankments. With regard to emergency relief, the char residents showed more interest than others. These different results for the different flood environment categories emanate from the distinct geographical and socioeconomic circumstances that characterize them, and policies to ensure more effective flood response should be sensitive to such issues.

Table 5.5

Percentage of Respondents Suggesting Various Preparatory Measures for the Upazila Parishad by Flood Environment

Flood Environment	Repair/ Construction of Roads/ Embankments	Arrangement for Better Drainage of Water	Storage for Crops	Arrangement for Shelter	Arrangement for Emergency Relief
Chars	13	3	8	62	21
Main Rivers	27	15	6	34	15
Secondary Rivers	40	59	2	9	1
Semi-Saline Areas	60	78	0	6	1
Haors/Beels	35	5	7	45	1
Flash Flooding	41	49	1	0	1
Breach Locations	56	16	3	50	2

Source: Household Survey

Table 5.6 shows the most common flood-coping measures that villagers believed should be adopted by the upazila parishad. The most frequently suggested measures included providing health care facilities, emergency relief, shelter and drinking water. Health care facilities were high in demand both during and after floods.

Case studies in beel and haor locations showed that there were few tubewells in those areas. While it might be possible to collect drinking water from those tubewells during the dry season, it became difficult during floods. As a result, many respondents drank beel or haor water during floods, increasing the risk of waterborne diseases. Respondents in these areas indicated quite strongly that they would like to receive water purifying tablets from their upazila parishads.

Table 5.6

Important Flood-Coping Measures Commonly Suggested for the Upazila Parishad

Phases	Measures Relating to	Number of Villages Suggesting	
		Out of 29 Sample Villages	Out of 51 Extra Villages
During Flood	Provision of Shelter	19 (66)	32 (63)
	Supply of Drinking Water	18 (62)	28 (55)
	Provision of Emergency Relief	24 (83)	35 (69)
	Provision of Health Care Facilities	24 (83)	36 (71)
	Supply of Fuel	10 (34)	6 (12)
	Protection of Crops, Cattle and Fisheries Resources	17 (59)	27 (53)
	Protection of Stored Food Items	14 (48)	20 (39)
	Provision of Marketing Services	18 (62)	15 (29)
Post Flood	Repair/Construction of Houses/ Homesteads	20 (69)	31 (61)
	Provision of Health Care Facilities	26 (90)	30 (59)
	Supply of Agricultural Inputs	28 (97)	36 (71)
	Repair/Construction of Infrastructure	24 (83)	33 (65)

Source: Institutional Survey

With regard to fuel supplies, respondents asked for conveniently located sales centers where kerosene, candles and match boxes could be purchased at fair prices. Case studies in the sample villages of Sreenagar upazila (a beel area), show that the wild shrubs commonly used as fuel become extremely scarce during floods, creating a demand for fuel that far exceeds the supply.

Case studies in the Chalan Beel area illustrate the problems people face while caring for their livestock during floods. Farmers in Pakisha reported that fodder becomes extremely scarce during floods, leaving

nothing but water hyacinth for feed. Water hyacinth is not adequate livestock feed, and the cattle often fell sick and died. The villagers have also been faced with a severe shortage of dry space during floods so that high ground refuge for cattle has also been frequently demanded.

Many cattle owners in Pakisha, a village in Singra upazila, located in the Chalan Beel, were found to sell off their cattle before the flood water arrived due to anticipated shortage of refuge and fodder. Not all of them could afford to buy new livestock once the flood water receded. A case study by Abu Al Sayed.

5.5 Flood Response of District Level Offices

During floods the district administration establishes a Flood Control Room and sets up a Flood Relief and Rehabilitation Committee. This committee collects information on flood situations in the different upazilas of the district and also prepares lists of various damages caused by flood. In collecting such information, the district relies heavily on the upazila parishads. The information is passed on to the divisional headquarters, and later to Dhaka, where it is used to design flood-related plans. Although each of the 12 districts (in which the 15 study upazilas are located) received some relief material (mainly food and clothing) from the central government, the amounts were small compared to the needs. Apart from administering governmental relief programs, the district administration on certain occasions took informal initiatives to collect relief items from their own localities. In most cases, the district administration relied on the upazila parishads to distribute relief.

Flood affected villagers suggested many flood-coping measures for the district level offices to perform. Their suggestions would require both direct and indirect involvement of the district administration. For example, the administration could directly provide shelter and emergency relief, while indirectly involve themselves in providing health care facilities and agricultural inputs by coordinating with other relevant offices.

At another level, the Bangladesh Water Development Board (BWDB) has been involved in constructing relatively large scale infrastructure (such as embankments, sluice gates and regulators) in most of the districts. BWDB also adopts certain pre-monsoon preparatory measures, such as reconstructing breached embankments, and repairing sluice gates and regulators. In Jamalpur, Brahmanbaria, Satkhira and Chandpur districts, BWDB was involved in excavating and re-excavating canals primarily through the Food for Work (FFW) program. In Faridpur, BWDB was reportedly involved in planning river dredging with the Bangladesh Inland Water Transportation Authority (BIWTA). The dredging was considered necessary to facilitate drainage and reduce flood frequency and intensity. People's evaluation of various flood control infrastructure has already been discussed in Chapter 4 which should provide some of the criteria in designing and implementing such projects in the future.

The district Local Government Engineering Bureau (LGEB) played no direct flood response role. However, it was involved in some construction, reconstruction and repair of bridges and culverts. These measures, when taken before floods, have acted as flood preparatory measures. Such construction and repair work proved important in post-flood situations as well. In this regard, better coordination with other governmental agencies, such as BWDB and Roads and Highways (R&H), would be desirable.

The flood response activities of the District Agriculture Office have primarily been rehabilitative in nature. Agricultural inputs such as seed, fertilizer and pesticide were distributed to flood affected small and marginal agricultural households throughout the upazilas. Such distribution programs were confined to a limited number of beneficiaries. In most cases, rehabilitative or other extension work performed by block supervisors failed to encompass an effective flood response component. In addition, the flood response activities were not coordinated between the District Agriculture Office and the Bangladesh Rural Development Board (BRDB).

Although flooding created several problems for fish farmers, there was little flood response from the District Fisheries Office. Flood waters created opportunities for open water fishing, but damaged culture fisheries in ponds and other confined water bodies. In all study upazilas except Matlab, which is largely a poldered area, ponds were inundated by floods allowing fish to escape. According to the fisheries offices, many more fingerlings needed to be released in open water during monsoon to enhance the potential of capture fisheries in those areas. Only minor attempts were made to distribute fingerlings to a few fish farmers. The fisheries office could aid fish farmers by raising pond banks and setting up hatcheries to supply fingerlings. In addition, it could coordinate with the Upazila Fisheries Office to formulate and implement relevant credit programs.

Latif, a resident of Goalbathan village in Sarishabari upazila, has become a fisherman from a farmer. He lost all his land due to impoverishment caused by flood. He now fishes in open waters to maintain his large family. He, however, lacks fishing equipment for which he is badly in need of credit support. A case study by Md. Mohabbat Ali.

The Civil Surgeon's Office in each district reported that lack of manpower and other material resources have kept it from effective flood response. Doctors and field workers were few, as were essential items such as water purification tablets and Oral Rehydration Solution (ORS). Besides, there was a shortage of speed boats to move people and supplies fast. Although the resource constraint was limiting, certain measures could have been pursued more vigorously. For example, an educational awareness program could have alerted people to the need and practicality of better sanitation. Such a program could have been coordinated with the Upazila Health and Family Welfare Center (UHFWC) and the union level Family Welfare Center (FWC).

5.6 Flood Response of NGOs and Local Groups

Out of the 15 upazilas covered by the study, 12 were the subject of some NGO activities in at least one of the two household survey villages. However, few NGOs were involved in flood response activities. Only seven of the study upazilas were the subject of flood-related NGOs (serving only eight of the sample villages). According to the household survey, just over three percent of respondents reported that they were affected in one way or another by some NGO-initiated flood preparatory measure.

As was the case with other institutions, the respondents suggested various flood preparatory measures for NGOs as well, which are reported in Table 5.7. This table shows that about a quarter of those who suggested some measure felt that NGOs should arrange for flood-time shelter, and repair and construct roads and embankments. In addition, respondents suggested that NGOs be involved in providing health care facilities and arranging better drainage of water.

Table 5.7

Commonly Suggested Preparatory Measures for NGOs

Measure Relating to	Number of Respondents Suggesting
Repair/Construction of Roads and Embankments	297 (23)
Arrangement for Better Drainage of Water	184 (14)
Arrangement for Shelter	302 (24)
Health Care Facilities	191 (15)

Note: Figures within parentheses indicate percentages of total number of respondents suggesting further measures.

Source: Household Survey

NGOs in the study areas were more active in flood-coping measures than flood preparatory measures. About 38 percent of the household survey respondents reported that they were covered by some flood-coping measure adopted by NGOs, mostly relating to emergency relief and health care facilities. NGOs also were involved in some post-flood rehabilitative measures, such as repair and construction of houses and homesteads, provision of health care facilities and supply of agricultural inputs.

Local groups, such as sports clubs, youth societies and cultural groups, operated in many of the study locations. It is understandable that general socioeconomic development, or flood response activities, was not the primary motive for forming these groups. They often did, however, play some role in mitigating problems relating to severe floods.

In many areas, local groups were the first to provide some institutional support to flood affected people, particularly in terms of emergency relief. In many instances, local groups helped construct small scale earthen barriers to reduce the onrush of water. They also rescued marooned people and took them to public shelters. These groups, which had limited resources, often collected cash and other contributions from the relatively well-off and unaffected households. In the immediate aftermath of flood, some local groups were involved in small scale canal re-excavation. In addition, they provided free labor, and occasionally some credit, to poor people rebuilding their flood-damaged houses. In Sreenagar upazila, a case study on a local group named *Shebak Shangha* indicated that it organized pre-flood preparatory education, sunk tubewells on high land, constructed small bamboo bridges with volunteer labor, arranged boats to rescue marooned people and helped the poor repair their houses after flood. Although these operations were undertaken at a small scale, they are indicative of the possibilities in the given context.

Local groups, which usually consist of zealous young people, could help in educating others to be more effective flood responders. In addition, they could aid in implementing certain programs undertaken by

other institutions. Since these groups are part of the local community, they could become an important asset in implementing flood response programs, particularly if their members receive appropriate training.

5.7 Policy Implications

A comparative analysis of the roles suggested for the neighborhood, union parishad, upazila parishad and NGOs by the respondents could aid in formulating policies on their involvement in an effective flood response program. This analysis is presented in Figures 5.1 through 5.3.

Suggestions of the household survey respondents on two important preparatory measures (reinforcing houses and flood warning) for the different institutions are presented in Figure 5.1. The figure shows that, in general, respondents want neighborhoods and the union parishad more involved in flood warning than reinforcing houses. They felt NGOs, however, could play an equal role in reinforcing houses and flood warning. In contrast, the household survey respondents seem to expect little from the upazila parishad in terms of reinforcing houses and flood warning. Although such responses indicated the respondents' preference to obtain such services from institutions that were close geographically, the institutional survey revealed that they did not preclude the role of the upazila parishad in originating the efforts leading to the delivery of these services.

Suggestions on flood-coping measures relating to shelter and emergency relief are depicted in Figure 5.2. The fact that demand for shelter goes down from the neighborhood to the union parishad, and from the union parishad to the upazila parishad, reflects the preference of respondents to obtain shelter in a place not too distant from their homes. Emergency relief was sought from all institutions, but expectations from the union parishad in this regard was the highest.

In Figure 5.3 the principal preparatory suggestions are shown by flood environment and level of institution. In the chars the respondents have most commonly suggested arrangement for shelter from all institutions excepting the neighborhood, for which flood warning has been the most popular suggestion. In the main river locations, the pattern is somewhat similar to the chars except that the most common suggestion for the NGOs was repair and construction of roads and embankments.

In the secondary river locations, suggestions relating to water drainage were most frequent for both the union and upazila parishads, whereas flood warning and shelter were most often suggested for the neighborhood and NGOs respectively. In the semi-saline areas, water drainage was the most frequently suggested measure for all institutions except NGOs. Arrangement for shelter was the priority from the union and upazila parishads in haor and beel areas, while flash flooding locations most often suggested water drainage measures from the union and upazila parishads. Respondents in the breach locations, however, suggested a variety of preparatory measures from the different institutions.

To make neighborhood-level flood response more effective, an intensive effort should be made by the local government agencies to educate and train up neighborhood groups. Besides, various NGOs and other nongovernmental local groups in rural Bangladesh should be encouraged to organize neighborhood groups to pursue flood response activities. Activities of local groups in flood response has primarily involved relatively young people. Institutional support from local government agencies could channel their sporadic

Figure 5.1
Important Preparatory Measures Suggested through different Institutions

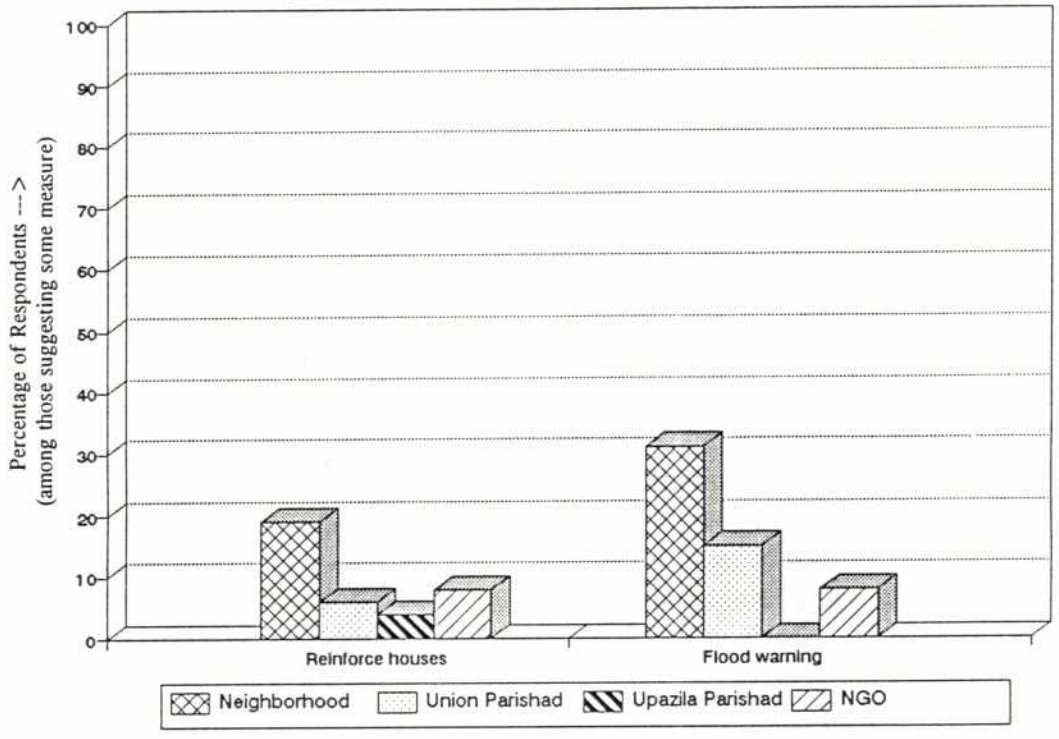

Figure 5.2
Important Flood-Coping Measures Suggested through different Institutions

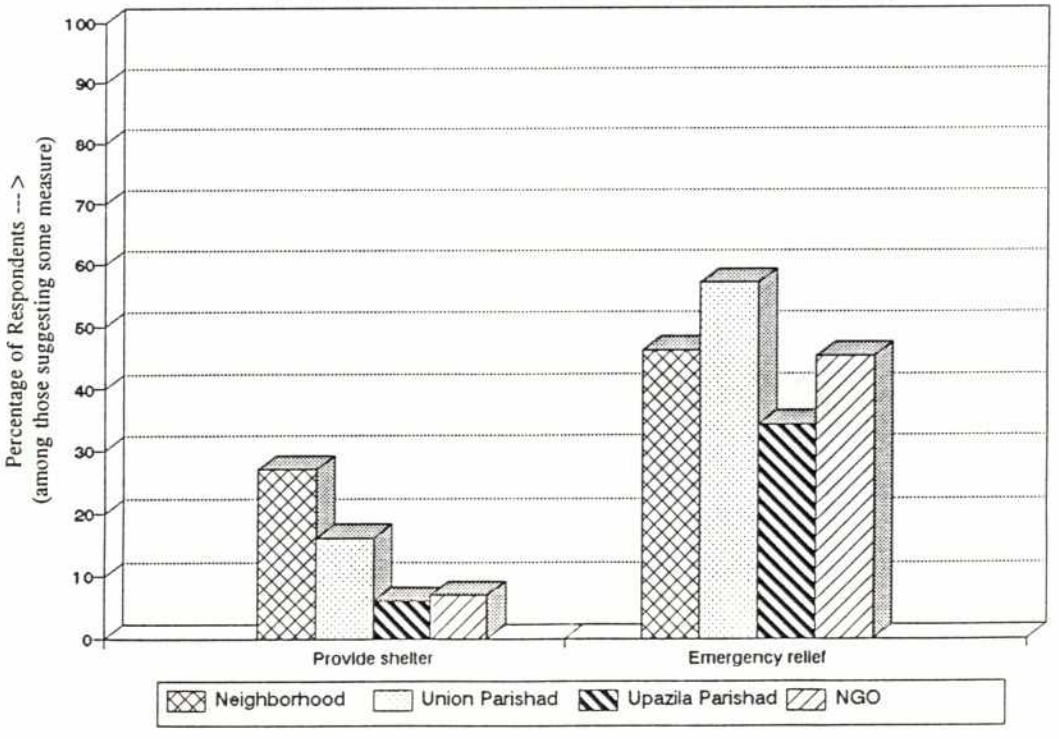

Figure 5.3
Principal Preparatory Measures Suggested (by Flood Environment & Level of Institution)

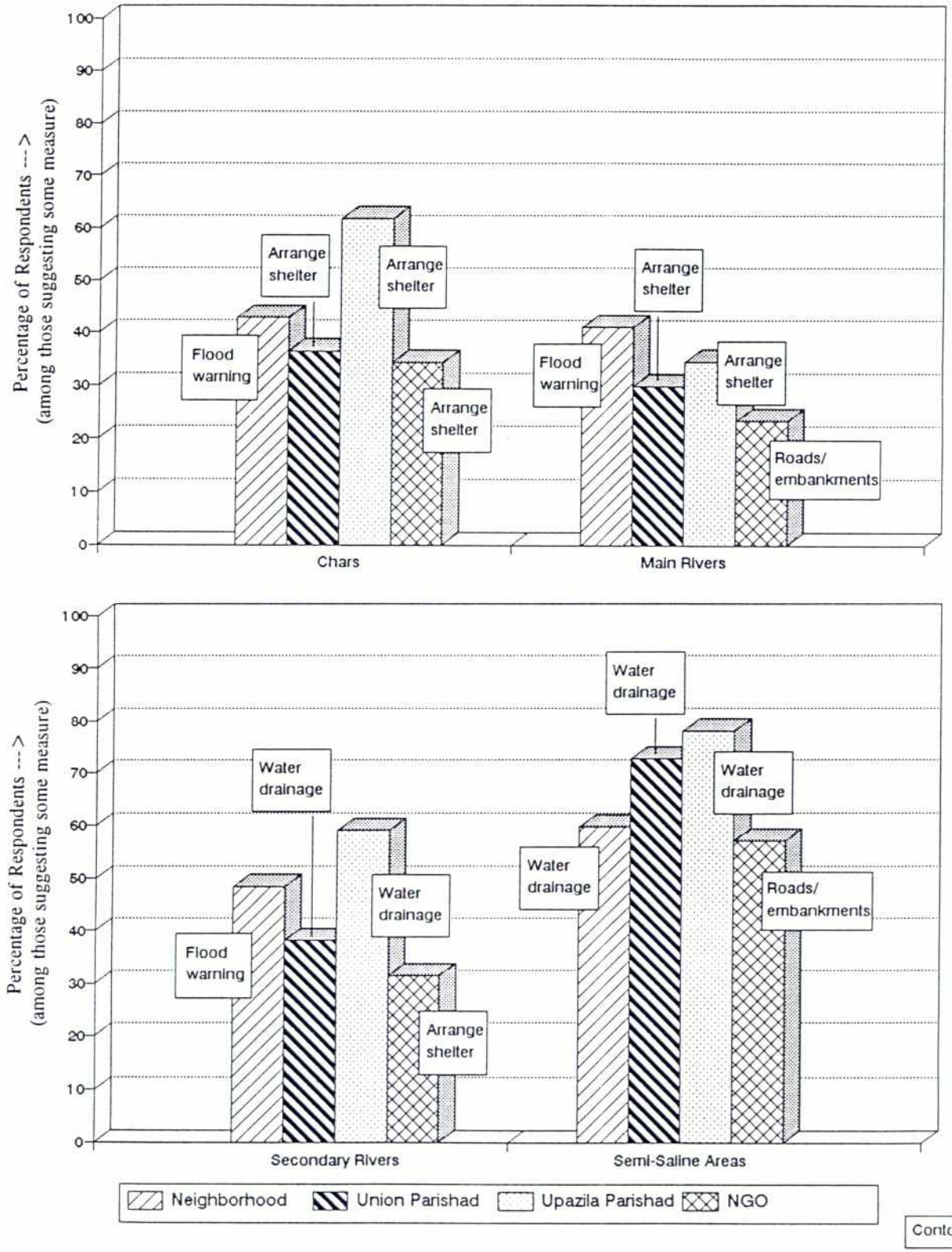

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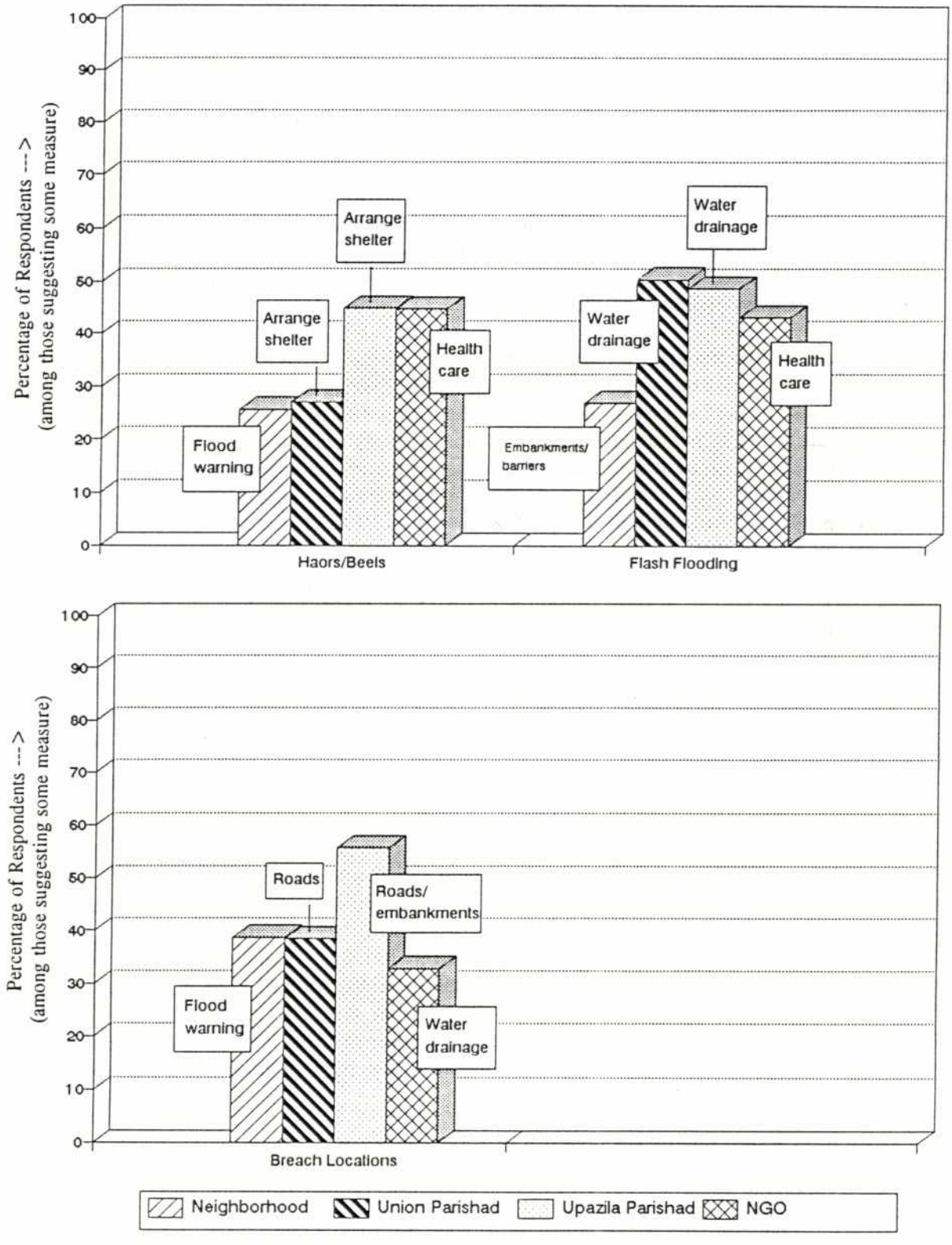
Figure 5.3
Principal Preparatory Measures Suggested
(by Flood Environment & Level of Institution)



enthusiasm into an integrated program of flood response and they could provide a ready source of energetic volunteers. Neighborhood groups need to be active continuously, which would be a more realistic expectation with greater institutional support.

