

PAP-3

Flood Action Plan

FAP 3

North Central Regional Study

Supporting Report X
Economic and Multicriteria
Impact Assessment

February 1993

Financed by:

Commission of the European Communities and
Caisse Française de Développement
Project ALA/90/03

Consortium:

BCEOM, Compagnie Nationale du Rhone
Euroconsult, Mott MacDonald International,
Satec Développement

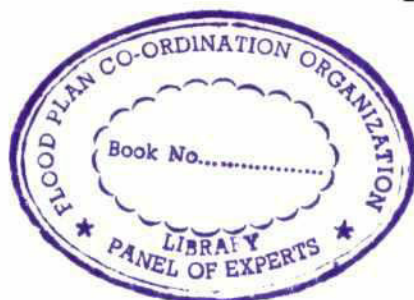
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NORTH CENTRAL REGIONAL WATER RESOURCES DEVELOPMENT PLAN
FAP-3
SUPPORTING REPORT X - ECONOMIC,
AND MULTICRITERIA IMPACT ASSESSMENT

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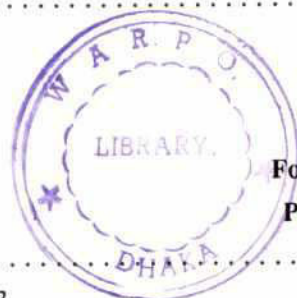
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ABBREVIATIONS AND ACRONYMS

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ADB	Asian Development Bank	IDA	International Development Agency
AEZ	Agro-Ecological Zone	IPM	Integrated Pest Management Programme
BADC	Bangladesh Agricultural Development Corp.	IRRI	International Rice Research Institute
BARC	Bangladesh Agricultural Research Council	JFP	Jamuna Flood Plain
BARI	Bangladesh Agricultural Research Institute	JPPS	Jamalur Priority Project Study
BAU	Bangladesh Agricultural University	LGEb	Local Government Engineering Bureau
BB	Bangladesh Bank	MCA	Multicriteria Analysis
BBS	Bangladesh Bureau of Statistics	ME	Ministry of Education
BCAL	Bangladesh Census of Agricultural Livestock	MF	Ministry of Finance
BCAS	Bangladesh Centre for Advanced Studies	MIWDFC	Minist.of Irrig., Water Dev.& Flood Control
FDC	Bangladesh Fisheries Development Corp.	ML	Ministry of Land
BIDS	Bangladesh Institute of Development Studies	MLGRDC	Minist.of Local Govt.,Rural Dev.& Coop.
BIWTA	Bangladesh Inland Water Transport Auth.	MOA	Ministry of Agriculture
BJRI	Bangladesh Jute Research Institute	MOEF	Ministry of Environment and Forestry
BKB	Bangladesh Krishi Bank	MOFL	Ministry of Fisheries & Livestock
BNPP	Bangladesh National Physical Plan. Board	MOSTI	Manually Operated Shallow T/W for Irrig.
BRAC	Bangladesh Rural Advancement Committee	MP	Ministry of Planning
BRDB	Bangladesh Rural Development Board	MPO	Master Plan Organisation
BRRI	Bangladesh Rice Research Institute	MTN	Madhupur Tract North
BUET	Bangladesh University of Engg.Technology	MTS	Madhupur Tract South
BWDB	Bangladesh Water Development Board	NCA	Net Cultivable Area
CA	Catchment Area	NCR	North Central Region
CAS	Catch Assessment Survey	NCRM	North Central Regional Model
CAT	Coordination Advisory Team	NCRMG	North Central Regional Model Group
CCCE	Caisse Centrale de Coopération Economique	NCRS	North Central Regional Study
CEC	Commission of European Communities	NFMP	New Fisheries Management Policy
CPM	Coarse Pilot Model	NGO	Non Government Organisation
CS	Consultants' Studies	NGR	Natural Growth Rate
DA	Development Area	NWP	National Water Plan
DAE	Department of Agricultural Extension	OBFP	Old Brahmaputra Flood Plain
DAE	Department of Agricultural Extension	O&M	Operation and Maintenance
DANIDA	Danish International Development Agency	ODA	Overseas Development Administration (UK)
DDT	Dichlorodiphenyl-trichloroethane	PA	Planning Area
DHI	Danish Hydraulics Institute	PFDS	Public Foodgrain Distribution System
DOE	Department of Environment	POE	Panel of Experts
DOF	Department of Fisheries	PSR	Preliminary Supporting Report
DOS	Disk Operating System	PU	Planning Unit
DSSTW	Deep Set Shallow Tubewell	PWD	Public Works Datum
DTW	Deep Tubewell	RARS	Regional Agricultural Research Station
DUL	Desh Upodesh Ltd.	RHD	Roads and Highways Department
EEC	European Economic Community	RS	Regional Scheme
EIA	Environmental Impact Assessment	SES	Socio-Economic Survey
EIP	Early Implementation Programme	SOB	Survey of Bangladesh
FAO	Food & Agricul.Organ.of the United Nations	SPARRSO	Space Research & Remote Sensing Organ.
FAP	Flood Action Plan	SRP	Systems Rehabilitation Project
FCD	Flood Control and Drainage	SRTI	Sugarcane Research and Training Institute
FCDI	Flood Control,Drainage & Irrigation Project	STW	Shallow Tube Well
FFYP	Fourth Five Year Plan	SWMC	Surface Water Modelling Centre
FHS	Flood Hydrology Study	TOR	Terms of Reference
FMM	Flood Management Modelling	Tk	Taka
FPCO	Flood Plan Co-ordination Organisation	UNDP	United Nations Development Programme
FRI	Fisheries Research Institute	UNHCR	United Nations H.Commission for Refugees
FRSS	Fisheries Resources Survey System	WFP	World Food Programme
FSR	Farming Research System		
FWP	Food for Work Programme		
FY	Financial Year		
GOB	Government of Bangladesh		
GW	Groundwater		
HTW	Hand Tubewell		
HYV	High Yielding Variety		

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CHAPTER I

OVERVIEW OF NCR DEVELOPMENT AND FLOOD CONTROL

1.1 Introduction

This Supporting Report (SR) sets out the economic analysis and brings together the social, institutional and environmental assessments made in other SRs.

An overview of NCR development and the role of flood control in the development process is presented at first. This is followed by more detailed analyses of flood damage and agro-economics before continuing with the economic and financial analyses and the impact assessment. The overall impact assessment is presented in Chapter 5 which sets out a multicriteria analysis (MCA).

The principal objective of a MCA is to draw up an assessment of water resource management strategies and potential FAP projects not only on the basis of financial and economic analyses of benefits and costs but also taking into account institutional, social and environmental effects. MCA must be an aid to decision making, thus it has to summarize and bring together different regional factors of development, identified and explained in other supporting reports of FAP-3.

1.2 Broad Socio-Economic Features

General

Bangladesh is predominantly a flat delta which has been built up by the action of the three major rivers of the area, the Ganges-Padma, Brahmaputra-Jamuna and the Meghna. The North Central Region (NCR) is directly affected by these three rivers. Bounded by the Jamuna river in the West, the Padma and Meghna rivers in the South and the Old Brahmaputra and Lakhya rivers in the North and East, this region has attracted many people, with the population growing fastest on the fertile land of the floodplain.

Particularly on the floodplains, with a high population density, pressure on cultivable areas and hydroclimatic constraints generate major socio-economic problems, as described in SR IV. An overview of the NCR both in the national context and at subregional level are presented in the following sections.

Population and Households

The area of the NCR is estimated to be about 9.3% of the total area of Bangladesh. The population density is about 1200 persons per sq.km., which is some 60% above the national density average. Excluding Dhaka city, it is still high (1000 persons per sq. km).

In the rural area of NCR the number of farm households is about 69% of the total households. This is lower than the national average, where some 73% of households are farm households. This lower proportion is largely due to the influence of Dhaka in the region.

The proportion of small farm households in the NCR (72%) is slightly above the national average of 70%. Nevertheless, the Gross Domestic Production per capita is close to the national average at Tk. 5 300 (US\$ 147).

Crops

Rice, jute, wheat and potatoes are the principal agricultural productions. Regional rice production constitutes more than 17% of the national production, jute around 15%, potatoes nearly 35%, wheat and sugarcane around 10%.

Fish and Livestock

The regional annual catch of fish in 1988-89 is estimated to be about 6.4% of the national fisheries. This is relatively low with regard to the importance of the regional agriculture compared to fishery production (at market price) reaching only 3% of the agricultural gross product. Livestock numbers are above the national average although they still form a small proportion of the agricultural output. The numbers of bovine animals form 20% of the total national bovine numbers.

Industry

NCR's regional industry and non-agricultural major activities employ about 20% of the national labour force engaged in this economic sector of which 52% are in Dhaka district, which means that the share of other NCR areas is around the national average. The principal manufacturing activities are the fibre industry, chemicals and food industry. More than 21% of the national cottage industry units are located in the NCR.

Communications

The regional railway mileage constitutes less than 10% of the national network. Although there is a relatively high proportion of the national highways inside the NCR (some 15% of the national highway), the minor unmetalled road mileage reaches only around 0.4% of the total national level.

1.3 Contrasted Subregions

Within the NCR there is considerable variability in biophysical features and socio-economic conditions, both aspects being interdependent. The North Central Region has been influenced by the three major rivers forming its boundary, which have determined its physical characteristics.

Five subregions can be outlined in the NCR (see Figure X.1.1) on the basis of biophysical and socio-economic features (which have important incidence on socio-economic aspects):-

- | | |
|-------------------------------|-----------------|
| • Jamuna Flood Plain | 35% of NCR area |
| • Old Brahmaputra Flood Plain | 20% of NCR area |
| • Madhupur Tract North | 19% of NCR area |
| • Madhupur Tract South | 11% of NCR area |
| • Padma Flood Plain | 15% of NCR area |

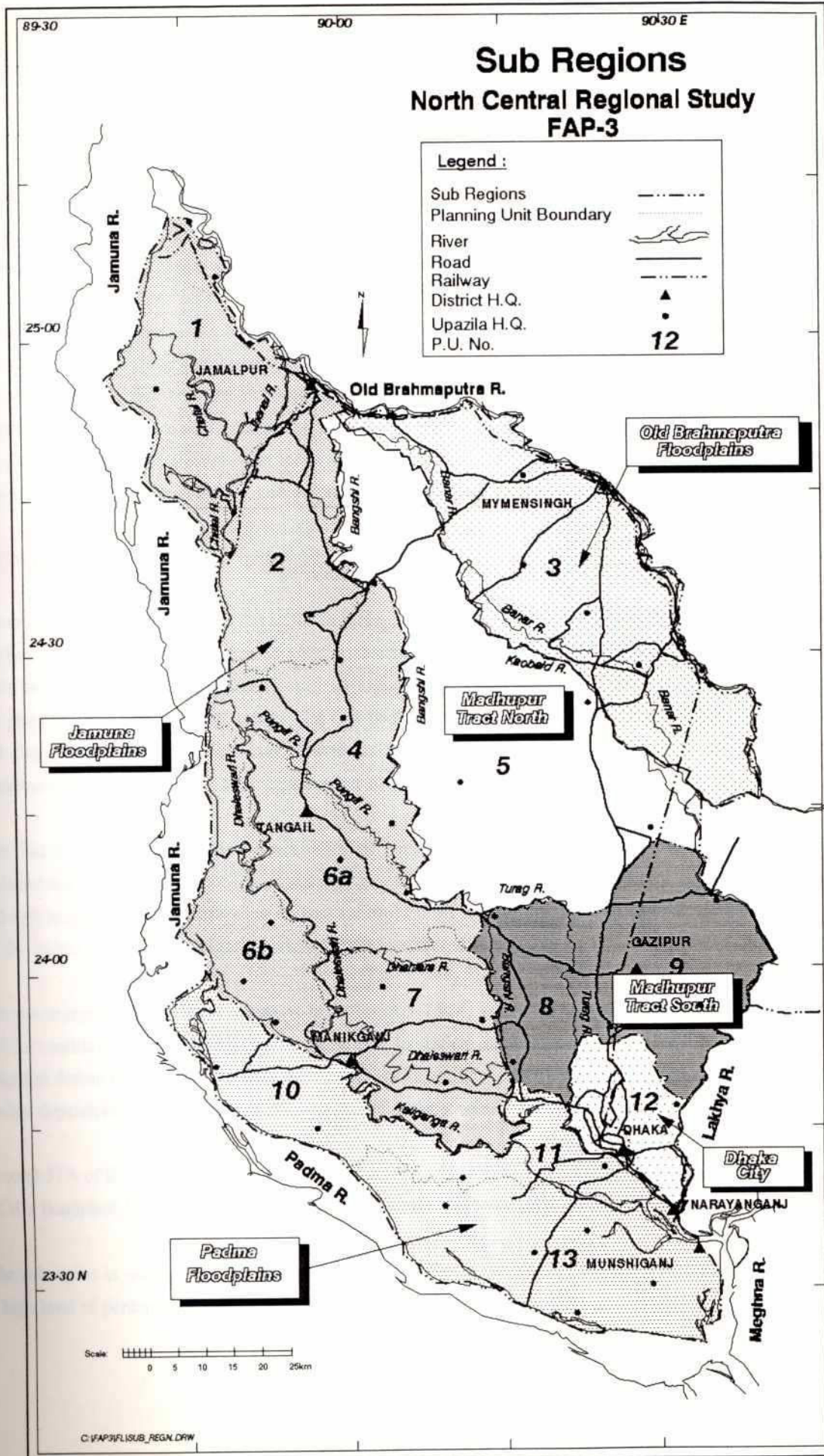
Jamuna and Padma Floodplains

The Jamuna and Padma Floodplains are extensively flooded (between 60 to 90% of their total area) during the monsoon season. There are problems of drainage at the end of the monsoon season (depending on the variability in local relief) and of supplemental irrigation (on ridges and swales) during the dry season. The regular river flooding has resulted in locally thick layers of silt deposits. Groundwater recharge is good.

The Jamuna floodplain is an active flood plain made up of sands and silts. In the intermediate level the soils are mainly loams on the ridges and clays in the basins. On most of the soils a plough pan impedes internal drainage. The Jamuna is the second largest river in Bangladesh. In the rainy season the river is nowhere less than five kilometres wide. Flooding can occur from three sources, direct rainfall, direct overbank spillage from the Jamuna and overbank spillage from the internal regional rivers or tributaries.

The Padma Floodplain flows to the south west and the south of the NCR and receives flood water from both the Padma and the Jamuna through their tributaries. Seasonal flooding by the rivers reaches around 2-5 feet on the

Figure : X.1.1



highest ridge and more than 10 feet in the lower basins during four to six months. Calcareous dark grey flood plain soils occupy most of the Padma flood plain usually in association with calcareous Brown flood plain soils. Basin soils crack widely when dry.

The percentage of net cultivated area (more than 70%) and cropping intensity are comparatively high, particularly in the Jamalpur area (cropping intensity of 211%). This is due to a recent increase in irrigation development. Besides this agricultural development, fishing activities are relatively important. The Jamuna production including rivers, beels and flood plain catches reach around 37% of the regional production with the Padma area reaching around 21%.

Except for zones near to Jamalpur and Tangail, the demographic pressure on land is not so high in the Jamuna flood plain as it is in the Padma flood plain. In the eastern part of the Padma floodplain (near to Dhaka) a very significant growth of the industrial factories has occurred. Near Dhaka more than 30% of the total population is engaged in the industrial sector and more than 15% in the wholesale and trade sectors whereas the other districts of the region have less than 5% and 3% respectively in these sectors. The road and railway network are generally hampered by the nature of the land, but the Jamuna and Padma flood plains are comparatively well covered.

Old Brahmaputra

In average years, less than 50% of the Old Brahmaputra flood plain area is flooded during the monsoon season. The Old Brahmaputra flows to the north east and passes by Jamalpur and Mymensingh towns. The old river carried more water than at present and had already built up high levees which the present river rarely overtops. In the south of this plain, there is a depression between the Old Brahmaputra river and the Madhupur Tract. Recent deposits of the Old Brahmaputra are non-calcareous alluvium. These soils are mainly grey silts or sands and are neutral to moderately alkaline after long submergence but become moderately to strongly acidic on drying out.

This Old Brahmaputra subregion has a relief of irregular ridges and depressions. It is in these depressions that localised drainage problems causing waterlogging occur during the monsoon season and dryness prevails on the ridges and high areas. Most of the flooding is from rainfall runoff and the possibilities of drainage are limited downstream by the Padma-Dhaleswari-Meghna system which is affected by tides.

The percentage of net cultivated area is high (around 75%), as are the cropping intensities (about 189%), but the aquifer conditions are relatively unfavourable and irrigation meets some 34% of the estimated eventual potential irrigation demand. The aquifer is generally too deep for shallow tubewell (STWs) development and irrigation, being mainly dependent on deep tubewells (DTWs), and is only used on about 30% of the cultivated area.

Around 57% of the NCR's beel capture fishery is found in the Old Brahmaputra floodplain. It is nearly 20% of the NCR's floodplain fish production, more or less the average value of all sub-regions.

The sub-region is well connected by highway and railway to Dhaka and there is a significant trading activity with a high level of persons engaged in the cottage industry sector (the highest outside Dhaka).

Madhupur Tract North and South

Madhupur is an elevated tract consisting of an extensive Pleistocene Formation. The northern part is a large plateau with dome shaped tops, flanking narrow winding valleys (mostly flattened and terraced for rice cultivation). Less than 25% of this subregion is flooded during the monsoon season only by local runoff and face local drainage problems.

Most of the upland of the Madhupur Tract has thick layers of moderately well drained permeable silty clays with heavy clays in the valleys. But some of the level uplands have impervious clay subsoils. Soil erosion is often observed after deforestation.

The northern part, of the Tract has a relatively low density of population (between 400 and 600 inhab./sq.km). The soils are clayey and generally deficient in nitrogen, phosphorus, potassium and lime. The percentage of cultivated area is less than 60% and the cropping intensity less than 170%. Irrigation is only used on about 35% of the cultivated area due to unfavourable aquifer conditions. The capture fishery is low and constitutes here about 11% of the regional production. The non-farm activity level is comparatively low; 20% of the total number of households are non-farm households against a regional average of 30%.

The southern part however, has a different topography. Most of the terrace is almost flat in relief, except where streams have cut across it. The terrace presents a marked elevation because of the entrenched drainage pattern and the dissected nature of the Tract. It is a transitional stratum which meets alluvia of the Padma flood plain. Between 30 to 40% of the sub-region is flooded during the monsoon season, which is much less than in the Padma flood plain to the south.

The southern part has a slightly higher density of population but is still low (between 600 and 1000 inhab/sq.km). The percentage of cultivated area is between 60 and 70% of the subregion area, and the cropping intensity is about 175%. The irrigated area is 45% of the cultivated area also with unfavourable aquifer conditions. Only 7% of the regional capture fishery are met in this subregion.

The southern Madhupur Tract is well served by roads and benefits from non-agricultural activities (trading, cottage industry, and petty services) related to the vicinity of Dhaka city. They are more important than in the northern sub-region.

Characteristics of the five sub-regions are summarised in Table X.1.1. From the general view about the North Central Region it is evident that the hydrological conditions are the most significant environmental factors that determine the cropping patterns, cultivating practices and productivity; in particular the annual rainfall frequency, depth of flooding and drainage. River flooding and land drainage conditions especially affect the fertile and densely inhabited Jamuna and Padma floodplains. These plains form around 50% of the NCR area.

TABLE X.1.1
Brief Regional Description – Physical Systems

Sub Region	JFP	MTN	MTS	OBFP	PPF*
A) Physiographic Subregions Physiographic Units Districts Concerned Area as % of NCR	Jamuna Flood Plain Jamalpur W. +Tangail W. 35%	M. Tract North Tangail E + Mymensingh S.W. 19%	M. Tract South 11%	Old Brahmaputra Flood Plain Mymensingh N.W. 20%	Padma Flood Plain Manikganj + Munshiganj 15%
B) Groundwater System % of potential resource already exploited by shallow tubewells SWL (m) Storage Coef. (%) DTW Specific capacity l/s/m	37 to 52% 6.5 to 7.5 7 to 12.5 10 to 17	12% >10 3.5 7	10% >11 1 to 3 6	5% >11.5 2 6.5	14 to 36% 3.5 to 6.5 2 to 6 8 to 12.5
C) Soils Principal Type Texture Ridge Texture Swales Texture Basin Upland Permeability	Grey Flood Plain soils, non-saline phase Sandy & Sandy loams Loams Clays - Variable	Red-brown Terrace soils - - Heavy Clays Clays Moderate to low	Red-brown Terrace soils & Dark Grey Flood Plain Soils - - Clays Clays Moderate to low	Dark Grey F.S. & Acid Basin Clays Sandy Loams Clays - Moderate to low	Dark Grey F.S. Sandy loams Loams Heavy Clays - Variable
D) Hydrological Conditions Climate Flooding Annual flooded area (% gross area) Demographic Pressure & land suitability index (Cultivated area % gross area)	Mean rainfall : < 200cm Vegetative growth throughout the year 60% (annual ecological changes with flooding and erosion) 79%	Mean rainfall: 175-200cm alternation of drought and wetness <25% (ecological changes very locally) 57% (deforestation and erosion)	Mean rainfall: 175-200cm alternation of drought and wetness 30 - 40% (ecological changes very locally) 60%	Mean rainfall: >200cm vegetative growth throughout the year. Except locally during the dry season < 50% (ecological changes locally) 75%	Mean rainfall: <175cm Vegetative growth throughout the year 90% Annual ecological change with flooding) 72% (water pollution near Dhaka)

*Note : * Small amounts of Jamuna Flood Plain soils also included in this sub-region*

1.4 Socio-Economic Framework and Constraints

1.4.1 Population and Activities

General

Regional characteristics of population and activities are summarised below in Table X.1.2 and in Tables X.1.3 to Table X.1.6. These characteristics are detailed in supporting reports IV (Human Resources, Socio-Economic and Institution), I (Land Resources and Agriculture), and III (Fisheries). A few additional information are also given below on non-agricultural activities.

TABLE X.1.2
Population and Socio-Economic Indicator of the NCR

A) Population			
		Bangladesh *	NCR
1991 Population	(Million hab.)	110	16
Area	(km ²)	143,998	13,442
Density	(Hab./km ²)	760	1,200
B) Socio-Economic indicators			
GDP	(in million Tk.)	562	84
GDP per capita	(in Tk.)	5,275	5,249
Share of Agriculture in GDP		38.7	--
Jute production	(in 1,000 T)	942	137
Rice production	(in million T)	11.3	1.95

* 1988 figures

Source : SR IV

TABLE X.1.3
Brief Regional Description – Human Environment

Districts	Jamalpur	Tangail	Gazipur	Mymensingh	Dhaka	Munshiganj	Manikganj	Narayanganj	Total NCR
Predominant sub-region 1/	JFP	JFP	MTS	MTN/OBFP			PJFP		
A)									
Population									
Total (million)	1.5	3	1.2	2.1	6	1.2	1.3	0.7	16
Population (%)	9.2	18.9	7.7	12.8	31.3	7.4	8.3	4.4	100
Area (%)	14.9	25.9	13.4	16.4	10.6	6.3	10.1	2.4	100
Density hab/km ²	730.4	890.2	677.7	915.1	3451.9	1369.3	964.9	2146.2	1200
B)									
Households									
Farm Households (%)	69.35	77.76	78.75	71.49	51.76	63.87	69.47	55.13	69.1
Small 2/	49.26	56.08	55.83	50.53	39.25	53.56	49.74	46.66	50.62
Medium 2/	17.08	19.03	20	18.7	11.01	9.28	17.27	7.68	16.22
Large 2/	3.02	2.65	2.93	2.25	1.5	1.04	2.46	0.79	2.27
Non-farm household	30.65	22.24	21.25	28.51	48.24	53.19	30.53	44.87	30.9
Landless	51.91	45.23	41.96	48.4	55.61	63.14	53.19	69.63	45.23
H. with cottage Industry	4.18	8.18	4.48	4.31	8.65	7.06	6.26	14.77	8.18
Total Household Nrs.	244999	396411	182864	312798	237886	147217	176595	83806	1782576

Notes : 1. JFP = Jamuna Flood Plain; MTS = Madhupur Tract South; MTN = Madhupur Tract North; OBFP = Old Brahmaputra Flood Plain; PJFP = Padma/Jamuna Flood Plain

2. Small : < 1 ha Medium : ≥ 1 ha - < 3 ha Large : ≥ 3 ha

Source : CS 1992

TABLE X.1.4

Brief Regional Description – Social Infrastructure; Transport and Communications

Districts		Jamalpur	Tangail	Gazipur	Mymensingh	Dhaka	Munshiganj	Manikganj	Narayanganj
Predominant sub-region 1/		JFP	JFP	MTS	MTN/OBFP			PJFP	
A) Social Infrastructure									
Hospital Beds/1000 pers		0.09	0.29	0.23	0.07	0.04	0.15	0.14	0.12
Paramedic/1000 pers		0.22	0.02	0.02	0.035	0.04	0.008	0.02	0.07
Doctors/1000 pers		0.015	0.06	0.06	0.01	0	0.04	0.06	0.15
Hats/Bazars Nr.pers/Bazar		12629	10524	6255	97095	53602	13245	7686	9346
Attending School (%)		14	20	24	10	21	23	18	56
Tubewell (%)		47	35	54	57	77	70	63	74
Pond (%)		48	62	45	40	21	22	34	24
River (%)		5	3	1	3	2	8	3	2
Village with electricity (%)		4	9	32	11	14	25	4	56
B) Transport and Communications									
Area km ² /Road km		12822	27581	7098	11138	30396	Total(km)		
Railway %		25	-	-	20	55	110		
Roads NHW %		35	9	27	18	11	417		
Roads RHW %		62				38	37		
Feeder Roads %		67		16	17	1	163		
Upazila Roads %		30	14	35	10	11	527		

Notes : 1. JFP = Jamuna Flood Plain; MTS = Madhupur Tract South; MTN = Madhupur Tract North; OBFP = Old Brahmaputra Flood Plain; PJFP = Padma/Jamuna Flood Plain

2. Small : < 1 ha Medium : ≥ 1 ha - < 3 ha large : ≥ 3 ha

Source : CS 1992

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TABLE X.1.5
Brief Regional Description – Agriculture, Livestock and Fisheries

Districts	Jamalpur JFP	Tangail JFP	Gazipur MTS	Mymensingh MTN/OBFP	Dhaka PJFP	Munshiganj	Manikganj	Narayanganj	Total NCR
Predominant Sub-Region									
A) Agriculture – Cropping (with Proportional Production)									
Total Cultivated area	116,760.0	246,000.0	162,020.0	105,800.0	112,640.0	63,500.0	91,040.0	21,000.0	918,760.0 ha
NCA, NCR area	78.0	57.0	75.0	73.0	63.0	76.0	72.0	–	683 %
Cropping Intensity	211.0	168.0	189.0	177.0	140.0	183.0	188.0	–	192 %
Irrigation Intensity	58.0	35.0	32.0	39.0	38.0	24.0	27.0	–	36 %
Rice	17.9	27.1	24.2	13.7	6.4	3.3	5.8	1.6	100 %
Rice Production Index	14.1	100.0	137.0	119.0	52.0	48.0	59.0	70	100 %
Jute	22.1	34.3	11.5	6.4	7.7	8.4	6.9	2.7	100 %
Wheat	14.5	33.9	9.6	3.9	11.6	4.3	21.5	0.7	100 %
Mustard	10.4	42.3	2.5	5.4	11.3	17.5	6.8	3.8	100 %
Sugar Cane	32.0	18.0	14.4	13.1	3.2	2.1	16.4	0.8	100 %
B) Agriculture – Livestock									
Cattle	11.6	32.5	11.3	15.6	10.3	8	8.1	2.6	2,696,509.0 Nr
Poultry	15.2	19.7	13.9	17.2	9.2	9.6	12	3.2	9,097,189.0
C) Fisheries – Capture									
River	21.8	26.6	4.1	12.5	17.4	13.7	3.9	–	7,222.0 T
Beel	4.9	24.1	1.4	56.7	1.3	9.8	1.8	–	4,501.0 T
Floodplain	10.6	43.3	5.4	19.5	6.2	10.1	4.9	–	14,866.0 T
Culture	5.3	41.3	5.6	17.1	11.5	12	7.2	–	8,140.0 T

Note : 1. JFP = Jamuna Flood Plain; MTS = Madhupur Tract South; MTN = Madhupur Tract North; OBFP = Old Brahmaputra Flood Plain; PJFP = Padma/Jamuna Flood Plain
Source : CE 1992

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TABLE X.1.6
Industries, Other Activities

Districts	Jamalpur	Tangail	Gazipur	Mymensingh	Dhaka	Munshiganj	Manikganj	Narayanganj	Total NCR
A) Industry and Non-Agricultural Major Activities									
All Sectors Persons Engaged	54894	102541	113214	118093	751733	46069	35549	214333	1436426
All Sectors of NCR	3.82	7.14	7.88	8.22	52.35	3.2	2.47	14.92	100
All Sectors of Dist.	100	100	100	100	100	100	100	100	100
Manufacturing Dist.	22.05	33.38	55.24	15.67	41.7	24.49	19.04	60.33	40.95
Wholesale, Trade Hotels Dist	37.03	12.22	22.47	42.01	53.12	47.39	41.87	25.88	31.65
Finance Insurance Business Services Dist.	7.1	4.44	2.38	5.43	8.44	4.36	5.23	3.73	6.48
Community Social Personal Services Dist	33.82	30.46	19.91	3.69	16.74	23.76	33.86	10.06	20.92
B) Some Details on Cottage Industries									
Nr. of Units	5642	5525		16677	38808				
Food, Beverage & Tobacco	18	8		12	13				
Textile, Leather Industry	30	28		29	31				
Wood product and Furniture	32	20		40	19				
Non-mineral product	4	9		4	5				
Fabricated Metal, Mineral products	9	28		5	10				
Other	7	7		10	22				

Source : CS 1992

Non-Agricultural Activities

It should be appreciated that in the present day farmers rarely obtain their income solely from agriculture. Various complementary income generating activities, depending on the socio-economic status of the producer are carried out. These include irrigated or rainfed cropping, fisheries, services (labour, tools), crafts, commerce, informal family-run business around population centre etc. Some farm units also obtain income from abroad (sent by emigrants working in foreign countries). All categories of peasants (whether or not they are landowners, the proletariat, those suburbanised, displaced or benefiting from emergency aid) may be considerably affected by changes related to flood control directly or indirectly.

Industrial Sector

Lack of organization and proper management, increasing cost of inputs (both local and imported), and under-utilization of capacity are the main constraints in this sector. Savings generated from this sector are far from satisfactory.

Investment in industrial sector requires large amount of money which is not available from private savings alone. It should be supported by institutional credit. Although there are several institutions advancing credit to industries, the loan repayments achieved are poor. Industrial performance, in general, is vulnerable to labour unrest, high cost of inputs (specially imported inputs and energy) and to political instability in the country. Thus investment in the industrial sector is lower than the desirable level.

Cottage Industry

In most cases cottage industry is only pursued in addition to other economic activities. In such cases, income from this source is added to income from other sources and saving from this activity alone is difficult. In those cases where people are involved full-time in cottage industry, there might be some possibility for saving, but this is dependent on the size of the firm and the type of industry under consideration. In the case of small establishments, income will be low as the middlemen (who are suppliers of raw materials and buyers of finished products) take the major share of the profit earned through such activities.

Trade and Commerce

If managed well, savings can be expected to be generated from trade and commerce. Investment in this sector is substantial. As it involves different size of investments, from small to large, different types of people can take up such activities, depending on what they can afford.

Commodity Market

Speculation in commodities is common. It is known that during certain times of the year, especially times of specific religious events/festivities, demand for certain commodities will increase. Speculators hoard such commodities creating artificial shortages and causing a price hike. By regulating the supply of the commodity in the market, financial gain is achieved.

1.4.2 Socio-economic Constraints

The NCR's agricultural output varies considerably across the sub-regions (see Tables X.3.10 and Table X.3.15). However even in the areas of high agricultural productivity, other problems may exist. Socio-economic problems related to the agricultural sector include the saving capacity, unemployment, women's activities, poverty and malnutrition. Other problems are linked to high population densities, migrations, and poor infrastructures. These together can form a very constraining socio-economic framework for regional development and must be taken into account in the planning process.

Saving Capacity

The agricultural sector in general is characterised by low savings and in a country like Bangladesh, where agriculture is the main source of income, the majority are poverty stricken. There is a high level of illiteracy, and traditional technology is used in production. The real income is low, leading to low savings. Most of the farmers are subsistence farmers and the consumption level is already so low that it cannot be further restricted to increase savings.

Unemployment

Unemployment and underemployment are chronic problems of Bangladesh. The population is expected to increase at a rate of 2.04 per cent per annum whereas labour force increases by 3.4 per cent, due to an increased female participation rate.

The rural economy has high unemployment. Much of this is disguised, as many labourers working in the family farm really do not contribute much to total production and their marginal productivity is close to zero.

Only indirect inferences can be made about unemployment according to agricultural operations. The supply of agricultural labour in specific villages is more or less fixed, and thus when the demand for labour is high for certain agricultural operations a shortage of labour is felt in these areas.

Agricultural operations that require significant labour include harvesting, threshing, transplanting and sowing. Many farmers report a shortage of labour for such activities.

The population pressure on scarce land is leading to landlessness in the rural areas, and it is mostly the landless and the marginal farmers who constitute the rural labour force. The rural sector has limited capacity to absorb the rapidly growing labour force. The potential of agriculture for creating employment cannot be exploited fully due to backward technology and lack of investment in modern agricultural technology. Though modern water-seed-fertilizer technology is quite labour-intensive only a limited amount of land in each sub-region is under irrigation (SR II.4). The Jamuna Floodplain (particularly the central and southern part) and the Madhupur Tract South sub-regions have a higher percentage of net irrigated to total cultivated area than other areas in the NCR, and unemployment should be lower in these areas. In general employment is not equitably distributed in the case of crop cultivation as the need for labour is different for different crops and different agricultural operations.