The flood response activities of the union parishad should be coordinated and supervised by the next higher local government institution. In addition, local flood-related infrastructure work (done mostly through FFW) should be designed under regional plans to complement the efforts of individual union parishads toward a goal of effectively tackling a regional flood problem. It has been observed during the field survey that certain union-level flood control activities have created greater flood hazard and drainage congestion in other unions. The union parishads reported that their flood response activities were constrained by a lack of manpower and other physical resources (union parishads have had only limited taxing rights). The union parishads should be mandated and supported by the central government to mobilize local resources in a more comprehensive way. When union parishads can generate more revenue on their own, and begin development projects with that revenue, public demands on flood response and other projects will be more seriously considered.

The upazila parishad could maintain a reserve fund for use in flood time emergencies. In addition, it could maintain boats to rescue marooned people during floods, renting them out during rest of the year. These boats could also be used to assess flood damages and other related problems, an assessment which needs to be sent on to the higher authorities for decisions regarding assistance. This study shows that there was a great need for flood warning as a preparatory measure. Since most of the upazilas were equipped with telecommunication facilities, a mechanism could be developed to quickly transmit flood warnings. The upazila parishad could then inform the union parishad chairman and members, who, in turn, could alert local residents.

The Upazila Agriculture Office, in collaboration with the District Agriculture Office and the extension workers of the Bangladesh Rural Development Board (BRDB), could have created a more comprehensive and well-coordinated post-flood rehabilitation program which could incorporate an efficient supply of agricultural inputs which was earnestly desired by the villagers (see Table 5.6). To enhance such a program, NGOs could also be included. The upazila parishad could encourage NGOs to become more involved in flood response. Some NGOs have already developed interest in these activities through their experience of the 1987 and 1988 floods.

Going further up the administration chain, the district could play a more effective role in flood forecasting and warning. In addition, it could assist the local government bodies in arranging flood shelters, and in procuring boats for rescue operations. The district administration could also help in raising funds from wealthier households to assist flood-affected people. It was observed in the study that better coordination among district administration and other district level offices, such as BWDB, LGEB, Agriculture Office, Fisheries Office and the Civil Surgeon's Office, would be required for both planning and implementing flood response in accordance with the priorities of the flood affected people. Most of the district level offices were not closely coordinated with their counterparts at the local level institutions, thereby producing an uncoordinated and suboptimal effort toward flood response. There needs to be a clearer delineation of duties for these institutions ensuring a continuity in them. Support is also needed to develop further relevant expertise within each of the institutions.

Although there were numerous NGOs in the study areas, few were involved in planned or well-coordinated flood response activities. Their flood response was mainly sporadic aid to poor households

during flood. However, an effective flood response could be developed through a concerted effort among governmental institutions and NGOs. NGO experience in group-based activities including training and credit programs could be useful in this regard. In addition, NGOs could help with such specific activities as excavation or re-excavation of canals, creation of storage facilities and shelter preparation.

Bangladesh Swiss Agricultural Project (BASWAP), an NGO, has built a number of grain storage godowns in Auliapukur, a village in Chirirbandar upazila. The small and medium farmers can store their grains in these godowns by paying small amounts of rent. They are then eligible to obtain credit against the stored grains. A case study by Md. Jakariya.

This chapter indicates that the different institutions were *ad hoc* in their flood response activities. For more effective flood response in the context of overall development objectives, these institutions must collaborate and coordinate to devise and implement various programs and projects. They also must be sensitive to the needs and aspirations of various socioeconomic groups living in areas characterized by diverse flooding conditions.

Chapter 6

HOUSEHOLD LEVEL FLOOD RESPONSE

6.1 Introduction

Flood preparation and the action taken during floods are the primary ways in which households prevent adverse flood impacts and minimize losses. There are several previous studies of flood hazard response in Bangladesh, but these have concentrated on the coastal environment (Islam, 1970, 1971, 1980) or on small areas of the floodplain of the main rivers (Ralph, 1975; Paul, 1984). This study expands on past work by assessing household responses in various flood environments in an effort to understand the potential for local programs to improve flood response. Closed questions covering a range of possible actions were used to gather data. The full analysis on which the conclusions are based is given in the Main Survey Report.

6.2 Flood Preparation

Two types of flood preparation were investigated. The first was preparation for the monsoon in general, preparations which also helped during floods. The most common method was storing fuel. The second was measures to reduce flood losses, such as raising floors and making barriers against floods and erosion.

Table 6.1 shows the most important flood preparation measures taken. Households in the haor and beel areas took the most active measures, particularly by making barriers against floods and wave action, and by preparing boats and raising floor levels. Chars and main rivers also were relatively frequently flooded but fewer preparations were reported. Few preparations were made in the least flood prone environments of secondary rivers, flash flood areas and semi-saline polders. While general preparations were more common in environments where floods remain longest and where there was no flood protection, it is notable that most households do not employ each specific flood related measure in one environment. While some measures may be unnecessary, such as protecting a house not prone to erosion or in a high place, it is likely that resources constrain ability to prepare for floods.

In the dry season men and women in the family including children join hands to raise the level of the homesteads including house plinths. They collect earth from the nearby khal or they buy it. Usually the price varies between Tk 50 to Tk 60 per boat. Preparatory measure like this helps a family to cope with flood better in the haor and beel environment. Case Study from Sreenagar and Sunamganj by Pia Afreena Khaleda Huq.

6.3 Flood Response

6.3.1 Limits to Assessment

Questions were asked about actions taken during three types of floods: normal monsoon, average floods (affecting agriculture and some homesteads), and severe floods (affecting homesteads, defeating normal

Table 6.1

Main Flood Preparation Measures by Flood Environment
(Percentage of Households Doing any Preparation)

Char

- Store fuel (77)
- Store fodder (36)
- Raise fodder level (32)
- Raise house floor (29)
- Make waterhyacinth barrier (26)
- Raise level of food stores (26)

Main River

- Store fuel (80)
- Store food (26)
- Store fodder (23)
- Buy and store household items (23)

Secondary River

- Store fuel (91)
- Store fodder (31)

Semi-Saline

- Store fuel (96)
- Store food (66)
- Buy and store household items (52)
- Store fodder (39)
- Sell grain for want of secure storage (29)

Haor/Beel

- Store fuel (81)
- Make waterhyacinth barrier (52)
- Store food (34)
- Buy and store household items (31)
- Raise level of food stores (30)
- Make soil barrier (26)
- Store fodder (26)
- Sell grain for want of secure storage (26)

Flash Flood

- Store fuel (93)
- Store fodder (29)

Breach

- Store fuel (93)
- Store fodder (32)
- Store food (28)
- Make soil barrier (21)

Source : Household Survey

preparatory measures and threatening life). Recovery actions taken after floods were discussed in relation to agriculture (Chapter 8), gender (Chapter 7) and institutional response (Chapter 5). Coping behavior falls into three categories: shelter and evacuation, actions to meet basic needs, and actions related to agriculture. Because the focus was flood response, few of the measures investigated are common during normal monsoon. One exception is erosion, a major, ongoing problem confronting char households.

6.3.2 Shelter and Evacuation

Wherever possible people prefer to stay in their home; alternative shelter may not exist anyway at times of severe floods. Therefore, building a *macha* (a platform in the house) was the most common shelter and evacuation response, with 29 percent of households building during average floods and 56 percent during a severe flood. The chars were the most vulnerable environment with 81 percent building a *macha* during an average flood. In all but the semi-saline and flash flood areas over 50 percent of households built a platform during a severe flood (Table 6.2, see also Main Survey Report).

Evacuation:
When men are busy dismantling the house and putting the different components together ready for shipment, the women take their pots and pans, plates and utensils and clothes, pots of rice, lentil, oil etc. and tie them all in different pieces of cloth (potla). They are often quarreling with the other family members in the rush that makes them even forget food for a while. Most immediately their thinking centers round the new settlement in the new char which is on the other side of the river.
A Case Study from Char Bhadrashan by Ramen Chandra Sikdar.

More extreme actions are generally uncommon in an average flood, but in a severe flood many households find that a *macha* is insufficient. In the char and beel areas, 26 and 30 percent of households respectively sheltered on boats. Over a quarter of all households, except those in the semi-saline and flash flood environments, said they evacuated in a severe flood. The difference in the semi-saline and flash flood area response reflects the fact that few reported severe flood experience.

House construction affects shelter and evacuation actions, as earth or grass walls, and to a lesser extent bamboo or jute sticks, afford less protection and are more likely to collapse in floods. Fifty percent of those with grass-walled houses evacuated during severe floods compared with 10 percent with pucca houses of brick or tin walls. Earth houses are avoided in the most flood prone environments. For example, grass houses were found to be most common in the chars where there is a lower loss if the house erodes. In the beels and haors, pucca houses were more common (44 and 18 percent respectively).

There was some variation in evacuation behavior between households in different flood environments. Higher land is an obvious destination, but in a severe flood 38 percent of char and 24 percent of main river evacuees moved to embankments, whereas 43 percent of beel and 33 percent of breach location evacuees moved in with relatives. In addition, 31 percent of haor evacuees moved to a higher house in their village. Moreover, char inhabitants tended to move away for longer (mean of 33 days, compared with 22 days across all evacuees).

Table 6.2

Sheltering and Evacuation During Monsoon and Floods

Percentage Households Taking Action During Normal Monsoon

Flood Environment	No. Households	All HH Evacuate	Some Evacute	HH Head Stays	Build Macha	Shelter on Boat	Move House
Char	339	1	1	1	9	3	1
Main River	611	0	0	6	1	0	0
Secondary River	220	1	0	0	13	0	0
Semi-Saline	161	0	0	0	0	0	0
Beel	233	0	0	0	2	0	0
Haor	235	1	2	8	2	0	0
Flash Flood	139	1	0	0	0	0	0
Breach	240	1	0	20	0	0	0
Total	2178	1	0	5	3	1	0

Percentage Households Taking Action During Average Flood

Flood Environment	No. Households	All HH Evacuate	Some Evacute	HH Head Stays	Build Macha	Shelter on Boat	Move House
Char	339	12	2	2	81	18	10
Main River	611	4	3	8	22	0	0
Secondary River	220	10	0	0	17	0	0
Semi-Saline	161	3	0	0	0	0	0
Beel	233	3	0	1	33	12	0
Haor	235	20	24	25	29	3	1
Flash Flood	139	1	0	0	1	0	0
Breach	240	1	3	20	17	1	0
Total	2178	7	4	7	29	5	2

Percentage Households Taking Action During Severe Flood

Flood Environment	No. Households	All HH Evacuate	Some Evacute	HH Head Stays	Build Macha	Shelter on Boat	Move House
Char	339	43	7	4	85	26	14
Main River	611	39	10	16	55	2	4
Secondary River	220	36	5	11	56	3	1
Semi-Saline	161	8	0	1	0	0	2
Beel	233	23	4	11	81	30	1
Haor	235	35	30	29	63	3	2
Flash Flood	139	7	2	0	17	0	0
Breach	240	28	20	31	50	3	0
Total	2178	32	10	14	56	9	4

Source: Household Survey

Although a severe flood was defined in broad terms for households, people most often reported their shelter and evacuation actions based on past experience. Although most households have experienced flooding in the home, the flooding depth and frequency varied between flood environments (Chapter 3). There was a general tendency for those who had been flooded in 1988, and especially those flooded above the roof, to report a higher incidence of evacuation (Table 6.3).

The char land people are accustomed to temporary life style as they construct their houses in such a way that the major components can both be dismantled and mounted back in no time without causing any damage. For example, all the side walls are bound to the corner posts by ropes, not with any nails. At emergency, they just untie the ropes and put them on an engine boat to move to safe locations. A Case Study from Bhedarganj by A. T. M. Shamsul Alam.

It is likely that those households which had not been flooded are not aware of the preparations and responses for severe floods. This implies that emergency planning and information linked to a local preparedness program could be helpful.

Table 6.3

Percentage of Households Reporting Evacuating in a Severe Flood Relative to Depth of 1988 Flood in Home

1988 Flood Depth	Char River	Main River	Secondary River	Semi-Saline	Beel	Haor	Flash Flood	Breach
Not Flooded	71	4	12	2	10	32	1	4
Above Floor	28	38	46	14	25	33	27	34
Above Roof	50	83	50	-	0	90	-	100
Total Percent	42	39	36	8	23	35	7	28
Percentage of all households in each depth category:								
Not Flooded	16	12	30	54	9	10	76	23
Above Floor	52	78	68	46	88	86	24	76
Above Roof	32	10	2	0	3	4	0	1
No. Houses	321	611	219	160	233	235	139	240

Source: Household Survey

6.3.3 Basic Needs

Basic daily functions such as obtaining safe drinking water, selling produce and buying necessities become more difficult during the monsoon, and critical during floods. Yet, employment becomes a greater problem during flooding. The chars, beels and haors are the three environments with the most extreme seasonality in agriculture and employment due to prolonged and deeper normal monsoon water levels. In these three environments, about 18 percent of households reported someone taking temporary employment during normal monsoon. During a severe flood the numbers fell to about eight percent.

Most households used a tubewell for drinking water in normal circumstances, but many depended upon a neighbor's well (52 percent of the households in the follow-up interviews with women). In general, few households store pure water or use a distant water source any more during severe floods than they do during a normal monsoon. In the haors, however, over 50 percent of households stored pure water or used distant sources during an average or severe flood. Cooking also is affected during floods (see Chapter 7) since fuel is less available and often wet. And, because straw and leaves are used as both fuel and fodder, households must choose between the uses of these scarce resources during floods.

Few households reported changing daily functions such as storing water, or employment or business activity according to flood experience. One difference was in the semi-saline areas where over 50 percent of those who had been flooded said they stored water, used distant water sources and conducted trade activities during floods. However, larger landowners generally were more involved than others in selling and buying goods during floods. Such action is consistent with their being the beneficiaries of widening inequality during floods. It was revealed in the Gender Study that less-affluent groups suffered most during floods. Seventy-one percent of the women reported that they had suffered serious damages or losses due to flooding in the last 10 years (see Chapter 7). Two-thirds said they went into debt because of flood losses.

6.3.4 Farming and Fishing

Farming and fishing are important to more people than those for whom these are main occupations. Table 6.4 shows the initial types of agricultural and fishing actions people take during floods.

Although the main agricultural response to flooding is in cropping pattern and timing of operations, the surveys showed that a substantial proportion of farmers harvested their crops before they were fully ripe if there was a flood. Such action is usually associated with boro harvest and takes place in the beel, haor, flash flood and secondary river areas, where floods have a relatively quick onset and threaten crops near harvest time. The fact that some farmers do harvest early implies that some advance flood warning is currently available. A better warning system, however, might help more farmers take action. It should be noted that Table 6.4 includes a high proportion of nonfarm households, and therefore does not accurately indicate this action among farmers alone. For example, 69 percent of farm households in the haors harvested early in an average flood.

During severe floods people need to move their stored grain and cattle as well as themselves. Households with stored grain in the chars, flash flood and breach locations, however, often lack the time to move it during flash floods. Moving cattle is often related to whether some or all the family members also leave the home. Again, in flash flood locations, there is usually little time to move cattle during floods. For

households in other environments, such as beel and possibly haor areas, there may not be a place to which cattle can be moved. All cattle in the char areas, however, are moved during a severe flood.

Because the dry season marks the intensive commercial fishing period, the monsoon might be considered a less important fishing time. But, Table 6.4 shows that during normal monsoon a very high percentage of households fish for their own consumption. Consumption fishing, however, declines during severe flooding when access to fishing areas may be difficult and when safeguarding property becomes more important. Severe flooding therefore greatly stresses poorer households who depend on catching fish from a public source, as well as jeopardizing the daily income to commerical fishermen.

6.4 Erosion Response in Chars

Erosion is a serious problem often associated with floods along the banks of the major rivers, especially the Jamuna, or in chars. (Elahi *et al.* 1991; Haque and Hossain 1987). The Riverbank Erosion Impact Study (REIS) recently found that bank erosion is taking place in about 50 districts of Bangladesh, and that in 35 upazilas it is severe and recurrent. (Elahi 1991:4-5) Unlike flood, which may recede and return land to its owner, erosion causes permanent loss and thus usually results in displacement and catastrophe for as many as one million persons annually:

> For the majority of the displacees, their land and livestock are the sole sources of livelihood prior to displacement. Once these are lost through displacement, few are able to readily rebuild these dimensions of their network without external assistance. (Rogge 1991:232)

Abdul Hye shifted his homestead ten times during the last twenty one years due to river erosion that often compelled him to change his profession. The grocery he was running was lost to the river. Now he is back again in agricultural work. His struggle continues still. Chronology of erosion and resettlement of Abdul Hye's family is as follows:

Year of Erosion	*Place of Settlement*
1969	*Partial erosion of village Shibsen; shifted homestead to the northern side of the village.*
1973	*The village fully eroded; shifted to Burujbari of Munshigonj district.*
1975	*Burujbari eroded; shifted to Borokati of Kachikata Union.*
1977	*Shibsen emerged partly; return back to Shibshen.*
1981	*Shibsen started eroding again; moved back to Borokati.*
1987	*Partial erosion of Borokati; shifted to the other side of the village.*
1988	*Borokati fully eroded; shifted to Monirabad of Naria.*
1989	*Monirabad eroded; shifted to Char Algi.*
1989	*After two months Char Algi eroded; shifted to Boyalmara.*
1989	*Boyalmara started eroding again; return back to Char Banades of Shibsen mouza.*

A Case Study from Bhedarganj by A.T.M. Shamsul Alam.

The river chars studied in this project are prone to both deep flooding and erosion. Because population pressure has forced increased settlement of these lands, this particularly vulnerable flood environment was emphasized in the final round of surveys, which offered an opportunity to ask questions about erosion in four char villages (see Appendix C).

Two of the villages, both in Char Bhadrasan Upazila, were particularly affected by erosion. In one, Gopalpur, 93 percent of households surveyed had taken shelter in another village for over 10 years. Most of those who had migrated had only returned to the char in recent years. In the other, Char Salehpur, about 50 percent had moved away for less than five years. In addition to migration, households frequently move within the village. On average, each household in Gopalpur and Char Salehpur had moved more than once within their village (less than a mile) in the last 10 years. Asset losses and damages were reported to be higher from erosion than floods. Between 1985 and 1991, the sample char households suffered an average loss of Tk. 4,890 to homestead property. Responses to erosion were to move houses (46 percent), move property (67 percent) and move cattle to embankments along the riverside or, in a few cases, sell them. Households reported that there was little opportunity to save crops. These findings are similar to those of the REIS study (Elahi *et al.* 1991).

Suggestions to reduce erosion losses differed between the two upazilas. In Bhuapur, bank protection was the main suggestion, while in Char Bhadrasan, moving and/or selling trees threatened by erosion was suggested. Individual responses are limited by access to resources, markets, lack of warning and transport problems (such as shortage of engine boats). Obviously, help with temporary shelter could help when households are forced to move, but because erosion results in longer term moves, assistance with employment and resettlement also would help.

6.5 Conclusions on Flood Coping

Few households need to take specific action during a normal monsoon since crops, settlements, and local economies are already adapted to these conditions. Obtaining water from distant sources, redrying grain and engaging in subsistence fishing are actions that may be termed normal. Behavior during average and severe floods is associated with flood environment, household flood experience, severity of the flood experienced and, to some extent, on the household's socioeconomic characteristics.

Overall, individual household experience of flooding influences behavior, and it is presumed that those with more experience described more accurately what people do during floods. However, behavior is also affected by the absolute severity of the flood experienced and, it is clear, that in different environments there will be different expectations and probabilities of severe flooding. In areas where many households have been flooded, even those without direct experience have similar behavioral expectations to those with experience. But, where severe floods are unusual, those without direct experience appear to expect to respond differently.

Table 6.4

Agriculture and Fishing Responses During Floods

Percentage Households Taking Action During Normal Monsoon

Flood Environment	No. Households	Harvest Early	Move Grain	Redry Grain	Move Cattle	Buy Fodder	Subsistence Fishing	Fish to Sell
Char	339	2	7	43	2	11	71	36
Main River	611	2	4	42	1	9	51	7
Secondary River	220	1	0	7	1	7	39	2
Semi-Saline	161	1	3	71	1	11	67	14
Beel	233	6	21	43	1	12	76	28
Haor	235	8	9	36	4	11	47	12
Flash Flood	139	1	1	23	0	2	31	3
Breach	240	2	1	13	0	12	51	6
Total	2178	3	6	36	1	10	55	14

Percentage Households Taking Action During Average Flood

Flood Environment	No. Households	Harvest Early	Move Grain	Redry Grain	Move Cattle	Buy Fodder	Subsistence Fishing	Fish to Sell
Char	339	14	14	44	18	18	65	38
Main River	611	10	9	47	7	14	47	6
Secondary River	220	18	6	13	9	7	40	2
Semi-Saline	161	1	34	73	6	12	67	15
Beel	233	29	35	50	6	15	73	28
Haor	235	49	37	52	17	21	37	14
Flash Flood	139	19	1	24	0	2	31	3
Breach	240	5	5	13	4	13	45	6
Total	2178	17	16	41	9	14	51	14

Percentage Households Taking Action During Severe Flood

Flood Environment	No. Households	Harvest Early	Move Grain	Redry Grain	Move Cattle	Buy Fodder	Subsistence Fishing	Fish to Sell
Char	339	9	14	32	37	18	43	27
Main River	611	17	32	54	30	19	36	5
Secondary River	220	31	20	25	32	10	34	6
Semi-Saline	161	1	35	74	23	14	32	2
Beel	233	31	57	55	17	15	65	22
Haor	235	46	44	44	23	22	6	3
Flash Flood	139	43	4	40	7	13	7	1
Breach	240	13	17	22	25	16	44	5
Total	2178	22	29	44	27	17	35	10

Source: Household Survey

This study compares some of the actions people tend to take before and during a flood event with normal daily routine. In planning specific flood response and proofing programs, the choice and design of interventions might be guided by asking people what they did in recent floods and how they evaluate their own actions.