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Whatever initiatives are taken in the agricultural sector, given the high population levels, there will still be surplus labour for whom employment opportunities will have to be created in the non-crop sector. In the rural areas non-crop activities would include fisheries, livestock, rural infrastructure and rural industries, specially cottage industries. However, lack of institutional credit means limited expansion of rural industries and thus a limited labour absorption capacity. The development of rural infrastructure is dependent on external resources and its labour absorption ability will depend on external factors.

Specific Women's Role

Besides taking care of daily household chores, women are involved in different types of productive activities in and around their homesteads and sometimes outside. Their homestead activity includes growing fruits and vegetables in and around their homesteads for home consumption as well as for the market if there is any surplus. Women also raise poultry and livestock. They sell eggs and milk to augment their household income. Besides these, women are also involved in different types of cottage industries. All of these activities are disrupted during the flood. Flood damages homestead, trees and plants, decimates livestock population or results in shortage of poultry and livestock feed and disrupts their cottage industry activities. Depending on the intensity of flooding, varying degrees of financial hardship is caused as a consequence. They stand in great need of both money and physical inputs to continue their production pursuits. Adequate institutional arrangement that will ensure physical inputs and production credit for rural women will go a long way in mitigating disruptions caused by flood.

Post harvest processing of grains mostly take place in the homestead area and women are totally involved in these activities (i.e., in parboiling, drying, threshing, husking, winnowing etc.). Seed preservation and grain storage are also taken care of by women. There is practically no difference regarding these activities amongst different landholding groups. However, large farm households also use hired help. Wages are paid in cash or kind (specific quantity of harvested grain) and meals are provided. Women are also involved in other agricultural activities in the homestead area.

Marketing of homestead agricultural/dairy products takes place either in the homestead area itself or in the market place. In the villages traders go from house to house to buy products such as eggs. Women are directly involved in such marketing activities.

Products such as milk and fruits, livestock and poultry are usually carried to the market by men. Sometimes women may carry these products to the markets themselves depending on the social custom in the area and on their economic status. Women of well-to-do households do not directly involve themselves in the marketing process.

As far as other activities are concerned specifically activities outside home such as participation in the construction of hydraulic infrastructure, building of roads etc.; women usually are not readily available for such activities unless they are really pressed financially, women belonging to landless households are more often involved in such activities, and also participate in the earthwork and turfing activities of embankments and roads.

Poverty

In Bangladesh, rural life revolves around the agricultural cycle. Traditionally, there are two periods of seasonal deficits, the first one from late September to early November, the second one being from late March to early May. The expansion of Boro crops has improved the situation in the summer months but the autumn lean season (coming after the planting of Aman) still affects the rural population very hard as harvest is still more than a month away. The worst affected are the agricultural labour households, consisting of the landless and the marginal farmers. This is also the time of low job availability, and low wage rates with a decline in wages in the order of 30 to 40%, see Table X.1.7. As wages decline, consumption of food by households also declines, with the most affected group being the daily labourers.

TABLE X.1.7
Seasonal Wage Rates

Greater District	Average wage rate on October 20, 1991 (Tk)	Average wage rate in normal period (Tk.)	Average drop in wage rate in October (%)
Dhaka	23	33	30
Tangail	21	35	40
Jamalpur	24	35	31
Mymensingh	23	35	34

Source : Rahman 1991

Malnutrition

The NCRS socio-economic survey (see SR IV) studied budgets of different household categories. The analysis shows that the landless households have a deficit budget and, with 74-84 per cent of total expenditure being on food, any fall in total income leads to a fall in expenditure available for food.

In the case of small farmers food constitutes 42-60 per cent of total expenditure whereas for medium and large farmers, food expenditure is 29-46% and 27-45% of the total, respectively. The dependency on hired labour income of the landless is thereby confirmed.

Previous studies (BBS 1988 and BIDS 1988) have defined the first poverty line as a minimum of daily intake per capita of 2,122 calories and put the hard core poverty level at a minimum of 1805 calories (1535 calories in the BIDS study, equivalent to 437 gm. of rice or wheat).

Using these criteria, it has been estimated (IFPRI 1991) that around 80 per cent of agricultural labour households were below the poverty line in 1990. Another study (BIDS 1990) shows chronic deficit households by different categories of households, see Table X.1.8. The table shows that the landless and the marginal farmers are chronic deficit households. Malnutrition will be high amongst these households.

Besides the agricultural households, some low income non-agricultural households may also be sufferers of malnutrition (these households may be daily labourers involved in non-agricultural activities, rickshaw pullers, petty traders etc.), as are some households of individuals working in the urban informal sector (the urban poor) who are expected to suffer from malnutrition.

TABLE X.1.8
Distribution of Chronic Deficit Households

Landownership Category	Total number of sample households	Chronic Deficit Households (%)
Landless	16	29
Functionally Landless (0.01-0.49 acres)	33	55
Marginal Landowners (0.05-1.49 acres)	21	11
Small Landowners (1.50-2.49 acres)	11	3
Medium Landowners (2.50-4.99 acres)	12	1
Large Landowners (Over 5 acres)	7	1
Total	100	100

Source : BIDS 1990

More details are given on land ownership as this criterion gives a good picture of chronic deficit households (see Table X.1.9 and Figure X.1.2). A very bad situation prevails south of Dhaka in the whole Munshiganj district, and close to Narayanganj, which are heavily flooded areas, and in Mymensingh Sadar thana. Other critical areas are mostly located in the Jamuna Flood Plain, and in Madhupur Tract South (the whole Jamalpur district, 5 thanas of Tangail district, the Manikganj district, and north western part of Dhaka district). This clearly indicates where the priority development projects should be located paying special attention to the distressed people.

TABLE X.1.9
Structure of Land Ownership of Rural Population (1983-1984)

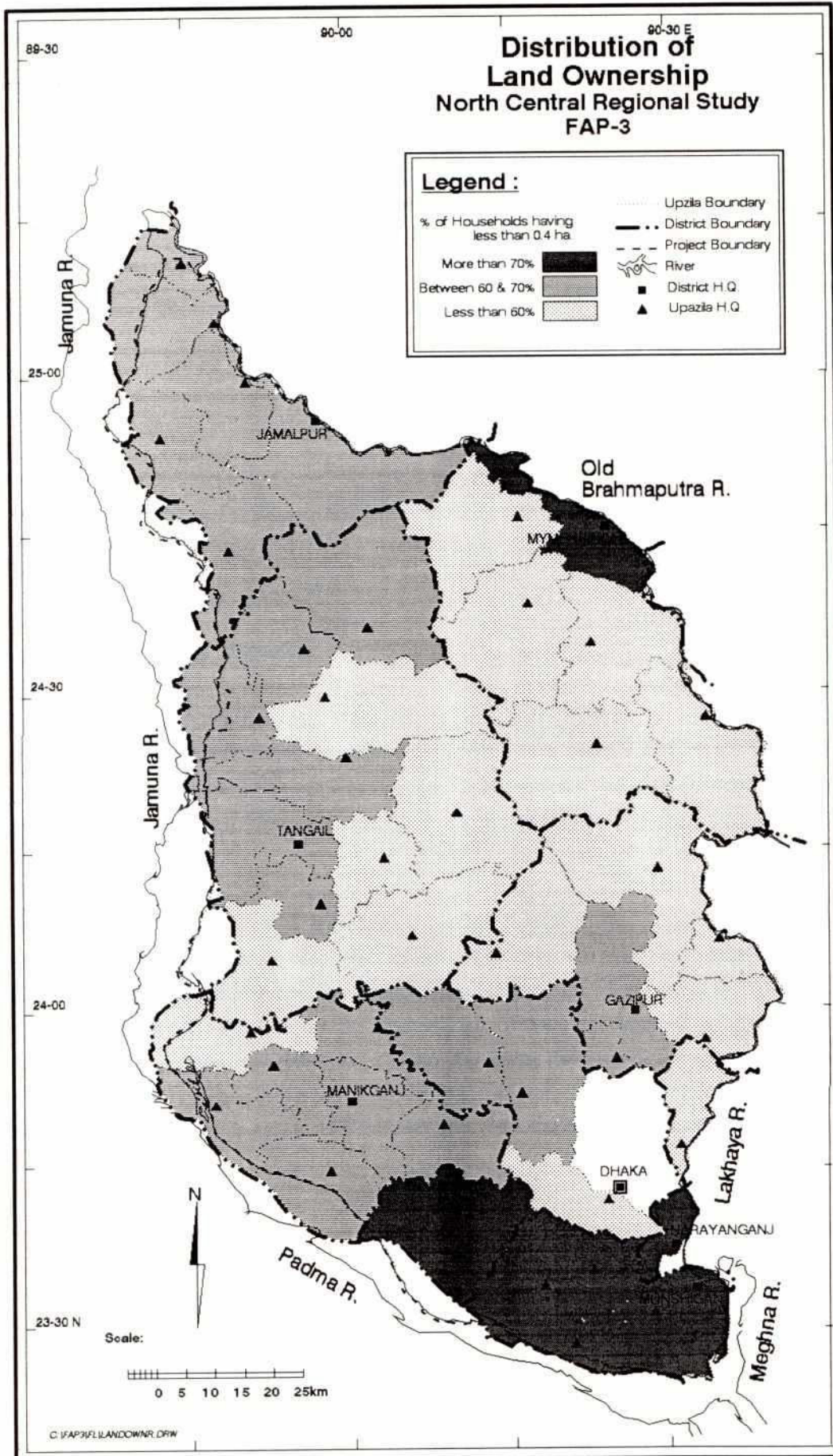
District	Thana	% of households having less than 0.4 ha *
Jamalpur		64.1
of which	Melandaha	66.3
	Sarishabari	67.2
	Madarganj	64.0
	Jamalpur	63.0
	Islampur	62.8
	Dewanganj	61.1
Tangail		58.0
of which	Kalihati	66.2
	Delduar	62.8
	Madhupur	62.3
	Gopalpur	61.9
	Tangail	61.7
Gazipur		57.2
of which	Tongi	66.7
	Joydevpur	62.1
Mymensingh		61.1
of which	Mymensingh	72.1
	Muktagacha	65.0
Dhaka		75.2
of which	Dohar	79.3
	Nawabganj	75.4
	Savar	68.9
	Dhamrai	63.4
Munshiganj		76.2
of which	Munshiganj	81.8
	Tongibari	77.6
	Lohajang	76.8
	Sreenagar	72.6
	Sirajdikhan	72.1
Manikganj		64.6
of which	Harirampur	68.0
	Singair	67.1
	Manikganj	65.6
	Shibalaya	65.2
	Ghior	62.9
	Saturia	62.1
Narayanganj		74.9
of which	Narayanganj	82.6
	Rupganj	69.4

* quoted when percentage is 60 or above

Source : CS 1992, see SR IV, Annexes



Figure : X.1.2



Nutrition levels by district are set out in Table X.1.10 and Figures X.1.3 and X.1.4. These show the intensity of food intake shortage during the slack period in the agricultural calendar (October 1991). This information together with the more general findings of the WFP Dhaka on the Thana Distress Level suggest that the sub-region defined as the Jamuna Flood Plains is the area where the level of malnutrition is highest in the NCR.

TABLE X.1.10
Distressed Households by District

Name of Greater Districts	No. of Sample Households	Distress Households % of household on 1 meal a day for 1-3 days a week
Dhaka	65	31
Tangail	19	39
Jamalpur	60	35
Mymensingh	37	32

Source : Rahman 1991

High Population density and Migration

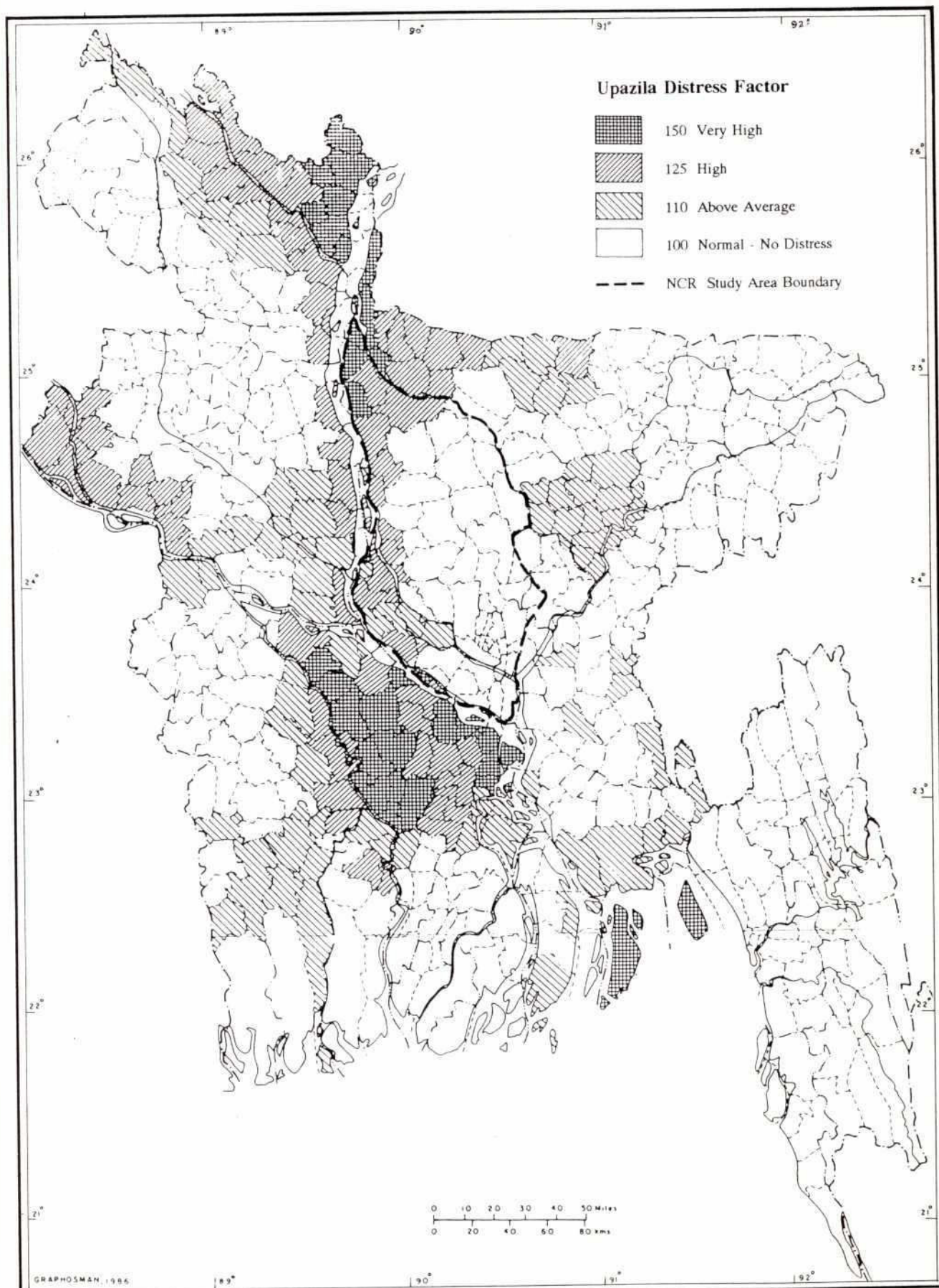
Population has greatly increased over the last two decades, and in the NCR the density is some 1,200 hab/km² as compared to the average national density of about 760 hab/km² (see Table X.1.2). Nearly half the population is below 15 years of age, and employment and migration are major problems. Although the majority of the households are involved in agricultural activities, more than 50% have small farms with less than 1 ha (2.5 acres, see Table X.1.4).

Migration is an important component of population dynamics. It leads to spatial redistribution of population and influences the demographic and socio-economic conditions of NCR as well as of the country. Looking at figures of districtwise annual population growth rate, Dhaka (3.68%) and Gazipur (3.31%) are areas of high population growth, followed by Narayanganj (2.51%), see SR IV. Mymensingh, Tangail and Jamalpur are districts where net out-migration has been taking place over the past decades. However, these trends were not fully confirmed when considering the preliminary results of the last 1991 population census, with a marked increase in Jamalpur district, while Manikganj (1%) and Munshiganj (1.1%) suffered from the lower population increase. This is probably due to three factors:

- the high population density
- the severe flood conditions
- the attraction of Dhaka city which is very near to these areas.

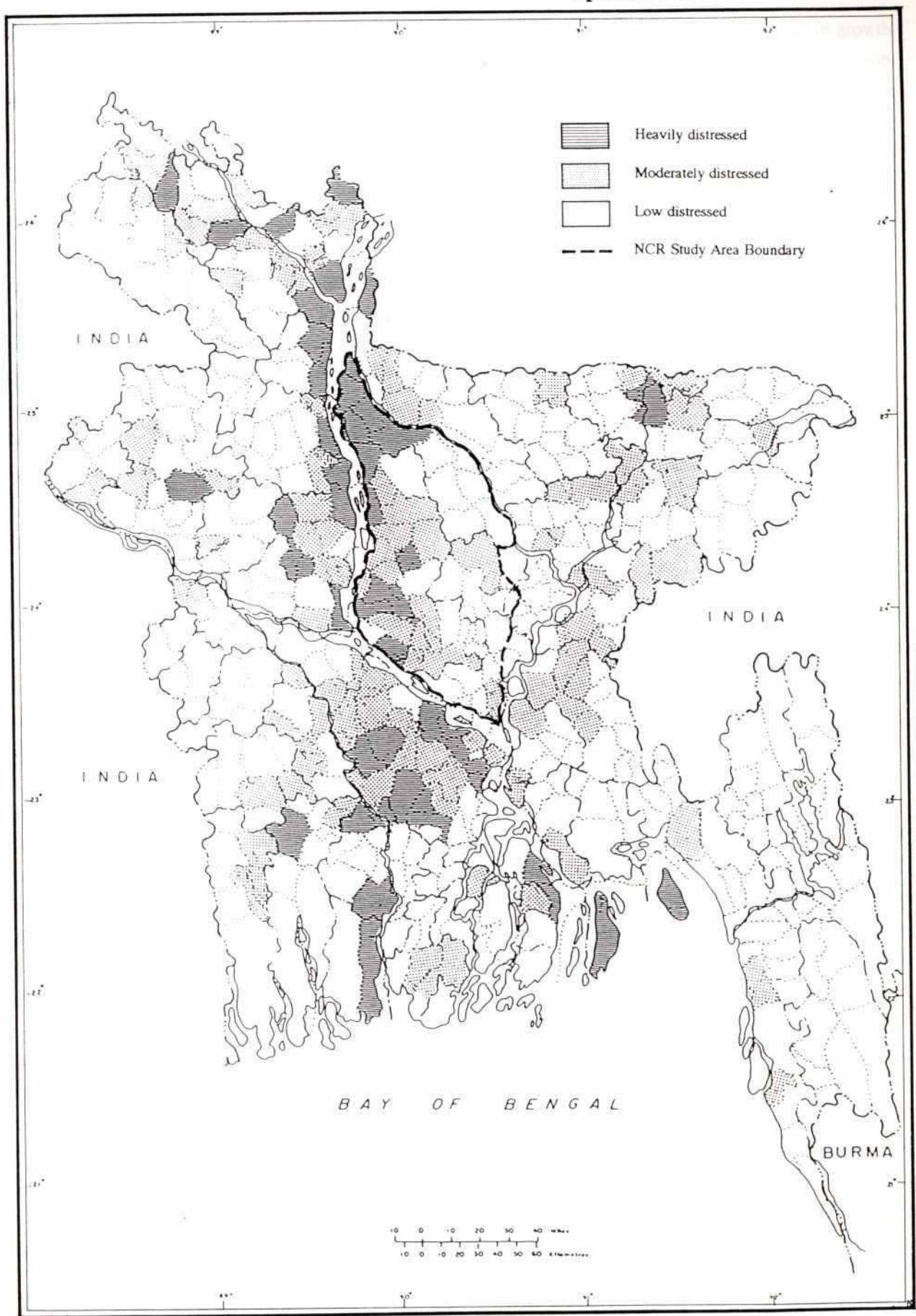
Net urban immigration is high and contributes to a yearly urban population increase of around 3% per year.

Figure X.1.3
Upazila Distress Level - 1986



Source : WFP Dhaka

Figure X.1.4
Upazila Distress Level - 1991



Source : WFP Dhaka

Socio-economic Infrastructures

Agricultural development cannot proceed in isolation and requires a socio-economic framework to sustain its growth. The anticipated economic effects of interventions in the flooding regime will depend on existing and potential sub-regional infrastructures, as described in Table X.1.3.

In the North Central Region, the railway adequately serves the East and North areas. The major marketed crop, jute, is carried to the inland markets and seaport mainly by water transport although the railway system carries a substantial portion of the raw jute and jute goods trade, as well as cereals.

People living in the flood plain are generally dependent on water transport in the rainy season. Even in dry seasons it is often easier to carry goods by boats than by bullock carts to the market. From May to November the waterways are busier than all other forms of communications. Any adverse changes to the water transport system would obviously have a considerable negative impact on the transport system.

The improvement of communications, access to education facilities and strengthening of medical infrastructure all featured highly in the concerns, problems and wishes of the rural population (as surveyed in the socio-economic study of the NCR, SR IV).

1.5 Conclusion on Natural and Socio-economic Environment

Major problems relating to the sub-regions and their planning units are summarised in Table X.1.11. Flooding in Jamuna and Padma Flood Plains contribute to the high level of malnutrition. Population pressure in the southern parts of these areas worsens this situation. In the northern Madhupur Tract, population pressure, even though not very high, has detrimental consequences to the poor natural resources (however this is linked with the poor land quality and limited water resources, and not the flooding).

Increasing cropping intensity and the use of high yielding varieties and livestock breeds have threatened the existing biological diversity in the Region. The situation is worsened by deforestation in the Madhupur sub-regions and by increased agricultural productivity and the drying up of wetlands for winter rice cultivation in the flood plains. The extent of pollution due to an increase of pesticide and fertilizer use threatens more and more areas of fisheries, wild life, and water bodies used for domestic purpose. These phenomena are not determining factors when differentiating sub-regions as planning units for planning purposes. However, they will have to be seriously considered when preparing more detailed studies.

There is a high degree of variability concerning both biophysical and socio-economic features in the North Central Region.

Regional development should reduce the internal imbalance and raise the income of the whole region to avoid over concentration of population around some urban centres. Increasing attention is being paid to sub-region growth by planners because it has been observed that some areas are progressing satisfactorily while most other areas are lagging far behind.

TABLE X.1.1.11
Major Problems
Relating to the Sub-Regions and their Planning Units

Major Problems	Jamuna Flood Plain	Madhupur Tract		Padma Flood Plain	Old Brahmaputra Flood Plain
		North	South		
	PU1, PU2+PU4, PU6+PU7	PU5	PU8, PU9	PU10+PU11, PU13	PU3
A. Physical Aspects					
Vulnerability to River Flooding	xxx	x	x	xxx	x
Drainage constraints	xx (Basins)	x (Valleys)	x (Valley & Basins)	xxx (Basins)	xx
Vulnerability to Dry season	xx (Ridge, Swales)	xxx (Uplands)	x (Swales, Uplands)	x (Ridge, Swales)	xx (Ridges, Swales)
B. Socio-Economic/Environmental Aspects					
Impacts of Demographic Pressure on:					
- Malnutrition	xx	x	x	xxx	x *
- Cultivable land	x	x	x	xxx	xx
- Biomass resources (national growth)	x	xxx	x	x	x
- Fishery resources	x	x	x	xxx	x
- Groundwater resources		xxx	xx		x
Employment	xx	x	x	xxx	x

Note : xxx Significant

xx Moderate

x Minor

* : xxx for Mymensingh area

This deprivation of resources is readily noticeable when one travels from Dhaka to any of the other NCR districts. However, immigration into Dhaka is so intense that per capita income has risen less in Dhaka statistical region (former district) than in other sub-regions.

The quality of life is very poor for the vast majority in NCR. There is one medical practitioner for more than 4,500 persons and one hospital bed for more than 3,500 persons. Calorific intake is four fifths of the estimated requirement of 2,300 calories per day.

The fragility of survival among the poor people (destitute, landless, non-agricultural wage labour, small farmers) is reflected by the meagre return they receive and the degree to which they must depend upon the market in the absence of significant ability to provide for their own subsistence. This fragility is more apparent in the areas susceptible to river flooding.

The process of agricultural development has shown significant progress in the past few years, though limited to a few specific areas (irrigation near Jamalpur and Mymensingh, growing of fruits and vegetables west of Dhaka, etc.). More widespread efforts will be needed in the near future. The potential for agricultural development still remains high and will concern mainly the shift to HYV which will be possible through flood protection, drainage and better water management. A substantial increase of cropping intensity is possible through irrigation of boro crops, it will concern mainly the western part of the region. It is believed that these measures will not be sufficient to solve the problems of the NCR in the long term (and also in the short term for specific areas in the Madhupur Tract and the Brahmaputra Flood Plain). Note that increased in irrigated rice has not been allowed for in the present analysis as this study concentrates on the benefits of controlling flooding in the monsoon season; the impact on irrigated crops in the rabi and boro seasons should be looked at further at Feasibility Study level.

All efforts are needed to create additional jobs in the non-agricultural sectors mainly in industry, and this will require investigations which were not part of the present TOR. There is need for further irrigation developments which will be based on a comprehensive and complementary use of both surface and ground-water resources. These aspects are not treated here, as they are only very exceptionally linked to the development of flooded areas. A good development of STW irrigation for boro crop (which can also bring some supplemental irrigation of aus and aman crops) has taken place recently, and will continue in the future, mainly under private initiative. It has the highest priority when considering irrigation. It is, however, the right time to start thinking of a possible switch to surface water, such as through a regular supply from the Old Brahmaputra river. The water development strategy ensuring an effective flood control is developed below.

Medium scale industries ideally suited to the small towns of NCR are rather rare. The main drawbacks to the extension of industry in each subregion are the cost of fuel, the difficulty of transporting materials and production, and the very poor rate of credit repayment by the borrowers. In such conditions industry and cottage industry do not presently provide sufficient employment opportunities in the very densely populated areas.

1.6 Water Development Strategy

1.6.1 Conceptual Approach

Strategic Conditions

It should be stressed that the water development strategy should not be considered in isolation from socio-economics. Water resources development may prove to be a leading force in rural development or it may just be an accompanying measure, particularly where small scale developments are concerned. The environmental and socio-economic overview presented in the preceding sections allows us to present the major problems and pre-conditions for rural development. It must be underlined that the present economic conditions of Bangladesh do not allow for a broad range of possibilities for financing regional development. This is particularly true for rural development. Bangladesh cannot afford to support development projects that would be uneconomic, see Section X.4.

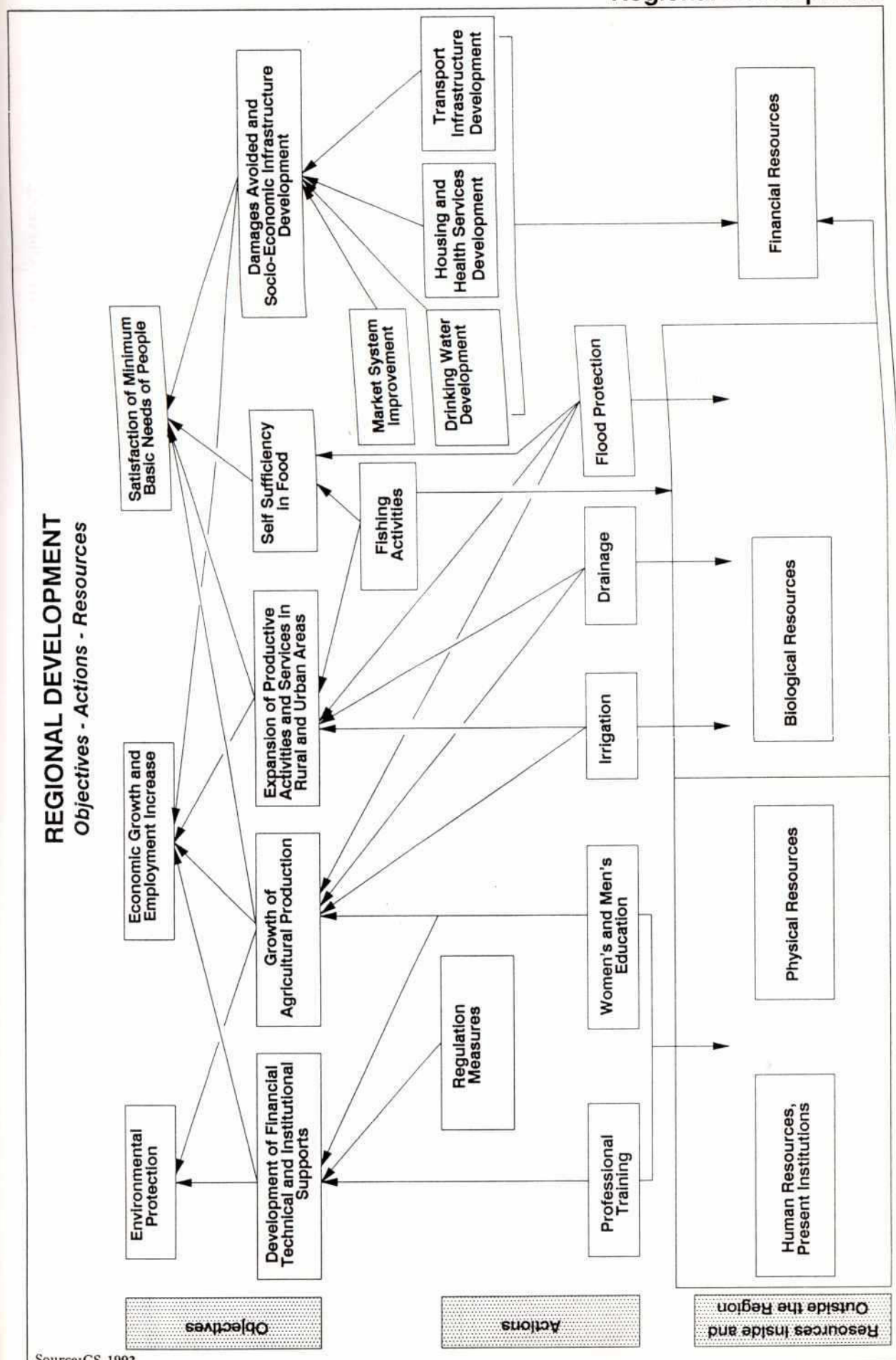
For regional development the government undertakes various actions to improve the present socio-economic situation of the NCR. Figure X.1.5 sums up some of the principal objectives, measures and actions which are required in Bangladesh, and it can be seen that if water development is to be successful then it must be carried out along with several other complementary activities.

In other respects, the small size of the majority of farm households does not allow for any significant build up of regional savings. As illustrated by Figure X.1.6, a rural development project should generate important and positive socio-economic effects induced by farm activities through agro-industrial or non-agricultural complementary development. On the other hand it must avoid being the cause of substantial losses resulting from an inappropriate use of natural resources, or from an unbalanced development inducing migration of population.

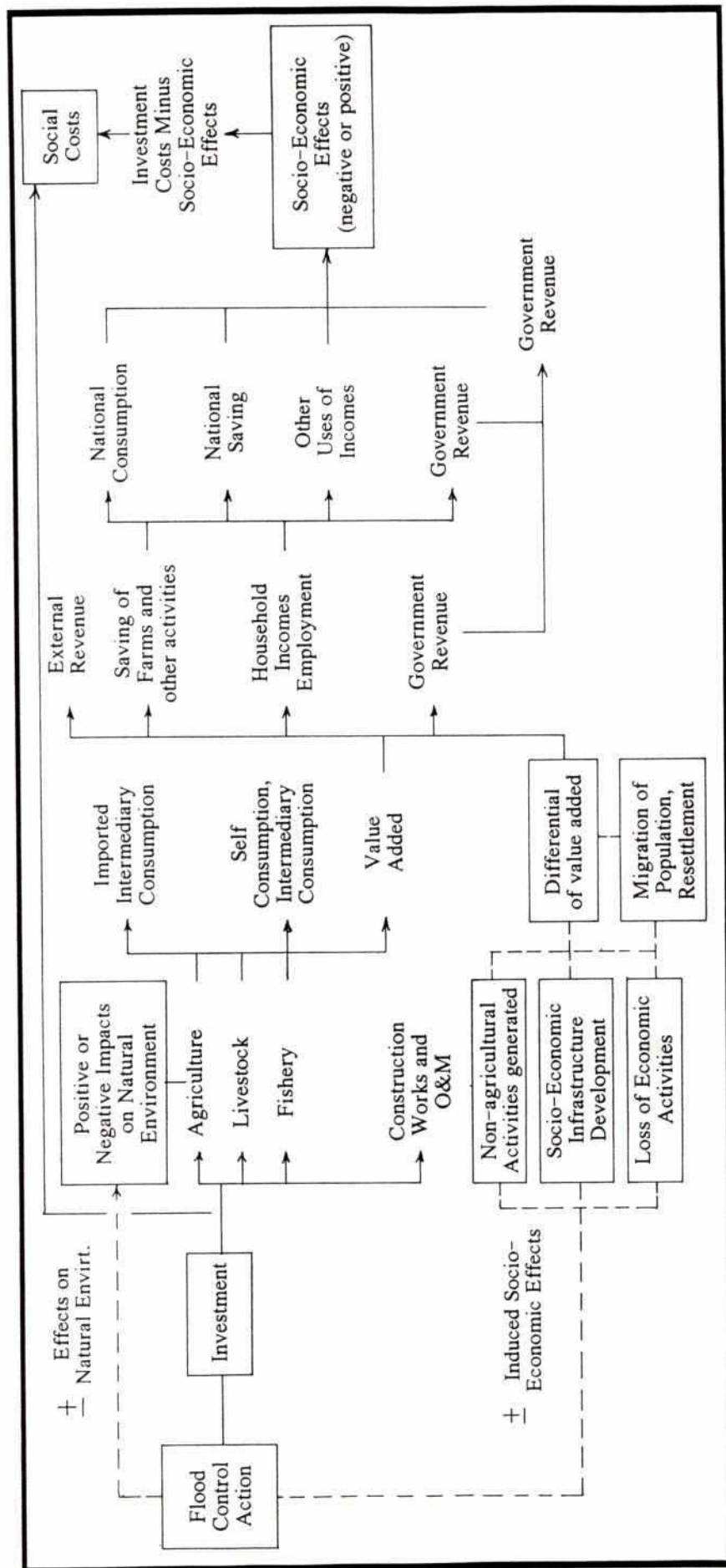
It is of great importance that the natural environment be preserved for future socio-economic security, and for maintaining the ecological balance. The scarce natural resources are under severe threat from the increasing demands of an expanding population.