It was found that:

- Flood preparation occurs relatively less in chars and main river areas, and may be limited by resources.
- Evacuation is most common in chars and haors, where flooding tends to be more extreme. Char households tend to move to embankments for long periods of time, while those from haors go to higher houses nearby for shorter times.
- The actions people said they take during severe floods reflect their past experience of flooding.
- Most households that are severely flooded face difficulty maintaining basic needs and suffer a much poorer quality of life. Severe floods usually add or worsen work for women who are responsible for activities most affected, such as obtaining water and cooking.
- There are limited employment opportunities and few household members find temporary employment.
- Some wealthier households may be able to take advantage of trading opportunities created by floods, but, for the majority, assets are likely to be sold or mortgaged to meet basic needs.
- Erosion is a particular problem in chars and results in long-term displacement and asset losses. Char houses tend to be low cost and few households have resources needed to cope with floods.

The results point to the following priorities for flood response and/or proofing programs:

- Improve and provide shelter in highlands or along modified embankments, particularly for char dwellers. Shelters obviously should have access to adequate supplies of good drinking water. Local homes in the haor and beel areas could be strengthened and raised. Access and boat sharing arrangements deserve more attention.
- Warning systems should be available, particularly in areas where floods are infrequent such as within projects where erosion and breaches are a risk. Households in such locations are least likely to take appropriate protection measures compared with those with frequent severe flood experience.

- Give advance warning to facilitate early harvesting where possible, and to move livestock and grain. Moving cattle is particularly important in the chars, and early harvesting (mainly of boro) is important in beel, haor and flash flood locations.

- Increasing the purchasing power of the poor during a flood crisis may be the most efficient method to bring in resources from other regions. Access to local public resources, such as fuel, fodder and fishing, becomes difficult and critical during floods and may be a factor behind distress sales. Such sales are only partly addressed by special flood credit programs targeted at the poor.

- Additional low-cost appropriate technology studies may suggest the need for portability and flood proofing in terms of resources such as cooking stoves, raft construction and grain drying.

Some of these issues were investigated in terms of respondents' priorities of flood impact mitigation measures in Chapter 4.

Chapter 7

ECONOMIC AND SOCIAL SIGNIFICANCE OF FLOOD FOR THE RURAL HOUSEHOLD: FINDINGS OF THE GENDER STUDY

7.1 Introduction

A family's flood experience is much influenced by the social and economic resources available to it. Adults, especially women, find their routine work becomes more and more difficult. Loss of key assets might result in long-term economic decline.

The purpose of this chapter is to provide insight into the ways in which flood affected the rural household in its village context, and to consider any specific gender issues in flood or its mitigation. This chapter first will discuss female and male responsibilities in the homestead, the sexual division of labor, and the implications for work during floods. This will be followed by a description of the social resources available to and used by study households, either male-headed or female-headed, and an overview of the economic responsibilities of senior women. Next will come a discussion of some important economic resources available to study households and the risks posed by recent severe floods. The chapter ends with a summary of case study materials and recommendations for program and policy development.

7.1.1 Gender Study Methodology and Data Sources

Findings presented in this chapter are based on the FAP-14 Household Survey and case studies, Gender Study questionnaire interviews, field observations, and a literature review. Gender Study interviews were done with 86 women in seven study villages. These interviews were done with a sample that was intentionally focussed on female-headed households. In selecting the sample, 28 women, including all female heads of household identified in the FAP-14 samples of five villages, were interviewed. Fifty-eight other women, not household heads but all either wives or mothers of male household heads, were interviewed. In most cases, women in households already covered by the wider survey were interviewed so as to take advantage of background information already collected. Also, only senior women were interviewed, those assumed to be active participants in family decision-making and thus most likely to provide pertinent information in a small study. Table 7.1 describes the gender study population by flood environment and village, family position, and landless percentages.

The villages selected for interviews were located in the northeast, north central and northwest FAP regions. They included one beel village, Gadighat; two haor villages, Muradpur and Fenibeel; two in the floodplain of the Jamuna River, Baraitali and Shanakoir; and two char villages, Shibsen and Jangipur. Except for Shanakoir the villages chosen were all relatively remote and flood prone sites.

7.2 Sexual Division of Labor in the Homestead

In a clearly differentiated gender system such as this one, the work of the two sexes was highly interdependent. If either women or men did not perform their duties the total production process would not occur. A basic distinction was who had responsibility. It was found that the existence of purdah need not preclude women from taking responsibility for all sorts of work. (Abdullah and Zeidenstein 1982:22)

The Gender Study collected detailed information on sexual division of household labor. Table 7.2 presents findings on some specific tasks done by males and/or females in sampled households, along with supplementary information from some other reports. As the division of labor has been carefully researched by others, this study has not attempted to make a full investigation of the topic[15].

7.2.1 Work of Males and Females in Flood

Much of the work listed in Table 7.2 was likely to be affected by flood in various ways. For example, some tasks, such as plowing, planting, and crop irrigation or plant watering, ceased during floods. This category included many tasks customarily performed by adult males. Some other tasks, such as open water fishing, were likely to be problematic during flood. A third category included family and homestead maintenance tasks, work that was an essential part of flood coping. Maintenance tasks became extremely difficult, sometimes nearly impossible, during floods. For adult men, this category included marketing and business. If either men or women depended on wage labor or other income-producing activity, as many did, these activities might cease during flood, or even during a strong monsoon rain, and seriously threaten the family well-being. Gathering fodder could pose another serious problem if stored supplies empty during floods.

Many of the typical responsibilities of adult women, such as cooking, obtaining drinking water and animal care, fell into this third, required-but-difficult category. During nonflood times, fuel was gathered by some male and female teenagers as well as young adult women. It was notable that tasks usually performed by children or teenagers (getting fuel or drinking water, for example) might be taken over by adults during flood because they became too difficult for children at these times.

Interviews conducted at a main river village (Goalbathan, in Jamalpur District), on the topic of men's responsibilities in flood, showed that they are expected to build rafts and platforms. They also gathered fuel and fodder, and conducted the marketing. Such activities might require the men to venture out into fast-moving flood waters. Men reported being troubled by price increases that occurred during floods, the cost of renting space on boats, and having rice husked by owners of diesel-powered huskers. Men and women both cared for animals in flood.

In the Sunamganj haor area men and women worked together to build the mounds (*bhiti*) on which homesteads are built, but women did most of the repairs. In addition, women repaired[16] and replastered the house after the monsoon. This, along with their responsibility for drying and storing grain, and redrying it after flood, indicated the kind of interests they might have in programs directed to recovery from flood. The Main Survey Report presents further details on sexual division of labor.

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[15]Some basic sources are: Safilios-Rothschild and Mahmud (1989), Cain (1977), and Cain *et al.* (1979).

[16]T. Abdullah, personal communication about Sunamganj observations. (August 1992)

Table 7.1

Gender Study Sample: Women Interviewed

Flood Environment	Village (Upazila)	Total Women	Female Household Heads	Senior Women in Headed Households	Percent Landless
Char	Shibsen (Bhedarganj)	20	5	15	65%
	Jangipur (Bhuapur)	9	2	7	55%
Subtotal		29	7	22	62%
Main River	Baraitali (Dhunat)	20	8	12	60%
	Shanakoir * (Sarishabari)	5	3	2	80%
Subtotal		25	11	14	64%
Beel	Gadighat (Sreenagar)	8	2	6	25%
Haor	Muradpur (Sunamganj)	20	5	15	70%
Flash Flood	Fenibeel * (Sunamganj)	4	3	1	25%
Totals		86	28	58	59%

* Pre-test interviews, used together with others if possible.

Source: Gender Survey

7.2.2 Women's Role in Agriculture and Fishing

Information on sexual division of labor spoke to the question of women's role in production, and highlighted the need to avoid stereotypes about the lesser economic significance of their work compared to men's. The range of agricultural tasks done demonstrated that women were much involved in agriculture. Contrary to usual patterns, a few FAP-14 female-household heads even did agricultural work on their

own[17]. Expanding the meaning of agriculture to include more than just rice cultivation and animal husbandry further strengthened the concept of women's agricultural production role. In its broadest sense, agriculture included animal husbandry, food preservation, and homestead cultivation of fruits and vegetables, along with field cultivation and harvest of staple crops. One important, but not often recognized, female responsibility in crop production was the storage and testing of seed grain (Abdullah and Zeidenstein 1982:24,30). This work was very often affected by flood.

Safilios-Rothschild and Mahmud found that "...Livestock ownership seems to often fall in the women's domain." Cows, goats and poultry were owned mainly by women for extra income. In addition to owning livestock, women in poor households tried to supplement their income by taking in goats and, less often, poultry, from better-off families on a share basis. In such an arrangement, the owner and the keeper shared the offspring equally (Safilios-Rothschild and Mahmud 1989:13; reference to Lily 1987).

Fishing, along with agriculture, is another area of economic production critically affected by flood in which women's role was often underestimated. Lily and Bhuiya (1989) did a national study on women in fishing. Their findings indicated that female productive activity paralleled those of others in agriculture. Professional fishing used to be the exclusive occupation of certain groups of Hindus, but now is being performed by Muslims and other Hindus. Although fishing activities were not prestigious, Lily and Bhuiya report that "...People in the fishing community feel that if the prevailing situation continues, in future women may get involved in fish capturing and selling in the same way as in agriculture" (p. 27). This would represent a relaxation of purdah standards (discussed below).

7.3 Household Composition

There were some important distinctions in household size and structure. As shown in Chapter 2, the mean household size in the FAP-14 study population was 5.79 persons, with some variation among socioeconomic groups. More affluent families tended to be larger than poorer ones.

Q: Who is the head (malik) of your household? A: I am. Q: What are the responsibilities of the head? A: To make important decisions - about purchasing lands or cattle, or to build a house. Q: Will your son become head someday? A: Yes, when I die. Well, maybe sooner, since we talk everything over and make our decisions together now. Interview of an elderly Sarishabari area widow whose married son is 28 years old, by S. Hanchett.

An important structural fact was whether a household is headed by a male or a female. According to estimates based on national studies (Hamid 1992b:119 and BBS 1989:202)[18], between nine and 16 percent of all rural Bangladesh households, and possibly as many as 25 percent, were female-headed.In the FAP-14 Household Survey of 30 villages, four percent of all households (n=87) identified themselves as female-headed. The Gender Study survey included interviews with 28 female

[17]These households were part of the Household Survey but were not in the group interviewed on household division of labor. They are headed by four women who either cultivate their own lands themselves (n=2) or take in land as sharecroppers (n=2). These four are in Singjala, Kamaldia, and Rampur Villages. Seven other female household heads who indicated their occupation as "agriculturalist" give out their lands to sharecroppers/renters.

[18] For a justification of the larger estimate, see Safilios-Rothschild and Mahmud 1989:x.

household heads (most of whom were already in the original survey group[19]). Female-headed households (FHH) were usually distinguished into two types: *de jure* or *de facto*[20]. *De jure* FHHs (23 households) were headed mainly by widows or divorced women who had full legal responsibility for their families and property. In *de facto* FHHs (five households), women were currently married but managed affairs of the home without their husbands' assistance.[21] In the five *de facto* FHHs, the husband typically worked afar and sent back support. The infrequency of remittances, however, suggested that this source of support might be inadequate to sustain the family remaining in the village. FHHs in the FAP-14 Household Survey were smaller on average than other households (3.4 *vs.* 5.8 persons).

The composition of the female-headed household was found to be generally quite different from the male-headed. In comparing the two groups in the Gender Study, it was found that the subnuclear (single person, single parent, or sibling pair, e.g.) or supplemented subnuclear (subnuclear plus an aged parent, e.g.) family was the mode for female-headed households(n=18, 64 percent). Whereas, the nuclear or supplemented nuclear family was the mode for male-headed households(n=46, 80 percent).

7.4 Kinship and Other Social Supports

Social supports from family and other relationships were extremely important in crises such as severe flood. This section will report how women interviewed for the Gender Study describe some social resources, the organization of the households themselves, and the ways in which household members used social resources during recent severe floods.

7.4.1 The Extended Family

Half of the 86 women interviewed had both their own and their husbands's relatives in the same village. Only five women lived in places where they had no relatives. In non-char villages, families had been in the same village for a median of two or more generations. In the more recently formed chars, however, the median was less than 10 years. Comparing female household heads and women in male-headed households there was a slight tendency for female heads to be attached to more secure established families. On this point, the women living near their husbands' relatives seemed to be no different from those living near their own relatives.

For those not living in the place where they grew up, the mean distance to the natal village was 8.25 miles. The mean time since the last visit was two years. Thirty-five percent of respondents said they owned land in their natal place.

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[19]The discrepancy between the four percent FAP-14 FHHs and national percentages of nine to 16 percent or more is probably due to stratified sample selection biases.

Background information from the general FAP-14 Household Survey was considered on 19 of the 23 female-headed households covered in the Gender Study.

[20]Islam (1991) distinguishes five types of FHH.

[21]Twenty-four of the 28 Gender Study FHHs were covered in the larger FAP-14 Household Survey.

7.4.2 Participation in Other Local Groups

Several FAP-14 study villages had rural development programs and other voluntary associations. Women were asked whether or not the males and females of their families participated in any local groups. The types of groups joined (with numbers of individuals participating) were:

Males	Females
Youth Club(2)	NGO Project/Group(3)
Other Club(1)	Religious Group(1)
Political Party(1)	Credit Association(2)
NGO Project/Group(2)	Unknown(1)
Credit Association(3)	

As mentioned in Chapter 2, there were several non-kin groups in each Bangladesh village, the most basic of which are factional (*samaj*) groupings. These were likely to be very important in crisis, but accurate information about these rural structures cannot be obtained through questionnaire surveys or even short-term rural appraisal studies. This is because of the fluid, possibly even volatile nature of relationships and the reluctance to discuss local politics with outsiders.

7.4.3 Uses of Social Support Networks in Flood

FAP-14 case studies and reports from other sources showed that the existence of kinship and other social networks did not guarantee their availability in crisis. For example, during a drought in Gujarat State, India, Chen (1991) observed that as the situation worsened and reserves dwindled, the circle of friends and relatives shrank. That is, social support networks contracted to a minimal scale as the capacity to help others declined. Similar observations were made in studies of the Bengal famines of 1943 and 1974 (Greenough 1982 and Sen 1981). During those famines, the nuclear family sometimes disintegrated, husbands abandoned wives, and parents abandoned children. Sen pointed out that the capacity to withstand or, more importantly, recover from such crises was as much a matter of a family's economic strength and power as the physical difficulty itself.

Nonetheless, a family did have certain rights to claim support, especially from relatives. Other studies referred to relatives as a source of assistance, such as for credit, during floods (e.g., Hossain *et al.* 1987:35). In Chapter 6 relatives were mentioned as sometimes providing refuge when families evacuated during flood. Relatives were listed as third in a sequence of resettlement options sought by displaced persons interviewed in the FAP Study 23 on flood proofing. Those options were: (1) nearby settlement, (2) a city, (3) relatives, (4) a landlord (service to), and (5) newly purchased land. (James 1991:12)

When asked whether they had sought help from others during their most recent flood crisis, more than half of Gender Study respondents (44) said they had. Slightly more than one third of these relied on assistance from relatives. Nearly half of the rest relied on either neighbors or others. A smaller group (16 percent) depended on wealthy people.

7.5 A Note on Purdah

Because of the purdah standard, living in public view during floods could burden women with shame or loss of self-respect. In Muslim society generally, and also in much of the Hindu society of central and

northern parts of the subcontinent, the concept of purdah was central to gender relations. Purdah literally means curtain, referring to partitions in the home and veils covering women in public. Correct behavior was said to bring honor (*izzat*) to one's family, while deviations brought shame (*shorom* or *lojja*)[8]. Blanchet described the comparative flexibility of purdah in Bangladeshi rural villages:

> Purdah, as an Islamic norm which secludes women because of the moral danger promiscuity represents in a society of men, is secondary here. In rural Bangladesh, the physical seclusion of women from men is relatively relaxed inside the compound. The category of village *bhai* (brother) who can enter freely is also quite extensive. Fictive brotherhood allows many men to meet unrelated women. On the other hand, we can see how women are very effectively deterred [by threats of danger to their children's and their own health, for example] from entering a world which is defined as "outside". (1984:119, *sic.*)

Class and age significantly affected the patterns of purdah behavior. In Bangladesh purdah always has been variably observed by women of different socioeconomic classes, according to Feldman and McCarthy (1983). It also varied according to the female's stage of life, being most strongly observed during a woman's reproductive years, but relaxed considerably for prepubescent girls or women past childbearing age[9]. According to Blanchet (1984:142) there were further exceptions: "Widows are noticeably freer to move around. Also, abandoned women who have had children and have no chance to be married again observe a much more relaxed purdah."

Mamata lost her house in the flood. She used to live on the bank of the Pungli River, but her house was washed away by the flood water. She then went to live on an embankment with her ten-year-old son. She built a bamboo platform there for them to live on, and they stayed on it for one month. She put a mosquito net with some paper around the platform to maintain her purdah. - From a report on the 1988 flood in Tangail District, by Rozana Akhter.

Regarding paid employment, which was important to large numbers of rural women, purdah was sometimes thought to preclude the possibility. But, many commentators have shown that standards of modesty and decorum can be maintained in various ways in the work place. Besides, more and more women have to seek employment outside the home even if it entails flagrant disregard of purdah traditions, as Begum (1988), Jahan (1989), Chen (1986), and many others have pointed out. In brief, it was generally agreed that attitudes toward women working outside the homestead were changing rapidly (World Bank 1990:89.)

[8] In The Quiet Revolution Marty Chen describes ways in which traditionally oriented men of elite groups try to control women's comportment, especially poor women's, by complaining publicly in village council meetings that they are acting shamefully when they go outside of their homes to seek work. See also Adnan (1990:11) and others on this point.

[9] If a girl is married before puberty, she may be expected to maintain purdah restrictions despite her young age, as one field interviewer in Chhoto Bashalia Village (Tangail) has observed in the case of one child bride aged 9-11. (Rozana Akhter, personal communication)

7.6 Economic Responsibilities of Senior Women

Eighty-three percent of Gender Study *de jure* female household heads either fully (n=16) or partially (n=3) supported themselves. Seven were supported either fully (n=6) or partially (n=1) by their sons. All five of the *de facto* female household heads said their absent husbands were their primary sources of support. Two, however, did wage labor partially to support themselves[10]. Women in male-headed households, as might be expected, were mainly (83 percent) supported by their husbands, and 16 percent (n=9) were supported by their sons. Some women in male-headed households, however, also contributed to family income.

Support from absent family members seemed to be an important lifeline, especially in Baraitali and Shibsen villages, where approximately half of all women interviewed said that either husbands or sons were living away from home in search of work. In one Shibsen household, the female head herself was working away from home. Three (15 percent) Muradpur women interviewees mentioned absent household members, as did one (13 percent) from Gadighat.

[In the 1988 flood] Nahar was especially anxious about the safety of her cows and goat, which were her only source of income. She was paying for her son's education by selling their milk. -From a Tangail District case study, by Rozana Akhter.

Nearly half (n=42) of all the women interviewed, either currently married or not, said that they were fully or partially responsible for the economic support of themselves and/or other persons. Twenty-nine women supported between one and eight adults or children in their own homes (mean of three). Twenty-three women supported either children or adults elsewhere (mean of two). Women supporting themselves and/or others ranged in age from their early to mid-20s (21 percent), through their 30s (21 percent), to their 40s and older (57 percent). In the 23 *de jure* FHH households, 15 women (65 percent) supported others, but only 10 of them carried full responsibility. Of the five *de facto* FHH in the study, three supported others, but only one had full responsibility. Of the 58 living in male-headed households, seven (12 percent) contributed to family income, but only one had 100 percent responsibility. Those with the greatest responsibilities were female heads living in subnuclear households typically as single parents supporting their children and sometimes an aging parent. The 20 female household heads who supported others have responsibility for an average of 3.5 persons each.

Land and paid employment were the two keys to women's own survival and fulfillment of their responsibilities to others. All of the women who supported themselves and others had either paying jobs or land, or both. One exception was five women who said they supported others but not themselves--women who relied on their sons's or husbands's employment rather than any employment or lands of their own. Their statement of responsibility, however, should not be discounted lightly, as it may well reflect contributions they make to family income that were not reflected in these interviews.

Twenty-nine percent (25 women) of the 86 women interviewed earned income from their labor[11]. All but one were the only income-earning females in their households, although most husbands of married women also earned some income. Slightly over half of employed women (n=14) lived in subnuclear

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[10]One said a sister (or possibly a husband's sister) contributed to her support.

[11]This number does not include all employed females in study households.

households, while most others (n=10) lived in nuclear households[12]. Sixteen (64 percent) were *de jure* female household heads; two (eight percent), *de facto*[13]; and seven (28 percent) were wives of male household heads. Gadighat (a beel village) was the only village in the study where no respondents pursued wage labor, although two Gadighat women, both female household heads, fully supported themselves and others with land holdings[14]. Four (16 percent) said they were unemployed.

Q: Do women have any special problems with their housework during the rainy season? A: We can't get work at that time, so we can't get food. Road repair work ceases, and even those with servants don't call them to come. The more affluent people just stay at home and do their own work. If it rains continuously for several days, we have an especially hard time. If it's off-and-on, we can keep on with our lives. - Interview with a Jamalpur District female household head and her daughters, all of whom work as day laborers or household servants, by S. Hanchett.

They worked either as servants (50 percent, n=13), or as day laborers (22 percent, n= 5); or they were self-employed (23 percent, n=6)[15]. Employers were mainly other families who usually paid in meals rather than in cash. Since such household work was the main form of employment available to these job-seeking females, nearly half of all the women were paid in meals. As important as this arrangement might be nutritionally, and as much as it might conserve family resources by reducing the numbers needing regular meals at home, it was not a form of payment that helped to advance a family economically. There did not seem to be any important differences in terms of the form of payment between employed female household heads and employed wives. More than one-third (n=7) of women with paying jobs also owned land - either in their current villages or their natal villages.

Occupations of female household heads in the larger FAP-14 Household Survey are described in Figure 7.1. It was noteworthy that more women in these situations were employed in remunerative activity than in the female sample as a whole. The household work category here, however, posed the same problem of ambiguity as it did in Table 5.4. It merged data on those who are paid to work in others's houses along with data on women primarily engaged in subsistence production in their own homesteads.

Findings on the sexual division of labor showed some important differences in responsibility patterns between male-headed and female-headed households. Most traditional female tasks were performed by senior women in male-headed households, and by the female head in female-headed households. There were some tasks, however, which were performed only by males in male-headed households, but also by the female head in female-headed households. These were tasks performed mainly by men, such as going out into fields or marketplaces. Included among these tasks were: plowing with a spade (*kodal*), planting seeds, transplanting (plucking and replanting) rice seedlings, weeding, and cutting crops.

[12]One lived in a lineal joint family.

[13]These percentages are not representative of the population as a whole, because in the study's selection of interviewees female household heads were over-represented.

[14]Gadighat is the only village in which enough interviews were done to make this a noteworthy point. In Fenibeel, where no respondents worked outside the home, only four women were interviewed.

[15]For one, her occupation is unknown.

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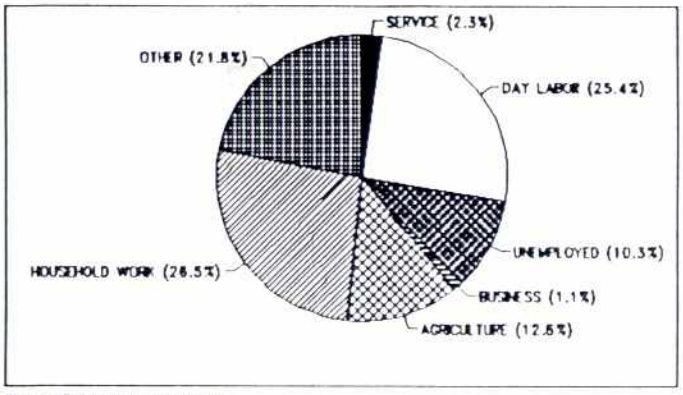
Another pattern difference between the two household types occurred in flexibility of responsibility assignment. Mainly because of the personnel shortage in female-headed households, many of which were the subnuclear type[16], all individuals handled a wider variety of tasks than those in larger, male-headed households. In male-headed households, there were sufficient human resources to maintain a more rigid pattern of labor division along traditional lines.