The above considerations set the background for the framework of a water development strategy which is outlined below. The NCR has been subdivided into Planning Units (PU) so that the specific features related to biophysical and socio-economic environments can be identified and grouped together into homogeneous areas. The characteristics of each PU are given for hydro-meteorological features (such as rainfall, frequency and depth of flooding, drainage patterns, river activity and instability), and socio-economic conditions (population, infrastructures, activities).

Figure : X.1.5
Regional Development



ENVIRONMENTAL AND SOCIO-ECONOMIC EFFECTS OF A FLOOD CONTROL DEVELOPMENT



Economically Viable Developments

Investment costs and resultant added values (direct plus indirect) must be balanced in order to define economically viable developments. In areas where there is the potential for significant increases of the agricultural value, the major flood infrastructures may be justified. On the contrary where the opportunities to sufficiently increase the present level of added value are low then only single low cost water management techniques and non-structural development will be justifiable.

However, in the initial planning approach, as the required basic data are not available to assess correctly the flood phase changes resulting from various options, economic criteria will be used with caution. Other criteria may have a higher weighting when ranking the development options. It is clear that economic criteria have to remain the basic ones when performing feasibility studies.

Distressed Sub-Regions

Priority should be given to heavily distressed and densely populated subregions, because without intervention these vulnerable zones can induce important social costs. Areas concerned are essentially in the Jamuna and Padma Flood Plains (PU1, PU2, PU4, PU6, PU7 PU10).

Socio-Economic Framework

In order to lower social costs it is better to develop first those subregions where a socio-economic framework already exists to enable economic growth to be sustained so that direct and indirect value added can be raised to a maximum, and fast.

Participation

The success of any water resource development project depends largely on its acceptance by the local community and on the active participation and co-operation of individual farmers. Thus it is important to involve the farmers in the management of flood control programmes. This should at least be done at the field level but such an approach requires a long time for informing the public and preparing local communities before carrying out construction works. A participatory approach to planning, construction, operation and maintenance should be evolved. This will include the involvement of some local organisations working with the help of government authorities to take and sustain the major initiative and to bear a major socio-economic effect.

Local Economic Initiatives

For the optimum benefit to be obtained from successful water resource development plan, local economic initiative should be encouraged to make full use of the opportunities induced by agriculture, livestock, fishery. In this way there would be both a growth of the regional value added and also improvements in the local employment situation.

Such economic promotion would only be possible with the introduction of new institutional measures, changes in economic policy, research and supporting service strengthening towards agricultural and industrial sectors. Other appropriate initiatives would be to assist in setting up small off farm ventures to benefit disadvantaged groups (such as the landless and women).

Multipurpose Use of Developments

Due to the pressure on resources it is important, where possible, to utilise new developments such as proposed embankments for more than just flood protection. Consideration will be given for incorporating multipurpose infrastructure for example using embankments as roads, for cultivation of crops, livestock and for settlements. Such initiatives require the participation of the land owners, and although it will require the use of more land it should help ease the problems of land acquisition and discourage public cuts.

Mitigatory Measures

Mitigatory measures will be required wherever groups or persons are adversely affected by the implementation of a proposed development. Such measures in the NCR should include locks for boats, beel conservation areas, plan modifications to allow for fish movements, assistance towards culture fisheries and other measures for disadvantaged groups.

Environmental Management Programme

The natural resources are under severe threat from the increasing demands of an expanding population, and it is of great importance that the natural environment be preserved for future socio-economic security. An environmental management programme should be instigated that ensures that the future developments improve rather than degrade the natural resources of the region.

1.6.2 Preliminary Screening of Development Options

Flood mitigation actions

Appropriate flood mitigation actions are summarised in Figure X.1.7 for each PU, after considering the main physical development constraints.

Development Options and Priorities

Taking into account the strategic conditions enumerated above and the principal socio-economic development and environmental protection measures needed for improving the present situation of each subregion, it is possible to recommend the development options which are needed in each PU based on flood control and water management (see Table X.1.12).

The subregions of Jamuna and Padma flood plains generally suffer from heavy flooding. The other subregions are less affected by flooding and the main constraints to agriculture in PUs 3,5,8 and 9 are rather water shortage, local drainage and land reclamation. Development of social infrastructure and of non-agricultural economic activities are also basic needs.

Among the Jamuna and Padma flood plains PUs 1,2,4,6,7 and 10 are the more distressed areas; PUs 1,6 and 7 have the advantage of a socio-economic framework able to sustain economic growth generated by a water resource development project.

Figure X.1.7
Development Consideration

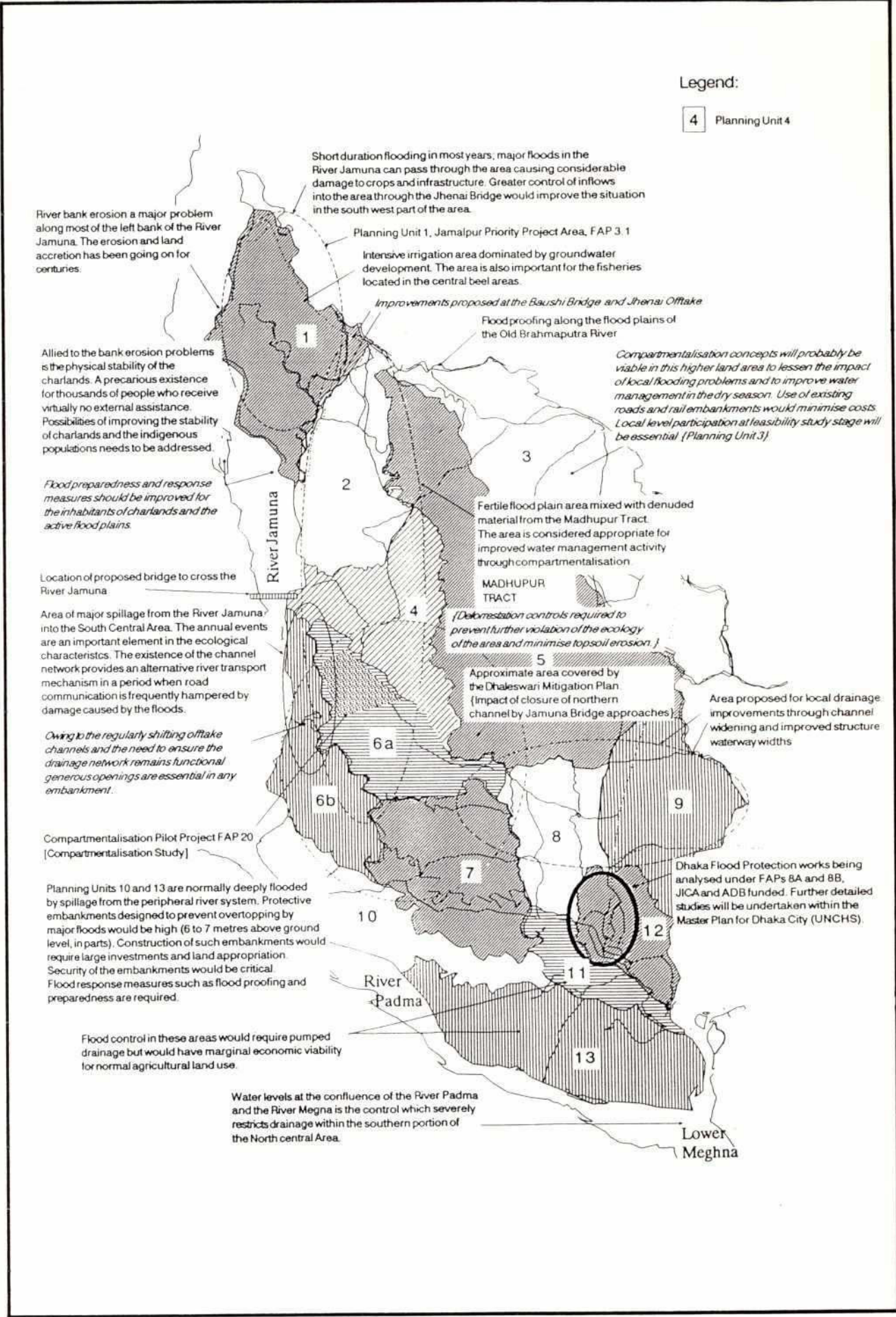


TABLE X.1.12
Identification and Location of Recommended Development Actions

Actors	Socio-Economic Development and Environmental Protection Needed	SUB-REGIONS												
		JFP						MTN	MTS		PFP			OBFP
		PU1	PU2	PU4	PU6	PU7	PU5	PU8	PU9	PU10	PU11	PU13	PU3	
Governmental	o Major Hydraulic Infrastructure (Flood control & Drainage)	x	x	x		x				x				x
	o Local drainage/Compartmentalisation							x	x			x		
	o Urbanisation- Household Settlement-Communication													
	o Land preservation	x					x			x				
	o Support to industrilisation	x	x	x	x	x	x	x	x	x	x	x	x	x
	o Institutional improvements	x	x	x	x	x	x	x	x	x	x	x	x	x
	o Programmes for distress people	x	x	x	x	x	x	x	x	x	x	x	x	x
	o Forest													
NGO	o Food	x	x	x	x		x			x				
	o Education Mass Awareness	x	x	x	x		x			x				
	o Environment management						x							
	o Wild life preservation						x							
People (and Local Organisations)	o Small hydroagricultural development	x	x	x	x	x	x	x		x				x
	o Energy	x	x	x	x	x	x	x						x
	o Industrialisation	x	x	x	x	x	x	x						x
	o Marketing system	x	x	x	x	x	x							
	o Fisheries	x	x	x	x	x		x	x	x		x		x
	o Agriculture	x	x	x	x	x	x	x	x	x	x	x	x	x
	o Water and Sanitation						x	x	x	x	x	x	x	x
	o Tree cover	x	x	x	x	x	x	x	x	x	x	x	x	x
	o Basic needs (employment-incomes life style)	x	x	x	x	x	x	x	x	x	x	x	x	x

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In PU 1 there are contrasted situations. Flooding is not a problem in the central and eastern parts which have already a high level of productivity. Floods are serious in the western part near the Jamuna, and restricted drainage in the southern part means a long flood duration.

As far as average years are concerned, if the timing is not improper farmers welcome shallow floods which improve the fertility of the soil. However, at the end of the monsoon the higher lands need supplemental irrigation whereas the lower lands are in need of drainage.

This situation will improve considerably through the implementation of recommended actions including some degree of flood protection by rehabilitating/extending existing western embankments; drainage; extension of irrigation; small water management projects. These should be accompanied by flood warning, flood preparedness and flood proofing projects in the areas which cannot be protected, or when the protection is considered uneconomic.

Hydraulic conditions in PU1 and PU2 are highly inter-dependent in the vicinity of Baushi bridge. When conceiving development scenarios due consideration has to be taken of these conditions.

The other priority programme should concern PUs 6 and 7 where agricultural production can be greatly improved. In these areas numerous basins are flooded during about 6 months and around 90% of the cultivated land is flooded every year. The impact of flooding results not only from the actual flooding event but also from its uncertainty in terms of area, depth, duration or time, or recurrence. In such a situation a flood embankment system can be profitable if this infrastructure is carried out in conjunction with other actions as shown on Table X.1.12. Another economic advantage of planning units 6 and 7 is the nearness of Tangail as a potential supporting service centre.

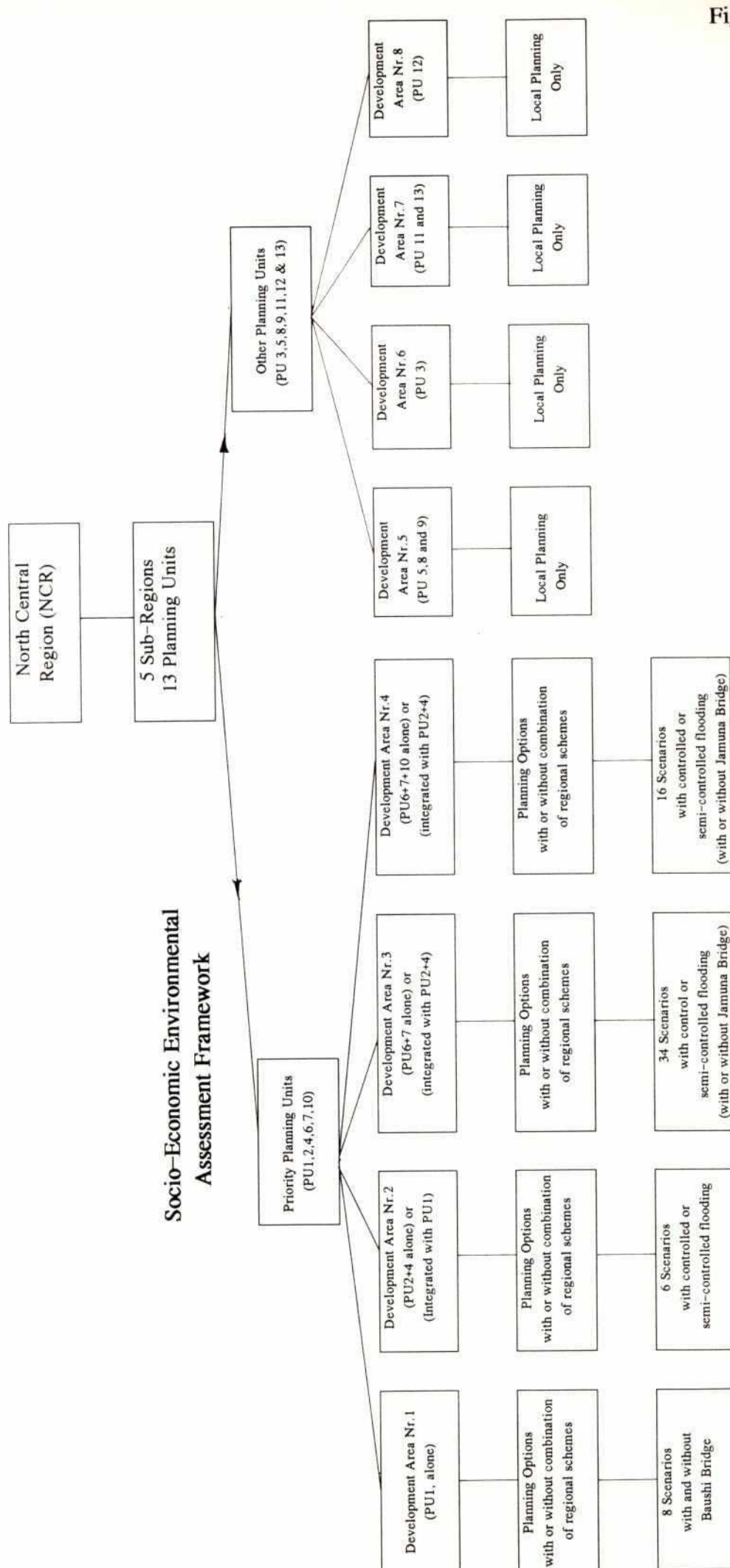
Profitable advantages can be also generated by flood control in the PUs 2,4. Agricultural development possibilities are also fairly high. However as far as PU10 is concerned possible future movements of the Ganges - Padma river system may become a major physical constraint and may turn every investment in this area into a losing concern.

Consequently, it is advisable to think of PU 1,2,4,6,7 and 10 as priority development areas. Thus inside these areas several planning actions have been described in technical and economic terms with or without combination of regional schemes (linking together for instance PU1 and PU2, also PU2 and PU4 for which flood mitigation measures are clearly interrelated). According to external decisions about the carrying out of Jamuna Bridge and possible control options at Baushi Bridge, alternative scenarios have been taken into consideration for the above priority planning units.

Besides the development of these priority planning units the Flood Action Plan must take into account the other planning units (PU 3,5,8,9,11,12 and 13) to assess and recommend local planning and water management measures. The overall generating process of development options for all PU is explained on Figure X.1.8.

The present multicriteria analysis concerns essentially immediate decision making, concerning the priority planning units. In this way chapters 4 and 5 describe procedural steps followed for predicting and assessing the impacts of alternative development scenarios, with the development options being grouped together when advisable.

Generating Process of Development Options



CHAPTER 2

ECONOMIC IMPACT OF FLOODS

2.1. General

The impact of severe floods on the regional economy may be reported under the following headings

- damage to crops
- damage to dwellings and households assets
- damage to public infrastructures
- damage to industries

Due to the uneven occurrence of these events their probability distribution has to be considered with a view to determining the mathematical expectation of their impact, i.e. their average impact. Past records of flood losses before 1987 are however scarce or unreliable. Agricultural statistics could be expected to provide relevant data but integrate the effect of changes in varieties and farming systems and the impact of droughts, pests and other adverse circumstances. Therefore a statistical analysis of relevant past records of losses appears hardly feasible.

The proposed assessment method is to relate flood damage to hydrological data which have been more regularly recorded, as recommended by FPCO "Guidelines for project assessment", from July 1991. Losses due to the catastrophic floods of 1987 and 1988 were intensively recorded and may be used to provide a scale of damage corresponding to the return period of these floods. With regard to the limited accuracy and availability of data, flood damage may be reasonably assumed to be linear functions of flood intensity. Another source of difficulty is in the complex origin and local characteristics of floods which make uncertain their statistical analysis. The most synthetic index of flood intensity seems to be the total flooded area reported by BWDB for 30 years for the country as a whole. Though of limited accuracy and not necessarily reflecting the very local conditions of flooding, it integrates the combined effect of water levels in the main rivers, local rainfall and associated runoff, back-water effects, and the impact of existing infrastructures.

The nationwide index of 28 years published by BWDB as shown in Table X.2.1 can be adjusted to a Gumbel distribution with a correlation coefficient of 0.96. It gives the following formula:

$$A(T) = 22.5 + 11.5 * U(T)$$

with $A(T)$ = affected area for a return period of T

$$U(T) = \text{Gumbel variate } (= -\ln -\ln (1-1/T))$$

The flood index calculated for different probability levels is shown in Table X.2.2. It gives a return period of about 100 years for 1988 flood and of about 20 years for 1987 flood.

2.2 Damage to Crops

Crop yields are known to fluctuate every year with weather and related factors. Average reported yields include provisions for such fluctuations but not for events such as severe floods that are exceptional in nature. Damage assessment will cover the impact of these floods that occur from July to September and will not include other farming

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hazards which are accounted for in the estimate of average yields. However, it is understood that farmers are generally aware of exceptional risks and adopt effective strategy to deal with such risks. It should be noted that although there will also be flood damages from early floods which will affect Aus and Boro crops, such floods are less significant in the NCR than elsewhere in Bangladesh; the available damage assessment statistics do not include any records of flood damage at these times and thus such damages have not been included in the present analysis.

The assessment of flood damage losses is thus restricted to the crops that are standing from early July to end September, i.e. B. and T. Aman rice, and to a negligible extent jute and sugarcane.

Available data are as follows:

- Unofficial records of totally and of partially damaged areas provided by MRR for each district and all crops together (see Table X.2.3),
- Reports of USAID (Office of Agriculture and Food) providing food production estimates and forecast at "old district" level (see Table X.2.4),
- Agricultural statistics gathered in the Agricultural Office of Districts and Thanas for the last years (since 1986/87 for Districts and since 1989/90 for Thanas) as shown in Table X.2.5.

The comparison between data from USAID and from Agricultural Offices is made difficult by the difference of geographical units that are used as shown below:

Old districts	New districts
Dhaka	Dhaka (Manikganj) (Gazipur) (Munshiganj) (Narayanganj) (Narsingdi)
Jamalpur	Jamalpur (Sherpur)
Mymensingh	Mymensingh (Netrokona) (Kishoreganj)
Tangail	Tangail

The only district covering the same area is Tangail. For this district USAID reports provide higher estimates of harvested areas, but production estimates are in the same order of magnitude. For the other districts, discrepancies are huge but may be at least partly explained by the fact that "old districts" referred to by USAID cover large areas outside the Study Region.

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Damaged crop areas reported by the Ministry of Relief and Rehabilitation (MRR) can be compared to the decrease of harvested area in 1987/88 and 1988/89 since 1986/87. They appear strongly overestimated except for Tangail and Dhaka districts where MRR estimates are very close to the estimates taken from the statistics of the Agricultural Offices.

A regression formula relating the % damage to the flood intensity index is calculated in Table X.2.6 for B. and T. Aman in each district, using 1987 and 1988 flood data and assuming that no damage is likely to occur with a return period of 5 years or less.

The mathematical expectation of production losses for different return periods is shown in Table X.2.7.

2.3 Flood Damage to Dwellings and Household Assets

The only data available are those collected by the Deputy Commissioners for the Ministry of Relief and Rehabilitation after the catastrophic floods of 1987 and 1988. They are shown in Table X.2.8 for damaged dwellings and in Table X.2.9 for livestock losses.

The percentage of affected households in each district has been calculated from the data above and is shown in Table X.2.10. Records concerning 1988 flood are apparently lacking for the district of Narayanganj where flood conditions are probably not very different from the conditions in Munshiganj or Dhaka district outside the city.

The value of damage cannot be assessed without making assumptions on the types of dwellings damaged and on the value of household assets. The unit value of different types of rural dwellings can be estimated according to the construction materials and the size of the most common ones as follows:

1. size: 12'*9'
mud floor
roof: straw
wall: jute sticks and bamboo
Total cost = Tk. 2,500
2. size: 12'*9'
mud floor
roof: straw
wall: bamboo
Total cost = Tk. 3,500
3. size: 12'*9'
mud floor
roof: tin and wood frame
wall: jute sticks and bamboo
Total cost = Tk. 6,000

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4. same as 3 with bamboo wall
Total cost = Tk. 7,500
 5. size: 21'*12'
mud floor
roof: tin and wood frame
wall: bamboo
Total cost = Tk. 15,000
 6. same as 5 with cemented walls
Total cost = Tk. 25,000

The most frequently damaged dwellings are believed to be of the poorest types and the value of household assets is not likely to represent more than 50 % of the construction cost. The average value of fully damaged dwellings and household assets is thus estimated at about Tk 4,500. The average value of partial damage is assumed to be around Tk 2,000 per unit.

The total value of damage to dwellings and household assets per 100 households in the different districts is shown in Table X.2.11.

The number of animals lost per 100 households is reported in Table X.2.12. With a unit price estimated at Tk 3,500 per head for cattle and Tk 35 per fowl for poultry, the value of damage per 100 households can be assessed as shown in Table X.2.13. The aggregated value of livestock losses, damage to dwellings and household assets per 100 households is summarized in Table X.2.14. The results of regression analysis to relate damage cost to the flood intensity index are presented in Table X.2.15.

Reported damage appears to be the highest in Manikganj district followed by Munshiganj, the rural area of Dhaka and Tangail. Data are missing for Narayanganj where the situation is believed to be quite similar to that in Munshiganj and Dhaka.

The mathematical expectation of damage per average household is shown in Table X.2.16.

2.4 Flood Damage to Public Infrastructures

The extent of flood damage to public buildings, roads, embankments, and related structures at district level has been reported to the Ministry of Relief and Rehabilitation by Deputy Commissioners on the basis of information provided by the different government establishments that were concerned. The results given in these reports are shown in Table X.2.17.

The report, do not include 1988 flood damages to Railways which are reported as follows:

- Jamalpur district : 2 bridges washed out & breaches over 50m length and 10,650 m² of longitudinal section of railway embankments,
Dhaka district : 2 bridges washed out.

Other figures for the damage were prepared by government agencies and related ministries with a view to getting a budget for reconstruction. These figures are known to include provisions for delayed maintenance and improvement and therefore generally exceed the actual cost of flood damages. Another difficulty in the assessment of flood damage to public infrastructures is the fact that the 1988 flood immediately followed that of 1987 before reconstruction could take place. It may explain the apparent underestimation of 1988 damage when compared with 1987 damage. An adjustment is thus made by including 1987 damage within the estimate of 1988 damage. The result of this adjustment is shown in Table X.2.18 that gives the estimate of damaged public infrastructures per square kilometre.

Little information is available on the size and characteristics of damaged buildings, roads, embankments, bridges and culverts. Unit value of these infrastructures may vary to a very large extent. The possible range of construction costs is illustrated by the following standard estimates:

1. School buildings (10 class rooms, total floor area of 2,200 m²) from Tk 220,000 for a temporary structure (thatched house) to Tk 2,200,000 for a permanent structure,
2. Highways from Tk 200,000 to 125,000 per km.
3. Village roads from Tk 70,000 to 40,000 per km.
4. Embankments from Tk 100,000 to 60,000,
5. Bridges from Tk 540,000 to 725,000 per metre,
6. Culverts 5.5 m long, 4 m wide, 4 m deep at about Tk 1,100,000.

An assessment of flood damage under BWDB Projects during 1988 provided the following average costs:

1. Embankments Tk 450,000 per km,
2. Canals Tk 150,000 per km,
3. Structures Tk 325,000 per unit.

The proposed damage cost estimate is based on average unit-values of Tk 300,000 per damaged building, Tk 60,000 per km of damaged road, Tk 80,000 per km of damaged embankments, and Tk 400,000 per structure. Partial damage is estimated at one third of full damage. The result of total cost estimate per square kilometre is presented in Table X.2.19.

It may be roughly assumed that this cost is a linear function of the flood intensity index and that no damage occurs with a flood of 5 year return period. The function parameters are calculated by the least square method as shown in Table VIII.2.20 after increasing cost estimates by 10 % as a provision for possibly omitted damage.

The mathematical expectation of damage is presented in Table X.2.21.

2.5 Flood Damage to Industries

Industrial establishments are classified as cottage, small scale and large scale industries. 1988 flood damage has been reported by the Ministry of Industry for each of these categories with the following details:

- damage to main infrastructure,
- damage to machinery and equipment,
- losses of raw materials,
- losses of final products,
- business losses due to the idleness of the units during the flood.

These data are shown in Tables X.2.22 to X.2.24.

For Cottage Industries the authenticity of the reported figures is doubtful and another approach is deemed necessary. The percentage of households with Cottage industry as reported in Bangladesh Census of Agriculture and Livestock are as follows:

•	Jamalpur	4.18 %
•	Tangail	8.18 %
•	Mymensingh	4.31 %
•	Gazipur	4.48 %
•	Manikganj	6.26 %
•	Dhaka	9.42 %
•	Narayanganj	14.77 %
•	Munshiganj	7.06 %

Average losses per Cottage industry were estimated in the assessment reported in Table X.2.22 at Tk 10,000 per household and it may be reasonably assumed that the number of damaged establishments was directly proportional to the number of fully or partially damaged dwellings reported in Tables X.2.8 and X.2.10 with 50 % damage cost for partial damage. The basis of calculation is shown in Table X.2.25. Average flood damage cost for Cottage industry may be supposed to be proportional to the total number of households and may increase with the population. Its estimate is presented in Taka per average household in Table X.2.27.

Flood damage to Small and Large Scale industries is mainly concentrated in Dhaka city and is more or less independent of the population. Estimates are thus presented as a total by district. The geographical distribution of the establishments within the districts is little known. It may be roughly assumed that only 10 % of damage to industry in Dhaka district is outside the city itself. It is also tentatively assumed that flood damage is evenly distributed over the whole district area.

Extensive estimates of industrial losses due to 1987 flood are not available. Therefore, the value of losses versus flood intensity index i.e. the frequency distribution of flood damage to the sector has to be assessed on the basis of very rough assumptions. It is assumed that production losses due to disruption in the availability of labour and the supply of raw materials may start with flood of 5 year return period while asset losses are unlikely with floods of less than 20 year return period. Damage costs are thus estimated as linear functions of the flood intensity index as shown in Table X.2.26. The mathematical expectation of total damage losses per square kilometre is tentatively made in Table X.2.28.

2.6 Estimate of Flood Damage per Planning Unit

A matrix has been worked out showing the distribution of Thana areas within the different Planning Units. This matrix is used for an assessment of flood damage in Planning Units by means of coefficients applied to each district data as follows :

$$\begin{aligned}
 D_i &= \text{Sum}_j (a_{ij} * D_j) \\
 \text{with } D_i &= \text{damage estimate in P.U. } i \\
 a_{ij} &= \text{conversion coefficient from District data to Planning Unit estimate} \\
 D_j &= \text{damage data in District } j
 \end{aligned}$$

The conversion coefficients were at once calculated as the ratio between the area belonging to a District within a Planning Unit and the total area of the Planning Unit.

However, this operation obviously overestimates flood damage in P.U. 5, 8, and 9, where most of the land belongs to the so-called Madhupur Tract and is not flood prone. A tentative adjustment was made by using the following assumptions :

- no flood damage over about 90 % of P.U. 5 area,
- no flood damage over about 80 % of P.U. 8 and 9 areas,
- total flood damage uniformly distributed over the remaining area within each District.

The adjustment procedure thus consisted of recalculating the conversion coefficients as follows:

$$\begin{aligned}
 a_{ij} &= (1 - r_i) * k_j * A_{ij} / A_i \\
 \text{with } r_i &= 0.8 \text{ for P.U. } 5 \\
 &= 0.7 \text{ for P.U. } 8 \text{ and } 9 \\
 k_j &= \text{correction factor for the distribution of damage} \\
 &\quad \text{within the district } j \\
 k_j &= A_j / (A_j - \text{Sum}_i (r_i * A_{ij})) \\
 A_i &= \text{area of P.U. } i \\
 A_j &= \text{area of District } j \\
 A_{ij} &= \text{area of District } j \text{ within P.U. } i
 \end{aligned}$$

The matrix used to convert District damage estimates into Planning Unit estimates is given in Table X.2.29. The estimate of average flood damage to crops expressed in % per Planning Unit is shown in Table X.2.30 at the present and with different levels of flood protection. In the same manner flood damage to dwellings, cottage industries, public infrastructure and industries in the different Planning Units are estimated in Table X.2.31 in Taka per household for dwellings and cottage industries and in Taka per square kilometre for public infrastructure and industries.

Overall flood damage to the agricultural sector in the present situation is estimated in Table X.2.32 at market price and in Table X.2.33 at economic price. Maximum cost is in Planning Unit 4 where it amounts to 9.6 % of the net value of production in normal year at economic prices. Flood damage cost is also high in Planning Units 6, 2 and

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7 with respectively 6.8, 5.5 and 4.6 % of the net economic value of production. It is lower in Planning Units 1 and 11 where it represents about 1.5 % of this value. It is less than 1 % in the other Planning Units.

Total flood damage cost to the other sectors of the economy is estimated in Table X.2.34.

For dwellings, household assets including livestock, and cottage industries it is the highest in Planning Unit 7 where it amounts to about 47 Million Taka, followed by Planning Units 6 and 13 with respectively 24 and 26.8 Million Taka. This cost may be subject to increase in the future with the growth of population if flood proofing measures cannot be privately taken.

The estimate of damage to public infrastructures is about 30 % lower than that of private dwellings. The most affected Planning Units are P.U. 1, 2, 4, 6, 7 and 13. The possible increase of damage cost in the future is obviously linked with the future development of these infrastructures and their standards of design, construction and maintenance.

Damage to industrial establishments outside the city of Dhaka represents only 6 % of total damage. The most affected area is Planning Unit 7. Their evolution in the future depends on individual efforts for flood proofing and on the improvement of communications.

TABLE X.2.1
Statistical Analysis of Flood Affected Area

Year	Flood affected area (Sq.Km)	Probability	Gumbel variate
1982	3.14	0.03	-1.21
1986	4.57	0.07	-0.98
1878	10.79	0.10	-0.82
1983	11.07	0.14	-0.68
1985	11.38	0.17	-0.56
1977	12.50	0.21	-0.45
1975	16.53	0.24	-0.35
1972	20.72	0.28	-0.25
1967	25.64	0.31	-0.16
1984	28.21	0.34	-0.06
1976	28.31	0.38	0.03
1960	28.49	0.41	0.13
1965	28.49	0.45	0.22
1961	28.75	0.48	0.32
1973	29.79	0.52	0.42
1964	31.08	0.55	0.52
1980	32.95	0.59	0.63
1966	33.41	0.62	0.74
1956	35.48	0.66	0.86
1971	36.34	0.69	0.99
1954	36.78	0.72	1.13
1962	37.30	0.76	1.29
1968	37.30	0.79	1.46
1969	41.44	0.83	1.66
1970	42.48	0.86	1.91
1963	42.99	0.90	2.21
1955	50.51	0.93	2.64
1987	57.27	0.97	3.35

TABLE X.2.2
Flood Intensity Index

Return period	Probability	Flood index
4.76	0.790	39.12
5.00	0.800	39.75
5.26	0.810	40.41
5.56	0.820	41.10
5.88	0.830	41.82
6.25	0.840	42.59
6.67	0.850	43.40
7.14	0.860	44.25
7.69	0.870	45.17
8.33	0.880	46.16
9.09	0.890	47.22
10.00	0.900	48.38
11.11	0.910	49.65
12.50	0.920	51.07
14.29	0.930	52.67
16.67	0.940	54.50
20.00	0.950	56.66
25.00	0.960	59.28
33.33	0.970	62.65
50.00	0.980	67.37
100.00	0.990	75.40
111.11	0.991	76.62
125.00	0.992	77.98
142.86	0.993	79.52
166.67	0.994	81.30
200.00	0.995	83.40
250.00	0.996	85.97
333.33	0.997	89.29
500.00	0.998	93.96
1000.00	0.999	101.93

Source: BWDB

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TABLE X.2.3
Damaged Crops (from Deputy Commissioners' Reports)

	1987 Flood						1988 Flood					
	Fully damaged (ha)			Partly damaged (ha)			Fully damaged (ha)			Partly damaged (ha)		
	Urban area	Rural area	Total area	Urban area	Rural area	Total area	Urban area	Rural area	Total area	Urban area	Rural area	Total area
Jamalpur	0.0	24019.0	24019.0	202.0	24916.0	25118.0	1620.0	73616.0	75236.0	810.0	37730.0	38540.0
Tangail	0.0	73863.0	73863.0	0.0	0.0	0.0	4495.0	109528.0	114023.0	0.0	0.0	0.0
Mymensingh	0.0	19651.0	19651.0	0.0	16705.0	16705.0	290.0	62868.0	63158.0	135.0	23173.0	23308.0
Gazipur	12.0	12560.0	12572.0	36.0	21502.0	21538.0	1856.0	27373.0	29229.0	1801.0	6082.0	7883.0
Manikganj	0.0	22062.0	22062.0	0.0	0.0	0.0	2000.0	92042.0	94042.0	0.0	0.0	0.0
Dhaka	13820.0	20501.0	34321.0	0.0	0.0	0.0	8446.0	31429.0	39875.0	768.0	1702.0	2470.0
Narayanganj	280.0	5124.0	5404.0	0.0	4764.0	4764.0	0.0	0.0	0.0	0.0	1619.0	1619.0
Munshiganj	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12946.0	12946.0	0.0	4840.0	4840.0

Source: Ministry of Relief and Rehabilitation.