Figure 7.1

Occupations of Female Household Heads (n=87)



Source : FAP-14 Household Survey

Land ownership among all the FAP-14 female-headed households was at approximately the same level as land ownership among male-headed households, with the exception that FHHs in this study owned only small or medium amounts of land. There were no female owners of large (greater than 7.49 acres) landholdings in this sample.

7.7 Female-Headed Households and Flood

Female-headed households displayed certain distinctive features that are significantly different from other households in terms of their resources or responsibilities during floods. Their husbands were either deceased or absent[17]. Their circumstances forced them to perform some tasks usually viewed as men's work in addition to traditional women's tasks. They might own land and sometimes managed their own farms. They were more likely than married women to have paid employment. Their small average family size meant, however, that they had fewer people to help them than do women of larger households. They usually did not have any adult males living in their homes.

It was clear that all or most of these women were managing for better or worse on their own. During floods or other crises they primarily depended on their own social and economic resources. If they were already poor they risk becoming destitute in such a crisis. If FAP planners wish to understand their distinctive concerns, there is no choice but to speak directly with them because they were not represented in the male spheres of society.

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[16]A subnuclear household is one which has no resident married couple. It usually consists of a single individual with his or her children, and perhaps an aged parent or other relative.

[17]One category of females not mentioned here, or usually discussed in the literature on female household heads, are the woman whose husbands are incapable of assuming the normal responsibilities of head. The women, therefore, assume those responsibilities by default. Such women are the wives of men who are ill, or perhaps mentally retarded (T. Abdullah, personal communication, August 1992).

7.8 The Family Diet: Seasonal Changes and Hunger

The marginal economic status of many survey households is discussed in both Chapters 2 and 8. One consequence of this pattern was chronic hunger due to inadequate income. During floods this state of hunger could lead to starvation if already inadequate food resources disappear. It was well known that hunger is a seasonal phenomenon associated with annual cycles of unemployment for those who depend on day labor wages. The rainy season was considered an especially hard time for rural laborers. Given the prevalence of seasonal unemployment and other hardships in rural Bangladesh, a few questions were asked about normal monsoon and flood effects on the diet. Households were asked whether their family diet changes in any way during either the annual rainy season or at flood times. Eighty-eight percent said it did. Two-thirds said there was less food, and a few (three percent) said there was different food.

Nearly two-thirds (62 percent) said they experienced food shortages during the rainy season, suggesting that flood-time food shortages were merely an extension of an annual event for many. When asked about the reasons for the changes in rain/flood time diet, three major reasons were mentioned: less money during this season (49 percent), inclement weather making shopping or cooking difficult (23 percent), and the agricultural cycle itself (11 percent). When asked whether their children are adequately nourished year-round, a majority (87 percent) of those with children less than age 15 said they were not.

7.9 Strategies for Economic Survival: Managing Assets and Credit in Flood

Previous studies of floods and other crises have described coping strategies of rural families and the ways in which they mobilized social and economic resources at such times. Two studies, by Ewert and Brockmueller (1990) and by Hossain *et al.* (1987), reported on actions taken by Bangladeshi families struggling to survive economically during and after some recent floods:

Ewert & Brockmueller (1990)	Hossain *et al.*(1987)
1. Seek loans, sell excess or nonessential assets. Work as day laborer.	1. Work as day laborer.
2. Seek credit from banks.	2. Use past savings.
3. Consider sale of essential assets.	3. Sell assets.
4. Mortgage or sell land	4. Borrow money.
	5. Do odd jobs.
	6. Use skills in cottage industries.
	7. Take advantage of relief materials.

The sequence outlined by Ewert and Brockmueller depicted a scenario of increasing desperation. According to this report, nonessential assets were such things as small livestock, poultry, trees or jewelry. Essential assets included housing materials, cooking utensils, furniture, farming implements and cattle (p. 33). In Chen's Gujarat study, a common pattern or asset management emerged during crisis: Villagers distinguished non-productive from productive assets and disposed of the former category first. Jewelry and utensils, assets usually controlled by women, might be among the first to be pawned or sold, leaving women without much to call their own (Chen 1991:209-210 *et passim*). Findings of this study echoed Chen's approach, even though the type of crisis investigated is different. In an interview in a Jamalpur District main river village (Goalbathan), a male day laborer, badly affected by the 1988 flood, said that families distinguish between large and small assets. He said they first sold off the small assets, such as vessels and jewelry, if they needed to raise cash. Examples of large assets are cattle and land.

Q: What did you do in 1988 when the flood came? A: When water came into the house, we took all our things and left. Q: Who decided to go? A: Eldest brother... [and] Everyone agreed. Anyway, our mother was very frightened of the snakes etc., so we left. Q: What did you take with you? Some unhusked rice, utensils, and our small animals [they don't own any big ones], and our stove (chula). Q: Where did you go? A: Near the pond of the Chairman. Q: Was it raining? Did you just sleep outside and get wet? A: We took a sheet of tin [corrugated tin] for cover. -Interview with a female household head, Jamalpur District, by S. Hanchett.

Eighty-two women were asked what kinds of things they owned, what they considered their most valuable asset, and whether this asset was subject to flood loss or damage[18]. The most commonly mentioned items were either cooking pots and other vessels, the house itself or its parts, or house and lands.

Animals were the next most valuable possessions mentioned. One-quarter (24 percent) of all respondents said they owned animals, though some of these may include animals owned by others and being raised on a share basis by women interviewees[19]. (In the larger FAP-14 Household Survey, 39 percent of families owned either cattle, or goats and poultry. Thirty-five percent said they owned poultry only.)

Tools and other equipment were mentioned as the most valuable possession of six percent (n=5) of respondents.

7.9.1. Leaving the House at Flood Time

A majority (74 percent) of those interviewed were forced to leave their homes at some time during the last 10 years because of flood. For most families such moves occurred in 1988, but for others moves were necessary anywhere from 1982 to 1991. Moves typically involved four to seven persons per house

[18]Interviewers had a list of possibly valuable items to suggest, but they were instructed to make every effort to elicit the women's own ideas about their possessions. They only mentioned some items if the women themselves did not come up with any ideas.

[19]When asked whether they could sell the animals they owned, some said they could not sell them on their own but must ask some other person's permission to do so. Eleven said they needed their husbands' permission, but three others said they needed the permission of some unspecified other person, which probably indicates the situation mentioned.

who left either on foot, by boat or other methods. In a few cases (nine percent, n=6) someone stayed behind, but this group seemed to prefer to keep the family together if possible. In two study villages -- Fenibeel (a flash flood village) and Jangipur (a char) -- fewer were affected in 1988 than in other years, judging from the numbers who had to evacuate.

Fifty-five percent of the women said they took along all their possessions and their animals when they left their houses. Twenty-six families (41 percent) fully or partially dismantled and moved the house itself: corrugated metal roofs are valued items likely to be guarded with special care in such a crisis. Special mention was made either of animals, clothing, or, in one case,a stove, as interviewers probed for further information[20]. The fact that all possessions could be carried away shows the minimal amount of assets owned by most respondents.

7.9.2 Loss of Important Assets in Floods

Seventy-one percent (n=61) of the women interviewed said they suffered serious losses as a result of flood within the past decade, the great majority of these (80 percent) in 1988. Others had serious losses in 1984, 1987, 1991 and other years. Of the five villages where the most interviewing was done, Baraitali, Shibsen, and Muradpur had the largest percentages of families suffering serious losses. Gadighat, the one beel village, and Jangipur, on the north central char, seemed to have been less seriously affected.

The most frequent type of loss was damage to the house itself, a serious problem for 65 percent of those mentioning losses (representing 55 percent of all families in the study). Most of these losses occurred in 1987 or 1988. Other losses mentioned included loss of house contents and animal illnesses or deaths. None of the respondents reported a family death. A total of seven women (eight percent of those interviewed) said it was necessary to either sell or mortgage their most valuable possession during a recent flood.

7.9.3 Use of Credit to Cope with or Recover from Flood

According to Hossain *et al.* (1987:35), "The pattern of borrowing in [flood affected areas studied] is not fundamentally different from what we observe in other rural areas of Bangladesh." Ewert and Brockmueller (1990:25, 37) found that, "The main constraint farmers faced in cultivating post-flood crops was a shortage of cash and credit. This influenced their choices and the inputs given.... The main sources of credit available to farmers are loans from friends, relatives, banks and private money-lenders. Some people said they were able to get a relatively low interest loan from family or friends who lived in the cities or who had a job."

As Shapan Adnan has suggested, losing important assets through mortgage or sales could be averted by public policies fostering income-generating programs and credit availability:

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[20]One household head, a man interviewed separately in Shanakoir, said that since 1988 they had kept a portable stove and some dry matches for use in floods. He also said that they tried not to have large grain stores on hand during the rainy season, lest they be damaged in a flood.

> ...The ready availability of employment and credit may be able to prevent the compulsive logic of debt dynamics forcing a peasant family to mortgage or sell out its land and livestock. (Adnan 1991:114)

Credit was, however, a potential source of difficulty in itself for a distressed family. As several studies and reports have shown, flood or other crises might force rural families into debt, which, though necessary to meet immediate family survival needs, might trigger a downward spiral of potentially devastating economic loss driven by what Adnan (1991) called "the compulsive logic of debt dynamics."

When asked if they had ever had to borrow money because of flood, two-thirds of the women in this study said they had. Seventy-five percent had during 1988. Reasons for borrowing during flood were poverty (15 percent), need for food (57 percent), house repairs (25 percent), and medical care (two percent)[21].

7.10 Families in Severe Flood: Observations and Personal Accounts

There have been few systematic observational studies of social behavior during floods. One, by Prof. Rosalind Shaw, focussed on the techniques of social survival in relief camps in Dhaka during the 1988 flood. She emphasized the ways in which people forced to leave their homes struggled to maintain some vestige of order in their lives, though their discomfort and shame (*lojja*) often were great. She observed that:

> For both women and men, the first priority was the protection of the means to cook and consume food: cooking pots, plates, and the knife. Control over the cooking process was of considerably more than practical importance. This control maintained *social* survival, the autonomy of the household, since it is the cooking-stove or *chula* and not shared shelter which defines the household. In the camp, one of the first priorities for a newly-arrived household was to make a new *chula* out of mud. ...Women alone in the camp, or female-headed households with one or two children, often borrowed another household's *chula*, but cooked separately when they did so, waiting until the owner of the *chula* had finished cooking, and using their own supply of cooking fuel. Commensal divisions between households tended to harden, even as social support and mutual cooperation between them increased. (Shaw 1989:13)

In addition to cooking difficulties, Shaw also mentioned a common sense of shame (*lojja*) felt by women living in relief camps close to strange men, or living on their own roofs exposed to public view.

The emphasis on cooking was a familiar theme in many personal reports obtained by this study. In one case, cooking became very difficult for a woman named Nahar. She first tried putting her mud stove (*chula*) on the banana tree raft, but the stove's heat burned the raft. Then she moved the stove onto a broken wooden chair, but it also burned. Finally she set the stove on a broken tin pot, put the whole thing on the raft and was able to cook without worrying. Having something to cook was a worry for Nahar. She found that fish were easy to get but not easy to keep. Once she had some live fish on the cooking raft but no place to store them. All the fish jumped back into the water while she was preparing to cook.

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[21]One (two percent) took a loan for an unknown reason.

In another case, a woman named Rahima made a portable mud stove before the flood. She gathered some dried bush, straw and wood for fuel. She stored her fuel on a tree, and kept a bamboo ladder on which to climb. She did this job alone, as she is always in charge of cooking and feeding the whole family.

Most other reports on ordinary people's experience of flood came from journalists and other observers. Many of these were compiled by Shapan Adnan, who pointed out that:

> ...Fulfillment of women's *traditional gender-based roles in the customary 'sexual division of labor' became more difficult* under conditions of flooding. Activities like cooking, cleaning, fetching of drinking water, homestead production, etc., could not be easily performed in flood-affected areas. In the deeply waterlogged tracts (e.g., *beels*) of the country, young girls were reported to be scrounging for edible reeds and roots, while women of all ages travelled long distances by boat or raft to fetch drinking water. (Adnan 1991:66)

A recent publication on Disaster and Destitute Women (Kafi 1992) included two case studies on the 1988 flood in Jamalpur District that were generally similar to those gathered in this study. These reports mentioned that some women living on embankments during flood were subjected to rape and other violence.

7.10.1 Themes of FAP-14 Case Studies

Six case studies that focused on gender issues in flood[22] illustrated many of the dilemmas facing families during the 1988 flood and some of their coping strategies. The texts are presented in the Main Survey Report.

In addition to demonstrating the above-mentioned concern about cooking and maintaining dignity, the case studies showed that severe flood strains marital relationships and increased pressure on adults, especially women. During one flood, one woman's (Rahima) husband insisted that she join him in guarding the house. They left their children with a neighbor each evening and stayed in their flooded house, where she had a frightening encounter with a poisonous snake. She and her husband cooperated in securing the house, but it was her sole responsibility to obtain drinking water. Another woman, Kalpana, and her sister-in-law went to great lengths to husk paddy with a bulky wooden husker *(dheki)* they hauled to the road on a raft. Kalpana was performing a typical woman's task under great duress, as was Nahar when she tried to cook atop the raft. In another case, a mother built a platform on which her daughter could give birth during flood.

Other concerns included sanitation and health risks to both people and animals. Several interviewees expressed anxiety over unclean conditions in flood. This was not surprising considering that excrement, dead animals and even human corpses might float around the homestead for days or weeks during flood. One divorced woman, Mamata, became ill during her stay on the embankment where she had to sit in the rain without protection. Another woman's husband died of cholera shortly after their house was washed away by river erosion.

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[22]Five of the six main case studies to be discussed here were collected by Kazi Rozana Akhter. They were translated by Jesmin Akhter. All of the women's names have been changed to protect their privacy.

The social need for women to avoid public elimination was a restriction with negative health implications for women. This and other urgent problems, such as giving birth during floods, might not be adequately addressed by current indigenous flood response measures.

A final theme had to do with shame at having to live in public, a feeling undoubtedly intensified by prevailing purdah norms. One woman said she felt quite embarrassed at having to live in the open like an itinerant woman without self-respect while she stayed on the road protecting her cow.

7.11 Conclusions

The information gathered through the Gender Study was more suggestive than statistically significant. The sample sizes from each site were small, indicating that findings on these 86 households and case studies must be seen as illustrating or supporting the more thorough studies of other researchers on similar topics rather than conclusively proving any points on their own. With these provisos in mind, it was nonetheless possible to identify many behavior patterns, and even some new questions, in the experience gained through this study.

The study has shown that women and men had some different concerns in flood coping. Differences existed in expected work during flood. Men's responsibility for marketing and (in flood) fuel collection created difficulty and might have exposed them to danger. Women's usual responsibilities of child care, providing drinking water, cooking and other duties might have demanded extraordinary effort and ingenuity to perform. Women seemed to be more informed about the health risks of drinking untreated flood water than some researchers assume (e.g., World Bank 1990:75).

Differences also existed in the cultural significance of the experience. Women faced special problems of privacy and maintaining a sense of self-respect. Their social position and their reproductive role posed special health problems. Privacy for bodily elimination and childbirth were unique female concerns which became especially urgent under flood conditions. Having such private affairs exposed to public view must aggravate women's sense of shame. These findings argue strongly for including both men and women in any kind of planning for flood action, including development of shelters, or any flood proofing or disaster preparedness programs.

Women and men also had some similar concerns during floods. Adults of both sexes seemed to perform tasks otherwise done by children. Both might be economically responsible for other persons. Men and women had assets (though of different types) and jobs that were vulnerable to loss during flood (or even seasonal monsoon rains). Some women in this study had mortgaged or sold their assets at times of flood. Many had borrowed money to feed their families, repair their houses, and otherwise recover from floods. In brief, the need of both for employment, credit and economic stability was clearly documented in this study.

Another water-related interest shared by the generally well-differentiated men and women of rural Bangladesh was in agriculture. Men's prominence in field cultivation was widely recognized among national planners, but women's agricultural work was not. Their key role in food production and animal husbandry made women as interested as men in the agricultural implications of flood impacts or control. Women were responsible for important tasks in the production and processing of staple crops such as rice. Women cared for seed grain; stored, dried and redried grain; transplanted, weeded, and threshed

grain; and performed several other post-harvest jobs required to make it edible. In some cases they also worked in the fields. Women planted and tended fruits and vegetables that contributed significantly to family nutrition. They had either primary or joint responsibility for the care of all farm animals. In brief, women and men had equivalent, though not identical, interests in agriculture, and thus, in the way the water regime affected it. This commonality was even closer in the case of female and male household heads, of whom approximately the same percentages owned land and depended on its productivity to discharge their economic responsibilities.

Several outstanding social questions relating to flood response still need attention. For one, there is a need for more information on how men and women coped with flood. The case studies presented here began to address this question, but further localized planning, e.g., for flood proofing, should be based on further investigation of the sexual division of labor during flood crises. Another question has to do with the possibly different economic impacts of flood on men and women. Women's property rights were known to be relatively insecure, and there was a strong possibility that their specific assets might be the first to be sacrificed to meet household survival needs in flood. This might be a necessary strategy in the short-term, but its implications for women's economic long-term security were ominous. A third question deserving investigation (by qualitative methods) considers the ways in which various types of social relationships, including ties through marriage, are used in developing social support networks in flood crises. Such investigation could be of use in identifying lines through which relief supplies or other benefits are likely to be distributed, and also gaps which publicly sponsored programs may aim to fill.

7.11.1 Program and Policy Recommendations

The Flood Action Plan is not meant to erase gender differences, nor is it seeking to rectify all the inequities of rural society. Nonetheless, certain gender aspects demand attention, and even some action, for the FAP to achieve its goal of planning and implementing water regime changes in a way that best meets the needs of most people affected by those changes. Meeting this goal will require balanced attention to the impacts of any major social change in a given region. It will mean taking a new look at women's needs, capabilities and contributions in the rural economy. Because the sexual division of labor here is especially firm, men and women make very different and distinct contributions to the social and economic whole. To use their expertise, women may need to be included in participatory planning in some ways that are not familiar to most living now in rural society. This may in turn necessitate some consciousness-raising (conscientization) work with local leaders or women themselves. Until now, it seems that those who organized or engineered water management projects did not need to consider such things, but insofar as flood planning includes consideration of social impacts and needs, sound planning requires that they do so henceforth.

There are several governmental and nongovernmental models to follow in working with and for Bangladeshi women, or raising the consciousness (conscientizing) of the population on women's issues. Goals are either: (1) to provide services such as relief or other supports, or (2) to promote self-help activities. Many Flood Action Plan programs, including flood proofing or participatory planning, are of the self-help type, but there always will be a need for timely and well-focussed relief or other services to those in need. Programs may be targeted to specific groups, such as the poor, or they may have a broader socioeconomic scope. Experience of some of the more effective programs indicates that parallel activities with men can reinforce those conducted for the benefit of women.

Programs will be most effective if they are backed by strong policy support and guidance. This study lends support to policies that involve women and men in planning, that considers women's typical disadvantages, that considers the value of their separate assets, and that gives priority to destitute women. Such polices are closely related to policies expressed in Government of Bangladesh documents, such as the Fourth Five Year Plan (1990-95).

Table 7.2

Sexual Division of Labor[23]

Tasks Done Only by Females	*Notes*
	Age group 25-29 tends to have these responsibilities (Gender Study data).
Gender Study Data	
Household Work	
Cooking	
Agricultural Work	
Care for smaller animals	
Parboil rice	
Husk rice in homestead	
Dry grain after flood	
Supplementary Information from Other Studies	
Store food and seed grains	Jansen 1986
Decide how much & what type of food will be eaten each day	
Wash clothes & utensils	Karim *et al.*
Smooth and plaster house floor and walls (with mud)	Karim *et al.*
Re-plaster damaged parts of the house after monsoon or before harvest	Abdullah and Zeidenstein 1982
Rear poultry and livestock	Jansen 1986
Feed cattle	Karim *et al.* 1991, from Halim & McCarthy 1983
Test seed grains before planting	Begum 1988:15; Abdullah & Zeid- enstein 1982; Karim *et al.*; Jansen 1986
Prepare threshing floor	Owens and Hussain 1984/85:18

[23]These data have been analyzed by Jesmin Akhter, M.S.S.

Table 7.2 (cntd.)
Sexual Division of Labor

Gender Study Data Only	*Notes*
Tasks Done Mainly by Females	
Household Work	
Gather fuel	Mostly done by females age 10+; and by males, 10-19.
Fetch drinking water	Mostly done by females age 10+; and a few boys.
Supervise children's school work	Schoolwork supervision: mainly females age 30-34.
Care for infants	Infant and family health care is mainly done by females age 25-29.
Care for family members who are ill	
Agricultural Work	
Watch grains drying (after harvest)	Females aged 25-29 mainly do; also young boys,5-14.
Plant vegetables	Females aged 25-29 mainly, assisted by males of all ages.
Water home garden	Mainly done by girls aged 10-14; some boys, 10-14.
Care for fruit trees	Mainly responsibility of females aged 25-29.
Make animal feed from oil cakes and other ingredients	Mainly done by females aged 25-29; some males, 15-24.
Tasks Done Only by Males	
Agricultural Work	
Plow with *langal* 'plow'	Age group 25-29 has highest level of responsibility. (One exception: a daughter, age 25-29, in a male-headed household has primary responsibility.)
Irrigate land	Age 15-19 and 25-29 mainly do.
Fishing Work	
Make fishing nets	Males of all ages over 15 do. [Note: Women are known to make nets in many areas. Data gathered differ from common knowledge.]
Color nets	Mostly done by men aged 25-29.
Sell nets or other products	Men of all ages between 20 and 65 do.
Repair boat	Primarily the responsibility of male heads, and secondarily, of sons.
Sell fish to brokers	
Sell fish in market	Male heads (aged 35-39) mainly do.
Sell fish to other homes	Mostly done by sons, aged 15-19.
Business Activities	
Sell door-to-door	Done mainly by male household heads, or adult males in female-headed households.
Sell goods in small shop	Males aged 35-39 or 55-59, all household heads, do.

Table 7.2 (cntd.)
Sexual Division of Labor

Gender Study Data Only	*Notes*
Tasks Done Mainly by Males	**Note: Many of the "mainly male" tasks in this section are the responsibility of females in female- headed households.**
Household Work	
Butcher smaller animals	Primarily the responsibility of 10-14 age group, though some elderly women (age 50-54) also do.
Agricultural Work	
Graze larger animals	Males age 10-14 tend to have primary responsibility for grazing larger animals.
Gathering fodder	Gathering fodder is mainly the responsibility of sons or male household heads in male-headed house holds.
Plow with *kodal* 'spade'	Mainly done by males aged 25-29. One female aged 45-49 (wife of male head) plows with spade.
Plant seeds	Mainly responsibility of males aged 25-29. Two females (male head's mother & daughter) do.
Weed in the fields	Mainly done by males aged 25-29. One female (male head's mother) does.
Pluck and replant rice seedlings	Plucking done by adult males mainly (25-29 ages), plus a few females (of all ages). Replanting, mainly by males aged 15-29. Also, by two females.
(Mainly by Males, cntd.) Cut crops Thresh crops	Mainly, by males aged 25-29. One female does. Done by males age 10+, and several females age 20+.
Carry grain to mill	Mainly, by males age 15-19. One female head does.
Fishing Work	Mainly done by males age 25-29. One female does.
Repair nets Make fish traps Catch fish in beel or river (with hooks, nets, or traps) Catch fish in pond	Mainly, by males aged 15-39. Females: ages 5-9 (three) and 20-24 (one) also do. Mainly, by males aged 25-29; women also were observed doing.
Business Activities	
Purchasing things at market	Mainly, boys (10-14) and other males of all ages. Females doing are either under age 15 or over 30. Mainly boys age 10-14, plus a few girls under age 15.
Selling directly (not to broker)	Decision to purchase bullocks is taken jointly by adult women and men, according to Abdullah and Zeidenstein (1982:25).

Table 7.2 (cntd.)
Sexual Division of Labor

Gender Study Data Only	*Notes*
Tasks Done by Either Males or Females	
Agricultural Work	
Feeding animals	Mainly done by females age 25-29 or males, 10-14.
Buying inputs (fertilizer etc.)	Done by females over age 45, or by males, 35-39.
Preparing vegetable garden for planting	Done by females age 45-54, or by males, 10-14.
Planting fruit trees	Responsibility mainly of males/females age 25-29.
Weeding vegetable garden	Done by females age 25-29, males, 10-19, and some little girls (under age 9).
Business Activities	
Selling items through another person	
Income-Generation Activities, Misc.	
Doing craft work for sale	Females age 20-24 mainly and a few older men are doing this work.

Chapter 8

AGRICULTURAL ADJUSTMENT AND HOUSEHOLD CONSUMPTION

8.1 Introduction

This chapter of the report evaluates the agricultural flood responses of people living in flood plains. A brief overview of land availability and the agricultural characteristics of the sample households is presented. Generally, food consumption requirements exceed current production capability in the majority of flood environments primarily because of small land holdings, risk aversion behavior to minimize losses caused by flooding, and insufficient financial resources to buffer households against even very small agricultural losses. Even when agriculture is the dominant occupation, secondary employment is essential in most flood environments to meet basic household consumption needs.

Agricultural practices are the means by which the rural population strikes a balance between its needs and the agricultural opportunities of the flood plain, including the water regime as part of the annual cycle of the seasons. This necessarily involves an adjustment to flood conditions, including time of initiation and recession, flow velocity, rate of rise, depth, duration, and rate of fall. Overall, the agricultural survey shows that effective modification of the flood regime through flood protection results in higher paddy production and higher agricultural incomes. Despite protection, extreme flood events like those of 1987 and 1988 cause agricultural losses in all areas. Policies and programs to mitigate the impact of flooding must accept that effective flood control can only minimize losses, and not achieve a risk free environment.

8.2 Background and Description of Sampled Households

National per capita availability of the 9.2 million ha of cultivable land, which supports 10 million farm holdings, fell from 0.21 ha in 1951 to less than 0.09 ha by 1991 (Figure 8.1). Seventy percent of farm holdings are less than one ha and only 4.9 percent exceed three ha[24]. The best available data shows that per capita production of agricultural crops fell from an index value of 108 in 1982/83 (1972 = 100) to 104 in 1986/87. Per capita paddy production stayed almost constant over the period 1978-87; vegetables decreased while livestock showed a marginal rise from 129 in 1978/79 to 133 in 1986/87. Thus, the general picture is of a gradual per capita decline in land resources that sustains national food production, and an agricultural production system that just meets increasing demands of an expanding population.

8.2.1 Landholdings

Land ownership in each village was recorded by total areas under each type of tenancy and at each land level in the Full Survey. These records formed the basis for sampling. Operated holdings were recorded plot by plot, but only for plots actually farmed. Small inconsistencies were found between the Full Survey and the Household Survey in the areas that households recorded as cultivated. The difference, however, was not sufficient to switch households between landholding categories.

[24] 1983/84 data from BBS 1991b.

Sample households were drawn to ensure coverage of 25 percent of all occupations and landholding categories. This helped to make sure that the larger landowners and scarcer occupations were sampled in proportion to their occurrence in the sample villages. Otherwise, a simple random sample could miss these small numbers of households in any one village. As explained in Chapter 1, for analysis of the survey data the absolutely landless were combined with those owning up to 50 decimals to create a landless and marginal farmer group.[25]

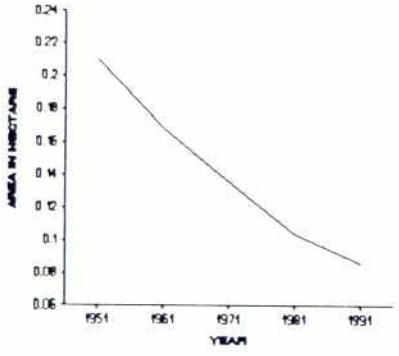

Figure 8.1 Per Capita Availability of Cultivable Land (ha per person)

The relationships among landholding and flood environment are shown in Table 8.1. While there is a wide range of landholding sizes across the broad occupational groups, there is a higher percentage of landless and marginal landholding households in the chars and main rivers, and a higher percentage of larger landowners in the secondary river, semi-saline and beel environments. It is notable that the largest landowners in the haor areas own and operate considerably larger holdings than elsewhere.

In general, the smallest landholding category was homestead land only, but share-croppers in this category have operated holdings greater that their owned area. In the largest landholding category, except semi-saline areas, the average operated holding is considerably less than the land owned per household. This reflects ownership of noncultivated land and net leased land. Additionally, the larger number of plots per household in the secondary river and semi-saline environments indicate that holdings are more fragmented in these areas than in chars and flash flood areas where the largest landowners have small numbers of plots for similar average areas. Average landholding size is also lower in the char and main river areas than in the other environments, probably reflecting greater landlessness and possible river erosion.

8.2.2 Sample Survey Household Characteristics

Table 8.2 shows that the 2,177 sample data differs slightly from the same national landholding data categories in the 1983/84 Agricultural Census. The mean land area owned in each landholding category is higher in the FAP 14 sample than for all Agricultural Census data. This is for two reasons: the sample has slightly higher percentages of larger landowners than in the population, and these tend to have slightly larger landholdings than average for their landholding category.

The land distributions in the sample were also compared to those in the FAP 12 studies (Flood Action Plan 1992a, vol. 4) which sampled only five study areas. Those areas included proportionately more protected areas and did not cover all of the flood environments. Overall, the land ownership distribution

[25] The decimal is 0.01 acre or 0.00404 ha. An alternative classification that had been adopted by FAP 12 for its socioeconomic assessments of project impacts was also tested: 0-20 decimals, 21-100 decimals, 101-250 decimals, 251-500 decimals, 501-750 decimals and over 750 decimals (Flood Action Plan 1992a, vol.4). Although this gives narrower land area bands it did not add to the explanation of responses given using the broader categories.

Table 8.1

Summary of Land Ownership by Flood Environment

Flood Environment	Land Ownership Catagory (Decimals)	Full Survey Data					Household Survey Data		
		No. House-holds	Land Owned (Decimals)	No. Plots Owned	Operated Holding (Decimals)	No. Plots Operated	No. House-holds	Land Owned (Decimals)	Operated Holding (Decimals)
Char	Landless <50	696	5.6	0.13	16.7	0.29	229	6.0	45.7
	Small 50-249	184	132.9	2.24	159.5	3.16	67	131.7	155.7
	Medium 250-74	64	422.2	5.76	448.7	5.98	32	429.4	316.1
	Large 750+	16	1375.6	10.13	1146.1	8.62	11	1496.9	281.1
	Environment $\bar{M}$	960	80.6	1.07	91.7	1.36	339	119.2	100.6
Main River	Landless <50	1503	11.7	0.49	16.1	0.84	375	12.5	18.2
	Small 50-249	631	113.5	5.16	107.4	5.13	177	118.3	116.4
	Medium 250-74	150	391.0	13.85	320.4	12.1	48	420.6	260.3
	Large 750+	21	1183.7	27.29	620.9	15.00	10	1008.4	454.6
	Environment $\bar{M}$	2305	75.0	2.88	66.4	2.88	610	91.6	72.9
Secondary River	Landless <50	278	14.0	0.84	30.5	2.37	80	13.8	41.1
	Small 50-249	237	131.8	8.11	142.1	9.43	85	135.2	139.8
	Medium 250-74	124	397.4	19.80	355.9	19.58	48	403.9	334.5
	Large 750+	20	1088.2	56.70	866.3	49.65	7	1197.0	864.9
	Environment $\bar{M}$	659	161.1	8.72	157.2	9.58	220	182.9	169.5
Semi-Saline	Landless <50	306	9.9	0.46	48.5	2.12	81	9.6	67.3
	Small 50-249	177	132.2	8.99	180.1	12.33	47	130.1	156.8
	Medium 250-74	90	431.8	23.13	444.4	24.22	26	441.8	427.6
	Large 750+	24	1057.0	56.79	1048.3	57.13	7	1094.9	499.6
	Environment $\bar{M}$	597	151.9	8.67	187.4	10.69	161	161.8	170.4
Beels	Landless <50	554	8.5	0.23	59.4	1.03	111	8.8	57.5
	Small 50-249	236	124.6	2.97	145.9	3.09	58	133.0	134.9
	Medium 250-74	157	431.6	7.69	365.1	6.94	49	425.2	411.4
	Large 750+	45	1470.0	20.27	1116.0	18.16	15	1413.1	670.8
	Environment $\bar{M}$	992	169.4	2.97	176.3	3.23	233	217.7	190.7
Haor	Landless <50	502	8.3	0.61	29.0	0.73	126	8.3	37.0
	Small 50-249	266	130.4	3.21	139.7	3.42	66	131.7	123.5
	Medium 250-74	102	407.6	7.49	415.9	6.75	33	415.3	357.1
	Large 750+	35	2224.6	17.97	1777.2	14.74	10	3985.3	1616.0
	Environment $\bar{M}$	905	174.9	2.82	172.8	2.74	235	269.4	173.5
Flash Flood	Landless <50	251	15.5	0.30	26.4	0.90	61	14.6	34.4
	Small 50-249	196	118.4	2.73	114.7	3.17	58	115.9	113.4
	Medium 250-74	53	395.9	6.43	281.7	4.85	15	440.9	303.5
	Large 750+	10	1438.1	9.50	972.5	8.10	5	1380.0	1355.0
	Environment $\bar{M}$	510	122.5	2.05	105.4	2.32	139	153.3	143.9
Breach	Landless <50	411	13.6	0.63	28.6	1.28	107	15.7	40.6
	Small 50-249	271	120.7	4.63	124.9	4.77	86	120.0	124.1
	Medium 250-74	121	402.8	10.46	359.7	8.99	35	439.2	324.3
	Large 750+	25	1233.8	17.48	935.0	13.68	12	1199.4	651.8
	Environment $\bar{M}$	828	142.4	3.88	135.9	3.93	240	174.0	142.5
	GLOBAL TOTAL	7756					2177		
	GLOBAL MEAN		122.9	3.66	123.0	3.96		156.0	129.8

in the two samples were broadly similar but there are two main differences. More of the FAP-14 sample were less than 50 decimals or 0.2 ha (average about 30 percent in FAP 12 and 54 percent in the FAP 14 sample) and fewer were in the 101-250 decimal category; and in the haors FAP-14 did not find as high a percentage of larger farmers as FAP 12 (Flood Action Plan 1992c). Although the FAP 14 farm sample differs from the 1983/84 Agricultural Census, it is more representative of the national landholding pattern than that sampled by FAP 12.

Table 8.2

Comparison of Sample and National Landholding Statistics

	Sample Survey			1983/84 Census a/		
Category (Decimals)	Percentage of Households	Mean Area Decimals	ha	Percentage of household	Mean Area Decimal	ha
Small (50-249)	64.0	125	0.51	70.3	93	0.38
Medium (250-749)	28.4	424	1.72	24.7	412	1.67
Large (> 750)	7.6	1622	6.56	5.0	1,185	4.80

Source: FAP 14 Household Survey
a/ 1983/84 Agricultural Census, BBS, 1991.

A review of Table 8.1 indicates that the overall FAP 14 sample distribution, according to landholding categories, is 54 percent landless, 30 percent small farmers, 13 percent medium farmers, and only three percent large farmers. Yet, 18 percent of the landless category, and many household heads who list other as their primary occupation, have substantial landholdings and may farm them. The remainder of the landless category practice subsistence horticulture.

Even though 84 percent of the sample farming households have less than 249 decimals (1.01 ha), they only own 27.5 percent of the total landholdings. This indicates a gross inequality in land ownership as clearly demonstrated in Table 8.3. As discussed below, this marginalization of land ownership means that financial and economic survival is tenuous, since off-farm employment opportunities are very limited for the majority of farming households.

8.3 Household Consumption and Production

A region's cropping patterns is the result of a complex set of decisions primarily taken at the household level. These decisions reflect the household's character as a social and economic unit. Commitments to consumption are fundamental considerations in making cropping choices.

The FAP-14 analysis included a system for using the survey data to build basic farm management budgets to provide a sense of the constraints that the household manager has to face. These budgets take the family consumption allowances as the family has presented, projects total consumption, and compares them with actual production on the basis of the actual areas planted and yields. Based on these findings, it further projects the pattern of exchanges with the market that would be necessary to consume the

Table 8.3

Land Ownership and Landholding Category

Land holding Category	Number of household	Percentage of households	Percentage of land owned	Total Area Decimals	Owned ha
Landless	1,270	53.8	3.7	12,536	50.7
Small	644	29.6	23.8	80,816	327.1
Medium	286	13.1	35.7	121,324	491.0
Large	77	3.5	36.8	124,936	505.6
Percent	--	100	100		
Total			--	339,621	1,374.4

Source: FAP 14 Household Survey.

amounts stated. This system has many uses, but the most important for current purposes is to show the close margin between gain and loss, the relative size of gain or loss compared to the total flow of consumption and production, and how fine an adjustment to the environment is needed to come out ahead.

Aggregate household food surpluses or deficits by flood environment are shown in Figure 8.2. In terms of aggregate rice production, the most productive environments were clearly beels and haors, followed by the beach environment. The least productive were chars followed by the semi-saline areas.

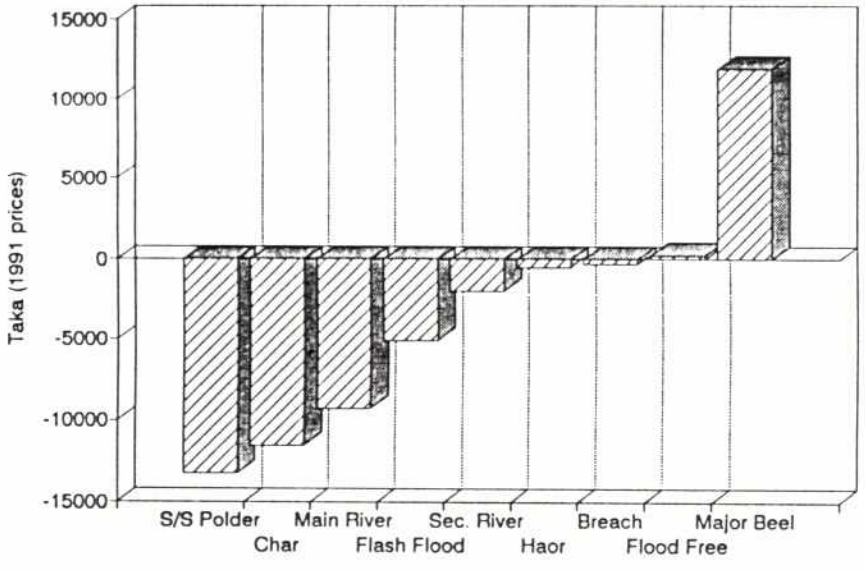

Figure 8.2 Balance of Annual Aggregate Household Production and Consumption of Food by Flood Environment

Figure 8.3 shows the relative production levels by flood environment for the major food types used to compile Figure 8.2. The breach, haor, and major beel areas are sharply surplus in rice, but deficit in vegetables and pulses. The char and secondary river areas are deficit in rice and slightly surplus in pulses. Main river areas and semi/saline polders are deficit in everything. Haors, beels, chars, and the semi-saline polders are major fish-producing areas. Fish and fish earnings, particularly from shrimp culture, provide a substantial part of the income which allows for rice imports in the coastal, semi-saline polder area.

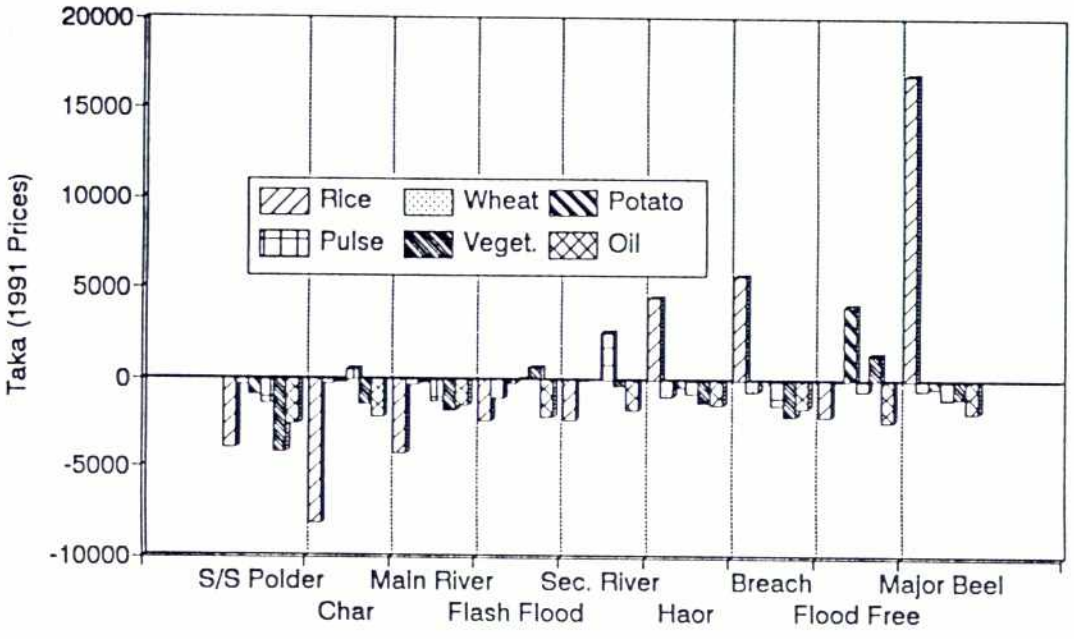

Figure 8.3 Annual Average Balance of Production and Consumption of Major Food Classes by Flood Environment

The relationship between farmers' agricultural income and income from other occupations is closely related to flood environment (Table 8.4).

Because over 37 percent of all farmers have expenditure exceeding earned income, they attempt to maintain their families by selling assets or obtaining loans. The highest proportion of farmers doing so are in the haor, flash flood and char environments which are subject to sudden and unexpected flooding, loss of land through erosion, or land sales enforced by poverty.

Those most in debt lived in the haor and flash flood areas. Problems of early harvesting, dry storage of harvested grain, livestock sales, and land sales following severe flood is most severe in haor areas. Conversely, the farmers with the biggest surpluses were located in breach and secondary river environments that are the least affected by sudden flooding. Surprisingly, char land farmers ranked fourth in surplus agricultural income, possibly because they were the most risk averse group.

Household heads engaged in nonlabor occupations, but who also do farming as a secondary occupation formed a large percentage of those farming in the beel and flash flood areas, while accounting for only 17.7 percent of the sample. This occupational pattern is an indication of their willingness to invest surplus funds in the traditional agricultural areas (remittance investment in Sylhet for example). It also is associated with the better infrastructure development characteristic of areas with profitable industry and trading, such as the southern side of the Sylhet Basin or the Dinajpur area of north Bengal.

Table 8.4

Percentage Distribution of Sample Farming Households by Socio-economic Status and Flood Environment

	Flood Environment									
Main (Plus Secondary Occupation)	Char	Main River	Second River	Semi-Saline	Beel	Haor	Flash Flood	Breach	Total	Percent
Farming/Deficit Income	43.3	32.1	38.2	32.1	36.1	54.2	47.5	27.0	483	37.4
Farming/Surplus Income	26.1	19.5	28.5	27.0	24.1	17.6	14.1	31.5	300	23.3
Other Occupation (Laborer) Plus Farming	24.6	26.0	20.8	23.5	15.8	15.5	16.2	23.9	279	21.6
Other Occupation (Non-Laborer) Plus Farming	6.0	22.4	12.5	17.4	24.0	12.7	22.2	17.6	228	17.7
Percent	100	100	100	100	100	100	100	100	100	100
Total	134	339	144	115	158	142	99	159	1290	

Source: Household Survey.

8.3.1 A Case Study

For detailed household level analysis, 10 households were chosen at random. A representative case was a small farmer of Goalbathan village in Sarishabari Upazila, located in a main river location. He is typical of the small farmer class who comprises 29.6 percent of the sample population, but he is far better off than the landless class which is the majority (53.8 percent) of the population. The male head was an owner-cultivator with 131 decimals (0.53 hectares) of land. Two children were in school, and neither husband nor wife had other employment. It was extremely difficult to meet all the family's needs on farming income alone. After providing for the family's food and for the cattle's straw, this family's balance was just Tk. 256 for the year. To cover his costs, the male head took a loan with his land as security, and sold a portion of his rice to his creditor at half the usual market price.

What options does this household have? Their rice, jute, and potato yields were good, and no other rice variety is likely to produce more (very little beside HYV aman and HYV boro are grown in this village). The flood period begins around the end of June for lowland and lasts for as many as six months, leaving very little time for other crops. If they planted the higher field only in HYV boro, and not jute and potato, their net balance would drop to a loss of Tk. 384.

In short, given their resources, it is difficult to see a more effective way of using them. He owns two cows, but uses his cousin-brother's cattle as draft animals. In 1991 he reported buying straw, which meant he was losing money on his cows. (In 1992 he did not have to buy straw.) Without their milch cows, their net return would increase about Tk. 1,500, but they would have to find a buyer for the bran and straw, and would lose the milk and the prospect of appreciated value on the younger cow. The combined loss is likely to be more than their 1991 Tk. 511 straw deficit.

Q: Do you grow the same things every year? A: More or less the same, but the plan shifts according to when the first rains come. Before they installed the sluice gate, it was common for newly transplanted aman plants to be washed out, so irri (boro) is safer. Rain in Ashin may wash out the young aman plants, and if that happens, we leave the land fallow for two or three months. Then we would plant either wheat or mustard followed by irri. If the aman doesn't wash out, we leave it fallow after harvest and then plant jute. If too many crops are planted on the same field, fertility will decline.

I sell irri for either Tk. 200 per maund at harvest time or Tk. 250 at other times...[but] I have to pay Tk. 800 for shallow tubewell irrigation charges on 33 decimals of land. I sell aman for Tk. 280 per maund without having to pay for water.

...When the water washes away the aman it washes away all my money, causing my 'deficit on the deficit'!

Interview of a farmer in Goalbathan Village for agricultural case study, by S. Hanchett, August 1992.

There is an embankment between this farmer's land and the source of flooding. This farmer, like most of those around him, rated it as very helpful. Although he reported that drainage structures, public high ground, and credit for tubewells were not present or available, he also evaluated them favorably. Taking his financial situation into account, the logic behind such evaluations is easy to see. A longer flood free period would be good, but not if it would reduce the water available for crops; the farmer is in no position to take a loss. The balance between gain and loss is delicate. Most families in this situation are at risk of serious deterioration in their food supply and other basics of daily life.

8.4 Cropping Patterns

There are two distinct cropping seasons during a year: the kharif and rabi seasons. Kharif is the main cropping season, characterized by the monsoon climate. It starts in March and ends in October. The kharif season is further divided into kharif-1 (March through June) and kharif-2 (July through October). Aus is grown during the kharif-1 season and T. aman is grown during the kharif-2 season. B. aman requires both kharif seasons to mature. Rabi is a short, dry season from November to February and is characterized by scanty or no rainfall, low temperatures, and clear skies.

Cropping patterns were examined to see if there were differences caused by land elevation, flood environment, flood depth, flood duration, and flood protection (Table 8.5).

8.4.1 Land Elevation

The cropping intensities and crop patterns of high and medium lands in the survey villages were very similar. Cropping intensity of lowlands was much less than medium lands, 150 percent compared to 195 percent. There were substantial differences in cropping patterns between land types within a village, but the variations between villages were such that there were few statistically significant differences to compare average cropping intensities or cropping patterns between land elevations across all villages.