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TABLE X.2.4
Rice Production Estimates per "Old District"

Broadcast Aman												
1986/87			1987/88			1988/89			% loss estimate 1987		% loss estimate 1988	
Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product.	Area	Product.	
Jamalpur	24.3	28.0	20.4	15.7	4.8	2.8	-15.9	-44.0	-80.2	-90.1		
Mymensingh	3.5	3.9	3.0	3.8	2.6	3.0	-13.5	-2.9	-24.8	-23.4		
Dhaka	145.7	159.4	134.8	115.9	89.6	57.9	-7.5	-27.3	-38.5	-63.7		
Tangail	55.1	51.8	40.4	28.7	4.0	2.5	-26.6	-44.6	-92.7	-95.2		

Transplanted Aman										
	1986/87		1987/88		1988/89		% loss estimate 1987		% loss estimate 1988	
	Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product	Area	Product
Jamalpur	165.3	235.1	154.5	211.4	127.2	173.2	-6.5	-10.1	-23.0	-26.3
Mymensingh	255.4	378.6	230.8	374.6	204.5	287.3	-9.6	-1.0	-19.9	-24.1
Dhaka	135.6	176.1	97.2	142.2	59.2	90.7	-28.3	-19.3	-56.3	-48.5
Tangail	115.2	141.7	116.0	131.9	31.9	37.0	0.7	-6.9	-72.3	-73.9

Broadcast and transplanted Aman										
	1986/87		1987/88		1988/89		% loss estimate 1987		% loss estimate 1988	
	Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product.	Area	Product.
Jamalpur	189.6	263.1	175.0	227.1	132.0	176.0	-7.7	-13.7	-30.4	-33.1
Mymensingh	258.9	382.5	233.8	378.4	207.2	290.3	-9.7	-1.1	-20.0	-24.1
Dhaka	281.3	335.5	232.0	258.1	148.8	148.6	-17.5	-23.1	-47.1	-55.7
Tangail	170.3	193.5	156.5	160.5	35.9	39.5	-8.1	-17.0	-78.9	-79.6

Source: USAID (Office of Food and Agriculture)

Note: All areas in 1000 ha.

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TABLE X.2.5
Rice Production Estimates per District

Broadcast Aman									
1986/87		1987/88		1988/89		% loss estimate 1987		% loss estimate 1988	
Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product.	Area	Product.
Jamalur	4.8	8.2	2.0	0.4	0.4	-58.3	-56.1	-91.7	-95.1
Tangail	70.0	98.0	54.0	12.5	11.0	-22.9	-39.4	-82.1	-88.8
Mymensingh	0.0	0.0	0.0	1.2	1.8				
Gazipur	1.5	2.4	1.6	0.7	1.1	6.7	4.2	-53.3	-54.2
Manikganj	52.1	99.0	54.3	0.0	0.0	4.2	-34.1	-100.0	-100.0
Dhaka	22.5	36.0	23.8	0.0	0.0	5.8	-14.2	-100.0	-100.0
Narayanganj	6.2	11.7	5.5	0.5	0.9	-11.3	-43.6	-91.9	-92.3
Munshiganj	33.9	57.6	32.0	3.9	6.2	-5.6	-5.6	-88.5	-89.2

Transplanted Aman									
1986/87		1987/88		1988/89		% loss estimate 1987		% loss estimate 1988	
Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product.	Area	Product.
Jamalur	76.2	174.3	63.0	28.4	56.4	-17.3	-18.6	-62.7	-67.6
Tangail	69.0	119.0	54.0	17.6	26.4	-21.7	-25.1	-74.5	-77.8
Mymensingh	120.0	274.5	118.2	100.0	247.5	-1.5	8.2	-16.7	-9.8
Gazipur	43.7	86.8	41.4	35.0	74.8	-5.3	-7.0	-19.9	-13.8
Manikganj	1.1	2.4	1.0	3.2	3.7	-9.1	-8.3	190.9	54.2
Dhaka	8.7	17.0	6.2	0.3	0.5	-28.7	-22.4	-96.6	-97.1
Narayanganj	4.9	7.0	2.4	0.5	0.9	-51.0	-45.7	-89.8	-87.1
Munshiganj	0.3	0.6	0.3	0.0	0.0	0.0	-100.0	-100.0	-100.0

Broadcast and transplanted Aman													
1986/87		1987/88		1988/89		% loss estimate 1987		% loss estimate 1988		1987 flood damage		1988 flood damage	
Area	Product.(T)	Area	Product.(T)	Area	Product.(T)	Area	Product.	Area	Product.	Area	Product.(T)	Area	Product.(T)
Jamalur	81.0	182.5	65.0	28.8	56.8	-19.8	-20.3	-64.4	-68.9	-16.0	-37.1	-52.2	-125.7
Tangail	139.0	217.0	108.0	30.1	37.4	-22.3	-31.6	-78.3	-82.8	-31.0	-68.5	-108.9	-179.6
Mymensingh	120.0	274.5	118.2	101.2	249.3	-1.5	8.2	-15.7	-9.2	-1.8	22.5	-18.8	-25.2
Gazipur	45.2	89.2	43.0	35.7	75.9	-4.9	-6.7	-21.0	-14.9	-2.2	-6.0	-9.5	-13.3
Manikganj	53.2	101.4	55.3	3.2	3.7	3.9	-33.5	-94.0	-96.4	2.1	-34.0	-50.0	-97.7
Dhaka	31.2	53.0	30.0	0.3	0.5	-3.8	-16.8	-99.0	-99.1	-1.2	-8.9	-30.9	-52.5
Narayanganj	11.1	18.7	7.9	1.0	1.8	-28.8	-44.4	-91.0	-90.4	-3.2	-8.3	-10.1	-16.9
Munshiganj	34.2	58.2	32.3	3.9	6.2	-5.6	-6.5	-88.6	-89.3	-1.9	-3.8	-30.3	-52.0

Source: District Agriculture Offices

Note: all areas in 1000 ha

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TABLE X.2.6
Regression of % Crop Losses vs. Flood Intensity Index

District	Crop	Flood intensity index			
		5 year	20 year	100 year	
		Return period	Return period	Return period	
Jamalpur		39.75	56.66	75.40	
	B. Aman	0.00	56.10	95.10	$Y = -101.7 + 2.657*I$
	T. Aman	0.00	18.60	67.60	$Y = -80.6 + 1.909*I$
Tangail	B. Aman	0.00	39.40	88.80	$Y = -100.1 + 2.493*I$
	T. Aman	0.00	25.10	77.80	$Y = -91.3 + 2.194*I$
Mymensingh	B. Aman	0.00			
	T. Aman	0.00	0.00	9.80	$Y = -12.7 + 0.279*I$
Gazipur	B. Aman	0.00	0.00	54.20	$Y = -70 + 1.545*I$
	T. Aman	0.00	7.00	13.80	$Y = -15.2 + 0.387*I$
Manikganj	B. Aman	0.00	34.10	100.00	$Y = -116.7 + 2.818*I$
	T. Aman	0.00			
Dhaka	B. Aman	0.00	14.20	100.00	$Y = -124.4 + 2.837*I$
	T. Aman	0.00	22.40	97.10	$Y = -117.5 + 2.746*I$
Narayanganj	B. Aman	0.00	43.60	92.30	$Y = -103 + 2.589*I$
	T. Aman	0.00	45.70	87.10	$Y = -95.4 + 2.439*I$
Munshiganj	B. Aman	0.00	5.60	89.20	$Y = -113.7 + 2.537*I$
	T. Aman	0.00	100.00	100.00	$Y = -91.1 + 2.755*I$

Source : CS 1992

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TABLE X.2.7
Average Production Losses in %

Return period	Broadcast Aman					Return Period	Transplanted Aman					
	Jamalpur	Tangail	Gazipur	Broadcast Aman			Jamalpur	Tangail	Mymensingh	Gazipur	Transplanted Aman	
				Manikganj	Dhaka						Narayanganj	Munshiganj
5.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.18
5.26	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.37
5.56	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.07	0.58
5.88	0.23	0.05	0.00	0.01	0.00	0.00	0.07	0.00	0.02	0.00	0.13	0.81
6.25	0.33	0.10	0.00	0.03	0.00	0.00	0.13	0.00	0.03	0.00	0.20	1.06
6.67	0.46	0.17	0.00	0.07	0.00	0.00	0.21	0.00	0.04	0.00	0.30	1.34
7.14	0.61	0.26	0.00	0.14	0.01	0.00	0.31	0.00	0.06	0.01	0.41	1.63
7.69	0.78	0.38	0.00	0.23	0.03	0.01	0.44	0.00	0.08	0.04	0.55	1.95
8.33	0.97	0.52	0.01	0.35	0.08	0.04	0.59	0.00	0.11	0.09	0.71	2.30
9.09	1.20	0.68	0.03	0.50	0.16	0.09	0.76	0.00	0.14	0.28	0.89	2.68
10.00	1.45	0.87	0.07	0.68	0.27	0.17	0.97	0.01	0.17	0.41	1.11	3.08
11.11	1.74	1.09	0.12	0.90	0.42	0.29	1.20	0.29	0.21	0.58	1.35	3.52
12.50	2.06	1.34	0.20	1.15	0.61	0.43	1.47	0.43	0.30	1.04	1.62	4.00
14.29	2.42	1.64	0.30	1.44	0.83	0.62	1.78	0.62	0.35	1.34	1.93	4.52
16.67	2.82	1.97	0.43	1.79	1.11	0.85	2.14	0.85	0.42	1.69	2.29	5.08
20.00	3.28	2.36	0.59	2.19	1.44	1.13	2.54	1.13	0.49	2.11	3.15	5.70
25.00	3.81	2.80	0.79	2.65	1.84	1.47	3.01	1.47	0.57	2.60	3.68	6.39
33.33	4.41	3.32	1.03	3.20	2.33	1.89	3.56	1.89	0.67	3.22	4.31	7.16
50.00	5.12	3.94	1.33	3.87	2.93	2.41	4.21	2.41	0.80	4.00	5.10	8.04
100.00	6.00	4.72	1.73	4.71	3.71	3.09	5.02	3.09	0.81	4.09	5.19	9.01
111.11	6.10	4.81	1.78	4.81	3.80	3.17	5.11	3.17	0.81	4.19	5.28	9.11
125.00	6.20	4.90	1.83	4.91	3.90	3.25	5.21	3.25	0.83	4.28	5.38	9.21
142.86	6.30	5.00	1.88	5.01	3.99	3.34	5.31	3.34	0.84	4.38	5.48	9.31
166.67	6.40	5.09	1.94	5.11	4.09	3.43	5.41	3.43	0.86	4.48	5.58	9.41
200.00	6.50	5.19	1.99	5.21	4.19	3.52	5.51	3.52	0.87	4.58	5.68	9.51
250.00	6.60	5.29	2.06	5.31	4.29	3.62	5.61	3.62	0.89	4.68	5.78	9.61
333.33	6.70	5.39	2.12	5.41	4.39	3.72	5.71	3.72	0.91	4.78	5.88	9.71
500.00	6.80	5.49	2.19	5.51	4.49	3.82	5.81	3.82	0.93	4.88	5.98	9.81
1000.00	6.90	5.59	2.27	5.61	4.59	3.92	5.91	3.92	0.95	4.98	5.98	9.91

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* Not including the urban area
SOURCE: MRR

TABLE X 29

SOURCE: MRR

TABLE X 2 10

Source : CS 1992 from MRR

TABLE X.2.11
Value of Damage to Dwellings and Household Assets (not including livestock) per 100 Households

	1987 flood						1988 flood					
	Urban			Rural			Urban			Rural		
	Totally	Partly	Total	Totally	Partly	Total	Totally	Partly	Total	Totally	Partly	Total
Jamalpur	0	26	8159	10682	10707	10707	2017	12164	29136	31003	31152	43167
Tangail	978	779	8738	5922	6700	6700	1613	10285	37570	78312	39183	88597
Mymensingh	0	0	2688	3430	3430	2688	1827	361	9718	6894	11545	7255
Gazipur	0	1245	4436	4233	5478	4436	9691	3776	37720	20008	47410	23785
Manikganj	0	0	52533	132299	132299	52533	5837	1729	201379	97590	207215	99319
Dhaka	0	7428	48348	30050	30050	48348	0	0	89083	76163	89083	76163
Narayanganj	696	0	1701	12512	19940	12512	0	0	0	0	0	0
Munshiganj	0	0	853	1517	1517	853	0	2655	114694	91331	114694	93986

Dwellings estimated at Tk 3000 per unit and household assets at 50 % of the dwelling value

Partial damage estimated at Tk 2000 per unit

TABLE X.2.12
Livestock Losses per 100 Total Households

	1987 flood						1988 flood					
	Urban			Rural			Urban			Rural		
	Cattle	Poultry	Total	Cattle	Poultry	Total	Cattle	Poultry	Total	Cattle	Poultry	Total
Jamalpur	0.00	0.00	0.13	4.79	4.79	0.13	0.00	2.91	0.08	8.81	0.08	11.72
Tangail	0.00	0.00	0.34	0.65	0.65	0.34	0.01	0.00	1.35	0.00	1.36	0.00
Mymensingh	0.00	0.00	0.04	0.30	0.30	0.04	0.00	0.04	0.26	0.89	0.26	0.93
Gazipur	0.00	0.00	0.14	0.50	0.50	0.14	0.03	1.65	0.05	3.90	0.05	5.56
Manikganj	0.00	0.00	0.02	0.26	0.26	0.02	0.01	0.22	1.18	23.41	1.19	23.62
Dhaka	0.00	0.16	1.19	0.00	0.00	1.19	0.00	0.00	1.06	0.00	1.06	0.00
Narayanganj	0.00	0.00	0.16	3.27	3.43	0.16	0.00	0.00	0.18	0.00	0.18	0.00
Munshiganj	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.93	6.61	0.93	6.61

TABLE X.2.13
Total Value of Livestock Losses per 100 Total Households

	1987 flood						1988 flood					
	Urban			Rural			Urban			Rural		
	Cattle	Poultry	Total	Cattle	Poultry	Total	Cattle	Poultry	Total	Cattle	Poultry	Total
Jamalpur	0	0	445	168	168	445	0	102	282	308	282	410
Tangail	0	0	1201	23	23	1201	32	0	4715	0	4747	0
Mymensingh	0	0	156	10	10	156	0	2	896	31	896	33
Gazipur	0	0	480	17	17	480	89	58	174	137	263	194
Manikganj	0	0	68	9	9	68	38	8	4121	819	4158	827
Dhaka	16	6	4170	0	0	4170	0	0	3716	0	3716	0
Narayanganj	0	0	554	114	120	570	0	0	642	0	642	0
Munshiganj	0	0	23	0	0	23	0	0	3247	231	3247	231

Cattle value estimated at Tk 3500 per head and poultry at Tk 35 per fowl

Source : CS 1992

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TABLE X.2.14
Total Value of Damaged Dwellings and Household Assets
Including Livestock per 100 Households

	1987 flood			1988 flood		
	Urban area	Rural area	Total area	Urban area	Rural area	Total area
Jamalpur	26	19454	19480	14283	60730	75012
Tangail	2734	15883	18617	11930	120597	132527
Mymensingh	0	6284	6284	2189	17539	19728
Gazipur	1245	9167	10412	13614	58038	71652
Manikganj	0	184910	184910	7612	303908	311520
Dhaka		82568	82568		168963	168963
Narayanganj	8837	14881	23718	0	642	642
Munshiganj	0	2394	2394	2655	209504	212159

TABLE X.2.15
Regression of Average Value of Damage to Dwellings
and Household Assets vs. Flood Intensity Index.

	Flood intensity index			
	5 year return period	20 year return period	100 year return period	
	39.75	56.66	75.40	
Jamalpur	0	194.8	750.12	$Y = 898.9 + 21.2 \cdot I$
Tangail	0	186.17	1325.27	$Y = 1649.5 + 37.6 \cdot I$
Mymensingh	0	62.84	197.28	$Y = 231.9 + 5.563 \cdot I$
Gazipur	0	104.11	716.52	$Y = 890.5 + 20.32 \cdot I$
Manikganj	0	1849.1	3115.2	$Y = 3329.2 + 87 \cdot I$
Dhaka	0	825.68	1689.63	$Y = 1874.5 + 47.372 \cdot I$
Narayanganj	0	237.18	6.42	
Munshiganj	0	23.94	2121.59	$Y = 2747 + 60.454 \cdot I$

Source : CS 1992

TABLE X.2.16
Average Damage to Dwellings and Household Assets per Household

Return period	Jamalpur	Tangail	Mymensingh	Gazipur	Manikganj	Dhaka	Munshiganj
5.00	0.00	0.00	0.00	0.00	1.02	0.04	0.00
5.26	0.00	0.00	0.00	0.00	2.59	0.28	0.00
5.56	0.00	0.00	0.00	0.00	4.76	0.84	0.00
5.88	0.00	0.00	0.00	0.00	7.53	1.74	0.00
6.25	0.02	0.00	0.03	0.00	10.96	2.99	0.00
6.67	0.14	0.00	0.11	0.00	15.07	4.61	0.00
7.14	0.45	0.07	0.22	0.04	19.91	6.62	0.00
7.69	0.94	0.39	0.39	0.23	25.51	9.06	0.00
8.33	1.63	1.06	0.61	0.60	31.95	11.95	0.22
9.09	2.54	2.12	0.89	1.19	39.27	15.32	0.97
10.00	3.68	3.60	1.23	2.00	47.57	19.22	2.40
11.11	5.08	5.54	1.64	3.06	56.92	23.69	4.56
12.50	6.77	7.98	2.12	4.39	67.44	28.80	7.54
14.29	8.78	10.98	2.69	6.02	79.28	34.63	11.42
16.67	11.15	14.64	3.35	8.01	92.60	41.27	16.35
20.00	13.94	19.04	4.12	10.40	107.66	48.85	22.48
25.00	17.24	24.34	5.03	13.28	124.81	57.57	30.05
33.33	21.18	30.77	6.10	16.77	144.56	67.71	39.44
50.00	25.97	38.72	7.40	21.07	167.82	79.76	51.27
100.00	32.12	49.07	9.05	26.68	196.64	94.83	66.96
111.11	32.83	50.27	9.24	27.33	199.92	96.56	68.80
125.00	33.57	51.53	9.44	28.01	203.32	98.34	70.73
142.86	34.34	52.84	9.65	28.72	206.84	100.20	72.74
166.67	35.15	54.22	9.86	29.47	210.51	102.14	74.86
200.00	35.99	55.66	10.09	30.25	214.34	104.16	77.09
250.00	36.89	57.20	10.33	31.08	218.38	106.30	79.46
333.33	37.85	58.84	10.58	31.97	222.67	108.58	82.01
500.00	38.89	60.64	10.86	32.94	227.14	111.04	84.80
1000.00	40.07	62.67	11.17	34.04	231.64	113.81	87.98

Source: CS 1992

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TABLE X.2.17
Damage to Public Infrastructures (total)

	1987 flood						1988 flood					
	Buildings		Roads (km)		Embankm.	Bridges &	Buildings		Roads (km)		Embk.	Bridges &
	Fully	Partly	Fully	Partly	(km)	Culverts	Fully	Partly	Fully	Partly	(km)	Culverts
Jamalpur	24	149	113	1176	232		10	225	321	1324	141	91
Tangail			1722		58	13	766		198	3224		328
Mymensingh		103		1049		42	5	538	268	2362		
Gazipur	25	141		700	2	48	70	256	719	838	96	
Manikganj			48				263	239	1825			
Dhaka *			1385		29	191			2468		59	
Narayanganj	14	249		1044	21							
Munshiganj												

* Not including Dhaka municipality

TABLE X.2.18
Damage to Public Infrastructures (per sq. km)

	1987 flood						1988 flood					
	Buildings		Roads (km)		Embankm.	Bridges &	Buildings		Roads (km)		Embk.	Bridges &
	Fully	Partly	Fully	Partly	(km)	Culverts	Fully	Partly	Fully	Partly	(km)	Culverts
Jamalpur	0.021	0.129	0.098	1.022	0.202	0.000	0.030	0.325	0.377	2.172	0.324	0.079
Tangail	0.000	0.000	0.513	0.000	0.017	0.004	0.228	0.000	0.572	0.960	0.017	0.102
Mymensingh	0.000	0.026	0.000	0.261	0.000	0.010	0.001	0.160	0.067	0.850	0.000	0.010
Gazipur	0.014	0.081	0.000	0.405	0.001	0.028	0.055	0.229	0.416	0.889	0.057	0.028
Manikganj	0.000	0.000	0.033	0.000	0.000	0.000	0.180	0.163	1.280	0.000	0.000	0.000
Dhaka *	0.000	0.000	1.203	0.000	0.025	0.166	0.000	0.000	3.347	0.000	0.076	0.166
Narayanganj	0.021	0.371	0.000	1.557	0.031	0.000	0.021	0.371	0.000	1.557	0.031	0.000
Munshiganj	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* Not including Dhaka municipality

TABLE X.2.19
Total Value of Damaged Public Infrastructures per Square km

	1987 flood					1988 flood				
	Build.	Roads	Embankm.	Struct.	Total	Build.	Roads	mbankm	Struct.	Total
Jamalpur	19200	26324	16124	0	61648	41354	66061	25924	31623	164962
Tangail	0	30756	1381	1548	33685	68407	53487	1381	40604	163879
Mymensingh	2568	5230	0	4188	11985	16352	21014	0	4188	41554
Gazipur	12485	8092	92	11097	31767	39419	42714	4531	11097	97762
Manikganj	0	1968	0	0	1968	70232	76777	0	0	147009
Dhaka *	0	72195	2016	66374	140585	0	200843	6116	66374	273333
Narayanganj	43394	31136	2505	0	77035	43394	31136	2505	0	77035
Munshiganj	0	0	0	0	0	0	0	0	0	0

* Not including Dhaka municipality

Average value of buildings estimated at Tk 300,000 per unit ; roads at Tk 60,000 per km ; embankments at Tk 80,000 per km ; structures at Tk 400,000 per unit

Source : CS 1992

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TABLE X.2.20
Regression of Average Value of Damage to Public
Infrastructures vs. Flood Intensity Index (Tk/km²)

	Flood Intensity			
	5 year return period	20 year return period	100 year return period	
	39.75	56.66	75.4	
Jamalpur	0	67813	181459	$Y = -209500 + 5108.7*I$
Tangail	0	37054	180267	$Y = -219800 + 5103.9*I$
Mymensingh	0	13184	45709	$Y = -54200 + 1290*I$
Gazipur	0	34943	107538	$Y = -126100 + 3030.9*I$
Manikganj	0	2164	161710	$Y = -330600 + 8423.3*I$
Dhaka	0	154643	300666	$Y = -330600 + 8423.3*I$
Narayanganj	0	84739	84739	$Y = -77200 + 2333.2*I$
Munshiganj	0	0	0	

Cost estimate increased by 10 %

Source : CS 1992

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TABLE X.2.21
Average Damage to Public Infrastructures per sq. km.

Return period	Jamalpur	Tangail	Mymensingh	Gazipur	Manikganj	Dhaka	Narayanganj
5.00	0	0	0	0	0	21	148
5.26	0	0	0	0	0	91	311
5.56	2	0	0	0	0	218	490
5.88	25	0	0	3	0	404	685
6.25	86	0	4	21	0	653	898
6.67	188	8	16	63	0	968	1129
7.14	332	47	40	131	0	1354	1380
7.69	521	131	74	225	0	1814	1651
8.33	759	264	121	348	17	2355	1944
9.09	1049	449	182	502	76	2981	2262
10.00	1396	690	256	690	186	3701	2605
11.11	1805	994	347	914	353	4524	2977
12.50	2283	1367	454	1180	581	5460	3380
14.29	2837	1816	581	1491	879	6523	3818
16.67	3480	2353	731	1854	1255	7731	4296
20.00	4224	2991	906	2278	1724	9106	4821
25.00	5091	3752	1111	2774	2303	10683	5401
33.33	6110	4666	1356	3360	3020	12513	6052
50.00	7337	5786	1653	4070	3923	14683	6797
100.00	8889	7231	2031	4972	5120	17390	7690
111.11	9067	7400	2075	5077	5261	17700	7790
125.00	9253	7574	2121	5185	5408	18020	7894
142.86	9446	7756	2168	5298	5561	18353	8000
166.67	9647	7947	2218	5415	5723	18700	8111
200.00	9858	8148	2270	5539	5893	19063	8225
250.00	10081	8360	2325	5669	6074	19446	8346
333.33	10319	8588	2384	5809	6268	19853	8473
500.00	10578	8835	2448	5960	6481	20294	8610
1000.00	10869	9115	2520	6131	6723	20789	8761

Source : CD 1992

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TABLE X.2.22
Available Data on Cottage Industry and 1988 Flood Damage Losses

	Number of damaged establishm.	Number of detailed damage reports	Reported detail (million Taka)			Total reported losses (mil, Taka)
			Total investm.	Asset losses	Product. losses	
Jamalpur	4681	78	1.17	0.35	0.43	46.81
Tangail	5466	164	2.46	0.74	0.90	54.66
Mymensingh *	18213	28	0.42	0.13	0.15	182.13
Gazipur **	8	8	0.12	0.00	0.04	0.04
Manikganj **	2	2	0.03	0.00	0.01	0.01
Dhaka ***	39350	93	1.40	0.42	0.51	393.50
Narayanganj **	36	36	0.54	0.16	0.20	0.36
Munshiganj **	17	17	0.26	0.08	0.09	0.17

* Includes Upazilas outside the Project area

** Total number of damaged establishments is possibly missing

*** Including the urban area

Source : Ministry of Industry

TABLE X.2.23
Available Data on Small Scale Industry and 1988 Flood Damage Losses

	Number of damaged establishm.	Number of detailed damage reports	Reported detail (million Taka)			Total reported losses (mil, Taka)
			Total investm.	Asset losses	Product. losses	
Jamalpur	603	330	26.80	7.06	7.27	26.18
Tangail	602	362	55.87	14.78	13.64	47.26
Mymensingh *	998	215	58.44	9.99	15.18	116.84
Gazipur **	60	60	54.80	15.19	13.96	29.15
Manikganj **	22	22	8.80	3.57	2.23	5.80
Dhaka ***	6783	313	206.77	47.85	57.04	2273.06
Narayanganj **	74	74	33.20	4.50	8.41	12.91
Munshiganj **	28	28	11.00	1.46	2.79	4.25

* Includes Upazilas outside the Project area

** Total number of damaged establishments is possibly missing

*** Including the urban area

Source : Ministry of Industry

TABLE X.2.24
Available Data on Large Scale Industry and 1988 Flood Damage Losses

	Number of damaged units	(million Taka)		
		Total losses	Asset losses	Product. losses
Jamalpur	0	0	0.00	0.00
Tangail	13	40.06	24.60	15.46
Mymensingh *	9	13.91	8.54	5.37
Gazipur	0	0	0.00	0.00
Manikganj	0	0	0.00	0.00
Dhaka **	850	2594.29	1813.93	1140.35
Narayanganj	0	0	0.00	0.00
Munshiganj	0	0	0.00	0.00

* Includes Upazilas outside the Project area

** Including the urban area

Source : Ministry of Industry



TABLE X.2.25

Damage to Cottage Industry per 100 Households vs. Flood Intensity Index

	Flood intensity index			
	5 year return period	20 year return period	100 year return period	
	39.75	56.66	75.40	
Jamalpur	0	1877	7405	$Y = -8891 + 209.3*I$
Tangail	0	3136	25241	$Y = -31575 + 716.5*I$
Mymensingh	0	627	1887	$Y = -2208 + 53.2*I$
Gazipur	0	1055	7384	$Y = -9183 + 209.5*I$
Manikganj	0	28013	44369	$Y = -46767 + 1237.9*I$
Dhaka	0	17198	36584	$Y = -40852 + 1026.3*I$
Narayanganj	0	8150	0	
Munshiganj	0	402	34583	$Y = -44773 + 985.4*I$

TABLE X.2.26

Total damage to Small and Large Scale Industry vs. Flood Intensity Index (Tk/km2)

		Flood intensity index			
		5 year return period	20 year return period	100 year return period	
		39.75	56.66	75.40	
Jamalpur	Assets		0	11208	$Y = -33886 + 598*I$
	Production	0		11541	$Y = -12868 + 323.7*I$
Tangail	Assets		0	14640	$Y = -44262 + 781.1*I$
	Production	0		11354	$Y = -12660 + 318.5*I$
Mymensingh	Assets		0	13688	$Y = -41386 + 730.4*I$
	Production	0		18903	$Y = -21077 + 530.2*I$
Gazipur	Assets		0	8780	$Y = -26545 + 468.5*I$
	Production	0		8069	$Y = -8997 + 226.3*I$
Manikganj	Assets		0	2439	$Y = -7374 + 130.1*I$
	Production	0		1524	$Y = -1699 + 42.7*I$
Dhaka *	Assets		0	247677	$Y = -748845 + 13216.5*I$
	Production	0		206460	$Y = -230203 + 5791.3*I$
Narayanganj	Assets		0	6710	$Y = -20289 + 358.1*I$
	Production	0		12541	$Y = -13983 + 351.8*I$
Munshiganj	Assets		0	1811	$Y = -5477 + 96.7*I$
	Production	0		3462	$Y = -3859.7 + 97.1*I$

* only 10 % of the industrial activity is assumed to be outside the city

Source : CS 1992

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TABLE X.2.27
Average Flood Damage Losses in Cottage Industry (Tk/HH)

Return period	Jamalpur	Tangail	Mymensingh	Gazipur	Manikganj	Dhaka	Munshiganj
5.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00
5.26	0.00	0.00	0.00	0.00	0.49	0.03	0.00
5.56	0.00	0.00	0.00	0.00	0.86	0.13	0.00
5.88	0.00	0.00	0.00	0.00	1.31	0.30	0.00
6.25	0.00	0.00	0.00	0.00	1.86	0.54	0.00
6.67	0.01	0.00	0.01	0.00	2.51	0.87	0.00
7.14	0.04	0.01	0.02	0.00	3.25	1.28	0.00
7.69	0.09	0.05	0.04	0.02	4.11	1.79	0.00
8.33	0.15	0.17	0.06	0.06	5.09	2.39	0.04
9.09	0.24	0.35	0.09	0.12	6.19	3.10	0.16
10.00	0.35	0.62	0.13	0.20	7.43	3.92	0.39
11.11	0.49	0.98	0.17	0.31	8.82	4.86	0.74
12.50	0.65	1.43	0.21	0.45	10.38	5.94	1.23
14.29	0.85	1.99	0.27	0.62	12.12	7.18	1.86
16.67	1.08	2.67	0.33	0.82	14.08	8.60	2.67
20.00	1.36	3.49	0.41	1.07	16.28	10.22	3.67
25.00	1.68	4.49	0.49	1.36	18.78	12.08	4.90
33.33	2.07	5.70	0.60	1.72	21.65	14.25	6.43
50.00	2.54	7.20	0.72	2.17	25.03	16.84	8.36
100.00	3.15	9.16	0.88	2.74	29.19	20.08	10.92
111.11	3.22	9.39	0.90	2.81	29.66	20.45	11.22
125.00	3.29	9.62	0.92	2.88	30.15	20.84	11.53
142.86	3.36	9.87	0.94	2.95	30.66	21.24	11.86
166.67	3.44	10.13	0.96	3.03	31.18	21.65	12.21
200.00	3.53	10.41	0.98	3.11	31.73	22.09	12.57
250.00	3.62	10.70	1.00	3.20	32.32	22.55	12.96
333.33	3.71	11.01	1.03	3.29	32.93	23.04	13.37
500.00	3.81	11.35	1.06	3.39	33.60	23.57	13.83
1000.00	3.93	11.74	1.09	3.50	34.34	24.17	14.34

Source : CS 1992

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TABLE X.2.28
Flood Damage Losses to Small and Large Scale Industry (Tk/km²)

Return period	Jamalpur	Tangail	Mymensingh	Gazipur	Manikganj	Dhaka	Narayanganj	Munshiganj
5.00	0	0	0	0	0	0	0	0
5.26	1	1	2	1	0	19	1	0
5.56	4	4	7	3	1	77	5	1
5.88	10	10	16	7	1	176	11	3
6.25	18	18	29	12	2	318	19	5
6.67	28	28	46	20	4	506	31	8
7.14	41	41	68	29	5	742	45	12
7.69	58	57	94	40	8	1029	63	17
8.33	77	75	126	54	10	1372	83	23
9.09	99	98	162	69	13	1774	108	30
10.00	125	123	205	88	17	2240	136	38
11.11	155	153	254	109	20	2777	169	47
12.50	190	187	310	133	25	3391	206	57
14.29	229	225	375	160	30	4093	249	69
16.67	274	269	448	191	36	4894	297	82
20.00	325	320	532	227	43	5811	353	97
25.00	392	388	638	274	52	7039	422	116
33.33	486	489	782	343	67	8837	512	141
50.00	618	635	977	439	89	11404	631	174
100.00	808	851	1252	580	121	15183	795	219
111.11	832	877	1286	597	125	15649	814	224
125.00	856	905	1321	615	130	16139	835	230
142.86	882	935	1358	634	134	16657	857	236
166.67	909	967	1397	655	139	17206	879	242
200.00	938	1000	1438	676	144	17792	904	249
250.00	970	1036	1482	700	150	18423	929	256
333.33	1004	1076	1530	725	156	19109	957	263
500.00	1042	1120	1583	753	163	19872	988	272
1000.00	1085	1170	1644	785	171	20755	1023	281