8.4.2 Flood Environment

Lowland cropping patterns of villages grouped according to the flood environment categories described in Chapter 1, are shown in Table 8.5. There were no significant differences in cropping intensities and cropping patterns between the groups of villages in the main river, secondary river, or breach categories. There were, however, distinctive characteristics with respect to cropping patterns in the char, semi-saline, haor, and beel areas.

The cropping patterns of char villages are quite homogeneous. A high percentage of the land is cropped in every season. The weighted mean cropping intensities are 84 percent in kharif-1, 70 percent in kharif-2, 52 percent in rabi. The crops grown are almost uniformly mixed aus and aman. These have been counted as two crops, followed by other (nongrain) rabi crops.

The two villages in the semi-saline category have a common characteristic in that neither of them produce crops during the kharif-1 season. Both villages are protected by polders and they both plant HYV and local T. aman during kharif-2 and HYV boro during the rabi season.

The cropping patterns of the beel group are similar except for Lalua, where 92 percent of the land is planted to B. aman during kharif-2. Except for a little jute in Lashkarpur, not much else is grown in these villages during the monsoon season. The major crop production in these villages is in the rabi season, and the crop grown is almost entirely HYV boro.

Almost all crop production in the haor villages occurs during the rabi season. All the villages grow HYV boro, except in Muradpur where local boro is grown because of early floods.

8.4.3 Flood Depth

Although land type is defined by depth of flooding, there were significant differences in cropping patterns between villages on the basis of flood depth. Lands of the same type were planted to a greater proportion in higher yielding varieties during kharif-1 and kharif-2 in moderately flooded villages as compared to deeply flooded villages. In moderately flooded villages, 19 percent of the lowland was planted to HYV aus compared to only two percent in deeply flooded villages. During kharif-2, 47 percent of the lowland is planted to T. aman (HYV and local varieties) in the moderately flooded villages compared to 16 percent in the deeply flooded villages.

8.4.4 Flood Duration

Villages with medium duration floods cropped their land more intensively overall than those with either short or long duration floods. However, the percentage of land planted to HYV varieties was higher with

shorter duration floods. For example, during kharif-2, with villages ranked in order from short to medium to long duration flooding, there was a shift in cropping patterns from T. aman (including HYV) to mostly mixed aman, to much less T. aman, to exclusively B. aman during long duration flooding.

8.4.5 Flood Protection

The villages were classified according to degree of flood protection: fully protected, partially protected, and unprotected. Fully protected villages were officially considered to be fully protected from flood waters by polders, embankments, or related structures constructed as a Bangladesh Water Development Board (BWDB) flood control and drainage (FCD) project. Land within these projects may still be subject to flooding from local rainfall, poor drainage, or embankment breaches. Partially protected villages were considered to be somewhat protected by virtue of a non-BWDB embankment or a road embankment.

Flood protection allows higher paddy production and higher crop incomes, as indicated by the relative percentages of land growing HYV crops. Fully protected medium lands were producing mostly HYV aus during kharif-1, while the major crops in the partially and unprotected lands were local aus, mixed aus/aman and jute. During kharif-2, the protected villages produce almost entirely HYV and L.T. aman -- 74 percent, compared to 53 percent for villages with partial protection, and 35 percent in the villages with no protection.

Higher percentages of cropland were also planted to HYV paddy on protected lowlands compared to lowlands with no protection. Sixteen percent HYV aus, 10 percent HYV aman, and 53 percent HYV boro was planted in protected villages compared to two percent, one percent, and 32 percent respectively, in the unprotected villages. The percentages of HYV paddy in the partially protected villages lie between these figures.

8.5 Crop Yields

Data were collected on yields by land level and crop type for the 1991 rabi, 1990 kharif-1, and 1990 kharif-2 seasons. No information was collected comparing flood conditions in these seasons to other seasons. Apart from different hydrologic and climatic regimes in the different flood environments, other factors affecting yield, such as soils, drainage, fertilizer application, pesticides, management practices, supplemental irrigation in the kharif seasons and irrigation during the rabi season, were not explored. Because the survey methodology relied on frankness and recall ability, building a crop yield matrix containing all likely variables affecting yield would have been misleading. In consequence, the yield estimates shown in Table 8.6 are indicative only. They do, however, reflect farmers' perceptions of their yields and the impressions they wished to convey, and, possibly, the response planners would receive.

Average yields of the main river and secondary river groups were similar. Except for mixed aus/aman, the char lands consistently had much lower yields for grain crops and jute than the main and secondary river groups, while pulse and oil seed yields were about the same. Yields of B. aman, T. aman, and HYV boro in the semi-saline group were lower than the main rivers group by 24, 38, and 39 percent respectively. Relatively high yields of HYV boro were reported for villages in the beel and haor categories as compared to the other villages. The average yield of the beel group was 55 percent higher than the main rivers group, and the average yields of the haor group was 26 percent higher. As noted earlier, wheat yields were lower in the char areas, but, otherwise, wheat, pulses, and oil seed yields were

Table 8.5

Cropping Patterns on Medium and Low Lands According to Flood Environment Classification

Land Type & Village	Total Area (ha)	Cropping Intensity Kh 1	Kh 2	Rabi	Total	Kharif 1 Aus (H)	Aus (L)	Mxd Aus	Jute	Mxd Aman	Kharif 2 T. Aman H/L	T.Aman (H)	T.Aman (L)	B. Aman	Rabi Boro (H)	Boro (L)	Wheat	Other Rabi
						(percent)												
Char Low Land																		
Shibsen	17.41	64	47	28	139	0	20	40	4	40	0	0	0	7	0	28	0	0
Gopalganj	20.00	92	88	91	271	0	6	82	3	82	0	0	0	6	0	0	15	76
Jangipur	20.24	100	80	61	240	0	4	81	14	79	0	0	0	1	0	0	8	53
Gopalpur	21.70	87	79	31	197	0	12	75	0	73	0	0	0	6	0	3	0	28
Char Salehpur	20.16	72	54	49	175	0	26	46	0	46	0	0	0	8	0	0	0	49
Total	99.51	84	70	52	206	0	13	66	4	65	0	0	0	6	0	6	5	42
Main River Low Land																		
Baraitali	5.47	34	35	86	155	0	0	2	32	2	18	4	11	0	2	5	20	59
Chhoto Bashali	31.58	77	12	84	173	22	14	6	35	6	2	0	0	4	8	6	10	60
Bararia	3.08	92	39	55	186	39	12	15	27	15	23	0	0	1	2	0	0	53
Shingjala	9.11	12	18	87	116	0	1	6	5	6	0	0	11	1	83	3	0	1
Budhal	20.32	36	84	57	177	17	12	1	6	1	24	19	38	2	48	1	2	6
Goalbathan	9.96	4	6	99	108	0	0	0	4	0	2	1	3	0	89	5	3	2
Shanakoir	18.58	0	46	100	146	0	0	0	0	0	7	21	14	3	94	5	0	1
North Sankibha	10.00	103	63	73	240	8	31	50	14	28	35	0	0	0	0	0	42	31
Total	108.10	45	38	82	164	11	10	8	16	6	11	7	11	2	43	4	8	26
Secondary River Low Land																		
Kamaldia	33.89	79	34	67	180	1	8	32	38	31	1	0	0	1	15	4	14	34
Rukuni	5.71	20	42	93	155	1	5	6	7	6	11	24	0	0	65	0	10	18
Auliapukur	0.16	0	100	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0
Total	39.76	70	35	70	176	1	8	28	33	27	2	3	0	1	22	3	13	32
Semi-Saline Low Land																		
Goalpota	22.67	0	100	16	116	0	0	0	0	0	100	0	0	0	12	4	0	0
Bakchara	32.15	0	65	67	132	0	0	0	0	0	56	0	3	6	67	0	0	0
Total	54.82	0	79	46	125	0	0	0	0	0	74	0	2	4	44	2	0	0
Beel Low Land																		
Lalua & Others	64.70	0	94	71	166	0	0	0	0	0	2	0	0	92	71	0	0	0
Lashkarpur	58.30	6	0	92	98	0	0	0	6	0	0	0	0	0	90	0	0	2
Gadighat	71.78	0	0	96	96	0	0	0	0	0	0	0	0	0	95	0	0	0
Total	194.78	2	31	86	120	0	0	0	2	0	1	0	0	31	86	0	0	1
Haor Low Land																		
Muradpur	77.49	0	0	100	100	0	0	0	0	0	0	0	0	0	0	100	0	0
Rampur	62.67	0	0	100	100	0	0	0	0	0	0	0	0	0	89	0	0	11
Chatipara	15.91	3	0	99	102	3	0	0	0	0	0	0	0	0	99	0	0	0
Total	156.07	0	0	100	100	0	0	0	0	0	0	0	0	0	46	50	0	4
Flash Flood Low Land																		
Fenibeel	2.43	0	100	0	100	0	0	0	0	0	100	0	0	0	0	0	0	0
Bhitidaudpur	36.88	10	31	82	123	0	10	0	0	0	4	5	5	17	76	3	0	3
Total	39.31	9	35	77	122	0	9	0	0	0	10	5	5	16	71	3	0	3
Breach Low Land																		
Panchthupi	6.23	18	28	84	131	15	0	0	3	0	0	28	0	0	84	0	0	0
Pakisha	68.34	0	83	59	142	0	0	0	0	0	0	0	0	83	59	0	0	0
Paschim Durgap	8.95	86	31	55	172	77	7	0	1	0	0	31	0	0	15	22	15	3
Total	83.52	11	73	60	144	9	1	0	0	0	0	5	0	68	56	2	2	0

Source: Household Survey

generally unaffected by flood environment because they are rabi crops.

In this survey, no significant yield differences were found between villages with different flood protection levels. FAP 12 found significant yield differences in some of the projects it evaluated. This suggests that, in some areas, increased flood security results in a higher use of production inputs such as fertilizer.

Table 8.6

1990-91 Average Crop Yields (mt/ha) by Land Elevation in Survey Villages

Crop	High Land (ha)	High Land (mt)	Medium Land (ha)	Medium Land (mt)	Low Land (ha)	Low Land (mt)	Total (ha)	Total Land (mt)	1989-90 * Nat'l Avg. (mt)
Kharif 1									
B. Aus	16.6	1.39	24.3	1.35	32.4	1.31	73.3	1.34	1.46
M. Aus	5.7	1.03	14.6	1.60	65.6	0.81	85.8	0.96	-
HYV Aus	18.2	2.80	15.8	3.03	21.5	3.24	55.5	3.03	2.57
Jute	52.6	1.75	21.5	1.67	39.3	1.61	113.0	1.69	2.31
Kharif 2									*
B. Aman	1.6	1.36	1.2	1.57	132.4	1.56	135.2	1.56	2.02
M. Aman	5.3	1.22	10.1	0.87	62.3	0.84	77.7	0.87	-
M. Aus/Aman	5.7	2.73	13.8	2.82	19.0	2.38	38.5	2.59	-
T. Aman H/L	65.6	2.16	57.5	2.32	62.3	1.58	185.4	2.01	-
L.T. Aman	19.8	2.38	40.1	2.15	15.4	2.34	75.3	2.25	2.02
HYV Aman	38.1	3.38	19.4	3.47	15.8	2.97	73.3	3.31	3.26
Rabi									
L. Boro	4.9	1.35	1.2	2.11	93.5	2.23	99.6	2.18	1.79
HYV Boro	74.5	3.69	49.8	3.42	393.5	4.85	517.8	4.54	3.92
Wheat	23.1	1.67	18.6	1.39	20.2	1.83	61.9	1.64	1.50
Pulses	26.7	1.32	20.2	1.01	41.3	0.81	88.7	1.01	0.68
Oilseeds	10.1	0.88	10.5	1.16	34.8	0.86	55.9	0.92	0.80
Potato	18.2	8.13	16.6	7.96	8.1	6.64	42.9	7.78	9.14

* National average yields are from Bangladesh Bureau of Statistics (1991b:184-189). B. Aman and L.T. Aman are combined. Rice yields are converted to paddy by a factor of 1.49.

The yields for B. aus, mixed aus, jute, mixed aman, mixed aus/aman, and HYV aman were consistently higher on the high and medium lands than on the lower lands. Such findings are consistent with shallower monsoon flood conditions on the high and medium lands. HYV boro yields were highest on lowland. This may reflect other factors, such as higher natural fertility and the fact that the lowest lands are the repository for excess fertilizer applied to higher fields. Yields of wheat and oilseeds did not appear to be sensitive to land elevation. Yields of pulses, however, decreased with land elevation.

8.6 Crop Losses From Floods

This section presents farmers' reports of crop losses from flooding. Data were collected on the extent of loss and, if there were crop losses, questions were asked about actions taken in a normal year, average flood year and severe flood year.

8.6.1 Normal Monsoon Inundation

No flood crop losses were reported in normal monsoon inundation except in Bakchara of Satkhira Sadar

in the semi-saline costal area. Bakchara is protected from flooding by a polder, but it lies in a low beel area with poor drainage. Normal annual occurrences of water logging caused by rain and poor drainage cause substantial losses of the aman crop. Seventeen percent of aman on highland, 24 percent on medium land, and 49 percent on lowland were reported lost.

8.6.2 Average Flood

Average flood crop losses reported by farmers in villages classified according to their flood environment is shown in Table 8.7. Because of the way the questionnaire was structured, it is not possible to say how much of a household's farmed land actually sustained a crop loss. It can be said, however, that of the total 1,206 ha of reported cropped land in all the villages, 780 ha, or 65 percent, were cropped by farmers who reported some crop loss under average flood conditions.

Char. Eighty-eight percent of the households in five villages report crop losses under average floods. Gopalganj, and Jangipur reported losses mostly in the 26 to 50 percent range, while the other three villages reported crop losses mostly in the 76 to 100 percent range. Three of the villages had the highest mean flooding frequencies within the home among all survey villages: Jangipur 4.3 times in the last 10 years, Gopalpur four times and Salehpurwith three times.

Main River. Overall, 52 percent of households, farming 43 percent of the land reported crop losses under average flood. There was considerable variation among the villages. Respondents in Bararia and Choto Bashalia reported few to no crop losses, while all of the farm households in North Sankibhanga reported losses ranging between 76 to 100 percent. North Sankibhanga is located on the river side of the Meghna-Dhonagoda FCDI project embankment and is losing crop land to river erosion at the rate of 140 meters per year.

Table 8.7

Crop Flood Losses, Average Flood by Flood Environment

Flood Environment	Farming Households			Cropped Area (ha)			Percentage of Households Suffering Flood Classified by Quartile Loss Class				
		With Loss			With Loss						
	Total	Total	%	Total	Total	%	(1-25)	(26-50)	(51-75)	(76-100)	Total
Semi-Saline	118	109	92	131	119	91	4	19	15	62	100
Char	163	144	88	158	139	88	7	35	16	42	100
Haor	146	121	83	165	141	85	18	59	22	1	100
Flash Flood	99	79	80	81	52	64	39	43	10	8	100
Secondary River	148	93	63	156	98	63	68	21	4	7	100
Breach	160	91	57	138	91	66	0	23	8	69	100
Main River	335	174	52	178	77	43	21	30	12	37	100
Beel	159	47	47	198	63	63	0	49	45	6	100
Total:	1328	858	-	1206	780	-					
Percent:	100	65	-	100	65	-	18	32	14	36	100

Source: Household Survey

Shanakoir, Bararia and Goalbathan villages under this classification are officially considered to be fully protected from floods by BWDB projects. No crop losses from normal flood were reported by the

farmers from Bararia. The village is protected by an embankment along the river Elangjani that passes by the northern boundary of the village from east to west.

Shanakoir and Goalbathan are located on the left bank of the Jamuna in Jamalpur District. Goalbathan is protected by the Brahmaputra left bank embankment, but the village is still frequently flooded by the Jamuna. In addition to the severe floods of 1987 and 1988, 60 percent of the village crop lands were reported flooded 60 to 70 days in 1984 and 1986. Under average floods, 65 percent of the farmers reported crop losses. Fifty-one percent of farmers reported crop losses in Shanakoir under average floods. Shanakoir is located on relatively higher terrain than Goalbathan. The source of flooding is the Jamuna and Jhinai rivers. The area has been flooded six times in the past 10 years. Besides the severe floods of 1987 and 1988, 60 percent of the crop land was flooded in 1982 and 1984, and 40 percent in 1989 and 1991.

Secondary Rivers. A higher percentage (63 percent) of secondary river households reported crop losses under average floods as compared to the main rivers group. However, the level of crop loss reported under average flood conditions was relatively light: 68 percent reported losses ranging from one to 25 percent, and 21 percent reported losses ranging from 26 to 50 percent. Rukuni and Kamaldia are both located in Madhukhali Upazila on the Ganges floodplain. Kamaldia is located on the edge of a beel and the crop lands are flooded almost every year. Rukuni is located at a higher elevation and is rarely flooded. Auliapukur is located between two rivers, Atrai and Kakra, which are the two major sources of flood in Dinajpur District. The village is quite prone to flooding, and almost all the farmers reported crop losses from average floods. The percentage of loss was low, however, ranging from zero to 25 percent.

Semi-saline. Goalpota and Bakchara are protected by polders of the Coastal Embankment Project. Ninety-four percent of the farm households reported crop losses under average flood. Crop losses most frequently ranged from 76 to 100 percent in Bakchara, and 26 to 50 percent in Goalpota. Although fully protected from flooding by external sources, the high crop loss in Bakchara occurs because of severe waterlogging and inadequate drainage during the aman season. Goalpota does not have the waterlogging problem because a sluice gate built in 1990 effectively drains the lowlands. Ninety to 70 percent of the crops were lost in the 1987 and 1988 floods. Prior to that the other major flood of recent memory was in 1984 when crop losses were nearly 70 percent.

Beels. Laskarpur and Gadighan reported no crop losses from normal or severe floods because, basically, the crops are grown in these villages only during the Rabi season.

Haors. Eighty-three percent of farm households in the three haor villages reported crop losses from average floods. Most frequently, losses ranged from 26 to 50 percent. Practically the only crop grown in these villages is boro paddy. Crop damage is caused by early, frequent flashfloods.

Flash Flood. Sixty-four percent of the crop land in this environment occurs in two villages, Fenibeel and Bhitidaudpur. Eighty-four percent of the farm households reported crop losses from average floods. Losses reported by farmers of Fenibeel ranged from one to 25 percent, while most of the losses reported by farmers of Bhitidaudpur ranged from 26 to 50 percent. Fenibeel is located 14 km north of Sunumganj, close to the northern hills, which makes it subject to frequent flash floods of short duration. Bhitidaudpur is frequently flooded by runoff from the Tripura hills. The floods are typically of four to 15 days duration.

Breach. The three villages in this class, Pachthupi, Pakisha, and Paschim Durgapur, are protected from flooding by BWDB embankments. Paschim Durgapur is within the Meghna Dhonogoda FCDI project and, therefore, is considered to be fully protected from floods. The village was flooded when the embankment breached in 1987 and 1988. Almost all households reported crop losses ranging from 76 to 100 percent in both average and severe floods. Apparently the villagers are responding on the basis of their experience of 1987 and 1988 without considering the distinction between average and severe floods.

Seventy-eight percent of farm households farming 90 percent of the land in Pakisha reported crop losses under average flood. Losses mostly ranged from 26 to 50 percent. Pakisha is protected by Polder C of the Chalan Beel Project. The embankment was breached in 1988. Although the embankment has been repaired, the height and compaction are not adequate and the embankment breaches annually at the same points.

Pachthupi is protected by the BRE and is considered to be relatively flood free. The village was flooded in 1984 and 1988 by breaches of the BRE, and in 1991 by overflow from the Karatoya/Bangalee rivers. No crop losses were reported by farmers from this village under average flood conditions.

8.6.3 Severe Flood

Severe flood crop loss reports for villages classified by level of flood protection is shown in Table 8.8. Under severe flood, out of the total 1,238 ha of reported cropped land in all the villages, 73 percent (909 ha) were farmed by households that reported crop losses. Almost 80 percent of the reported crop loss ranged between 76 and 100 percent. The general pattern is that almost all the farm households in a village reported crop losses from severe floods. The few exceptions were in Choto Bashalia, Lashkarpur, and Gadighat. In Choto Bashalia, 33 of the 38 ha farmed are lowlands, with only 11 percent of the lowland cropped in kharif 2. Therefore, there was no crop that could be damaged at the time of the 1988 flood. Similarly, the crop lands of Lashkarpur and Gadighat are located in beel areas and are inundated every year. Therefore, almost no crops are grown during kharif 2.

Table 8.8

Crop Losses During Severe Flood by Level of Protection

Flood Environment	Farming Households			Cropped Area (ha)			Percentage of Households Suffering Flood Classified by Quartile Loss Class				
	Total	With Loss Total	%	Total	With Loss Total	%	(1-25)	(26-50)	(51-75)	(76-100)	Total
Fully Protected	295	267	91	255	217	85	1	4	3	92	100
Part Protected	417	363	87	342	297	87	8	16	12	63	100
Not Protected	616	422	69	599	395	66	10	6	6	78	100
Total:	1379	1053		1238	909						
Percent:	100		76	100		73	7	8	7	78	100

Source: Household Survey

The aman crop was most frequently reported damaged. Of the households reporting crop loss under average floods, 67 percent reported damage to the aman crop, 23 percent to the aus crop, and 20 percent to boro. Similarly, under severe flood, 72 percent reported damage to the aman crop, 22 percent reported damage to aus, and 15 percent to boro. Ten percent of households reported damage to more than one crop under both flooding conditions.

8.7 Response to Crop Losses

Farmers in the sample villages usually tried to make up for crop flood losses by taking suitable measures in the subsequent season. Resorting to such measures depended on the severity of crop loss and the set of conditions that guided the decision making process of the affected farmer.

The survey question to respondents about actions taken was open-ended in order to capture all types of actions taken by the sample households. The open-ended responses were subsequently grouped into 10 categories. There was some overlap in these response categories as explained below.

Actions were taken after the recession of flood water. Very few households reported replanting aman and aus rice, indicating that flood water receded after the latest time for replanting these crops had passed. Most actions were taken during the rabi season. Table 8.9 shows households reporting crop losses and action taken after average floods.

Table 8.9

Household Response to Crop Flood Losses, Average Flood

	No. of Households	Crop Plots By Land Elevation High	Medium	Low	Total	%
Total Flood Prone Farm Households	1327					-
Households Reporting Crop Damage	860	177	273	680	1130	100
Households Taking No Action	339	54	92	244	390	39
Action Taken:						
Households Taking Action	521	123	181	436	740	100
Increased Boro Cultivation	-	33	46	155	234	32
Increased Wheat Cultivation	-	10	14	20	44	6
Increased Rabi Cultivation	-	39	53	49	141	19
Increased Aus or Aman Cultivation	-	13	25	12	50	7
Increased Cultivated Area	-	1	3	7	11	1
Loan and Lease	-	19	23	114	156	21
Sale of Land	-	0	0	0	0	0
Other	-	12	31	94	137	19
Total **	-	127	195	451	773	104

**Some households reported more than one action.

Sixty-five percent (860) of flood prone farming households (excluding the flood free village and nonfarming households) reported crop loss under average flood conditions. Of these farm households, 61 percent took some action in response to crop losses and 39 percent took no action. Twenty-four percent of the households not taking action reported they were unable to make arrangements to do so.

Of the farm households taking action, 32 percent increased boro cultivation, six percent wheat cultivation, and 19 percent other rabi crops. Therefore, the action taken by at least 57 percent of the farm households who took action was to increase cultivation during the rabi season.

Seven percent of households increased aman cultivation after flood waters receded. Twenty-one percent of households reported that they "loaned and leaseed," meaning they borrowed money to purchase crop production inputs such as seed and fertilizer, and/or leased land under a sharecrop arrangement. One percent of households responded that they increased cultivated area, without designating the crop. There was some overlap in these responses, so they are not strictly additive. However, they indicated that between 83 to 85 percent of households who took action responded to crop flood losses by subsequently increasing the cultivation of other crops. No households reported selling land.

Under severe flood (Table 8.10), 75 percent (997) of all flood prone farming households reported crop losses. Sixty-three percent of these households took some action, and 37 percent did not. Of the 365 households that did not take action, about one-fourth specifically said they "could not make arrangement to take action," meaning they were unable to obtain a loan, and/or lease land. Loss of crops on high and medium elevation lands was reported more frequently in severe flood compared to average floods. Fifty-two percent of the households reported losses on lowland, 25 percent medium land, and 23 percent highland.

Taking into account the overlap in responses, at least 86 percent of the households that took action after the severe flood increased their cultivation of subsequent crops. Again, of the most frequently reported responses, 61 percent increased cultivation of boro, wheat, and other rabi crops.

Table 8.10

Household Response to Crop Flood Losses, Severe Flood

	No. of Households	Crop Plots By Land Elevation High	Medium	Low	Total	%
Total Flood Prone Farm Households	1327					-
Households Reporting Crop Damage	997	305	341	695	1341	100
Households Taking No Action *	365	83	94	260	437	37
Action Taken:						
Households Taking Action	632	222	247	435	904	100
Increased Boro Cultivation	-	72	59	156	287	32
Increased Wheat Cultivation	-	16	8	18	42	5
Increased Rabi Cultivation	-	68	66	79	213	24
Increased Aus or Aman Cultivation #	-	16	28	14	58	6
Increased Cultivated Area	-	2	4	18	24	3
Loan and Lease	-	39	57	133	229	25
Sale of Land	-	14	20	37	71	8
Other	-	12	18	29	59	7
Total **	-	239	260	484	983	109

* Includes 108 households who reported they could not make arrangements (such as credit) for taking action.

** Some households reported more than one action.

Includes one household that increased Aus cultivation.

8.7.1 Selling Land

Eight percent of households reported selling land as a response to severe flood. The distribution of households who sold land by flood environment was haor, 33 percent; flash flood, 27 percent; semi-saline, 15 percent; char, 10 percent; breach, eight percent; and main river, six percent. Of those who sold land, 35 percent were now landless (zero to 0.20 ha), 38 percent were small landowners (0.20 to 1.01 ha), 19 percent were medium landowners (1.01 to 3.03 ha), and eight percent still possessed more than 3.04 ha.

When discussing crop losses, farmers were concerned largely with after flood recovery and not with minimizing the initial loss. However, substantial numbers of households harvested boro and aus early, and they redried grain in flood years. As discussed in Chapter 6, farmers, as a group, had a greater response.

8.7.2 Conserving Grain

Many households harvested early during average and severe floods. In the most flood prone haor and beel areas, however, any flood worse than the normal monsoon flood evoked a very similar response, as shown in Table 8.11. This was because the timing rather than the magnitude was the factor influencing

Table 8.11

Flood Response to Conserve Grain

Flood Environment	No. of Household	Percentage of Households who: Move Grain			Redry Grain		
		Normal Monsoon	Average Flood	Severe Flood	Normal Monsoon	Average Flood	Severe Flood
Beel	233	21	35	57	43	55	50
Haor	235	1	37	44	36	44	52
Semi-Saline	161	3	34	35	71	74	73
Main River	611	4	9	32	42	47	54
Secondary River	220	4	32	9	42	54	47
Breach	240	0	20	6	7	25	13
Char	339	1	17	5	13	22	13
Flash Flood	139	1	4	1	23	40	24
Total	2178						
Mean		6	16	29	36	44	41

Source: Household Survey

harvest decisions. Conversely, severe floods in flash flood, secondary rivers and breach environments evoked a much greater response than average floods because their duration and magnitude were significantly greater. In the char areas, the response to severe floods was less than to normal floods. This was because nonagricultural factors, such as saving lives, evacuating and salvaging movable assets, were the dominant considerations.

Conserving grain, either through moving it to a safer location or salvaging wet grain, was an important response in the beel, haor, semi-saline, main and secondary river environments. Drying grain was important for even normal flood conditions, and was the major problem in semi-saline environments. This problem emphasizes the need for flood proofed, elevated storage areas and containers. Fewer households redried grain following severe floods in the breach, char and flash flood environments because harvest losses or washed out crops meant that there was little left to dry.

Few households moved grain in normal floods, except in the beels. The response in this environment increased with the severity of flooding. Households near the main rivers appeared to be well adjusted to normal and average floods, but they made a greater effort to move stored grain during severe floods. This reinforces the findings discussed in earlier chapters that mitigation measures in these areas should only be targeted to cope with severe floods. Households in the remaining secondary rivers, breach, char and flash flood environments made markedly reduced attempts to move and redry grain during severe flood. Char residents, however, were the only respondents who also reduced early harvesting. They did so because the char peak floods occur after the last boro or early aus harvest.

Q: What was your biggest problem in the flood of 1988? Farmer-1: Collecting fuel, cooking, and caring for animals. Farmer-2: Animals -- getting leaves to feed them -- were the biggest problem. We moved our cows two or three miles to the school (madrasa).... Husking rice was another problem, especially since we needed to take it over to Pigna, where there was a diesel-fueled paddy husking machine that wasn't submerged. The boatmen were charging Tk. 10 to take us over there, and the husker charged Tk. 30 per maund for his job, instead of his usual Tk. 10. Interview of two men in Goalbathan Village, for agricultural case study, by S. Hanchett, August 1992.

Early harvesting is an emergency measure to salvage field crops as a flood approaches, while redrying stored grain (paddy) is a response to reduce damage to wet food supplies. Moving stored grain, like early harvesting, is an attempt to protect supplies. Thus, these three measures were different types of response activities directed toward maintaining food supplies in the face of flood and they did not occur simultaneously. Each had its local variant. For example, in Muradpur (a haor village), farmers reported that during prolonged rainy periods when there is little sunshine for drying paddy, sacks of newly harvested paddy are submerged in deep water near the homestead to prevent early germination. They can remain in the water for up to two weeks without spoiling, but must be dried in sunlight immediately after removal from the water, lest the grain become powdery and inedible.

Some basic questions remain about early harvest, moving, or redrying grain. For example, what is the disposition of grain that is harvested early, or soaked grains? Is it sold off quickly to salvage some benefit? Some areas reported quick sales to traders who came in by boats and bought wet paddy at very low prices. There should be further investigation of the economic decisions involved, i.e., how farmers try to optimize their returns in such an imperfect market. Several farmers said they wanted marketing facilities and transport improvements, which would help with this process.

8.7.3 Livestock

Livestock is vital to the rural economy, as it is the main source of draft power. For the poorest households, poultry is a significant source of capital in times of disaster. Ownership of livestock, except poultry, was found to be primarily with householders owning cultivable land. Ownership of draft animals increased with socioeconomic status, as shown in Table 8.12.

Table 8.12

Ownership of Livestock and Poultry by Socioeconomic Status

	Landless	Small Farmer	Medium Farmer	Large Farmer	Total
No. Respondents	1256	595	259	68	2178
Percent Owning:					
Draft Animals	16	37	51	63	27
Goats and Sheep	16	17	25	25	18
Poultry	57	68	78	68	63

Source: Household Survey

On average only nine percent of farmers moved cattle (buffalo, cows, oxen) during average floods, but this increased to 27 percent during severe floods. The problems of moving cattle have been well documented in earlier chapters of this report. As for all other agricultural patterns, char and haor environments were significantly different from other environments, particularly for average floods. They had twice the number of households reporting moving cattle. Fodder requirements do not vary greatly between average and severe flood, except for the flash flood and semi-saline environments. These two environments experience either the effect of pre- or early monsoon major crop losses caused by wash-out or lodging of paddy (in the northeast and northern districts), or the effects of tidal surges and drainage congestion (in the coastal belt).

Possibly the biggest problem commonly associated with flooding is the loss of draft power essential for aman land preparation and post flood recovery. The Ministry of Agriculture's (1987:14-15) review of the 1987 flood estimated that there was a 37 percent shortfall in draft power for the peak tillage period. This report recommended the emergency purchase of 8,500 new power tillers costing $9.7 million as an essential post-flood recovery measure to prevent a reduction in the 1998 rabi boro rice crop. In the 1987 event, the following season's boro harvest was the best ever recorded despite these concerns about draft power. Our analysis of the ownership and selling of draft animals in response to flooding shows that only about eight percent are sold *because* of floods. If this is added to the six percent sold because of a lack of fodder (Table 8.11), then only 15 percent can be directly attributed to the physical impact of floods either on animals or crops. One of the most important finding from the household agricultural survey is that *poverty* accounted for 54 percent of all draft animals sold over the period 1986-91.

The number of respondents reported in Table 8.13 as owning draft cattle in 1991 was less than those sold between 1986 and 1991. This was because cattle were either sold as a business (31 percent of all sales in this period were the result of planned sales), or because sick or aged animals were slaughtered or sold.

Sales enforced by poverty accounted for 54 percent of all sales. Poverty sales were highest in the breach (66 percent) and flash flood (63 percent) environments because of the impact of major crop losses on household cash flows and debt servicing.

Table 8.13

Ownership and Selling of Draft Animals by Flood Environment

Flood Environment	Number of Respondents	Number of Respondents		Percentage Selling 1986-91 by Response				
		Owning in 1991	Selling 1986-1991*	Flood	No Fodder	Poverty	Eid Sales	Investment
Haor	235	45	106	21	30	45	3	1
Breach	240	73	77	12	0	66	5	17
Main River	611	135	120	8	2	58	12	21
Beel	233	43	70	6	10	43	26	16
Char	339	113	186	5	3	53	30	9
Flash Flood	139	48	70	4	4	63	14	14
Semi-Saline	161	67	38	3	0	58	16	24
Secondary River	220	72	91	0	0	53	4	43
Total	2178	596	758	-	-	-	-	-
Means	-	-	-	8	6	54	15	16

Source: Household Survey.
* This is the number of transactions; one household may have sold several times during 1987-91

Generally, it could only lead to further impoverishment, as land preparation for the next season, and recovery of earning capacity, would be put into jeopardy as a result. The reasons for poverty sales were numerous, but only 12 percent of the respondents were specific, as shown in Table 8.14.

8.7.4 Other Actions

Other actions during the monsoon and floods, as described in the study by Paul (1984), were not reported. These included fencing deep water aman paddy to protect it from water hyacinth, or clearing the water hyacinth by hand. As with Paul's study, there appeared to be few adjustments to unusual floods, although cropping patterns and crop varieties are themselves well adapted to the variety of normal monsoon conditions. However, this appearance may be a result of the questionnaire used.

8.8 Conclusions

The overwhelming response to crop flood loss was to increase the area cultivated in subsequent crops. Increased cultivation of high yielding varieties of boro rice was the most frequently adopted action. This finding is corroborated by the national crop statistics which show a 22 and 30 percent increase in HYV boro after the floods of 1987 and 1988, respectively. An increase in the area planted to this crop

highlights the importance of irrigation in the dry season for making up the loss of crops in the flood season. Loan or lease, reported by a large number of households, was very closely linked with this action. Increased cultivation of rabi crops, including wheat, was adopted by a large number of respondents.

The implication for government action of farmers' response to flood loss by producing more in the subsequent rabi season, is to make it easier for more of the farmers to do so. Most important actions would be to provide credit, and to assure an adequate supply of, and access to, crop production inputs in time for farmers to use them. Obvious examples are seeds and fertilizers. Because floods also may damage the infrastructure for input delivery, rapid repairs or temporary provisions could help farmers. Access to irrigation equipment is also important to enable winter season cropping. Given the free market policy, credit and action are probably the most critical in ensuring adequate funds at reasonable interest rates and repayment terms. A program to relieve the food and financial losses of floods could provide production inputs at reduced prices. Disaster loans, longer term credit, and grants to small farmers to increase production after the floods would help them avoid selling their land and major assets.

Table 8.14

Frequency of Sale of Draft Animals Caused by Poverty Classified by Flood Environment

Flood Environment	Total Respondent	No. Reported Sales	Sale Due to Poverty	No Specific Reason Except Poverty	Shortage of Cash Income	Sickness & Old Age of the Animal	Marriage of Daughter	Death of Spouse	Meeting Family Medical Need
Char	339	186	99	99					
Main River	611	120	69	63	4		2		
Secondary River	220	91	48	34	5	5	1		3
Semi-Saline	161	38	22	11	1	5	5		
Beel	233	70	30	30					
Haor	235	106	48	43	3		2		
Flash Flood	139	70	44	37	2			5	
Breach	240	77	51	42		3		3	2
Total	2178	758	411	360	15	13	10	8	5
Percentage			100	87.6	3.6	3.2	2.4	1.9	1.2

Source: Household Survey

Obviously, considerable physical capacity is already available to increase production of food grains. If farmers can greatly increase production during the rabi season after sustaining flood damage, why do they not do it in normal years to produce a surplus for sale? The answer probably is that it costs more to raise boro rice than aus or aman. This is because boro must be irrigated everywhere except in some haor and beel areas. The production cost risk relative to value of rice produced may be much higher to farmers (including sharecroppers) who must borrow to pay for production costs. These relationships should be

analyzed through farm budgets for households under various circumstances of financing, land tenure, size of farm and cost of irrigation. Such analysis could determine the incentives or disincentives to increasing crop production during the rabi season.

The concept of classifying villages according to flood environment, and finding homogeneity in cropping patterns within certain ones of these classes with distinctive differences between classes, is worth pursuing in terms of master and regional planning. When it comes to project planning, however, the diversity of conditions found by FAP 14 within and between villages and localities of the same general classification, clearly show that detailed, location specific feasibility studies are necessary to identify the impacts and benefits of alternative plans.

The observation of low cropping intensity during kharif-1 on lands with short duration floods, plus the fact that these lands are suitable for growing HYV aus, suggests that submersible embankments and supplemental irrigation should be considered as a potentially promising source of increasing foodgrain production.

Although the FAP-14 survey was not designed to determine the presence or absence of benefits from flood control (FCD/I) projects, the results indicate that such projects do enable a shift in cropping patterns to higher yielding varieties. This conclusion is in agreement with other studies, such as FAP 12, which were designed to specifically address this issue. It is apparent that such projects frequently still have problems of crop losses from average floods and drainage congestion, as well as still being vulnerable to severe floods. Therefore, flood action plans for farmers within these projects, or in new projects, should include both structural and nonstructural flood proofing components appropriate to the specific circumstances of a locality.

A major theme that pervades the review of agricultural flood response is that the majority of the study households, like the majority of the Bangladesh population, are at the margin of survival. The major problem is not floods *per se*, but inadequate resources, fragmented and subsistence land holdings, very few realizable assets that are not part of their means of earning a livelihood, and no cash savings from agriculture to tide farmers over disasters. Catastrophic floods tip the balance and force land and asset sales, and possibly remove the weakest landholders from farming. In developed countries, this would normally mean that more efficient farmers buy up the vacated land, exercise economies of scale, and make the farming system more productive and resilient to disaster. In Bangladesh, however, the ever increasing population allows no such advance, and rural households continue down the spiral of poverty.

Chapter 9

CONCLUSIONS

9.1 Applications of Study Findings

The Flood Response Study investigated patterns of flood response in eight different flood prone environments of the Bangladesh flood plain, a group that represented all major flood types and problems. The study sample gave a representation of physical and social conditions affecting flood response in each flood environment rather than being statistically representative of the whole flood plain population. Within each village or environment, however, sample sizes used were sufficient to statistically analyze topics such as variation in flood response activities and evaluations about the water regime or flood mitigation measures. As explained in Chapter 1, sample survey methods were complemented by qualitative methods such as group and individual interviews.

The findings are relevant to national and regional level planning. Because there was great diversity within any one flood environment, however, local surveys still are needed for developing detailed local plans.

The results of this study have some practical implications for program or project development. They are especially pertinent to the expansion of flood proofing strategies identified in the Flood Action Plan Study 23 final report. Preparing an urban or rural community to cope with flood in a way that minimally disrupts normal activities, requires a diversified approach that combines technical expertise with the needs of the affected population. It also may combine structural measures, such as creating public high grounds or flood control and drainage, with programs such as storm warning systems and disaster-preparedness.

The study also added to the existing information on how local interests and opinions about flood action varies. Cases presented showed that there can be intense disagreement or conflict over flood control projects between groups such as farmers and commercial fishermen, or large and small land owners. Gender Study findings showed that men and women have different concerns; and that female-headed households have unique needs.

Further research would show even more interest diversity among the peoples of the flood plain. In searching for local solutions to flood problems there may be winners and losers. Effective, sustainable program design should be based on planning that considers differences and either resolves conflicts or seeks less controversial alternatives.

9.2 Addressing Flood Problems of Different Environments

Common concerns and interests were found in the different flood environments, but contrasts between environments were significant. This showed that rural people experienced the high flood threat in a various ways.

A list of common flood experience problems for many of the rural study sites could serve as a starting point for flood proofing or other localized planning activities. It should be understood, however, that emphasis on one or another problem would differ between locations. The most common concerns across the study population as a whole were:

analyzed through farm budgets for households under various circumstances of financing, land tenure, size of farm and cost of irrigation. Such analysis could determine the incentives or disincentives to increasing crop production during the rabi season.

The concept of classifying villages according to flood environment, and finding homogeneity in cropping patterns within certain ones of these classes with distinctive differences between classes, is worth pursuing in terms of master and regional planning. When it comes to project planning, however, the diversity of conditions found by FAP 14 within and between villages and localities of the same general classification, clearly show that detailed, location specific feasibility studies are necessary to identify the impacts and benefits of alternative plans.

The observation of low cropping intensity during kharif-1 on lands with short duration floods, plus the fact that these lands are suitable for growing HYV aus, suggests that submersible embankments and supplemental irrigation should be considered as a potentially promising source of increasing foodgrain production.

Although the FAP-14 survey was not designed to determine the presence or absence of benefits from flood control (FCD/I) projects, the results indicate that such projects do enable a shift in cropping patterns to higher yielding varieties. This conclusion is in agreement with other studies, such as FAP 12, which were designed to specifically address this issue. It is apparent that such projects frequently still have problems of crop losses from average floods and drainage congestion, as well as still being vulnerable to severe floods. Therefore, flood action plans for farmers within these projects, or in new projects, should include both structural and nonstructural flood proofing components appropriate to the specific circumstances of a locality.

A major theme that pervades the review of agricultural flood response is that the majority of the study households, like the majority of the Bangladesh population, are at the margin of survival. The major problem is not floods *per se*, but inadequate resources, fragmented and subsistence land holdings, very few realizable assets that are not part of their means of earning a livelihood, and no cash savings from agriculture to tide farmers over disasters. Catastrophic floods tip the balance and force land and asset sales, and possibly remove the weakest landholders from farming. In developed countries, this would normally mean that more efficient farmers buy up the vacated land, exercise economies of scale, and make the farming system more productive and resilient to disaster. In Bangladesh, however, the ever increasing population allows no such advance, and rural households continue down the spiral of poverty.

Chapter 9

CONCLUSIONS

9.1 Applications of Study Findings

The Flood Response Study investigated patterns of flood response in eight different flood prone environments of the Bangladesh flood plain, a group that represented all major flood types and problems. The study sample gave a representation of physical and social conditions affecting flood response in each flood environment rather than being statistically representative of the whole flood plain population. Within each village or environment, however, sample sizes used were sufficient to statistically analyze topics such as variation in flood response activities and evaluations about the water regime or flood mitigation measures. As explained in Chapter 1, sample survey methods were complemented by qualitative methods such as group and individual interviews.

The findings are relevant to national and regional level planning. Because there was great diversity within any one flood environment, however, local surveys still are needed for developing detailed local plans.

The results of this study have some practical implications for program or project development. They are especially pertinent to the expansion of flood proofing strategies identified in the Flood Action Plan Study 23 final report. Preparing an urban or rural community to cope with flood in a way that minimally disrupts normal activities, requires a diversified approach that combines technical expertise with the needs of the affected population. It also may combine structural measures, such as creating public high grounds or flood control and drainage, with programs such as storm warning systems and disaster-preparedness.

The study also added to the existing information on how local interests and opinions about flood action varies. Cases presented showed that there can be intense disagreement or conflict over flood control projects between groups such as farmers and commercial fishermen, or large and small land owners. Gender Study findings showed that men and women have different concerns; and that female-headed households have unique needs.

Further research would show even more interest diversity among the peoples of the flood plain. In searching for local solutions to flood problems there may be winners and losers. Effective, sustainable program design should be based on planning that considers differences and either resolves conflicts or seeks less controversial alternatives.

9.2 Addressing Flood Problems of Different Environments

Common concerns and interests were found in the different flood environments, but contrasts between environments were significant. This showed that rural people experienced the high flood threat in a various ways.

A list of common flood experience problems for many of the rural study sites could serve as a starting point for flood proofing or other localized planning activities. It should be understood, however, that emphasis on one or another problem would differ between locations. The most common concerns across the study population as a whole were:

- Severe flood protection.
- Storm and flood warning.
- Emergency shelter with privacy arrangements.
- Cooking fuel.
- Safe drinking water.
- Getting food.
- Cooking arrangements.
- Sanitation facilities.
- Animal care.
- Fodder supply (that does not compete with fuel supply).
- Protection of crops and pond fishery resources.
- Grain storage/drying facilities.
- Getting timely agricultural inputs for replanting after crop loss.
- House repair.
- Employment continuity (a seasonal and flood-time problem).
- Transport access (road, boat, others).
- Road, embankment or other infrastructure repair.

In addition to these basic points, others -- provision for giving birth, protection from theft, keeping a family together -- were mentioned in surveys and case studies.

Most of these problems already were handled to some extent in severe flood situations. But, numerous gaps were identified, indicating that there is much work still needed to assist the rural population during flood. Some measures to address the above concerns are inexpensive or will involve nothing more than mobilizing labor. Others will involve profound change and re-allocation of resources. The most useful contribution from the national level to such an effort would be to systematically encourage taking low cost steps before resorting to more expensive measures.

Some specific ideas about approaching flood problems in each flood environment emerged from these findings.

9.2.1 Chars

Chars tended to have poor agricultural productivity because of their typically sandy soil. Populations were highly transient, moving from place to place as land disappeared. When the land emerged, they often had difficulty reclaiming it. Sometimes there were violent local conflicts over land. Populations tended to be largely impoverished, public facilities were poor, and education levels were very low. Some villages had many commercial fishermen. House construction was of lightweight materials that were easily damaged by flood. Most were affected in the 1988 flood. In two of the chars studied, floor levels were routinely raised in preparation for the annual monsoon. On one char, it was common to build a protective barrier around the whole homestead or the plinth. Many camped on embankments during floods, and there was a strongly felt need for emergency shelter. Information about water level rises needed to improve, as did efforts to transport people to emergency shelters.

Program Recommendations:

(1) Because many char residents seek shelter on embankments during severe flood, it would be helpful to provide veterinary care or emergency shelter in those locations.

(2) Certain public lands (including embankments) that are known to be settlement sites in flood should be strengthened or otherwise prepared for a periodic influx of settlers.
(3) Storm warning systems for chars should alert the public to the need to evacuate.
(4) Persons displaced by river erosion are helped partly by local systems such as *uthuli* which provide shelter. But, these refugees were among the most economically insecure of all families and, thus, may require extra public service supports.

9.2.2 Beels and Haors

These two environments had many similarities in flood response. Like chars, they were flooded deeply but for longer times each year. Populations were, however, not transient, and houses tended to be more sturdily built. Relatively high yields of HYV boro crops were reported, and rice production overall was high. Trading activity accelerated during the monsoon season. Boats were important when taking shelter in floods. In two beels, people routinely constructed barriers around their homesteads. When it was necessary to evacuate the home in flood, people tended to find shelter in higher houses of the same village. Fewer tubewells were found than in other study villages, and, consequently, access to safe drinking water during floods was a more serious problem than in other locations.