Source : CS 1992

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TABLE X.2.29
Allocation of District Data to P.U. (coefficients)

P.Unit	Jamalpur	Tangail	Mymensingh	Gazipur	anikgan	Dhaka	Narayanganj	Munshiganj	Munshiganj
1	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.40	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.07	0.00	1.16	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.07	0.03	0.14	0.00	0.00	0.00	0.00	0.00
6	0.00	1.22	0.00	0.09	0.15	0.00	0.00	0.00	0.00
7	0.00	0.06	0.00	0.11	0.83	0.48	0.00	0.00	0.00
8	0.00	0.00	0.00	0.58	0.00	0.12	0.00	0.00	0.00
9	0.00	0.00	0.00	0.92	0.00	0.00	0.05	0.00	0.00
10	0.00	0.00	0.00	0.00	0.20	0.04	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.98	0.13	0.13	0.13
12									
13	0.00	0.00	0.00	0.00	0.02	0.31	0.03	0.72	0.72

TABLE X.2.30
Percentage of Average Flood Damage to Crops

P.Unit	Present damage		100 year protection		50 year protection		20 year protection	
	B. Aman	T. Aman	B. Aman	T. Aman	B. Aman	T. Aman	B. Aman	T. Aman
1	7.34	3.89	0.96	0.76	1.89	1.35	3.84	2.51
2	7.58	5.25	1.12	0.98	2.14	1.76	4.24	3.32
3	0.51	0.74	0.07	0.17	0.13	0.29	0.27	0.53
4	7.72	6.07	1.21	1.11	2.29	2.01	4.47	3.80
5	0.71	0.44	0.13	0.08	0.24	0.14	0.46	0.27
6	7.87	5.44	1.25	0.99	2.37	1.80	4.62	3.40
7	7.42	2.70	1.28	0.49	2.44	0.92	4.72	1.75
8	1.84	1.11	0.41	0.19	0.74	0.35	1.34	0.68
9	2.39	1.18	0.54	0.19	0.95	0.34	1.72	0.66
10	1.36	0.24	0.22	0.04	0.43	0.08	0.85	0.15
11	5.78	6.82	1.09	1.10	2.05	2.09	3.88	4.09
12								
13	4.55	8.83	0.92	0.95	1.70	1.92	3.17	4.12

TABLE X.2.31
Average Flood Damage to Households, Public Infrastructure and Industry
(in Tk/Hh for Households and Cottage Industry - in Tk/km2 for Infrastructure and Industry)

P.Unit	Present damage			100 year protection			50 year protection			20 year protection		
	Househo.	Infrastr.	Industry	Househo.	Infrastr.	Industry	Households	Infrastr.	Industry	H/H	Infrastr.	Industry
1	47	11556	1154	9	2105	294	16	3756	497	31	7065	808
2	82	12197	1442	17	2414	386	31	4280	648	56	7931	1037
3	18	3740	1995	3	716	477	6	1272	811	11	2372	1351
4	103	12584	1616	22	2601	442	39	4597	739	72	8455	1175
5	11	1553	237	2	304	62	4	539	104	7	1002	168
6	135	12673	1520	27	2643	415	47	4666	695	87	8565	1104
7	295	16752	10271	46	3195	2760	84	5669	4631	161	10526	7399
8	38	5934	2844	7	1060	761	13	1893	1277	24	3570	2044
9	41	6098	776	9	1123	202	16	2001	340	28	3754	549
10	61	2308	947	9	480	255	17	846	428	33	1545	683
11	164	22622	20499	29	3605	5496	52	6487	9224	98	12459	14749
12												
13	126	13208	6735	26	1900	1798	47	3442	3019	85	6714	4834

(1) Damage to households and to infrastructure in Taka per household (not including Dhaka city)

(2) Damage to industry in Million Taka (not including Dhaka city)

Source : CS 1992

TABLE X.2.32
Present Average Net Value of Agricultural Losses at Market Prices

P. Unit	Gross product			Production costs			Net losses % of Total
	Normal year	Average year	Decrease	Normal year	Average year	Decrease	
1	4075.6	4041.8	33.8	2437.1	2432	5.1	28.7
2	2646.4	2600.1	46.3	2161.8	2154.7	7.2	39.1
3	5059.2	5043.7	15.5	3699.7	3697.5	2.2	13.3
4	1979.1	1940.4	38.7	1845.4	1838.2	7.2	31.5
5	4253.7	4246.3	7.4	3177	3176	1	6.3
6	3287.7	3243.3	44.3	3080.3	3071.3	9	35.3
7	2153.5	2128.4	25.1	1899.5	1894.4	5.1	19.9
8	1103.7	1101.7	2	782.9	782.6	0.3	1.7
9	2379.1	2370.9	8.2	1679.7	1678.5	1.2	7.1
10	1429.6	1425.9	3.7	1264.6	1263.8	0.8	2.9
11	595.1	590.6	4.4	389.7	389	0.7	3.7
12							
13	5282.8	5267.8	14.9	2997.2	2994	3.1	11.8
Total NC	34245.5	34000.9	244.3	25414.9	25372	42.9	201.3

* This table in which family labour has been costed at the same price as hired labour as been prepared only for the conversion to economic prices

TABLE X.2.33
Present Average Agricultural Losses at Economic Prices

P. Unit	Gross product			Production costs			Losses	
	Normal year	Average year	Decrease	Normal year	Average year	Decrease	Total	of total net value
1	4075.6	4041.8	33.8	2188.6	2183.7	4.9	28.9	1.5
2	2646.4	2600.1	46.3	1928.4	1921.6	6.8	39.5	5.5
3	5059.2	5043.7	15.5	3337.6	3335.4	2.2	13.4	0.8
4	1979.1	1940.4	38.7	1644.0	1637.4	6.6	32.1	9.6
5	4253.7	4246.3	7.4	2856.2	2855.3	1	6.4	0.6
6	3287.7	3243.3	44.3	2755.7	2747.6	8.1	36.3	6.8
7	2153.5	2128.4	25.1	1712.9	1708.3	4.6	20.4	4.6
8	1103.7	1101.7	2.0	698.2	697.9	0.3	1.8	0.4
9	2379.1	2370.9	8.2	1501.4	1500.3	1.1	7.1	0.8
10	1429.6	1425.9	3.7	1137.1	1136.4	0.7	3	1
11	595.1	590.6	4.4	355.5	354.8	0.6	3.8	1.6
12								
13	5282.8	5267.8	14.9	2800.8	2798	2.8	12.1	0.5
Total NC	34245.5	34000.9	244.3	22916.4	22876.7	39.7	204.8	1.8

TABLE X.2.34
Estimate of Present Average Flood Damage

P. Unit	Number of Household	Area (Sq. km.)	Damage to Crops	Damage to Households	Damage to Infrastr.	Damage to Industry	Total Damage
1	145625	894	33.8	6.8	10.3	1	51.9
2	113471	740	46.3	9.3	9	1.1	65.7
3	293114	1724	15.5	5.1	6.4	3.4	30.4
4	111957	762	38.7	11.5	9.6	1.2	61
5	238010	2125	7.4	2.5	3.3	0.5	13.7
6	177546	1144	44.3	24	14.5	1.7	84.5
7	159372	901	25.1	47	15.1	9.3	96.5
8	59182	461	2	2.2	2.7	1.3	8.2
9	119995	789	8.2	4.9	4.8	0.6	18.5
10	99375	672	3.7	6	1.6	0.6	11.9
11	80851	250	4.4	13.2	5.7	5.1	28.4
12							
13	212846	1015	14.9	26.8	13.4	6.8	61.9
Total NC	1811344	11477	244.3	159.3	96.4	32.6	532.6

Source : CS 1992

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CHAPTER 3 AGRO-ECONOMICS

3.1 Source of Agro-Economic Data

Agricultural statistics of cropped areas and crop productions have been collected for each Thana (see SR I). These estimates have been related to the different Planning Units in proportion of the area of each Thana included in each Planning Unit. Crop budgets have been compiled from various publications of BIDS and the Agricultural Economics Division of Bangladesh Agricultural Research Institute with provisional unit prices taken from the Guidelines for Project Assessment (Annex 6) revised in February 1992 and updated to mid-1991.

The same operation has been made for livestock using Thana records. Animal production has been estimated on the basis of national statistics by using the ratio between total animal production and the number of animals. Animal production budgets are very difficult to assess and it is tentatively assumed that the ratio of the net income to the gross product of the livestock sector is approximately the same as for the crop sector.

Basic data concerning fisheries have been compiled from published documents of the Fishery Department after review and discussions with competent officials of this Department.

An Agro-Economic survey was undertaken by the Consultant from July to August 1991 to complement the available data and for cross-checking (see Annex X.1).

3.2 Market and Economic Unit Prices

1987-1988 Unit prices of agricultural outputs are proposed in the annex 6 of FPCO guidelines for project assessment with a view to providing a uniform basis for project evaluation by the different study teams in the different regions of the country. An updating of these unit prices has been undertaken by the Planning Commission and should soon be available to FAP consultants. Mid-1991 draft price tables have been prepared and till writing this report, they were still awaiting official approval. Figures for agricultural inputs and outputs as shown in Tables X.3.1 and X.3.2 and used in this study are therefore provisional.

For livestock and fishery production additional studies are still required to determine reliable market and economic prices of inputs and outputs. Average local farmgate prices have been roughly estimated by interviews and a conversion factor of 1.00 is provisionally assumed.

3.3 Agricultural Production Costs

Publications of BIDS and BARI have been used as a primary source of data for estimating the labour and input requirements per hectare of crop. These figures were adjusted by the Consultant with respect to information collected in NCR. They were ultimately revised taking into consideration the results of the agro-economic survey which show a fair amount of variation in the use of labour and farm inputs between farmers. Average estimates of crop budgets are shown in Tables X.3.4 to X.3.7 for Deep Water Aman, Local Transplanted Aman, HYV Transplanted Aman, Local Aus, HYV Aus, Local Boro, HYV Boro, Wheat, Jute, Potato, Sugarcane, Pulses, Oilseeds and Onions.

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Although production costs to some extent may probably be related to yields it has not been possible to look into such aspects at this stage of study; further detail will be required at Feasibility Study level

A number of other crops are also grown in the Region and could not be reported in detail. They are assumed to provide approximately the same average return as the average of major crops.

Irrigation costs have been estimated on the basis shown in Table X.3.3 for shallow tube wells and deep tube wells.

As required in FPCO Guidelines the estimate of production costs include 16% interest over 6 months (18 months for sugarcane) on 80% of farmers' cash expenditures including the purchase of seeds and chemicals and the payment of hired labour and draft animals or power tillers. In accordance with the agro-economic survey data it has been estimated that about one third of human labour and draft power is hired and two thirds are provided by the farmers on their own.

3.4 Gross Product of the Agricultural Sector

The cropped areas and the production of main crops including rice, wheat, potato, jute, sugarcane, pulses, oil seeds, and onions have been determined through an agricultural survey concerning each Thana within the North Central Region. The results of this survey based on records from the local Agricultural Offices and field observations (see SRI) are shown in Tables X.3.8 and X.3.9. They were used to estimate the gross product of main crops at market and economic prices in a normal year, i.e. without occurrence of an exceptional flood, however every year will vary (although not this assumption cannot be substantiated statistically, as yields across the region will vary considerably from thana to thana, due to the complexity of the hydrological and agricultural characteristics of the region, it is considered the best indication that can be assumed at this stage). The results are shown in Tables X.3.10 and X.3.11.

Planning Unit 12 is excluded from our estimates as it corresponds to the urban extension of Dhaka city where agricultural activity is marginal and gradually replaced by industries and services. This area is the object of FAP 8 study.

A very high diversification of production may be observed and an average 15 % of the cropped area is used for growing a broad range of cash crops such as vegetables, fruits and spices. It is illustrated by an average cropping intensity of almost 1.9 and demonstrates the capacity of local farmers to make an intensive use of limited land resources and apparently adverse conditions. The productivity of these miscellaneous crops may be assumed to be somewhat different from the average of the main crops.

After provision for exceptional floods, average agricultural production is decreased for B.Aman and T.Aman by a certain percentage as estimated in Table X.2.30.

The overall gross product of crops per Planning Unit in normal and average years at market and economic price may thus be estimated as given in Table X.3.25.

Livestock estimates were prepared from Thana records. They are shown in Table X.4.12. Animal production is known with much less detail and was roughly estimated by using ratio calculated from national statistics.

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The gross product of animal husbandry includes the provision of draft power for cropping in addition to milk, meat, eggs and by-products for consumption or other uses. Its estimated value is very tentative but may represent some 20 % of the gross product of crops at market price.

An estimate has been made of the gross product of fisheries using the following average market prices paid to fishermen in Taka per kilo :

•	River fish	40
•	Beel fish	30
•	Flood plain fish	25
•	Fish from cultured ponds	45
•	Fish from more or less derelict ponds	25

The estimate of total fishery gross product per Planning Unit is given in Table X.3.26

The gross product of the fish capture sub-sector in NCR is shown to be about 3 % of that of the whole agriculture sector.

3.5 Net Agricultural Benefit

In case of total damage by exceptional floods, production costs are lost. However, these do not include harvest and post-harvest costs and it may be estimated that half the nutrients provided by mineral manure remain available for the next crop. The corresponding decrease of usual production costs is given by crop budget.

These crop budgets were used to prepare estimates of the production costs of main crops at market and economic prices as shown in Tables X.3.13 and X.3.14. They include the cost of labour accounted at the same price for family or hired labour, the cost of draft animals used for land preparation, threshing and transport, and the cost of inputs including farm manure.

The net benefit derived from the main crops in normal year, i.e. without damage due to exceptional floods, is estimated by the difference between the gross product and the production costs as shown in Tables X.3.15 and X.3.16 at market and economic prices.

The other crops not detailed in the above Tables may be reasonably supposed to provide the same benefits as the average of the main crops. The net farm benefit is therefore increased proportionally to the area of other crops reported in Table X.3.8. A provision has also to be made for exceptional flood damage which decreases the average farm benefit as estimated above in Tables X.3.15 and 16. The overall net agricultural benefit is presented accordingly in Tables X.3.17 and X.3.18. The total amount for the whole region is about 9,050 million Taka at market price and about 10,971 million Taka at economic price.

The lowest net benefit per hectare is provided by wheat, jute, the local varieties of Aus and by Deep Water Aman with, however, fairly broad variations between Planning Units (see Table X.3.23). For the whole cropping system the average return per cropped hectare is also variable with the lowest in Planning Units 4 and 6 and the highest in Planning Unit 13 followed by Planning Units 11 and 1.

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The farm employment estimate shown in Table X.3.19 is derived from crop budgets and cropped areas. It strictly covers the cultivation works and does not include the ancillary activities that are common in any farm for repairs, miscellaneous transport and marketing. A total of about 267 million work-days are used in the whole NCR region for cropping. They are shared between rice for about 60 %, jute for about 7%, potato and wheat for a little more than 3% each, sugarcane for about 2% and around 50 other crops for the remaining 25%.

After incorporating the value of farm labour in farming benefits we get an estimate of the value added by crops as shown in Table X.3.20. It amounts to 22, 499 million taka, i.e., about 2/3 of the gross product at market price.

The average productivity of farm labour is revealed by the added value per work-day presented in Table X.3.21. Its average is estimated at 83 taka/man-day at market price. Main crops rank as follows :

- Potato
- Pulses
- Sugarcane
- Onions
- T.Aman (HYV)
- Local T.Aman
- Boro (HYV and Local varieties)
- D.W.Aman, Local Aus, Jute, Wheat and Oilseeds

Their selection by farmers is obviously linked with the seasonal availability of suitable land and the return per hectare, with their capacity to pay for costly inputs and with their access to market outlets. Another decision criterion may be for small farmer to satisfy first their self-consumption.

The average situation of farm households is summarised in Table X.3.24. The average farm size is 0.65 hectare with limited variations between the different P.U. It provides about 211 work-days per farm with an added value of about 18,000 Taka as average. The ranking of P.U according to their economic return is still very similar to the previous ones.

The poorest areas are Planning Units 4, 5, 6, 7, 10, 11 while the most promising are Planning Units 1 & 13.

A particular case is that of Planning Unit 11 with a low cropping intensity and a relatively high productivity of farm labour. It can be explained by the combination of severe flooding and the proximity of Dhaka city with its labour market.

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TABLE X.3.1
Updated Prices of Agricultural Inputs

Items	Market price	Conversion factor	Economic price (Tk/kg)
FERTILIZER			
Urea	4.58	1.34	6.14
TSP	5.40	1.88	10.15
MP	4.05	2.02	8.18
PESTICIDES	504.00	0.87	438.48
SEEDS			
L. Aus	10.50	1.02	10.71
HYV Aus	10.00	1.02	10.20
L.T. Aman	10.00	1.02	10.20
HYV Aman	9.00	1.02	9.18
Local Boro	10.00	1.02	10.20
HYV Boro	10.00	1.02	10.20
Wheat	12.00	1.29	15.48
Potato	8.50	0.87	7.40
Jute	24.00	1.06	25.44
Sugarcane	1.00	0.95	0.95
Pulses	25.00	0.87	21.75
Oilseeds	19.00	0.88	16.72
Onions	600.00	0.87	522.00
Labour	50.00	0.85	42.50
Draft Power	45.00	0.87	39.15

Source: FPCO Guidelines for Project Assessment Annex-6 estimation of economic prices of selected commodities for use in FAP Planning Studies Draft report of February, 1992 subject to change.

TABLE X.3.2
Updated Prices of Agricultural Outputs

Items	Market price	Conversion Factor	Economic price (Tk/kg)
Aus	6.07	1.02	6.20
Aman	6.44	1.02	6.57
Boro	6.21	1.02	6.34
Wheat	6.31	1.29	8.14
Potato	4.58	0.87	3.98
Jute	8.01	1.06	8.49
Sugarcane	1.01	0.95	0.96
Pulses	14.92	0.87	12.98
Oilseeds	13.47	0.88	11.85
Onion	9.05	0.87	7.87
Rice straw HYV	0.72	0.87	0.62
Rice straw Local	0.95	0.87	0.83
Jute sticks	2.55	0.87	2.22

Source : FPCO Guidelines for Project Assessment Annex 6 BBS Sectoral deflators (1991/1988 = 1.25) Estimation of economic prices of selected commodities for use in FAP Planning Studies- Draft Report of February 1992 subject to change.

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TABLE X.3.3
Irrigation Cost Estimate (Tk/year/hectare)

	Financial price	Conversion factor	Economic price
1. Shallow tube wells			
1.1. Capital cost (interest 12%)			
tube well (1)	140	0.62	87
pump & engine (2)	1400	0.62	868
1.2. Operation cost			
repair & maintenance (3)	1185	0.62	735
fuel & lubricant (4)	1435	0.63	904
labour (5)	528	0.87	459
1.3. Total cost	4688	0.65	3053
2. Deep tube wells			
1.1. Capital cost (interest 12 %)			
tube well (6)	230	0.62	143
pump & engine (7)	2310	0.62	1432
1.2. Operation cost			
repair & maintenance (8)	1955	0.62	1212
fuel & lubricant (9)	7165	0.63	4514
labour (10)	264	0.87	230
1.3. Total cost	11924	0.63	7531

1. Assume a useful life of 7 years for an investment of Tk 3,000; average command area of 4.7ha
2. Assume a useful life of 3,500 hours (7 years at 500 hrs/year) for an investment of Tk.30,000
3. Assume 130 % of initial investment over the whole useful life
4. Assume a pumping head of 7 m and 11,000 m³/ha annual supply i.e. 89 l/ha/year of diesel oil plus 15 % cost for lubricants and spare parts
5. Assume 12 work-days of labour for irrigation per hectare
6. Assume a useful life of 7 years for an investment of Tk 20,000 ; average command area of 19 ha
7. Assume a useful life of 3,500 hours (7 years at 500 hrs/year) for an investment of Tk 200,000
8. Assume 130 % of initial investment over the whole useful life
9. Assume a pumping head of 35 m and 11,000 m³/ha annual supply i.e. 445 l/ha/year of diesel oil plus 15 % cost for lubricants and spare parts.
10. Assume 12 work-days of labour for irrigation per hectare

Source : Consultant's survey and estimates FPCO Guidelines for Project assessment

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TABLE X.3.4
Production Costs of Rice per Hectare at Market Prices in Normal Year

Unit	Convers. factor	Unit price Tk	B. Aman		T. Aman (Local)		T. Aman (HYV)		Aus & Boro (L)		Aus (HYV)		HYV Boro	
			Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Land preparation Labour Bullock power	0.85 0.87	50.00 45.00	41 35	2050 1575	39 35	1950 1575	39 35	1950 1575	35 35	1750 1575	41 35	2050 1575	41 35	2050 1575
2. Sowing/transpl. Labour	0.85	50.00	7	350	29	1450	33	1650	14	700	42	2100	42	2100
3. Weed./crop husb. Labour	0.85	50.00	44	2200	19	950	36	1800	54	2700	50	2500	58	2900
4. Harvesting Labour	0.85	50.00	29	1450	30	1500	33	1650	33	1650	35	1750	35	1750
5. Threshing Labour Bullock power	0.85 0.87	50.00 45.00	15 7	750 315	17 8	850 360	19 10	950 450	16 13	800 585	22 12	1100 540	28 8	1400 360
6. Inputs Seeds Urea TSP MP Pesticides	1.34 1.88 2.02 0.87	4.58 5.40 4.05	88 33 16 6	880 151 86 24 85	60 60 29 7	600 275 157 28 54	70 151 96 21	630 692 518 85 329	84 34 20 3	882 156 108 12 101	70 150 67 32	700 687 362 130 469	70 185 103 32	700 847 556 130 469
7. Irrigation Interest	0.63			264		255		819 411		289		398		4503 720
8. Miscellaneous (10 % of costs)				1018		1000		1351		1131		1436		2006
9. Total production costs				11199		11004		14860		12438		15797		22066
10. Decrease of costs for crops damaged by flood				2373		2607		3412						



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TABLE X.3.5
Production costs per hectare of main crops at market price

	Unit	Convers. factor	Unit price Tk.	Wheat		Jute		Potato		Sugarcane		Pulses		Oilseeds		Onions	
				Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Human labour	man-day	0.85	50.00	160	8000	250	12500	270	13500	290	14500	42	2100	95	4750	320	16000
2. Bullock power	pair-day	0.87	45.00	45	2025	42	1890	42	1890	90	4050	5	225	35	1575	*	3280
3. Inputs																	
Seeds	kg	0.87/1.02		134	1608	8	192	2000	17000	5000	5000	70	1750	10	190	7	3900
Manure	kg	1.00						8870	2218								
Urea	kg	1.34	4.58	127	582	60	275	450	2061	175	802			26	119	69	316
TSP	kg	1.88	5.40	100	540	12	65	469	2533	175	945	35	189	62	335	80	432
MP	kg	2.02	4.05	30	122	10	41	464	1879	88	356	35	142	15	61	71	288
Pesticides		0.87							2103						340		
4. Irrigation																	
5. Interest		0.63			248		215		1637		1594		114		126		454
6. Miscellaneous (10 % of costs)					1312		1518		4614		2725		452		750		2467
9. Total production costs					14436		16695		50752		29972		4972		8245		27137

TABLE X.3.6
Production Costs of Rice per Hectare at Economic Prices in Normal Year

Unit	Conversion factor	Unit price Tk	B. Aman		T. Aman (L)		T. Aman (HYV)		Aus and Boro (L)		Aus (HYV)		HYV Boro	
			Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Land preparation														
Labour	0.85	42.50	41	1743	39	1658	39	1658	35	1488	41	1743	41	1743
Bullock power	0.87	39.15	35	1370	35	1370	35	1370	35	1370	35	1370	35	1370
2. Sowing/transpl.														
Labour	0.85	42.50	7	298	29	1233	33	1403	14	595	42	1785	42	1785
3. Weed./crop husb.														
Labour	0.85	42.50	44	1870	19	808	36	1530	54	2295	50	2125	58	2465
4. Harvesting														
Labour	0.85	42.50	29	1233	30	1275	33	1403	33	1403	35	1488	35	1488
5. Threshing														
Labour	0.85	42.50	15	638	17	723	19	808	16	680	22	935	28	1190
Bullock power	0.87	39.15	7	274	8	313	10	392	13	509	12	470	8	313
6. Inputs														
Seeds			88	898	60	612	70	643	84	900	70	714	70	714
Urea	1.34	6.14	33	203	60	368	151	927	34	209	150	921	185	1135
TSP	1.88	10.15	16	162	29	294	96	975	20	203	67	680	103	1046
MP	2.02	8.18	6	49	7	57	21	172	3	25	32	262	32	262
Pesticides	0.87		74		47			287		88		408		408
7. Irrigation														
8. Economic adjustment														
9. Miscellaneous														
(10 % of costs)				247		246		408		269		403		2837
10. Total production costs			906	906		900		1249		1003		1330		1739
11. Decrease of costs for crops damaged by flood				9963		9903		13736		11035		14633		19124
				2114		2381		3390						

B: IABCOIT-X-4-6 WK1

TABLE X.3.7
Production Costs per Hectare of Main Crops at Economic Price.

	Unit	Convers. factor	Unit price Tk	Wheat		Jute		Potato		Sugarcane		Pulses		Oilseeds		Onions	
				Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Human labour	man-day	0.85	42.5	160	6800	250	10625	270	11475	290	12325	42	1785	95	4037.5	320	13600
2. Bullock power	pair-day	0.87	39.15	45	1761.75	42	1644.3	42	1644.3	90	3523.5	5	195.75	35	1370.25	*	3280
3. Inputs																	
Seeds	kg	0.87/1.02		134	2074.32	8	203.52	2000	14790	5000	4750	70	1522.5	10	167.2	6.5	3393
Manure	kg	1	0.25					8870	2217.5								
Urea	kg	1.34	6.1372	127	779.424	60	368.232	450	2761.74	175	1074.01			26	159.567	69	423.466
TSP	kg	1.88	10.152	100	1015.2	12	121.824	469	4761.28	175	1776.6	35	355.32	62	629.424	80	812.16
MP	kg	2.02	8.181	30	245.43	10	81.81	464	3795.98	88	719.928	35	286.335	15	122.715	71	580.851
Pesticides		0.87							1830						295.75		
4. Irrigation																	
5. Economic adjustment		0.63							1031.45								
6. Miscellaneous (10 % of costs)					278.731		194.606		1381.18		1632.40		112.976		127.089		433.445
					1295.48		1323.92		4568.84		2580.14		425.788		690.949		2252.29
9. Total production costs					14250.3		14563.2		50257.2		28381.5		4683.66		7600.44		24775.2

* Mainly use of power tillers

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TABLE X.3.8
Cropped Areas (ha, 000)

P.U.	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others
1	1015	18775	23118	8249	1129	2329	34085	4949	10922	1582	3544	724	3053	289	39900
2	9309	12605	20994	8294	1346	1124	35689	3513	7960	987	358	767	3433	187	24148
3	200	50005	50453	35148	29612	4349	40508	5732	9285	1469	1837	1597	1637	501	9289
4	24194	7256	7823	10698	1320	934	29218	4536	6742	755	322	2396	7155	97	17621
5	2669	30473	40377	33338	11936	3062	39399	3847	8184	1026	3933	3250	3701	195	18414
6	40733	6012	2804	26967	3175	774	40787	10429	13076	1954	2851	4354	10841	582	35209
7	27471	2170	1714	26906	619	621	22801	10886	6925	1653	3345	6824	13022	454	5279
8	529	1611	6093	2515	1583	1371	11583	869	1406	197	176	871	1778	15	16022
9	6492	4052	16512	8886	5830	1575	24458	864	3071	291	1596	3062	1145	219	24251
10	24784	147	63	13482	53	1111	12268	5014	2424	901	545	6919	5308	2554	14968
11	3438	318	758	1603	282	373	5570	584	1399	1768	62	391	1373	40	2449
12															
13	27422	174	341	15881	836	1844	19431	4051	7750	20737	698	3587	4896	264	32520
Total NCR	168256	133598	171050	191967	57721	19469	315796	55274	79144	33319	19268	34742	57342	5396	240070

TABLE X.3.9
Production (tons)

P.U.	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions
1	1460	37331	74872	11157	2802	6506	169201	11036	17830	23512	271035	650	1582	1732
2	15457	24360	66709	11076	3476	2364	125882	6523	13271	13319	18365	626	2765	1451
3	371	102004	174165	53270	96329	9726	167790	10323	14815	15101	83022	1022	1073	3105
4	25538	15681	29879	13641	3651	1340	116872	8695	11577	9738	19135	2005	5305	789
5	3363	66206	147706	47801	35771	6260	149572	7156	12679	11888	196956	2502	2926	1409
6	47794	14323	9940	33301	7565	1235	136449	19669	18918	22723	155815	3589	8954	4353
7	34167	4249	6117	24446	1242	1278	107354	19954	9938	20939	185915	6446	6098	1776
8	733	2998	20657	3676	5486	2955	53199	1787	2261	2773	8797	681	1170	98
9	13152	7366	54813	17893	20179	3429	103116	1283	5390	3600	76851	2183	790	2495
10	29844	237	186	12063	127	2196	61105	8772	3304	14621	18268	5905	3119	9853
11	5533	573	2496	2909	806	713	26284	1092	2197	44845	2533	331	993	262
12														
13	33932	274	1185	29542	2989	3720	97675	6113	11472	619329	30906	3169	3687	1604
Total NCR	211344	275602	588725	260774	180422	41722	1314499	102403	123652	802388	1067598	29109	38464	28927

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TABLE X.3.10
Agricultural Gross Production in Normal Year at Market Price (Tk. million)

P. U.	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	14	311	536	89	19	53	1172	78	181	108	274	10	21	16	828	3710
2	144	203	477	88	24	19	872	46	135	61	19	9	37	13	486	2633
3	3	851	1246	425	654	79	1162	73	150	69	84	15	14	28	194	5047
4	237	131	214	109	25	11	810	61	117	45	19	30	71	7	287	2174
5	31	552	1057	381	243	51	1036	50	129	54	199	37	39	13	385	4257
6	444	119	71	266	51	10	945	138	192	104	158	54	121	39	577	3289
7	317	35	44	195	8	10	744	140	101	96	188	96	82	16	87	2161
8	7	25	148	29	37	24	369	13	23	13	9	10	16	1	378	1101
9	122	61	392	143	137	28	714	9	55	16	78	33	11	23	566	2387
10	277	2	1	96	1	18	423	62	33	67	18	88	42	89	241	1460
11	51	5	18	23	5	6	182	8	22	205	3	5	13	2	75	624
12																
13	315	2	8	236	20	30	677	43	116	2837	31	47	50	15	1334	5761
Total NCR	1963	2298	4211	2079	1225	338	9106	720	1253	3675	1080	434	518	262	5440	34604

TABLE X.3.11
Agricultural Gross Production in Normal Year at Economic Price (Tk. million)

P. U.	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	13	307	538	88	19	52	1177	97	205	94	261	8	19	14	1014	3904
2	140	200	480	87	24	19	876	57	152	53	18	8	33	11	489	2646
3	3	838	1252	418	657	78	1168	90	170	60	80	13	13	24	194	5059
4	231	129	215	107	25	11	813	76	133	39	18	26	63	6	288	2214
5	30	544	1062	375	244	50	1041	63	145	47	189	32	35	11	384	4254
6	432	118	71	261	52	10	949	172	217	91	150	47	106	34	577	3288
7	309	35	44	192	8	10	747	175	114	83	179	84	72	14	87	2153
8	7	25	148	29	37	24	370	16	26	11	8	9	14	1	379	1104
9	119	61	394	140	138	27	718	11	62	14	74	28	9	20	564	2379
10	270	2	1	95	1	18	425	77	38	58	18	77	37	78	236	1430
11	50	5	18	23	5	6	183	10	25	179	2	4	12	2	71	595
12																
13	307	2	9	232	20	30	680	54	132	2468	30	41	44	13	1223	5283
Total NCR	1912	2265	4232	2047	1230	333	9147	898	1418	3197	1026	378	456	228	5542	34309

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TABLE X.3.12
Livestock and Animal Production per Planning Unit (Tk. million)

Planning Unit	Number of animals					Animal production				
	Cattle	Goats	Sheep	Fowl	Ducks	Milk	Beef	Mutton	Chicken	Eggs
1	172925	87986	8517	905090	117445	5188	1902	367	920	20451
2	204372	81437	28536	533069	92955	6131	2248	418	563	12520
3	373413	110784	9814	1362715	151972	11202	4108	458	1363	30294
4	188014	68290	17413	475075	58011	5640	2068	326	480	10662
5	388478	174103	23247	1020932	146702	11654	4273	750	1051	23353
6	335336	94413	28706	692191	101621	10060	3689	468	714	15876
7	202699	66023	14040	825746	97914	6081	2230	304	831	18473
8	81784	30216	9822	202416	54073	2454	900	152	231	5130
9	186379	95505	23748	767266	158255	5591	2050	453	833	18510
10	104690	41302	5364	465912	95458	3141	1152	177	505	11227
11	68262	28863	3065	233604	47828	2048	751	121	253	5629
12	43099	18334	2465	193278	46663	1293	474	79	216	4799
13	274926	60134	8929	1061908	144488	8248	3024	262	1086	24128
Total NCR	2624377	957390	183665	8739201	1313384	78731	28868	4336	9047	201052

TABLE: X.3.13
Agricultural Production Costs in Normal Year at Market Price (Tk. million)

P. Unit	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	11	207	344	103	18	29	752	71	182	80	106	4	25	8	497	2437
2	104	139	312	103	21	14	788	51	133	50	11	4	28	5	399	2162
3	2	550	750	437	468	54	894	83	155	75	55	8	13	14	142	3700
4	271	80	116	133	21	12	645	65	113	38	10	12	59	3	269	1845
5	30	335	600	415	189	38	869	56	137	52	118	16	31	5	287	3177
6	456	66	42	335	50	10	900	151	218	99	85	22	89	16	541	3080
7	308	24	25	335	10	8	503	157	116	84	100	34	107	12	77	1900
8	6	18	91	31	25	17	256	13	23	10	5	4	15	0	269	783
9	73	45	245	111	92	20	540	12	51	15	48	15	9	6	398	1680
10	278	2	1	168	1	14	271	72	40	46	16	34	44	69	209	1265
11	39	3	11	20	4	5	123	8	23	90	2	2	11	1	47	390
12	307	2	5	198	13	23	429	58	129	1052	21	18	40	7	694	2997
Total NCR	1884	1470	2542	2388	912	242	6968	798	1321	1691	578	173	473	146	3829	25415