Program Recommendations:
(1) Continued water purification problems indicated that existing services might not be adequate. This point needs investigation.
(2) Storm warning systems directed to these areas should help farmers decide when it is necessary to harvest crops early.
(3) Because large landowners had greater interest in grain storage and drying facilities than other areas, they could be expected to share costs of such facilities if developed as part of a flood proofing program.

9.2.3 Main Rivers

There was great interest in being free of severe flood, but less interest in changing average floods or normal rainfall effects. This environment comprised a diverse range of flood experience, and residents had adopted various flood preparation and coping measures. There were large numbers of protected households who tended not to make many preparations for flood, but who were still likely to be affected by severe flood.

Program Recommendations:
(1) People in protected areas needed to know what to do if there was a breach risk. One way to disseminate this information would be to introduce a unit on flood preparedness into the primary school curriculum.
(2) Improve embankment breach warnings systems and government agency responsiveness to breach notification.
(3) Diversified economic activity and overall population stability indicated that some kind of flood insurance scheme might be appropriate.
(4) Shelter recommendations given for char areas would also apply in some main river areas.

9.2.4 Secondary Rivers

Cropping patterns depended on land elevation, duration of normal inundation, and level of flood protection. Study village populations (like those in flash flood environments) did less monsoon season subsistence fishing than those in other environments. There was somewhat less interest in changing severe flood than in the main river environments. There was an even stronger interest in storm warning than in some other environments, possibly because existing reports did not pertain to this situation.

Program Recommendations:

(1) Increase information dissemination (by radio and other means) to inform the public of flood risks on rivers other than the Jamuna, Meghna, and Padma/Ganges.

(2) Investigate the need for drainage. This measure might be more important than flood control in certain areas.

9.2.5 Flash Flood Areas

Because flash floods come quickly and are difficult to predict, flood response patterns and perceived local needs were somewhat different in this environment than in others. For example, there was a tendency to do less flood preparation. There also was less interest in designating places of refuge, such as public high ground, than in other environments. People in this environment had a strong interest in improving flood/storm warnings.

Program Recommendations:

(1) Whenever risks exist, flash flood warnings should be issued by locally appropriate methods of information dissemination.

(2) There is more need for public assistance with recovery from flood than coping with flood. Assistance should include home repairs, replacing lost crops, and clearing sand deposits from agricultural lands.

(3) A flood loss insurance program might interest the affected public.

9.2.6 Semi-Saline/Empoldered Areas

Waterlogging, or drainage congestion, was a greater problem in this environment than flood. Political and economic situations have created strong conflicts of interest between shrimp cultivators and farmers. Like flash flood areas, households did less flood preparation than those in other environments. The large proportion of earth-walled houses reflected a comparatively low-risk experience of severe flood, as these houses often collapsed if water entered. There was a strong interest in storm warning systems. There might be a need for information on flood response if breach risk exists.

Program Recommendations:

(1) Because the political and economic situation has created competition between farmers and shrimp cultivators, careful local planning and the balance of diverse, possibly conflicting interests, must be part of any flood action program in many semi-saline areas.

(2) Drainage congestion is the source of flood and, therefore, a priority concern.

(3) If there are risks of embankment breaches, appropriate public education and warning systems should be developed.

9.2.7 Embankment Breach Locations

Because of their history of problems, there was much local skepticism and controversy about embankments. People were dissatisfied with breach warning and notification systems. Existing flood adjustments tended to follow the pattern of the general environment involved (e.g., main river or beel). There was a need for local breach warning and emergency-preparedness, plus an information campaign to increase local awareness of continued risks.

Program Recommendations:

(1) Are the same as for main river locations.

9.3 Other Program Recommendations

Certain general needs deserve special mention because they were found to be common to all flood environments. These needs included storm warning, fuel and drinking water provision, and public information. Storm warning or flood information was a priority, and nearly all households got some flood information (except for 30 percent of households in the secondary river locations in average flood). The most important information source was informal (neighbors), indicating that local sharing of information was well developed. Of the formal media, the only important source was the radio. Apparently because the radio carries little information on lesser rivers, fewer households in secondary river environments got flood information from radio. Similarly, the radio was not much help in locations affected by rain-induced or flash floods. This finding suggested that there was a particular need for improved public flood and storm warnings. Such improvements are likely to depend on improved local warning systems and improved technology.

Collection of extra cooking fuel (straw, cow dung, wood, etc.) was general practice as the monsoon season approached. If an unusual flood occurred and supplies declined, obtaining more fuel was one of the most difficult tasks faced by rural household coping with flood. Long-term solutions to this problem require attention to ways in which the nation's energy sources can be increased to meet population needs. Social forestry programs using public lands might be part of the solution in rural areas. The energy situation is under discussion in various national planning forums, and should be an important part of any flood proofing or disaster preparedness planning efforts undertaken through the Flood Action Plan.

Purifying drinking water was important to all, but particularly in villages where there were few tubewells -- beels/haors in this study. One suggestion made in many group interviews was that either local government (union or upazila) or NGOs should distribute purification tablets. In other environments as well, concern with clean drinking water was far more prevalent than was sometimes assumed. As mentioned earlier, there is a need to enquire about why existing water purification programs have not reached the study areas.

As might be expected, the findings suggested that those with little previous severe flood experience probably would not be adequately prepared in time of flood. There was, therefore, a need for dissemination of information on flood preparation and coping techniques. As mentioned above, the government school curriculum would be one way to reach a large number of people and build citizens' awareness of effective flood response methods. Although this would be an effective long-term public strategy, short-term joint governmental-nongovernmental public education programs for adults already being used deserves support.

In planning improvements in flood information, and also in improving storm/flood warning systems, it would helpful to build on the information collected in this study. This study's data would help determine in which flood environments there is the greatest potential to use the media or other methods for warnings, to identify ways to issue effective warnings, and to help people make use of them.

9.4 Loss Mitigation and Governmental Service Provision

Further program needs deserving consideration were: income supports, employment and/or credit for economically marginal families, flood insurance or some other loss compensation program, expanded neighborhood flood response efforts, stronger local government services, and mitigation of agricultural losses.

9.4.1 Economic Support Programs

In developing flood recovery programs, there are various programs that could help prevent the need to borrow against or sell valued assets. Employment opportunities were much desired, and public works (or even relief programs) could provide employment. A problem with this strategy is that public works projects are often slow in starting up. One way to help those in financial distress would be more widespread available credit, especially small loans to those who can repay. In addition, interest or principal on outstanding loans could be forgiven, something that was done for many borrowers after the 1988 flood. Another economic support might be outright grants for those who cannot repay loans. Or, some kind of national flood insurance program which would emphasize loss compensation for the very poor. These questions and options, all of which depend on availability of funds and some of which are issues of national debate, deserve further discussion as part of a Bangladesh flood action strategy.

9.4.2 Enhancing the Potential of the Neighborhood or Local Group

Households in flood affected areas often cooperated with each other at the neighborhood level during flood crises. For example, some repaired each other's houses or provided emergency shelter. Study respondents had several suggestions for ways the neighborhood might do even more. It was felt that neighbors are in a good position to pool labor to save crops and other assets from loss. They also could make common arrangements for protection of livestock. Implementing programs based on such suggestions would require certain new public education and other efforts, such as an intensive drive to increase rural awareness about working together during floods. It could be followed by appropriate group training programs on points such as emergency resuscitation of drowning victims or animal care during flood. Such effort would be most effective if it involved people from all socioeconomic levels and had support from local government. Such coordination could help translate the sporadic enthusiasm of neighbors into an integrated program of flood response.

The potential of local voluntary organizations, especially youth clubs or nongovernmental organizations (NGOs), is not to be underestimated. The local groups often have been very helpful to rural communities in constructing small-scale barriers, rescuing stranded people, collecting donations for relief supplies, and even small-scale re-excavating canals to improve drainage.

Although NGOs are not evenly distributed around the floodplain and possess diverse mandates, they could be valuable in mobilizing and educating the population on effective flood response or new flood proofing initiatives.

9.4.3 Government Responsibility and Coordination

The study showed that people in flood affected areas of the country need a great deal more institutional support with flood response than they currently have. The minimal current flood response involvement of local government is a concern. A strategy is needed that will use all levels of government and facilitate collaboration between governmental (and some non-governmental) organizations on specific programs and projects. Some recommendations for policy and program development at each level of local government follow.

9.4.3.1 The Union Parishad

Many people felt the union was an appropriate source of flood preparation and coping/recovery assistance, especially with emergency relief, emergency health care, drinking water, local construction or repair of infrastructures and houses, and protection of crops, cattle or fisheries resources. The union parishad also should have facilities for storage and distribution of emergency medicines.

This governmental level cannot currently fulfill these expectations because it is limited in setting local priorities and in controlling public funds. Enhancing the funding base and responsibilities of the union parishad would increase its capacity to serve local needs. Union parishads should be mandated by the central government to mobilize local resources (or, alternately, use an increased percentage of tax monies) to start development projects that meet public demands for flood response and that reflect general development priorities.

Any increased powers of the union must, of course, be balanced by increased oversight by the public and by other levels of government. The flood response activities of the union parishad need to be coordinated and supported by the immediately higher local government institution. This would streamline union-administered relief activities, increase accountability and minimize malfeasance.

In flood-related infrastructural work, union parishads should cooperate in a localized manner to avoid interfering with the efforts of different unions.

9.4.3.2 The Upazila Parishad[26]

The upazila, as the next governmental level above the union, was considered by many respondents to be an important aid source in coping with flood. Detailed suggestions included the following:

- Using telecommunication facilities to receive accurate flood warnings, which, in turn, would be disseminated to villages.
- Maintaining a reserve fund for use in flood emergencies.
- Arrange to have boats available for emergencies.
- Assess the magnitude of flood problems should they occur.
- The Food For Works activities, managed through the Project Implementation Office of the upazila parishad, was confined mainly to earthen road repair and construction.

[26]The upazila as an administrative unit is in the process of being reorganized into a thana at the time of writing this report. for the upazila.

Diversifying these activities into flood proofing or related works is recommended. For example, the level of public ground could be raised to use as emergency shelter for people or animals, drainage canals could be excavated or re-excavated, or pond banks could be raised to better contain fish during flood. Other projects might include building culverts or simple bridges to improve drainage.

- The Upazila Agriculture Office, in collaboration with the District Agriculture Office, should coordinate a rehabilitation program to help meet flood recovery needs of agriculturalists.
- Both agricultural and fisheries offices could greatly assist flood coping efforts if extension services were expanded. Their work has had lower priority in upazila-level planning than infrastructural works, but priorities need to be reviewed.
- The upazila also could assist in providing extension services and veterinary care for livestock during flood.
- Upazila efforts to provide health care could be improved by quickly supplying emergency medicines and by developing mobile health teams to provide on-site treatment for the sick.
- The local government machinery should complement NGOs that have shown an interest in working on flood response problems.

9.4.3.3 District Level Offices

The district administration could play a more effective role in flood forecasting and warning. It also could assist local governments in arranging for emergency uses of public high ground. In general, better coordination among district level offices such as BWDB, LGEB, Agriculture Office, and the Fisheries Office is required both at the planning and implementation phases of flood response. The district administration should closely monitor execution of any such coordinated planning activities.

9.4.4 Mitigation of Agricultural Losses

Cropping patterns, social relations within the family, patterns of consumption (such as traditional diets), economic markets (including the pricing, measurement and transport techniques for the traditional foodstuffs and established cash crops), and the evolved agricultural technologies of the different regions in Bangladesh all are parts of the system of adjustment to the flood regime. Each part sustains and is being sustained by the others.

Some findings on cropping patterns have implications for government programming and policy development. One is that the overwhelming response to crop flood loss is to increase the area cultivated in subsequent cropping seasons. (Along with crop losses, farmers also may lose valuable seed grains and fertilizers.) Increased cultivation of high yielding varieties of boro rice in the rabi season was found to be the most frequent response, a finding corroborated by national crop statistics for 1987 and 1988. This emphasizes the importance of irrigation in the dry (rabi) season. Assistance with irrigation equipment would be of great value to farmers trying to produce dry season crops. It also suggests that government planners may wish to consider measures that would make it easier for more farmers to plant new crops. Such assistance might include improved credit provision, assurance of an adequate supply of inputs, and assurance that they will be available in time for farmers to use. This means minimizing road damage interference with delivery.

When developing flood proofing programs, planners should consider which advance arrangements would make it easier for farmers to recover from flood losses. To help small farmers increase production after flood, and avoid selling their land, a program of disaster loans, long-term credit, or grants would be invaluable. An emergency supply of power-tillers or other equipment for loan or rent also would help.

Low cropping intensity during the kharif-1 season on lands with short duration floods, along with the fact that these lands are suitable for growing HYV aus, suggests that supplemental irrigation should be considered as a potential way to increase food grain production.

While these programs would offer much needed short-term assistance, the response itself may have some long-term agricultural development implications. Boro cultivation may be expanded into more marginal lands where it is less profitable as a short-term response to meet food needs after a flood. Alternatively, this response may result from more efficient use of irrigation equipment. That is, farmers may overcome social or institutional barriers to efficiently irrigate after a flood in order to expand boro cultivation. This may be done, for example, by increasing pump operating hours and the command area of tubewells, thus increasing the number of farmers and plots receiving irrigation. If this is the case, then a long-term gain could be achieved by programs to improve irrigation management. However, this gain could have some adverse implications for the farm household economy. While agricultural development that concentrates on boro cultivation generally should help farmers to avoid flood risks, it increases vulnerability of farm households to financial risks by increasing dependence on ground-water and purchased inputs.

The finding that flood protection projects did enable a shift in cropping patterns to higher yielding varieties does not obviate the need for agriculture-related flood action planning within these projects. It is apparent that some such projects still have frequent problems of crop losses from average floods and waterlogging, as well as being vulnerable to severe floods. Programs are needed to encourage agriculture within protected areas. With farmer involvement, it is recommended that internal water management and planning needs (e.g., drainage system improvements or even controlled flooding) be addressed. There is also a need for improved information on flood risk in protected areas.

9.5 Setting Priorities: Flood Action and Other Development Issues

It is important to keep in mind that this study covered only one problem confronting the rural population of Bangladesh, and that this problem was, in a sense, competing with several others for scarce resources. It has been verified that, indeed, the population was mostly unhappy about severe flood. The focus on flood here, however, should not be construed as indicating anything about the way this problem rates in the larger scheme of rural development needs.

Depicting the national development agenda as a round pie, flood action is only one wedge of that pie[27]. When asked about their other needs besides protection from flood, several villagers mentioned other important local problems, including lack of electrification, scarcity of basic supplies for agriculture and irrigation, and unemployment, to name a few.

[27]There are many other items on the development agenda that are not represented in this simplified diagram. Nor is the size of any segment meant to indicate its true significance (or weight) relative to others.

This leads to the question of how and why flood is a problem in one place or group as compared to another. The environmental factors are there to be sure. Floods periodically cover from 30 to 50 percent of the nation. This is a problem, in part, because there is great population pressure on limited land masses. It is generally agreed that as the person-land ratio increases there is a tendency for people to move into areas once considered uninhabitable. As families subdivide property, more and more people are eking out a living from smaller and smaller plots.

Another aspect of the flood problem is that it creates more problems for those with few resources than for those with many. Economic advantage permits stockpiling supplies and otherwise insulates some households from destitution if basic assets are damaged. Male and female assets may be differentially affected. Social networks of various economic status groups are different and have different capacities to support a household during disaster. Networks with lesser economic strength are likely to shrink more quickly than others. Therefore, poorer flood-affected families will have less social support than others. Although severe flood is something of a leveler that hits everyone in a region regardless of socioeconomic status, it would be unwise to assume that, except in the case of death itself, the physical event has the same consequences for rich and poor.

It is clear that a dramatic, but rarely acknowledged consequence of severe flood is that it has accelerated impoverishment in rural areas, forcing sales of valuable assets, increasing indebtedness, driving some out of agriculture, and worsening already insufficient diets and health standards. Under these circumstances, creating a secure physical environment will not guarantee (or even support) a better quality of life for people unless other development problems receive the same kind of urgent attention that flood is receiving through the Flood Action Plan. Overall development that will improve the well-being of the rural poor must be considered as one important flood proofing activity.

This leads to another broad development issue, namely the continuing dependence of a large percentage of the rural population on an agricultural sector that cannot ensure full employment. This is one problem with which reduced or controlled flooding might help, in that it could create more physically secure zones for both increased cropping intensity and construction of facilities that could offer a broader range of employment opportunities to the population. This still does not ensure, however, that the population will be in a position to take advantage of such opportunities unless other needs, especially primary education, are addressed. The levels of formal education in this study population tend to be abyssmally low, especially in the chars. In comparison to the absence of meaningful job skills and the existence of severe economic pressures, or an informal money lending system or dowry demands that can push the economically marginal family into penury, or inadequate transport or public health facilities, the flood problem may or may not be considered to have greater priority. This study has shown that in some areas of the country programs directly related to solving flood problems would be of central importance. In others, however, such programs would be only supplementary to other, more important programs. The point remains, however, that flood action planning must be done in a way that reinforces other development goals; a way that will produce a synergistic and generally beneficial effect.

9.6 National Policy Implications

Many of the programs and changes suggested above will be possible only with national-level policy support and guidance.

As is clear by now, Flood Action Plan programs and projects will have national development implications, and they, therefore, must be implemented in ways that fit with national development policies. Some of the points raised here do indeed converge with policies outlined in documents such as the Fourth Five Year Plan. Yet, it is only at the highest levels of policy making that a balance between flood planning and other national priorities can be established. Once such a balanced strategy is created, it can serve as the basis for flood action planning that works together with other national level goals in a mutually reinforcing way.

It is recommended that participatory project planning should be part of the process. But, this also will require support (and encouragement) from the highest levels of government. Participation, as a relatively decentralized approach to planning, needs to be combined with some degree of central planning. In reconciling the seemingly contradictory tendencies of these two approaches, it, once again, will be up to national policymakers to establish balance in planning and implementing Flood Action Plan initiatives that ensures people's participation will have a legitimate place in the development of any project or program development.

Improving coordination among multiple local level offices is another recommendation in need of clear policy support. It only will occur if various sectors at the highest levels of regional offices agree to jointly plan and implement flood action projects, and if new organizational mechanisms ensure that they do so.

GLOSSARY

Aman	Rice/paddy grown in *Kharif-2* crop season. This includes traditional broadcast paddy which are mostly deep water or floating varieties grown from April to November and local transplanted varieties grown from July to November. *Aman* also includes Locally Improved Varieties (LIV) and High Yielding Varieties (HYV) grown in the *Kharif-2* season, all of which are transplanted.
Aus	Rice/paddy either broadcast or transplanted; grown in *Kharif-1* season (April-August).
Average Flood	A situation in which not only most agricultural lands are submerged but also some homesteads in low lying areas are either threatened or marginally inundated.
Bari	Homestead where usually more than one household of the same lineage *(gushti)* are located.
BASWAP	Bangladesh Swiss Agricultural Project.
Beel	Basin formed by a cutoff channel of an old river; swampy area.
BIWTA	Bangladesh Inland Water Transport Authority.
Boro	Transplanted rice/paddy grown in *Rabi* season (December - April).
BRDB	Bangladesh Rural Development Board.
Broadcast (B.)	It is usually referred to in case of local *Aman* and *Aus* paddy where seeds are cast by hand on prepared soils of the plots.
Bund	Embankment.
BWDB	Bangladesh Water Development Board.
Char	Accreted land within the river channel.
Chula	Earthen stove used for cooking and even parboiling paddy.
Decimal	One hundredth of an acre (1 acre=0.405 ha).
DTW	Deep tubewell.
Economic Status	Socioeconomic category defined by size of landholding (either landless, small, medium, or large) and monthly cash income vs. expense balance (either deficit, in balance or surplus).

Elevation Categories (of Village)	Highland village constitutes more than 50 percent F_0 land. Medium land village constitutes more than 50 percent F_1 land. Lowland village constitutes more than 50 percent F_2 to F_4 lands.
FCD	Flood Control and Drainage.
FCD/I	Flood Control Drainage and Irrigation.
FFW	Food for Work.
Flood Duration	Categorized as: short (up to 2 months), medium (2 - 4 months), and long (over 4 months).
Flood Frequency	In this study, occurrence of flooding events in the last 10 years, categorized as: never, rare (1-2 of last 10 years), occasional (3-7 of last 10 years), and frequent (8-10 of last 10 years).
Flood Protection	According to respondents' replies, a village may be under full protection (e.g. within a FCD/I embankment project of BWDB); partial protection (e.g. some protection or moderation of floods is achieved by local embankments, road or railway embankments, or distant embankments); and unprotected.
FPCO	Flood Plan Coordination Organization.
FWC	Family Welfare Centre (union level).
Haor	A saucer shaped tectonic depression characterized by deep flooding and permanent water bodies at its bottom; found in the north-east of the country.
Hectare/ha	247 decimals.
HYV	High Yielding Variety (usually refers to paddy).
IRRI	International Rice Research Institute (Philippines); often used by farmers to refer to HYVs which may or may not have their origins at IRRI.
Khal	Canal.
Kharif-1 &-2	The first and second crop seasons of the Bangla Crop Calendar. First season starts in April and ends in July/August; and the second starts in July/August and ends in November/ December.
Land Elevation	Highland with inundation depth up to 30 cm (F_0), Medium land with inundation depth up to 90 cm (F_1) and Lowland with inundation depth more than 90

	cm (F_2 to F_4). Definitions developed by the Master Plan Organization of the MIWD&FC.
LGEB	Local Government Engineering Bureau.
LLP	Low-lift pump.
Land Tenure Types	These include (1) self-cultivating owners who own and operate their own farm and (2) tenants who operate land owned by others either on cash rental or on sharecropping basis.
Local Transplanted (L.T.)	Local variety of transplanted rice/paddy.
Maund	Traditional weighting unit of agricultural products equivalent to 37.5 kg.
MIWD&FC	Ministry of Irrigation, Water Development and Flood Control.
Mouza	The lowest administrative unit, a village defined for revenue collection purposes.
NGO	Nongovernment Organization.
ORS	Oral Rehydration Solution.
Paddy	Rice in husk.
Para	Neighborhood.
Para-pratibeshi	Neighbor.
Paribar	Family/household that comprises all blood and marriage related members taking meal cooked in the same *chula*.
Polder	An embankment that surrounds the area to protect it from flood or storm surge.
R & H	Roads and highways.
Rabi	Crop season starting November/December and ending March/April.
Seasons	There are three crop seasons in a year (*Kharif-1, Kharif-2 and Rabi*) while a Bangla year has six natural seasons which are: *Grisma* (Summer), *Barsha* (Rainy), *Sharat* (early Autumn), *Hemanta* (late Autumn), *Sheet* (Winter) and *Basanta* (Spring).
Seer	Unit of weight, 1 seer = 0.935 kg.

Severe Flood	A situation when a considerable number of houses as well as most of the agricultural plots are inundated and the usual measures for protecting homesteads prove ineffective.
Sharecropping	Tenancy arrangement in which crops are shared between the owner of land and its tenant.
STW	Shallow tubewell.
Submersible Embankment	An embankment raised to protect a particular area from early flood usually of flashy nature. The embankment is then submerged during the monsoon.
Thana	See *Upazila*.
UHFWC	*Upazila* Health and Family Welfare Centre.
Upazila	An administrative unit composed of a number of unions. (Recently redesignated as *Thana*.)
Upazila Parishad	A Council which consisted of a Chairman directly elected by the electorate of the *Upazila*, the Chairmen of all the *Union Parishads* as voting members, and the *Upazila* Officials as non-voting members. This stands dissolved now.
Union Parishad	A Council composed of one Chairman and nine members, all directly elected by the electorate in the union.
Union	An administrative unit composed of about 10-15 villages (on the average) divided into three wards.
USAID	United States Agency for International Development.
Uthuli	Usually erosion affected temporary migrants sheltered under some informal (mostly verbal) contract by others in nearby locations.
Village	A settlement unit representing a *mouza* or part of it.
Waterlogging	A situation where water remains stagnant for quite sometime.

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