Note: family labour and hired labour being costed all together

TABLE: X.3.14
Agricultural Production Costs in Normal Year at Economic Price (Tk. million)

P. Unit	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	10	186	318	91	17	26	652	71	159	80	101	3	23	7	447	2189
2	93	125	288	92	20	12	683	50	116	50	10	4	26	5	356	1928
3	2	495	693	388	433	48	775	82	135	74	52	7	12	12	128	3338
4	241	72	107	118	19	10	559	65	98	38	9	11	54	2	239	1644
5	27	302	555	368	175	34	753	55	119	52	112	15	28	5	258	2856
6	406	60	39	298	46	9	780	149	190	98	81	20	82	14	484	2756
7	274	21	24	297	9	7	436	155	101	83	95	32	99	11	69	1713
8	5	16	84	28	23	15	222	12	20	10	5	4	14	0	240	698
9	65	40	227	98	85	17	468	12	45	15	45	14	9	5	356	1501
10	247	1	1	149	1	12	235	71	35	45	15	32	40	63	188	1137
11	34	3	10	18	4	4	107	8	20	89	2	2	10	1	43	355
12	273	2	5	175	12	20	372	58	113	1042	20	17	37	7	649	2801
Total NCR	1676	1323	2350	2118	845	215	6039	788	1153	1674	547	163	436	134	3456	22916

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TABLE: X.3.15
Net Value of Agricultural Production in Normal Year at Market Price (Tk. million)

P. Unit	D.W. Aman	Local T. Aman	HYV T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	2	105	192	192	-14	1	24	420	6	-2	27	168	6	-4	8	364	1304
2	39	64	165	165	-15	2	5	84	-5	2	11	8	6	9	8	87	471
3	1	300	496	496	-12	186	25	268	-10	-5	-5	29	7	1	15	52	1348
4	-34	51	97	97	-24	4	-1	165	-4	5	6	10	18	12	5	19	362
5	1	217	457	457	-33	54	13	167	-5	-8	2	81	21	9	7	98	1080
6	-12	53	29	29	-70	1	0	45	-12	-27	5	72	32	31	24	37	209
7	10	12	18	18	-140	-1	3	241	-17	-15	12	88	62	-25	4	11	261
8	1	7	57	57	-2	12	7	113	0	-1	3	4	6	1	0	109	318
9	49	17	147	147	32	45	8	175	-3	3	2	30	17	1	17	168	707
10	0	0	0	0	-71	0	4	153	-11	-7	21	2	54	-2	20	32	195
11	13	1	7	7	3	1	1	59	-1	-1	116	1	3	2	1	28	234
12																	
13	8	0	3	3	38	7	7	248	-16	-13	1784	10	29	9	7	640	2764
Total NCR	79	828	1669	1669	-308	313	96	2137	-78	-68	1984	503	262	45	115	1678	9050

TABLE: X.3.16
Net Value of Agricultural Production in Normal Year at Economic Price (Tk. million)

P. Unit	D.W. Aman	Local T. Aman	HYV T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	3	121	221	221	-3	3	26	525	26	45	14	160	5	-4	6	403	1551
2	47	75	191	191	-5	4	6	193	7	36	3	7	5	7	7	133	718
3	1	343	559	559	30	223	30	393	9	35	-14	28	6	0	12	66	1722
4	-10	57	107	107	-11	6	0	254	12	35	1	9	15	8	4	49	570
5	4	242	507	507	7	69	16	287	8	26	-4	78	17	7	6	126	1397
6	27	58	33	33	-36	5	1	169	24	27	-8	69	26	24	20	93	532
7	35	13	20	20	-105	-1	3	311	20	13	0	84	52	-27	3	18	441
8	1	9	65	65	1	14	8	149	3	5	1	3	5	0	0	139	406
9	54	20	167	167	42	52	10	250	-1	17	0	29	14	1	14	208	878
10	23	0	0	0	-54	0	5	191	5	3	13	2	44	-3	14	48	292
11	16	2	8	8	5	1	2	76	1	5	90	1	2	1	1	29	240
12																	
13	34	1	4	4	57	8	9	308	-4	19	1426	10	24	6	6	575	2482
Total NCR	236	942	1883	1883	-72	385	118	3107	110	266	1523	480	215	20	94	1921	11228

TABLE: X.3.17

Net Value of Agricultural Production in Average Year at Market Price (Tk. million)

P. Unit	D. W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	1	94	174	-14	1	24	420	6	-2	27	168	6	-4	8	304	1276
2	30	55	144	-15	2	5	84	-5	2	11	8	6	9	8	87	432
3	1	295	488	-12	186	25	268	-10	-5	-5	29	7	1	15	52	1334
4	-48	44	86	-24	4	-1	165	-4	5	6	10	18	12	5	19	330
5	1	215	452	-33	54	13	167	-5	-8	2	81	21	9	7	98	1074
6	-40	48	26	-70	1	0	45	-12	-27	5	72	32	31	24	37	172
7	-9	11	17	-140	-1	3	241	-17	-15	12	88	62	-25	4	11	240
8	1	7	56	-2	12	7	113	0	-1	3	4	6	1	0	109	317
9	47	16	143	32	45	8	175	-3	3	2	30	17	1	17	168	700
10	-3	0	0	-71	0	4	153	-11	-7	21	2	54	-2	20	32	192
11	10	1	6	3	1	1	59	-1	-1	116	1	3	2	1	28	231
12	-3	0	3	38	7	7	248	-16	-13	1784	10	29	9	7	640	2753
Total NCR	-12	787	1595	-308	313	96	2137	-78	-68	1984	503	262	45	115	1678	9050

TABLE: X.3.18

Net Value of Agricultural Production in Average Year at Economic Price (Tk. million)

P. Unit	D. W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	2	111	203	-3	3	26	525	26	45	14	160	5	-4	6	403	1504
2	38	66	170	-5	4	6	193	7	36	3	7	5	7	7	133	678
3	1	338	551	30	223	30	393	9	35	-14	28	6	0	12	66	1708
4	-24	50	96	-11	6	0	254	12	35	1	9	15	8	4	49	503
5	4	240	503	7	69	16	287	8	26	-4	78	17	7	6	126	1391
6	-1	53	30	-36	5	1	169	24	27	-8	69	26	24	20	93	496
7	17	13	19	-105	-1	3	311	20	13	0	84	52	-27	3	18	420
8	1	8	63	1	14	8	149	3	5	1	3	5	0	0	139	404
9	52	20	163	42	52	10	250	-1	17	0	29	14	1	14	208	871
10	20	0	0	-54	0	5	191	5	3	13	2	44	-3	14	48	289
11	13	1	6	5	1	2	76	1	5	90	1	2	1	1	29	236
12	22	0	3	57	8	9	308	-4	19	1426	10	24	6	6	575	2470
Total NCR	146	901	1808	-72	385	118	3107	110	266	1523	480	215	20	94	1921	10971

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TABLE: X.3.19
Farm Employment in Normal Year (,000 work-days)

P.Unit	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	138	2516	3699	1254	215	354	6953	792	2730	427	1028	30	290	92	7947	28465
2	1266	1689	3359	1261	256	171	7281	562	1990	266	104	32	326	60	4220	22843
3	27	6701	8072	5343	5626	661	8264	917	2321	397	533	67	155	160	1569	40813
4	3290	972	1252	1626	251	142	5961	726	1686	204	93	101	680	31	2898	19912
5	363	4083	6460	5067	2268	465	8037	615	2046	277	1141	137	352	62	3116	34490
6	5540	806	449	4099	603	118	8321	1669	3269	528	827	183	1030	186	5883	33509
7	3736	291	274	4090	118	94	4651	1742	1731	446	970	287	1237	145	834	20646
8	72	216	975	382	301	208	2363	139	351	53	51	37	169	5	2787	8109
9	883	543	2642	1351	1108	239	4989	138	768	78	463	129	109	70	4198	17707
10	3371	20	10	2049	10	169	2503	802	606	243	158	291	504	817	2288	13841
11	468	43	121	244	54	57	1136	93	350	477	18	16	130	13	439	3659
12																
13	3729	23	55	2414	159	280	3964	648	1938	5599	203	151	465	85	5940	25652
Total NC	22883	17902	27368	29179	10967	2959	64422	8844	19786	8996	5588	1459	5448	1727	42119	269647

TABLE: X.3.20
Agricultural Added Value in Normal Year at Market Prices (Tk.000,000)

P.U.	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	8	220	359	49	12	42	768	46	135	49	219	8	11	12	761	2699
2	93	140	312	48	15	14	448	23	101	24	13	7	25	11	298	1574
3	3	630	892	255	468	58	682	36	111	14	56	11	9	23	130	3375
4	117	93	149	57	16	6	463	32	89	16	14	23	46	6	164	1292
5	19	419	775	220	168	36	569	26	94	16	138	28	26	11	253	2799
6	237	88	49	135	31	6	461	71	137	31	114	41	83	33	331	1848
7	178	25	31	65	5	7	473	70	72	34	136	77	37	11	52	1273
8	4	18	105	17	27	17	231	7	17	5	6	8	10	1	249	722
9	91	43	275	100	100	20	424	3	42	6	53	24	7	20	378	1586
10	165	1	1	31	1	12	278	29	23	33	10	68	23	61	147	884
11	34	3	12	15	4	4	116	4	16	140	2	4	9	2	50	413
12																
13	183	1	5	159	15	21	446	17	84	2064	20	37	33	12	937	4034
Total NC	1133	1682	2964	1151	861	244	5358	364	921	2434	782	334	318	202	3750	22499

TABLE: X.3.21
Added Value per Work-Day in Normal Year

P. Unit	D. W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	60	88	97	39	56	117	110	58	49	114	214	251	37	135	95	95
2	74	83	93	38	59	80	62	41	51	91	126	221	77	184	69	69
3	94	94	110	48	83	88	82	39	48	36	104	159	56	141	83	83
4	36	95	119	35	66	45	78	44	53	81	154	229	68	195	65	65
5	53	103	120	43	74	77	71	41	46	59	121	205	75	170	81	81
6	43	109	108	33	52	53	55	43	42	59	137	224	80	177	55	55
7	48	87	113	16	39	78	102	40	41	77	141	267	30	76	62	62
8	61	83	107	45	91	83	98	50	48	100	121	209	57	149	89	89
9	103	80	104	74	91	84	85	25	54	72	115	185	61	287	90	90
10	49	68	89	15	52	74	111	37	38	137	64	235	46	74	64	64
11	72	74	96	63	69	70	102	42	47	292	90	233	66	150	113	113
12			101	66	95	76	113	26	43	369	101	245	70	137	157	157
13	49	59	108	39	79	83	83	41	47	271	140	229	58	117	83	83
Total NCR	50	94														

TABLE: X.3.22
Added Value per Hectare Cropped in Normal Year - Economic Price (Tk/ha)

Added Value per Hectare Cropped in Normal Year															
P. Unit	D. W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others
1	8152	11732	15538	5947	10555	17819	22522	9234	12354	30818	61921	10531	3485	43152	19081
2	10035	11101	14855	5810	11236	12221	12567	6610	12706	24578	36418	9303	7351	59011	12342
3	12753	12597	17675	7247	15788	13302	16826	6218	11981	9837	30273	6671	5336	44982	14023
4	4831	12780	19008	5330	12487	6799	15847	7033	13212	21829	44602	9613	6489	62423	9285
5	7239	13742	19206	6595	14050	11747	14431	6635	11510	15830	35205	8615	7153	54327	13763
6	5828	14621	17303	5009	9876	8100	11308	6817	10471	16008	39831	9426	7627	56542	9396
7	6473	11653	18079	2407	7335	11844	20749	6445	10353	20772	40768	11220	2811	24260	9896
8	8282	11067	17159	6819	17234	12641	19949	8009	12110	27081	35047	8797	5368	47534	15516
9	14024	10705	16646	11218	17202	12819	17339	3998	13598	19463	33262	7765	5796	91731	15568
10	6666	9130	14260	2297	9835	11197	22637	5857	9622	37098	18446	9860	4416	23771	9799
11	9821	9880	15328	9631	13081	10675	20823	6711	11724	78915	26055	9767	6243	48027	20446
12															
13															
Total NCR	6735	12589	17328	5994	14924	12546	16968	6582	11643	73045	40600	9628	5537	37360	15619

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TABLE X.3.23
Farm Employment per Household (Work-days)

P.U.	D.W. Aman	Local T. Aman	HYV T. Aman	Local Aus	HYV Aus	Local Boro	HYV Boro	Wheat	Jute	Potato	Sugarcane	Pulses	Oilseeds	Onions	Others	Total
1	1	25	37	12	2	3	69	8	27	4	10	0	3	1	52	255
2	15	20	41	15	3	2	88	7	24	3	1	0	4	1	51	276
3	0	32	39	26	27	3	40	4	11	2	3	0	1	1	8	196
4	39	11	15	19	3	2	70	9	20	2	1	1	8	0	34	235
5	2	22	34	27	12	2	43	3	11	1	6	1	2	0	17	184
6	41	6	3	30	4	1	61	12	24	4	6	1	8	1	43	247
7	36	3	3	39	1	1	44	17	16	4	9	3	12	1	8	196
8	2	5	25	10	8	5	60	4	9	1	1	1	4	0	71	206
9	10	6	29	15	12	3	54	2	8	1	5	1	1	1	46	193
10	51	0	0	31	0	3	38	12	9	4	2	4	8	12	35	211
11	15	1	4	8	2	2	35	3	11	15	1	1	4	0	14	114
13	28	0	0	18	1	2	30	5	15	42	2	1	4	1	45	194
Total	18	14	22	23	9	2	51	7	16	7	4	1	4	1	31	211

TABLE X.3.24
Average Situation of Farm Households in Normal Year

P.U.	NCA	Work-days	Cropps.int.	Added value
1	0.59	255	2.11	26660
2	0.72	276	2.18	19000
3	0.61	196	1.89	16200
4	0.69	235	2.07	15220
5	0.65	184	1.68	14940
6	0.71	247	2.09	13640
7	0.64	196	1.94	12100
8	0.69	206	1.71	18340
9	0.63	193	1.77	17300
10	0.73	211	1.88	13460
11	0.58	114	1.10	12860
13	0.58	194	1.83	30470
Total	0.65	211	1.90	17760

TABLE X.3.25
Gross Product of Crops per Planning Unit (Million Taka)

Planning Unit	At Market Price		At Economic Price	
	Normal year	Average year	Normal year	Average year
P.U .1	3710	3677	3904	3870
P.U .2	2633	2586	2646	2600
P.U .3	5047	5032	5059	5044
P.U .4	2174	2135	2214	2175
P.U .5	4257	4250	4254	4246
P.U .6	3289	3244	3288	3243
P.U .7	2161	2135	2153	2128
P.U .8	1101	1099	1104	1102
P.U .9	2387	2379	2379	2371
P.U.10	1460	1456	1430	1426
P.U.11	624	620	595	591
P.U.13	5761	5746	5283	5268
Total NCR	34604	34357*	34308*	34064

Source : CS 1992

TABLE X.3.26
Fishery Gross Product per Planning Unit (Million Taka)

Planning Units	Fish Capture	Fish Culture	Total
P.U .1	108.9	15.6	124.5
P.U .2	45.4	11.6	57.0
P.U .3	185.1	62.1	246.2
P.U .4	28.8	10.6	39.4
P.U .5	87.3	51.2	138.5
P.U .6	58.4	18.7	77.1
P.U .7	50.1	25.6	75.7
P.U .8	19.4	13.9	33.3
P.U .9	34.0	23.8	57.8
P.U.10	31.8	20.6	52.4
P.U.11	46.7	8.0	54.7
P.U.13	90.3	34.2	124.5
Total NCR	786.2	295.9	1082.1

Source : CS 1992

* The total shows a minor difference with the sum of PU values which have been rounded

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CHAPTER 4

ECONOMIC AND FINANCIAL ANALYSIS

4.1 NCR Water Development Alternatives

4.1.1 General

As a component of FAP and in keeping with the terms of reference, NCRS is aimed at preparing "a regional water development plan with emphasis on the flood control and drainage measures that would be needed to achieve a sustained development of the regional economy, taking into account social and environmental factors".

The possible impact of the application of the main development options, i.e., embankments and drainage improvements, has been previously examined for the different Planning units. The regional hydraulic model showed that no significant change can be expected from major infrastructures in Planning Units 3,5,9,11 and 13.

As a result of this preliminary screening and following additional engineering studies, elementary projects have been identified for prefeasibility analysis.

Each elementary project is supposed to be self-supporting, i.e., to bring its own benefits and disbenefits. As such it may be a development phase within an overall scheme, it may exclude other projects or may be a part of them with or without any interaction.

The expected effect of elementary projects is supposed to depend on their sequence within the overall Master Plan. Circumstances due to external decisions, such as the construction of Jamuna bridge with the closing of the northern offtake of Dhaleswari may also modify the actual content and impact of the projects. The feasibility and priority ranking of elementary projects consequently have to be analysed within different scenarios corresponding to the possible sequences of decisions and events.

Local improvements of water management are considered a necessary complement to major structures. They are included in elementary projects and may consist of compartmentalisation and/or drainage improvement.

Non-structural measures have also been considered. Their costing and the assessment of their benefits will require more detailed studies which are beyond the scope of the present study.

4.1.2 Identification of Elementary Projects

A total of 24 elementary possible projects have been identified as follows:

- 6 projects concerning PU1 (RS1bN, RS1bY, RS1cN, RS1cY, RS1dN, RS1dY), RS1a with flood proofing only being considered as the reference situation,
- 1 project concerning mainly PU2 and PU4 (RS2),
- 17 projects concerning mainly PU4, PU6, PU7, PU8 and PU10 (RS3A1S, RS3A1C, RS3A2S, RS3A2C, RS6A1S, RS6A1C, RS6A2S, RS6A2C, RS3B1S, RS3B1C, RS3B2S, RS3B2C, RS6B1S, RS6B1C, RS6B2S, RS6B2C and RS4).

The description of these projects is summarised below (see also Figures 4.1 to 4.11):

- RS1bN, RS1cN and RS1dN are alternative embankment and drainage projects to improve the flooding conditions in Jamalpur Pilot Project area without restriction of drainage through Baushi bridge.
- RS1bY, RS1cY and RS1dY are alternatives to the projects above with restricted drainage at Baushi bridge.
- RS2 includes the upgrading and repair of existing embankments and the construction of a control structure at Baushi bridge to restrict the inflow of drainage water from PU1 to PU2.
- RS3A1S and RS3A1C alternatives consist of embankments along the Dhaleswari from RB Pungli to Barinda offtake with the construction of semi-control or control structures.
- RS3A2S and RS3A2C are second phase projects corresponding to RS3A1S or RS3A1C and consist of embankments along Dhaleswari and Kaliganga, from the river Barinda to Kalatia.
- RS3B1S, RS3B2S, RS3B1C and RS3B2C are alternatives to the projects above in the case of Jamuna bridge being constructed.
- RS6A1S, RS6A2S, RS6A1C, RS6A2C are alternatives of two phases of an embankment project with associated semi-control or control structures in the distributaries along Jamuna down to Harirampur.
- RS6B1S, RS6B2S, RS6B1C, RS6B2C are alternatives to the projects above in the case of Jamuna bridge being constructed.
- RS4 consists of a 20% improvement of the conveyance of Bangshi river and lower Dhaleswari.

Provision for minor improvements of local drainage are associated with the above projects. Non-engineering or low engineering projects, such as those limited to flood proofing, flood preparedness and local drainage improvements alone, do not appear in this inventory as they will come as substitutes for major projects in the areas where major works do not appear effective or feasible.

Figure : X.4.1

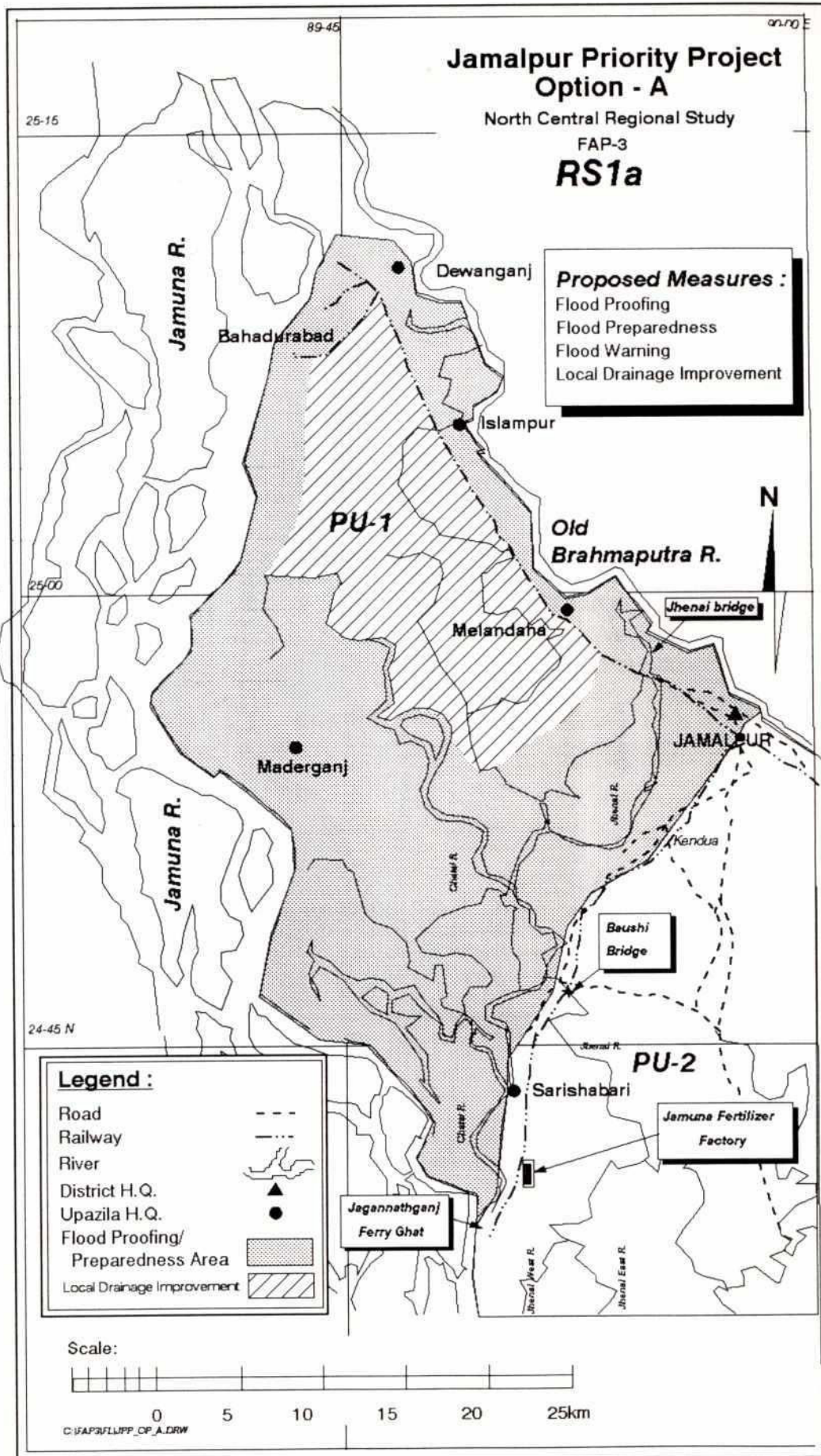


Figure : X.4.2

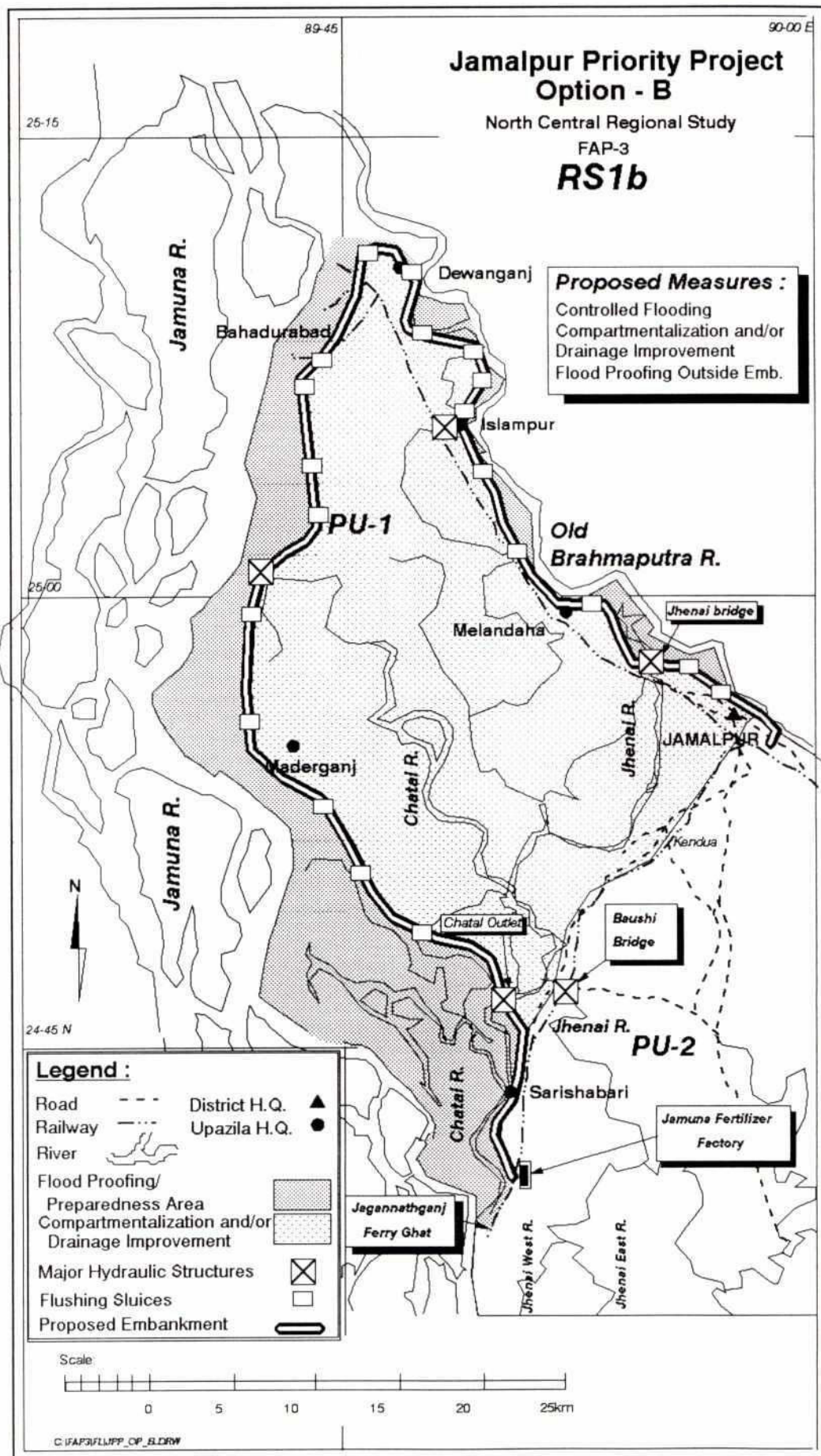


Figure : X.4.3

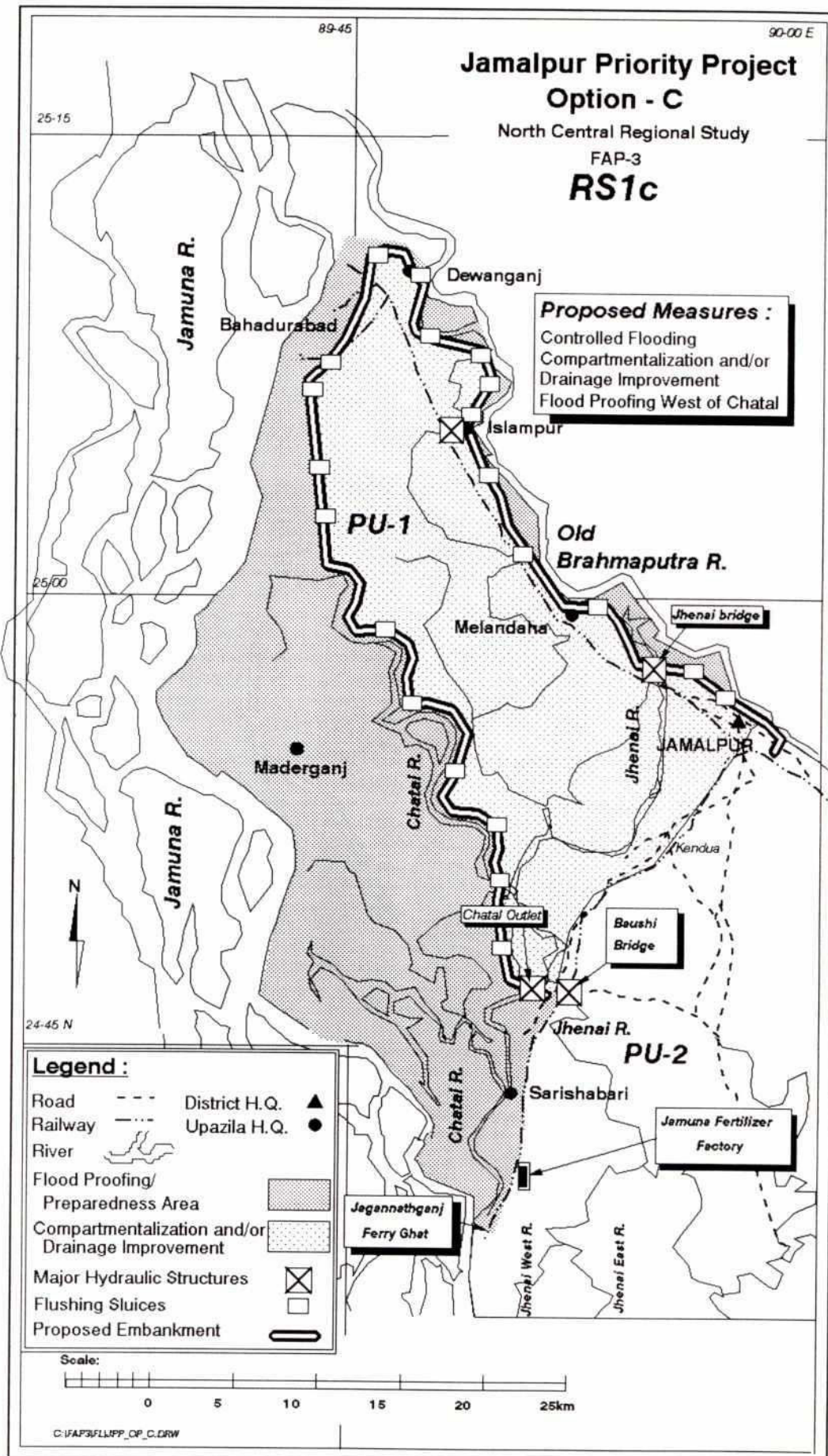


Figure : X.4.4

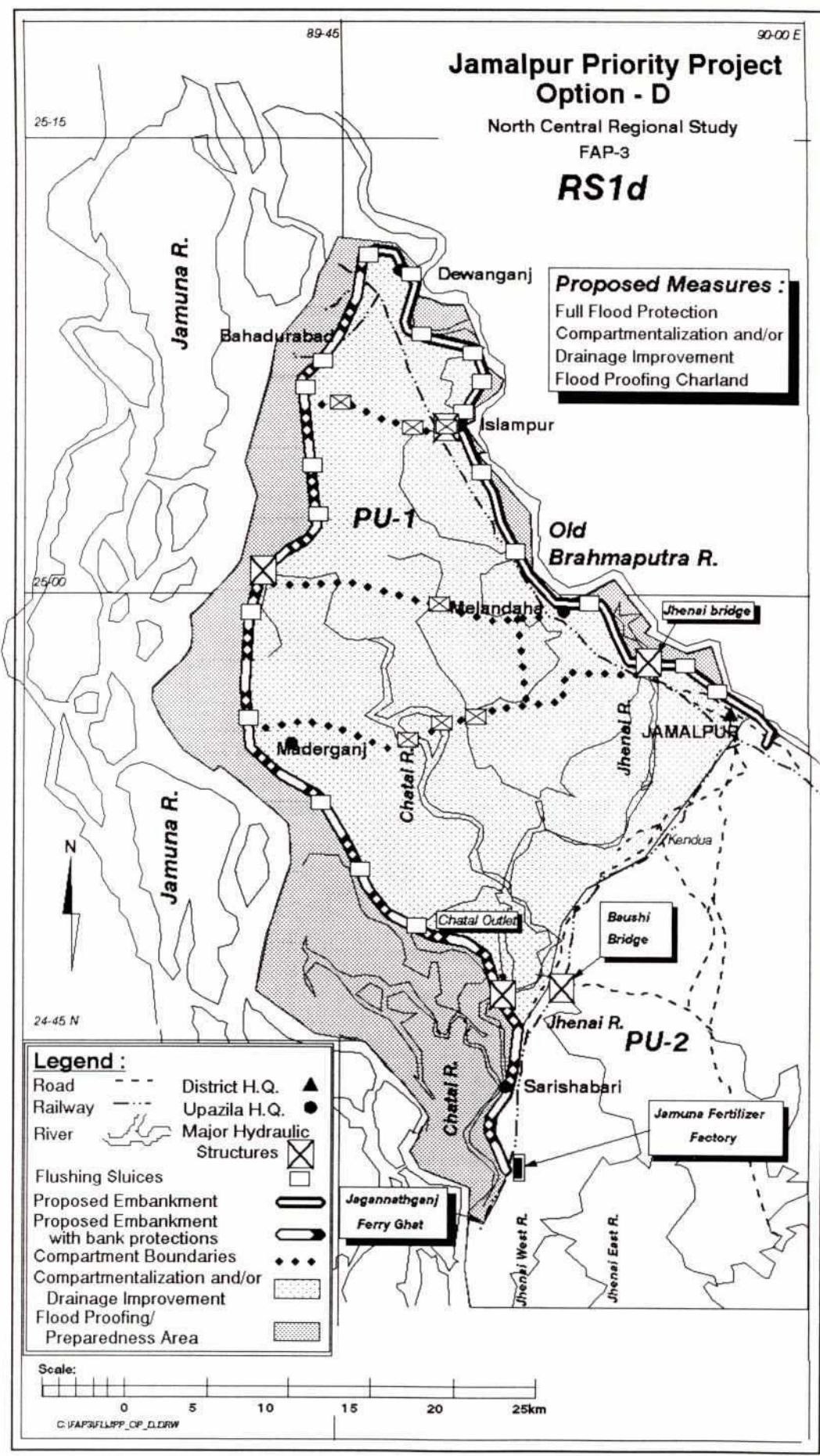


Figure : X.4.5

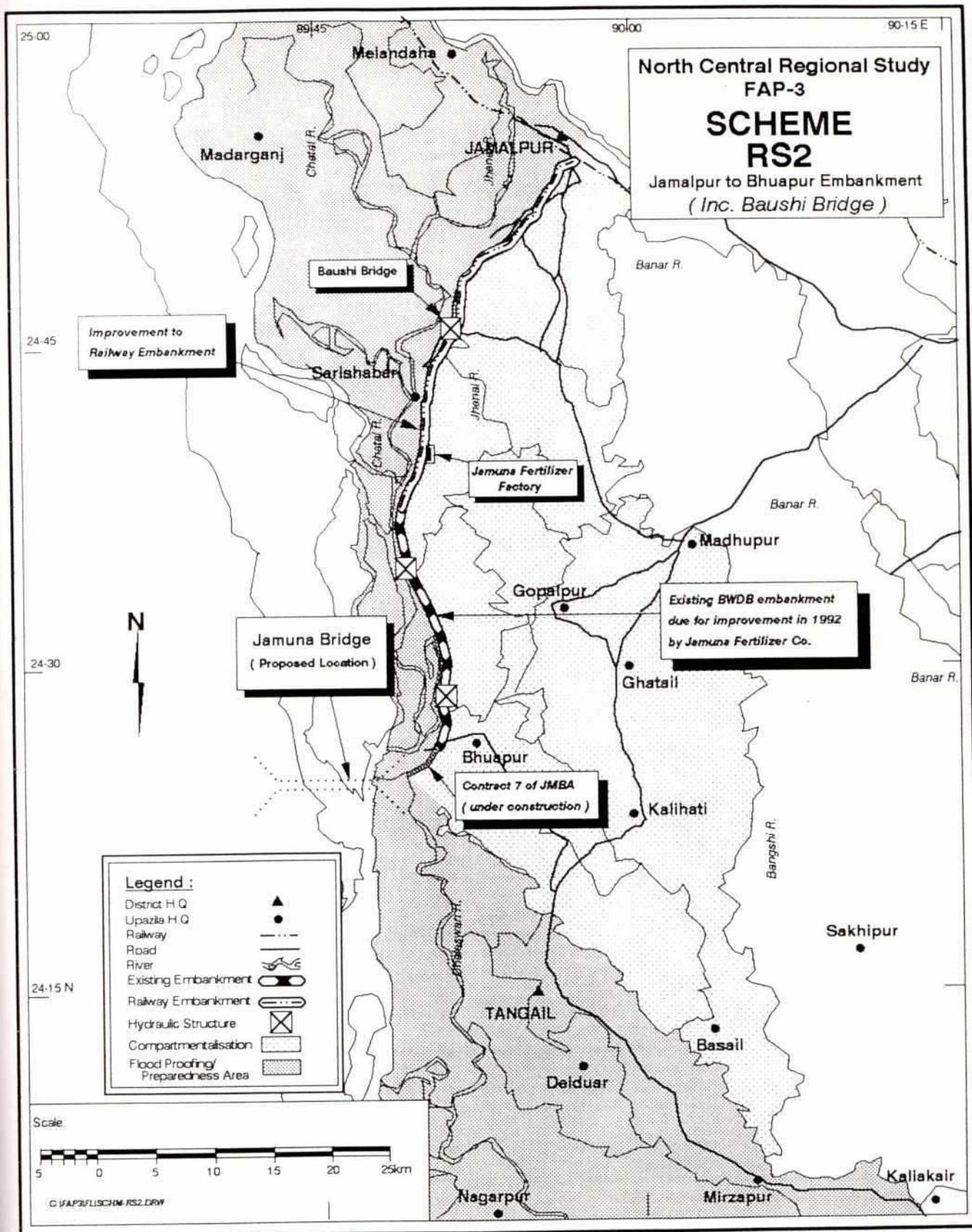


Figure : X.4.6

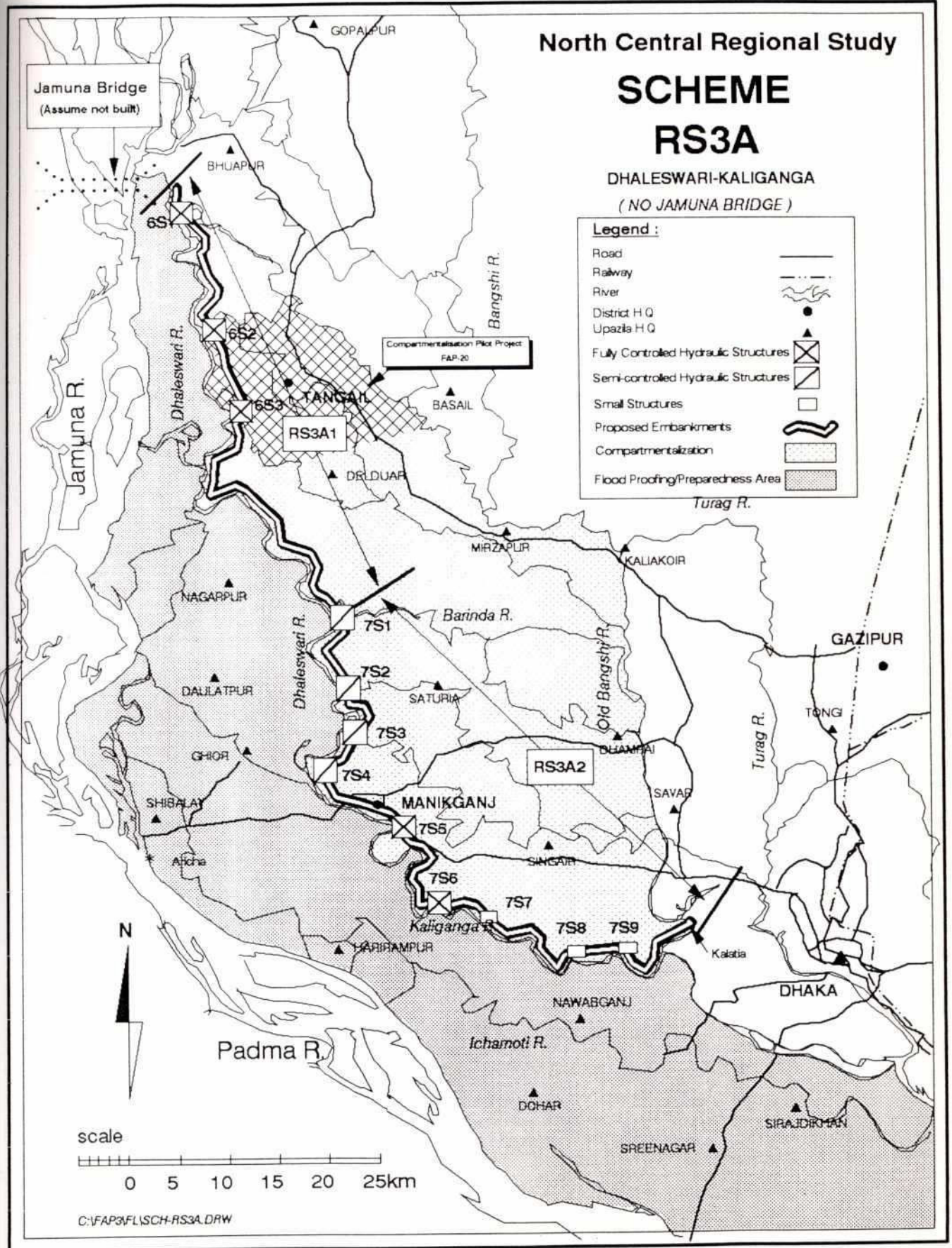


Figure : X.4.7

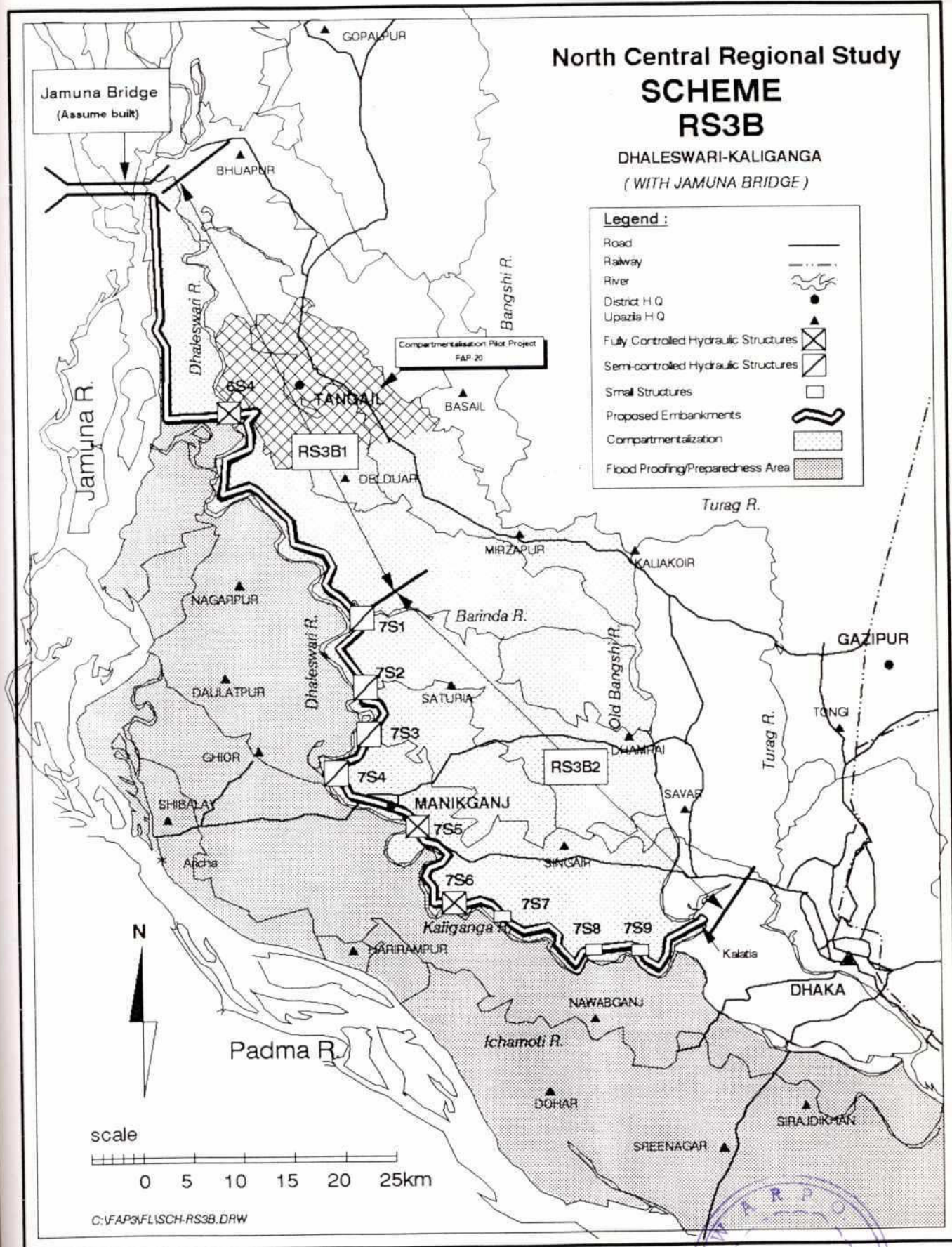


Figure : X.4.8

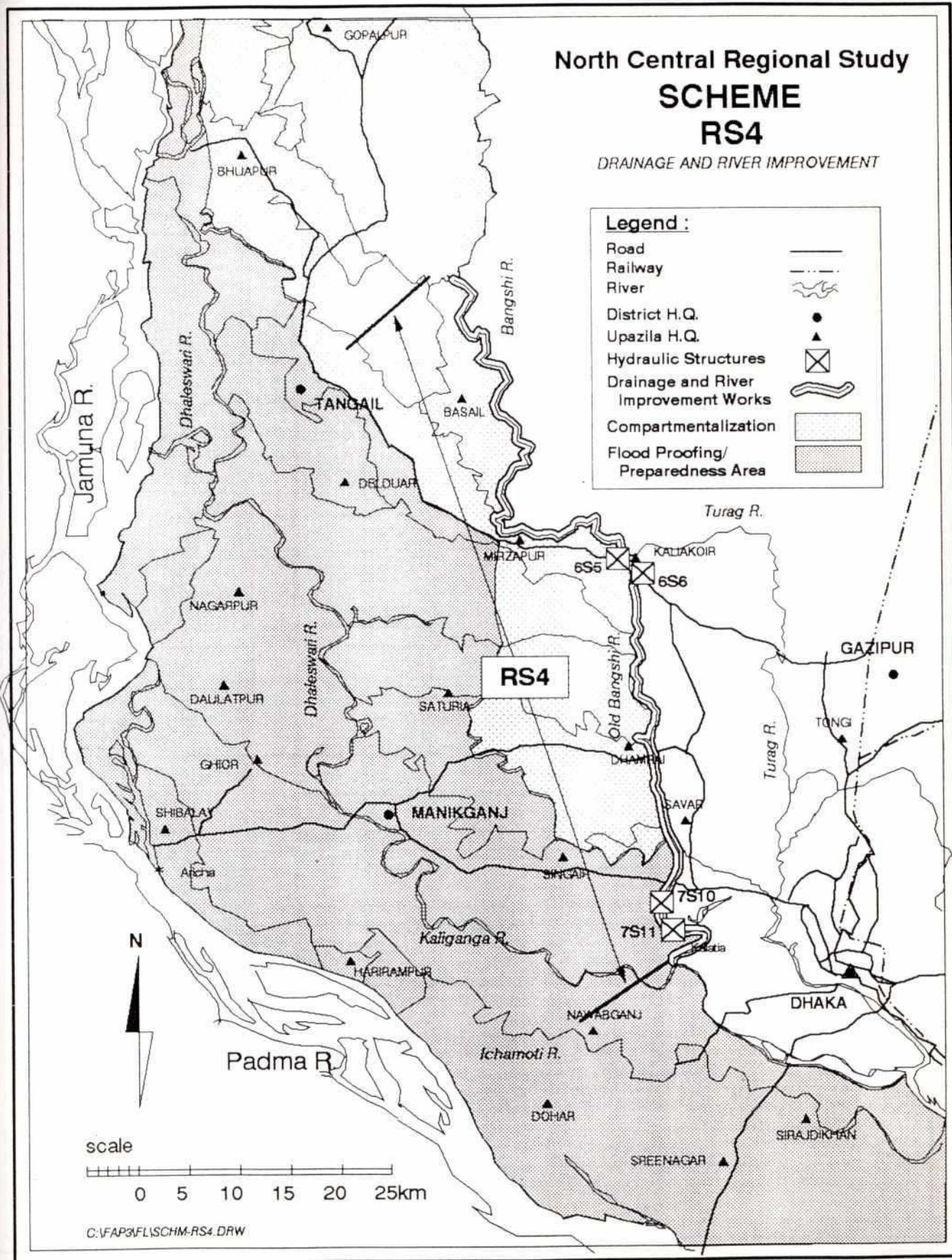


Figure : X.4.9

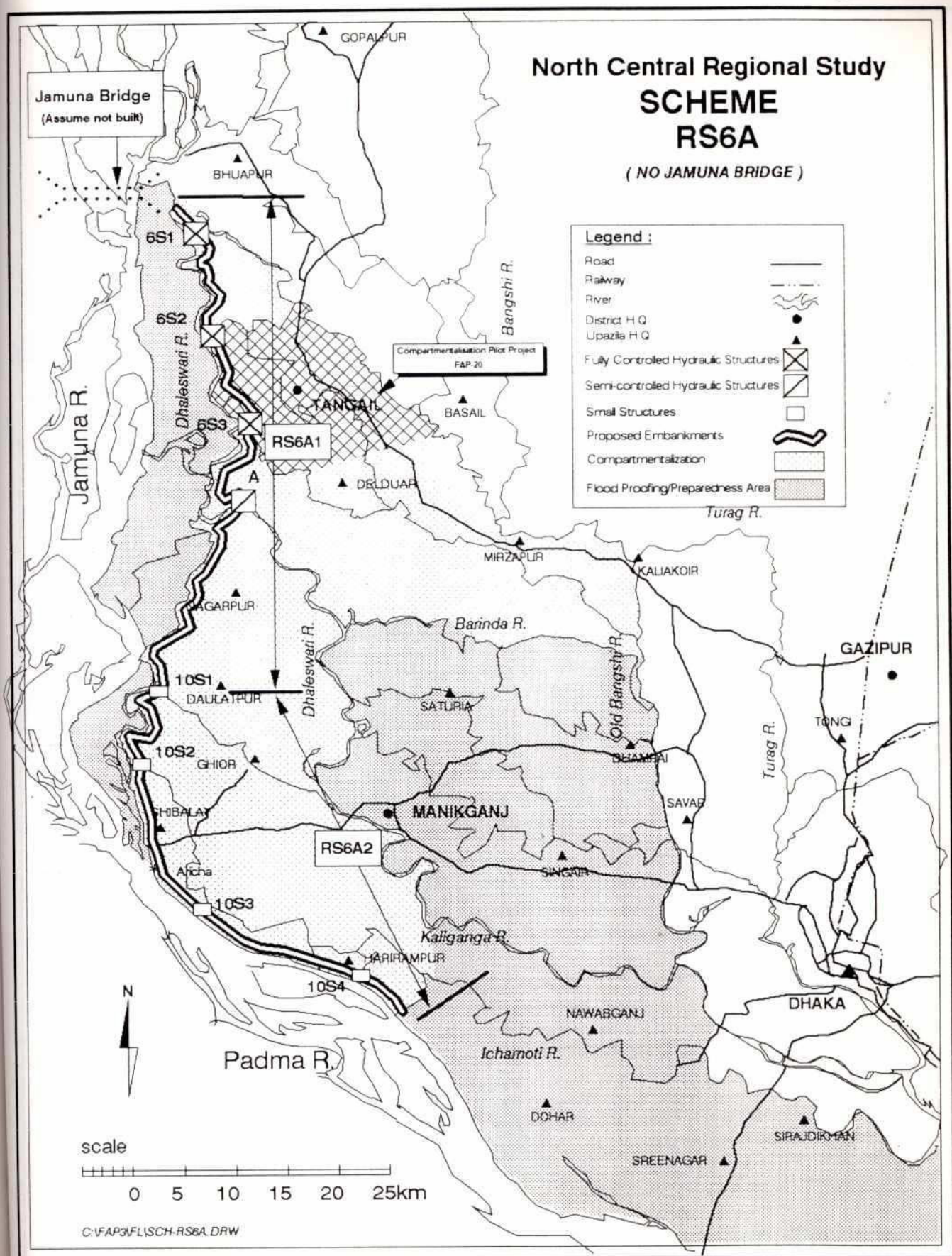


Figure : X.4.10

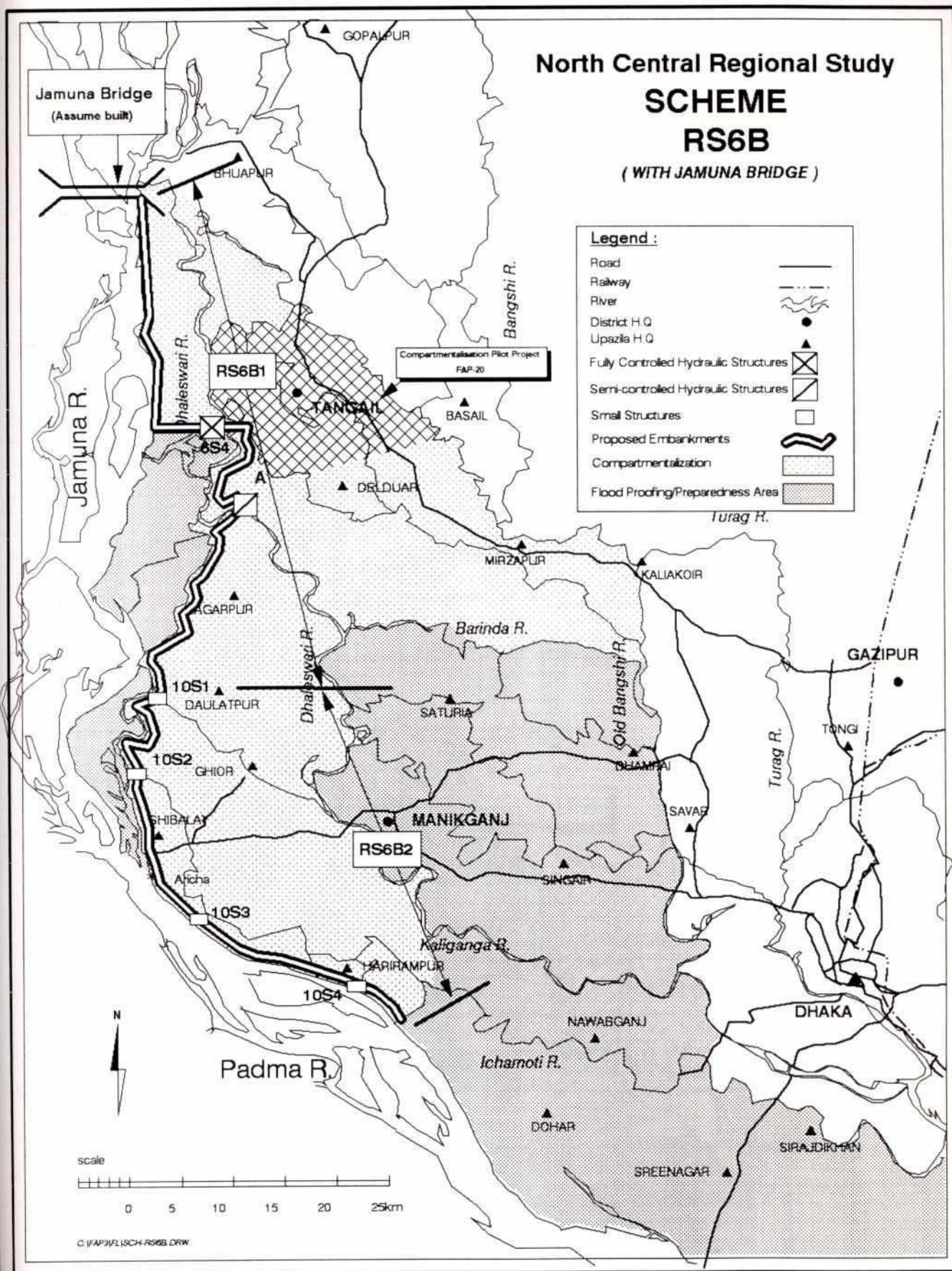
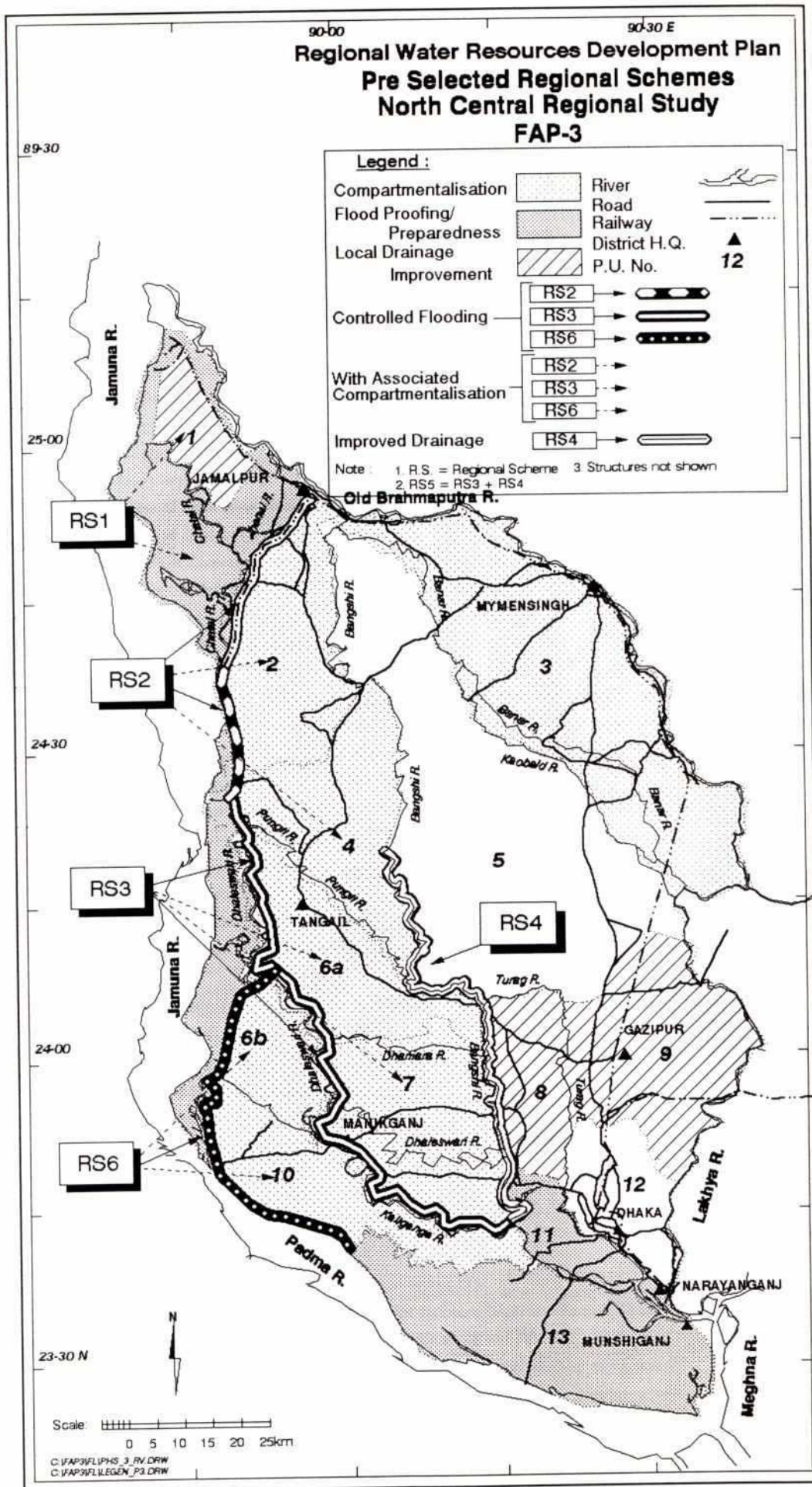


Figure : X.4.11



4.1.3 Possible Scenarios

In the context of further development of the North Central Region the following two sets of scenarios may be envisaged:

- One without Jamuna bridge as at present
- The other with Jamuna bridge and an associated guide embankment being constructed.

The following scenarios have accordingly been investigated and hydraulic model runs have been made relating to these scenarios as described in SR II.V, see also Table X.4.1 :-

A. Without Jamuna bridge

OA.	No structural development (simulated by the base run of the regional hydraulic model)
1.	Development of Jamalpur Pilot Project through RS1bN project (simulated by run B2).
2.	Development of Jamalpur Pilot Project through RS1cN only (simulated by run C2).
3.	Development of Jamalpur Pilot Project through RS1dN only (simulated by run D2).
4.	Drainage improvement of PU2, PU4, PU6, PU7 and PU8 through RS4 only (simulated by run 34).
5S-5C.	1st phase of Dhaleswari embankment through RS3A1S or RS3A1C only.
6S-6C.	1st phase of Dhaleswari embankment associated with RS4.
7S-7C.	2nd phase of Dhaleswari embankment only (simulated by run 33).
8S-8C.	2nd phase of Dhaleswari embankment associated with RS4.
9S-9C.	Jamuna embankment down to Harirampur only.
10S-10C.	Jamuna embankment associated with RS4
11.	RS2 project only.
12.	RS2 project associated with Jamalpur Pilot Project development through RS1bY project (simulated by run B1).
13.	RS2 project associated with Jamalpur Pilot Project development through RS1cY project (simulated by the run C1).
14.	RS2 project associated with Jamalpur Pilot Project development through RS1dY project (simulated by run D1).
15.	RS2 project associated with RS4 project (simulated by run 1).
16S-16C.	RS2 project associated with Dhaleswari embankment 1st phase (simulated by runs 9 and 7).
17S-17C.	As 16s or 16c associated with RS4 (simulated by runs 24 and 18).
18S-18C.	RS2 associated with Dhaleswari embankment 2nd phase (emulated by runs 5 and 3).
19S-19C.	As 18s or 18c associated with RS4 (simulated by runs 23 and 11).
20S-20C.	RS2 associated with Jamuna embankment only (simulated by runs 27 and 25)
21S-21C.	As 21S or 21C associated with RS4 (simulated by runs 28 and 26).

B. With Jamuna bridge (no impact on Jamalpur Pilot Project)

OB.	No structural development
22.	RS4 project only (drainage improvement)
23s-23C.	1st phase of Dhaleswari embankment
24S-24C.	As 23S or 23C associated with RS4.
25S-25C.	2nd phase of Dhaleswari embankment
26S-26C.	As 25S or 25C associated with RS4.
27S-27C.	Jamuna embankment only.
28S-28C.	Jamuna embankment associated with RS4.
29.	RS2 project only (simulated by run 16).
30.	RS2 associated with RS4 project (simulated by run 17).
31S-31C.	RS2 associated with Dhaleswari embankment 1st phase (simulated by runs 10 and 8).
32S-32C.	As 31S or 31C associated with RS4 (simulated runs 20 and 19).
33S-33C.	RS2 associated with Dhaleswari embankment 2nd phase (simulated by runs 6 and 4).
34S-34C.	As 33S or 33C associated with RS4 (simulated by runs 21 and 22).
35S-35C.	RS2 associated with Jamuna embankment (simulated by runs 32 and 29).
36S-36C.	As 35S or 35C associated with RS4 (simulated by runs 31 and 30).



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TABLE X.4.1
Scenario Components and Hydraulic Runs

Scenario	Scheme Components	Model Runs
<u>Without Jamuna Bridge</u>		
0A	No	0
1	RS1bN	B2
2	RS1cN	C2
3	RS1dN	D2
4	RS4	34
5S	RS3A1S	<u>9</u>
5C	RS3A1C	<u>7</u>
6S	RS3A1S+RS4	<u>24</u>
6C	RS3A1C+RS4	<u>18</u>
7S	RS3A1S+RS3A2S	<u>5</u>
7C	RS3A1C+RS3A2C	33
8S	RS3A1S+RS3A2S+RS4	<u>23</u>
8C	RS3A1C+RS3A2C+RS4	<u>11</u>
9S	RS6A1S+RS6A2S	<u>27</u>
9C	RS6A1C+RS6A2C	<u>25</u>
10S	RS6A1S+RS6A2S+RS4	<u>28</u>
10C	RS6A1C+RS6A2C+RS4	<u>26</u>
11	RS2	36
12	RS1bY+RS2	B1
13	RS1cY+RS2	C1
14	RS1dY+RS2	D1
15	RS2+RS4	1
16S	RS2+RS3A1S	9
16C	RS2+RS3A1C	7
17S	RS2+RS3A1S+RS4	24
17C	RS2+RS3A1C+RS4	18
18S	RS2+RS3A1S+RS3A2S	5
18C	RS2+RS3A1C+RS3A2C	3
19S	RS2+RS3A1S+RS3A2S+RS4	23
19C	RS2+RS3A1C+RS3A2C+RS4	11
20S	RS2+RS6A1S+RS6A2S	27
20C	RS2+RS6A1C+RS6A2C	25
21S	RS2+RS6A1S+RS6A2S+RS4	28
21C	RS2+RS6A1C+RS6A2C+RS4	26
<u>With Jamuna Bridge</u>		
0B	Jamuna Bridge only	37
22	RS4	<u>17</u>
23S	RS3B1S	<u>10</u>
23C	RS3B1C	<u>8</u>
24S	RS3B1S+RS4	<u>20</u>
24C	RS3B1C+RS4	<u>19</u>
25S	RS3B1S+RS3B2S	<u>6</u>
25C	RS3B1C+RS3B2C	<u>4</u>
26S	RS3B1S+RS3B2S+RS4	<u>21</u>
26C	RS3B1C+RS3B2C+RS4	<u>22</u>
27S	RS6B1S+RS6B2S	<u>32</u>
27C	RS6B1C+RS6B2C	<u>29</u>
28S	RS6B1S+RS6B2S+RS4	<u>31</u>
28C	RS6B1C+RS6B2C+RS4	<u>30</u>
29	RS2	16
30	RS2+RS4	17
31S	RS2+RS3B1S	10
31C	RS2+RS3B1C	8
32S	RS2+RS3B1S+RS4	20
32C	RS2+RS3B1C+RS4	19
33S	RS2+RS3B1S+RS3B2S	6
33C	RS2+RS3B1C+RS3B2C	4
34S	RS2+RS3B1S+RS3B2S+RS4	21
34C	RS2+RS3B1C+RS3B2C+RS4	22
35S	RS2+RS6B1S+RS6B2S	32
35C	RS2+RS6B1C+RS6B2C	29
36S	RS2+RS6B1S+RS6B2S+RS4	31
36C	RS2+RS6B1C+RS6B2C+RS4	30

Note:- Underline means representative run used

Source:- PSR II V

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4.2 Cost/Benefit Analysis

4.2.1 Cost Estimates

The different components of elementary projects are described in the engineering section (see SR VII). They have been costed at market price in agreement with FPCO guidelines for Project Assessment, using unit rates published by BWDB.

Project cost estimates at market prices are shown in Table X.4.2.

The corresponding economic prices have been worked out following FPCO guidelines using updated conversion factors as shown in Table X.4.3

Project costs at economic prices, employment per construction and O&M, and land losses are shown in Table X.4.4. Project costs for the different scenarios are reported in Table X.4.5 and X.4.6 without duplication of investment for local improvements in water management units.

4.2.2 Assessment of Project Benefits and Disbenefits

a. General

The anticipated effect of projects will result from changes in flooding conditions, i.e., % of total area flooded as F0 (0 to 30 cm), F1 (30 to 90cm), F2 (90 to 180 cm) and F3 (more than 180 cm), and area protected against exceptional floods.

Flooded areas in normal year have been determined by simulations of the regional hydraulic model (see SR II.5) and necessary interpolation for the scenarios not covered by a specific run of the model. The areas protected against exceptional floods (5 to 100 years return period) were estimated by the consultant as a result of proposed design and of hydrological information.

Project benefits and disbenefits can be identified as follows:

- modifications of cropping systems, yields increase,
- decrease of crop losses due to flood,
- land losses for infrastructures,
- modifications of flood plain fish resources,
- decrease of flood damage losses to dwellings, industries and public infrastructures.

Other direct economic impacts may be considered as negligible. Livestock industry is not directly linked with flood occurrences and much more concerned with cropping intensity which is already high. With the projects envisaged here, there will be a slight increase of the cropping intensity, thus probably a slight decrease of bovine livestock (see Table X.3.4) and of corresponding production. This will probably be compensated by an increase of small livestock and chicken - W and WO project benefits are considered similar and not accounted for. Forestry is marginal in NCR and is not expected to develop as a result of water development projects

b. Without Project Situation

The basic assumptions taken in the Study's analysis of the without project (WO) situation are as follows:-

- There will be no major change of cropping patterns and of varieties (local, HYV), which means that the cropped areas of Aus (local and HYV), and of Aman (Broadcast, transplanted local and transplanted HYV) will not vary. Thus for these crops the present cropping patterns are reflecting the without project future situation.
- The rate of development of irrigation, which is basically under private initiative, will not be modified by the project, with the assumption taken, which is to consider that flood protection and drainage will not be a pre-requisite to develop irrigation in most of the areas (however in the next stages of study, feasibility level, drainage conditions will need to be investigated at a local level, and this assumption will have to be reassessed). The irrigated areas being the same in the WO and WP situation, irrigation is no longer considered in the economic analysis.
- Yields have been kept constant, which is a rather conservative assumption. In fact, when considering the target yields in the protected areas, they have been estimated as equivalent to the best yields which are already observed in the most favourable PU (i.e. when the floods have a minor incidence). Technical progress, however, is taking place and yields are generally accepted to be increasing at an average rate of 1 to 2% per year. If for a specific crop, in a specific area we adopt the following abbreviation:-

Y_f	=	present yield
Y_{wo}	=	WO yield at the project horizon (30 years)
Y_w	=	W yield at the project horizon (30 years)
Y_{pm}	=	Maximum observed present yield in flood protected areas, taken as target yield after flood protection

This study could have considered the following yield estimates:-

$$\begin{aligned} Y_{wo} &= (1.0x)^{30} Y_p \\ Y_w &= (1.0x^1)^{30} Y_{pm} \end{aligned}$$

x being the WO yield yearly rate of increase due to the technical progress, x^1 being probably slightly above x, with the improvements brought by the project, or assuming that $x^1 = x$ (conservative assumption)

$$Y_w - Y_{wo} = (1.0x)^{30}(Y_{pm} - Y_p)$$

Thus $Y_{pm} - Y_p$ would at the minimum be multiplied by a coefficient of 1.3. As it is difficult to assess the target yield. We have, however made a conservative estimate by neglecting this theoretical 1.3 correcting factor.

This means that the WO situation is represented by Y_p (present yield), whereas the WP situation is Y_{pm} , the best observed present yield in the same conditions

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c. **Agricultural Benefits**

Methodology

Major changes which are likely to take place with a flood protection project are anticipated to be:

- Some transformations of cropping patterns together with a shift towards the use of higher yielding varieties,
- An increase of cropping intensity,
- The application of higher levels of inputs.
- Reduction in crop losses and damage
- Increased agricultural employment

The FAP-12 FCD/I agricultural study (FAP-12 1992) has shown that usually:

- "The major impact of FCD/I projects has been on cropping patterns in the kharif season. Reduced flood depths and durations led to a move from B.Aman to TL Aman and T. Aman HYV, and sometimes from B.Aman to Aus followed by T.Aman.
- In general, changes in cropping patterns made possible by FCD/I interventions tend to increase the preponderance of paddy, as this is the main monsoon crop and it generally gives the highest financial returns.
- FCD/I projects have rarely resulted in increased cropping intensities. Project impacts on cropping intensity are in general modest, except where irrigation alleviates a soil moisture constraint in the Boro or Aus season crops. However, most FCD/I projects affect only the monsoon season, when most land would be cultivated in any case".

In the GPA (FPCO 1992) specific attention is given to the assessment of benefits accruing from irrigation by tubewells through private investments:-

- "Crop produced through private investments" : "in the W and WO cases these will cancel out unless the project influences the rate of private investment".

A careful analysis of possible transformation of cropping systems in NCR following the improvement of flood protection, drainage and water management induces the following conclusions:

- i) The conversion of flooded land into land which is not flooded at all, or flooded up to 20 or 30 cm, with a very short duration, permits the growing of HYV T.Aman. This is the major improvement: Local Aman (Broadcast or transplanted depending on the present severity of flooding) is converted into HYV T.Aman. (Note that HYV/L T. aman is only suitable on FO land with non-permeable soils). In the lower areas, where deep water Aman is presently grown, this shift to HYV T.Aman is possible only if a good drainage system is developed along with accompanying flood protection.

Aus crop is usually not affected, as it is harvested before the flood. However flood protection prevents the damage due to exceptional floods to this crop (this may encourage farmers to deliver some supplemental irrigation for Aus crop).



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- ii) Cropping intensity changes. Flood protection may facilitate the possibility to grow an Aman crop where flooding previously prevented it, however in most cases there is actually no increase of cropping intensity as the new Aman crop replaces a shorter cycle kharif crop.

Cropping intensity changes are also linked to the development of irrigation. Irrigation has been developed to grow primarily rice (which represents often more than 90% of irrigated crops) and sometimes potatoes and vegetables (see PU 13). Although increased irrigation will generally result in increased output, the cropping intensity may fall (e.g. B.aman +/- aus - rabi may be replaced by a single crop of boro i.e., triple or double cropped replaced by a single crop) In NCR irrigation with STW and DTW has been developed independently of flood protection, and this will continue in the future. In deeply flooded area Boro cropping may also be benefitted from early drainage rather than flood protection. However flood protection is a pre-requisite to develop irrigated boro in two cases:

- where early floods prevent this crop, which is exceptionally the case in NCR,
- in very deeply flooded areas, which have not drained until mid or end of December. In this case benefits of flood protection and irrigation cannot be separated, all costs and benefits of flood control, irrigation and drainage have to be considered in the economic analysis.

The NCRS has been limited in its analysis of irrigation by the poor accuracy of information available on flood phases, see Section 4.1.1, and this has hindered the quantification of the impact of controlled flooding on irrigation at this stage of study. It has therefore been assumed that the development of irrigation will be the same in the WO and W project situations, but this assumption should be revised at the feasibility study stage.

- iii) A higher level of inputs is used in kharif season due to the increase level of security (from FCD), which makes the investment more profitable. This concerns mainly the crops which benefit directly from the flood control plan: specifically HYV T.Aman. It is possible that these effects will concern some other crops, but this is very difficult to assess. The economic analysis thus considers a higher level of inputs used, and higher yields that are induced with the project.

The principles described above have been developed following the "Guidelines for Project Assessment" (FPCO 1992).

Irrigation

A basic assumption in the economic analysis has been not to consider any investment programme in irrigation as resulting from or being closely linked with the flood control options. Consequently, it is assumed that the development of irrigation, mainly due to private initiative at present will remain the same in WO and W project situations.

The attached map (Figure X.4.12), prepared with the data provided in SR II.4, shows that this assumption is reasonable in Jamuna and Padma flood plains as explained below :

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In PU 1, the potential of STW is higher (119%) than the total forecast water demand and thus there is little impact of controlled flooding on irrigation development. In PU 2, 4 and 6, most of irrigation development can be completed with STW as respectively 94%, 95% and 86% of the potentially irrigable area can be irrigated with the STW technique. The remaining part can be developed using the DSSTW.

In PU 7, 10 and 13 the STW potential is much lower, and corresponds respectively to 56, 65 and 41% of the needs. However current irrigation developments are still very low, with 37, 36 and 14% only of STW potential being presently used. It is thus assumed that in the next 20 years even in these areas irrigation can be based on STW private investments.

However, it appears that in PUs 7,10 and 13 flooding has an influence on the development of irrigation (see Section 4.3.2). In these areas it is anticipated that the rate of development of irrigation will be much higher in W than in WO situation. This should be considered in subsequent stages of the study as it has not been possible at this stage to quantify the effect projects may have on irrigation development (this needs more detailed drainage studies).

Agricultural studies (such as FAP 12) show that the main crops affected by floods are Deep Water and Transplanted Aman. The strategy of farmers is to minimise risks by planting the varieties that can be safely grown. This strategy is confirmed by cropping patterns in different areas with different flood patterns.

Detailed estimations of the effect of project proposals on cropping patterns should be made at the feasibility level of analysis, however at this pre-feasibility study level preliminary estimations have been made of the main anticipated agricultural practices in accordance with the GPA (FPCO 1992). This has involved making estimates based on crop yields and cropping patterns already grown elsewhere in the region on land with similar flooding patterns and soil types. (This approach allows for the present farmers' approach to deciding on cropping patterns by assuming that farmers' future decisions on improved land will be as those taken by other farmers already cropping on similar land). The NCRS used an approach which has evolved out of that used by the MPO (MPO 1987). The MPO's approach for Flood Control with Gravity Drainage (FCD) assumed the following:-

100% of F1 class land moves to F0 class land

75% of F2 class land moves to F0 class land, 25% of F2 class land moves to F1 class land

20% of F3 class land moves to F1 class land, 45% moves to F2 class land, 35% remains as F3 class land

The NCRS, through the hydraulic model allows for a more specific analysis, in that the model predicts the changes in flood phases resulting from the development scheme under consideration. It should be reminded however, that the analysis at this stage has been based on a coarse pilot model, and it would be inadvisable to rely entirely on the results of the model (more detailed analysis should be carried out with an improved and more detailed model at feasibility level).

The resultant methodology for this pre-feasibility level of study, is as follows:-

i) For DW Aman

Future area = present area $\times f_1/p_1$

with p_1 = present proportion of (F2 + F3)

f_1 = future proportion of (F2 + F3)

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ii) For T.Aman (Local and HYV)

$$\begin{aligned}\text{Future area} &= \text{present area} + \text{NCA} \times (p_2 - f_2) \\ \text{with NCA} &= \text{net cultivable area (total)} \\ p_2 &= \text{present \% of } (F_0 + F_1 + F_2 + F_3) \\ f_2 &= \text{future \% of } (F_0 + F_1 + F_2 + F_3)\end{aligned}$$

F₀ being taken in a restrictive sense, excluding all flood free zones as shown in SR II.5, Annex II.15.

This gives an estimation of the total area of Aman cropping based on present proportions under Aman of the total area flooded and predicted changes in flooded area (future T. Aman area is increased by assessing the difference between flooded area at present and in the future); note that the Aman crops grown are mainly on the F₀ and F₁ lands within the total flooded area. The split between HYV and Local varieties is estimated by observing present practices and thus:-

T.Aman (HYV) is taken as the HYV% of the total Aman area as observed in the less flooded thana (subject to the condition $f_2 < p_2$, otherwise as at present)

Other crops are not expected to change significantly as a result of proposed infrastructures. Present yields and crop budgets have been used to calculate expected gross produce, production costs and net income in a normal year at economic prices. Land losses are deducted as a percentage of total area in each Planning Unit concerned.

The results of the above approach have been checked and found to give consistent results. Although adequate for regional planning purposes, more detailed analysis will be required at the feasibility study level. The TOR for the feasibility studies include for the carrying out more detailed field surveys and for the development of a sub-regional model based on improved topographical and hydrological data that should give a more accurate representation of the flood situation.

Flood Damage

Flood damage losses have also been estimated, (see SR X.2, Table X.2.30) and the percentage of protected area in each Planning Unit with each scenario is taken into consideration to determine the residual losses and the average net agricultural income. Average flood damage to Dwellings, Industries and Public Infrastructures for different levels of protection have also been estimated with the percentage of protected area used to estimate the impact of proposed projects.

C. Impact on Flood Plain Fishery

As explained in the Fishery report (see SR III), the estimate of fish resources in flood plains is assumed to be proportional to the area flooded with a depth above 30 cm (F₁ + F₂ + F₃) as determined by the hydraulic model.

The results of this estimate are shown in Table X.4.9 and X.4.10. A conversion factor of 1 is assumed from market to economic prices.

D. Decrease of Flood Damage to Dwellings, Industries and Public Infrastructures

Average flood damage for different levels of protection was estimated in Table X.2.31. The percentage of protected area is used to estimate the impact of proposed projects. A conversion factor of 1 is assumed from market to economic prices.

Some broad indicators on damage reductions are given below for a few typical schemes, results are summarised in Table X.4.11:-

Scheme	PU	(1) Present Average Flood Damage	(2) Damage Reduction with protection (million Taka)	(3) % of (1)
RS1bN	1	51.9	26.9	52
RS2	2,4	126.7	32.8	26
RS3A1C	6	84.5	20.4	24
RS3(A1+A2)C	6,7	181.0	79.0	44
RS4	4,6,7	242.0	-	0
RS6(A1+A2)	6,10	96.4	18.3	19

Note: the detailed analysis has also considered minor parts of other PU also concerned by the proposed schemes. These damage reductions have been calculated by using flood intensity index adjusted to a Gumbel Law (see Table X.2.2). Damages have been correlated with the flood severity for each main category of damage (Crops, Households, Infrastructure, Industries, Tables X.2.7,X.2.16,X.2.21,X.2.27,X.2.28,X.2.30, and X.2.31). Then a recapitulation has been made, giving due consideration to the importance of each category. As an example, the table below gives the damage reduction coefficients for standard degrees of flood protection for RS1b(PU1):-

Standard Degree of Flood Protection	20 years	50 years	100 years
Damage reduction to crops ¹	52%-65%	29%-35%	13%-20%
Damage reduction to Households	66%	34%	19%
Damage reduction to Infrastructure	61%	33%	18%
Damage Reduction to Industries	70%	43%	25%

¹ First figure: Broadcast Aman, Second figure: Transplanted Aman, Overall with a 40 year flood protection, damage reduction was 52% as shown above.

4.2.3 Economic Indicators of Worthiness

Project costs and benefits or disbenefits are summarised in Table X.4.11 and X.4.12 which differentiate the without and with Jamuna bridge situations. It is assumed that construction is completed within 3 years and that the agricultural benefits grow after construction at the rate of 20% per year i.e. full benefit achieved in year 8, (this being consistent with the recommendations of FPCO guidelines), that each elementary project or project phase can be constructed in 3 years and will bring its own benefits. A more detailed analysis will be necessary in a next stage and is considered not appropriate in this preliminary analysis (obviously some of the scenarios will need 5 years or more to be implemented). However it is considered that no major bias is introduced in the analysis by the 3 years construction assumption, with the costs and benefits moving in parallel.

a) Without Jamuna Bridge

Among the 34 Scenarios which have been compared to the base case (the reference situation), 13 appear economically feasible. Their economic ranking is as follows:-

When comparing individual components, RS3, phases 1 and 2 (Dhaleswari-Kaliganga Embankment), have the highest EIRR and NPV then RS2 (flood control between Jamalpur and Bhuapur). Consequently, all alternatives which group them together are good, and sometimes also scenarios including a third component (5 scenarios with RS4, 2 with RS1b, 2 with RS6). However the RS4-drainage improvement of Bangshi river shows a low EIRR (6%) and it may not be advisable to keep the 3 scenarios including it. In the case of RS1b, the EIRR reaches 12% if the cost of flood proofing is excluded (or 10.3% including flood proofing costs but no benefits). RS1b also has hydraulic interrelations with RS2 and should be for further analysed. RS6 shows an EIRR of 10.9%, but would be a high risk investment, see discussion in Chapter 6.

The sensitivity analysis confirms the feasibility of RS2 and RS3 as described in Section 4.2.4.

b) With Jamuna Bridge

It is much more difficult to compare the various scenarios of the with Jamuna Bridge situation. The hydraulic model of the with Jamuna bridge base case cannot be well calibrated and thus may not be representative. It has been found to be difficult to differentiate the impacts of the Jamuna bridge alone, and that of additional structures. However the provisional analysis confirms RS2 is as an outstanding scenario, which seems a sound conclusion, as Jamuna bridge has only small interferences with this scenario. All other scenarios (except RS1b which is not significantly effected by the bridge) have much lower EIRR with Jamuna bridge than without it. The combination of RS2 and RS3 remains attractive (EIRR of 15.4%), as do combinations of RS4 with RS2 and RS2 & RS3. However, the EIRR of RS4 again shows as rather low (8.3%), and alternatives with RS4 were no longer considered in the analysis.

In conclusion it was decided to concentrate the efforts on more detailed comparisons of above selected scenarios without Jamuna bridge, and to provide some additional information with Jamuna bridge on certain scenarios including RS2.

4.2.4 Sensitivity Analysis

Sensitivity analyses have been carried out on the significant variables as follows :

i) On the cost side : construction costs and the time required for construction. The sensitivity analysis thus assumes 2 possibilities:

- Duration of construction doubled from 3 years to 6 years;
- Construction costs doubled.

This method was preferred to the "switching values" method, the results being easier to interpret due to the large number of scenarios which have been considered.

ii) On the benefit side:

- Changes of cropping patterns, in relation to changes of flood categories (assessed through the hydraulic model).
- Consideration of indirect benefits, which could add up to 40% to direct agricultural benefits.
- Macro-economic impacts (see Section 4.3.7)

On the benefit side only this last factor has been systematically considered. Changes of cropping patterns have been compared with two sets of runs of the model in the without Jamuna bridge situation. The sensitivity analysis has considered indirect benefits in PU1 only. Other factors are deemed minor when compared to those.

The results of the sensitivity analysis are shown in Table X.4.13. If these analyses are taken into account then only 4 scenarios still appear definitely feasible without Jamuna bridge. They consist of

- First phase of Dhaleswari embankment only (RS 3.1)
- First and second phase of Dhaleswari embankment only (RS3, 1 & 3)
- First phase of Dhaleswari embankment associated with RS2 (Baushi bridge structure and upgraded embankments in PU2), or second phase of the same with RS2.

Only 1 scenario appears feasible in all circumstances with Jamuna bridge. It consists of the construction of RS2 alone (flood control between Jamalpur and Bhuapur).

TABLE X.4.2
Project Cost Estimates

Project Cost Estimates																
Project designat.	Major embankments				Major Structures	Water Management Units						Total construct. costs	Physical contingenc. 25 %	Admin. & engin. cost 15 %	Total financial cost O&M struc	O & M earth= 6.00% 3.00%
	Loss of land (ha)	Land acquisit. cost	Royalty cost road factor=	Embankm. (earthwork) 100.00%		Loss of land (ha)	Land acquisit. cost	Embankm. (earthwork)	Structures	Roads	Channel improv.					
RS1bY *	490	132.25	59.91	334.52	262.91	115	30.92	30.65	123.68	0.00	62.40	1037.24	259.31	194.48	1491.03	53.55
RS1bN *	447	120.57	53.91	300.99	244.5	115	30.92	30.65	123.68	0.00	62.40	967.62	241.91	181.43	1390.95	49.86
RS1cY *	563	151.82	86.76	484.38	218.38	135	36.39	38.87	151.06	0.00	62.40	1230.06	307.52	230.64	1768.21	66.44
RS1cN *	519	140.14	80.08	447.13	199.97	135	36.39	38.87	151.06	0.00	62.40	1156.04	289.01	216.76	1661.81	62.44
RS1dY *	701	189.02	108.01	603.08	1588.61	115	30.92	30.65	123.68	0.00	62.40	2736.37	684.09	513.07	3933.53	133.88
RS1dN *	657	177.35	101.34	565.82	1570.9	115	30.92	30.65	123.68	0.00	62.40	2663.06	665.77	499.32	3828.15	129.91
RS2	184	49.60	28.34	158.25	55.94	148	39.90	28.99	138.85	6.92	57.99	564.78	141.20	105.90	811.87	30.15
						146	39.52	28.72	137.52	6.85	57.43	270.04	67.51	50.63	388.18	13.95
RS3A1S	241	65.02	37.16	207.46	76.37	142	38.26	27.80	133.14	6.63	55.60	647.44	161.86	121.40	930.70	34.69
RS3A1C	241	65.02	37.16	207.46	87.31	142	38.26	27.80	133.14	6.63	55.60	658.38	164.60	123.45	946.42	35.17
RS3A2S	409	110.29	63.02	351.86	19.07	174	47.03	34.17	163.66	8.15	68.35	865.60	216.40	162.30	1244.30	47.77
RS3A2C	409	110.29	63.02	351.86	156.98	174	47.03	34.17	163.66	8.15	68.35	1003.51	250.88	188.16	1442.55	53.72
RS3B1S	106	28.69	16.39	91.53	1.56	142	38.26	27.80	133.14	6.63	55.60	399.60	99.90	74.93	574.43	21.47
RS3B1C	106	28.69	16.39	91.53	1.56	142	38.26	27.80	133.14	6.63	55.60	399.60	99.90	74.93	574.43	21.47
RS3B2S	409	110.29	63.02	351.86	19.07	174	47.03	34.17	163.66	8.15	68.35	865.60	216.40	162.30	1244.30	47.77
RS3B2C	409	110.29	63.02	351.86	156.98	174	47.03	34.17	163.66	8.15	68.35	1003.51	250.88	188.16	1442.55	53.72
RS4	485	145.18	82.96	463.18	16.07	305	82.17	59.71	285.94	14.24	119.42	1268.87	317.22	237.91	1824.00	69.65
RS6AS	533	143.91	82.23	459.14	213.87	194	52.32	38.02	182.07	9.07	76.04	1256.67	314.17	235.63	1806.46	67.30
RS6AC	533	143.91	82.23	459.14	227.41	194	52.32	38.02	182.07	9.07	76.04	1270.21	317.55	238.16	1825.93	67.88
RS6BS	399	107.57	61.47	343.20	139.63	194	52.32	38.02	182.07	9.07	76.04	1009.39	252.35	189.26	1451.00	54.09
RS6BC	399	107.57	61.47	343.20	142.23	194	52.32	38.02	182.07	9.07	76.04	1011.99	253.00	189.75	1454.74	54.21
RS7AS	901	243.19	138.97	775.89	225.35	194	52.32	38.02	182.07	9.07	76.04	1740.92	435.23	326.42	2502.57	95.11
RS7AC	901	243.19	138.97	775.89	317.13	194	52.32	38.02	182.07	9.07	76.04	1832.70	458.18	343.63	2634.51	99.07
RS7BS	767	206.86	118.20	659.97	151.11	194	52.32	38.02	182.07	9.07	76.04	1493.66	373.42	280.06	2147.14	81.91
RS7BC	767	206.86	118.20	659.97	231.95	194	52.32	38.02	182.07	9.07	76.04	1574.50	393.63	295.22	2263.34	85.40

* Y: Including Baushi Bridge Structure, N: Not Including Baushi Bridge Structure

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TABLE X.4.3
Basis for Conversion of Project Costs from Market Prices to Economic Prices

	Conversion factor	Content of project costs in % of base cost			
		Embankm. (earthwork)	Structures	Roads	Channel Improv.
1. Skilled labour	0.87	4.00	14.00	7.00	4.00
2. Unskilled labour	0.72	63.00	8.00	49.00	63.00
3. Transport equipment	0.68	1.00	1.00	1.00	1.00
4. Cement	0.79		17.00	4.00	
5. Steel (Basic metal)	0.75		34.00	9.00	
7. Machinery	0.62	32.00	9.00	26.00	32.00
10. Bricks	0.87		17.00	4.00	
12. Physical contingencies	0.87	25.00	25.00	25.00	25.00
13. Engineering & Admin.	0.87	18.75	18.75	18.75	18.75

Conversion factor on O&M estimated at 0.75 as a weighted average of the miscellaneous items

TABLE X.4.4
Project Costs, Employment and Land Losses

Project designat.	Including Water Management Units						Not including Water Management Units						Including WMU			Not incl. WMU		
	Financial			Economic			Financial			Economic			Employment		Land losses (ha)	Employment		Land losses (ha)
	Investment		O&M	Investm.	O&M	Loc. cost	For. cost	O&M	Investm.	O&M	Constr.	O&M	Constr.	O&M				
	Loc. cost	For. cost																
RS1bY	962.18	528.86	53.55	992.59	40.16	718.76	436.12	40.19	672.92	30.14	13.7	0.8	605	11.5	0.6	490		
RS1bN	895.58	495.38	49.86	928.49	37.40	652.16	402.65	36.50	620.18	27.38	12.6	0.7	562	10.4	0.6	447		
RS1cY	1210.41	557.80	66.44	1162.27	49.83	920.16	451.29	51.20	784.11	38.40	16.7	1.0	698	14.1	0.8	563		
RS1cN	1140.19	521.62	62.44	1093.91	46.83	849.94	415.12	47.19	727.82	35.39	15.6	0.9	654	13.0	0.7	519		
RS1dY	1965.11	1968.42	133.88	2858.58	100.41	1721.70	1875.69	120.52	2261.74	90.39	28.5	1.4	816	26.2	1.3	701		
RS1dN	1894.89	1933.26	129.91	2791.04	97.43	1651.48	1840.53	116.55	2206.15	87.41	27.4	1.4	772	25.1	1.2	657		
RS2	521.86	290.01	30.15	541.79	22.61	293.86	160.27	16.06	286.63	12.05	9.0	0.5	332	6.6	0.4	184		
	225.81	162.37	13.95	274.60	10.46						2.3	0.2	146					
RS3A1S	605.21	325.48	34.69	616.17	26.02	386.60	201.08	21.19	354.66	15.89	8.2	0.5	383	5.9	0.3	241		
RS3A1C	610.00	336.42	35.17	628.86	26.37	391.39	212.02	21.66	365.56	16.24	8.3	0.5	383	6.0	0.3	241		
RS3A2S	876.10	368.20	47.77	792.84	35.83	607.36	215.28	31.17	457.62	23.38	12.1	0.8	583	9.4	0.6	409		
RS3A2C	936.44	506.11	53.72	952.79	40.29	667.70	353.19	37.12	595.07	27.84	13.0	0.8	583	10.3	0.6	409		
RS3B1S	375.13	199.30	21.47	383.13	16.10	156.51	74.90	7.96	162.05	5.97	7.3	0.5	248	5.1	0.3	106		
RS3B1C	375.13	199.30	21.47	383.13	16.10	156.51	74.90	7.96	162.05	5.97	7.3	0.5	248	5.1	0.3	106		
RS3B2S	876.10	368.20	47.77	792.84	35.83	607.36	215.28	31.17	457.62	23.38	12.1	0.8	583	9.4	0.6	409		
RS3B2C	936.44	506.11	53.72	952.79	40.29	667.70	353.19	37.12	595.07	27.84	13.0	0.8	583	10.3	0.6	409		
RS4	1265.08	558.93	69.65	1173.99	52.24	795.56	291.75	40.64	620.20	30.48	17.1	1.1	790	12.3	0.7	485		
RS6AS	1139.98	666.49	67.30	1190.90	50.47	875.21	457.04	48.82	768.87	36.62	16.5	1.0	727	13.4	0.8	533		
RS6AC	1145.90	680.03	67.88	1206.60	50.91	881.14	470.58	49.41	782.37	37.06	16.6	1.0	727	13.5	0.8	533		
RS6BS	944.33	506.67	54.09	958.51	40.57	645.36	336.55	35.62	576.83	26.72	15.6	1.0	593	12.6	0.7	399		
RS6BC	945.46	509.27	54.21	961.53	40.65	646.50	339.15	35.73	579.42	26.80	15.7	1.0	593	12.6	0.7	399		
RS7AS	1718.46	784.11	95.11	1603.86	71.33	1419.50	613.98	76.64	1102.84	57.48	24.9	1.5	1095	21.8	1.3	901		
RS7AC	1758.61	875.89	99.07	1710.31	74.30	1459.65	705.77	80.60	1194.32	60.45	25.5	1.5	1095	22.4	1.3	0		
RS7BS	1488.63	658.51	81.91	1371.50	61.43	1189.66	488.38	63.44	910.81	47.58	24.0	1.5	961	20.9	1.2	767		
RS7BC	1523.99	739.36	85.40	1465.26	64.05	1225.03	569.23	66.93	991.38	50.19	24.6	1.5	961	21.5	1.2	767		

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TABLE X.4.5
Project Costs in Scenarios without Jamuna Bridge (million Taka)

Senarios	Project	Financial			Economic		Employment		Land losses (ha)
		Investment		O&M	Investm.	O&M	Constr.	O&M	
		Loc.cost	For.cost						
0A	No								
1	RS1bN	895.58	495.38	49.86	928.49	37.40	12.6	0.7	562.0
2	RS1cN	1140.19	521.62	62.44	1093.91	46.83	15.6	0.9	654.0
3	RS1dN	1894.89	1933.26	129.91	2791.04	97.43	27.4	1.4	772.3
4	RS4	1265.08	558.93	69.65	1173.99	52.24	17.1	1.1	789.6
5S	RS3A1S	605.21	325.48	34.69	616.17	26.02	8.2	0.5	382.8
5C	RS3A1C	610.00	336.42	35.17	628.86	26.37	8.3	0.5	382.8
6S	RS3A1S+RS4	1626.59	779.60	89.29	1510.96	66.97	22.8	1.4	1014.3
6C	RS3A1C+RS4	1631.38	790.54	89.76	1523.65	67.32	22.9	1.4	1014.3
7S	RS3A1S+RS3A2S	1481.31	693.68	82.47	1409.01	61.85	20.3	1.3	966.1
7C	RS3A1C+RS3A2C	1546.44	842.53	88.89	1581.65	66.66	21.3	1.3	966.1
8S	RS3A1S+RS3A2S+RS4	2502.69	1147.80	137.06	2303.81	102.80	34.9	2.2	1597.6
8C	RS3A1C+RS3A2C+RS4	2567.81	1296.65	143.48	2476.45	107.61	35.9	2.2	1597.6
9S	RS6A1S+RS6A2S	1139.98	666.49	67.30	1190.90	50.47	16.5	1.0	726.9
9C	RS6A1C+RS6A2C	1145.90	680.03	67.88	1206.60	50.91	16.6	1.0	726.9
10S	RS6A1S+RS6A2S+RS4	2405.05	1225.41	136.95	2364.88	102.71	33.6	2.1	1516.5
10C	RS6A1C+RS6A2C+RS4	2410.98	1238.95	137.53	2380.59	103.15	33.7	2.1	1516.5
11	RS2	747.68	452.38	44.10	816.39	33.08	11.3	0.7	478.1
12	RS1bY+RS2	1643.25	947.76	93.96	1744.88	70.47	23.9	1.4	1040.1
13	RS1cY+RS2	1887.86	974.00	106.54	1910.30	79.90	26.9	1.6	1132.1
14	RS1dY+RS2	2642.56	2385.64	174.01	3607.42	130.50	38.7	2.1	1250.4
15	RS2+RS4	1786.94	848.93	99.80	1715.78	74.85	26.1	1.6	1121.3
16S	RS2+RS3A1S	1352.89	777.86	78.79	1432.56	59.10	14.9	0.8	572.7
16C	RS2+RS3A1C	1357.68	788.80	79.27	1445.24	59.45	15.0	0.8	572.7
17S	RS2+RS3A1S+RS4	2148.45	1069.61	119.44	2052.76	89.58	31.80	1.85	1346.01
17C	RS2+RS3A1C+RS4	2153.24	1080.55	119.91	2065.45	89.93	31.90	1.85	1346.01
18S	RS2+RS3A1S+RS3A2S	2228.99	1146.06	126.57	2225.40	94.93	31.6	2.0	1444.2
18C	RS2+RS3A1C+RS3A2C	2294.11	1294.91	132.99	2398.04	99.74	32.6	2.0	1444.2
19S	RS2+RS3A1S+RS3A2S+RS4	3024.55	1437.81	167.21	2845.60	125.41	43.9	2.7	1929.3
19C	RS2+RS3A1C+RS3A2C+RS4	3089.68	1586.66	173.63	3018.24	130.22	44.9	2.7	1929.3
20S	RS2+RS6A1S+RS6A2S	1887.65	1118.87	111.40	2007.29	83.55	27.8	1.7	1205.0
20C	RS2+RS6A1C+RS6A2C	1893.58	1132.41	111.98	2022.99	83.98	27.9	1.7	1205.0
21S	RS2+RS6A1S+RS6A2S+RS4	2926.91	1515.42	167.10	2906.68	125.32	42.6	2.6	1848.2
21C	RS2+RS6A1C+RS6A2C+RS4	2932.84	1528.96	167.68	2922.38	125.76	42.7	2.6	1848.2
37C	RS1bY+RS2+RS3A1C+RS3A2C	3189.69	1790.29	182.85	3326.53	137.14	45.2	2.7	2006.2
38C	RS1bY+RS2+RS3A1C+RS3A2C+RS4	3985.25	2082.04	223.49	3946.73	167.62	57.5	3.4	2491.3

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TABLE X.4.6
Project Costs in Scenarios with Jamuna Bridge (million Taka)

Scenarios	Projects	Financial			Economic		Employment		Land losses
		Investment		O&M	Investm.	O&M	Constr.	O&M	
		Loc. cost	For. cost						
0B	No								
22	RS4	1265.08	558.93	69.65	1173.99	52.24	17.1	1.1	789.6
23S	RS3B1S	375.13	199.30	21.47	383.13	16.10	7.3	0.5	248.1
23C	RS3B1C	375.13	199.30	21.47	383.13	16.10	7.3	0.5	248.1
24S	RS3B1S+RS4	1530.89	696.03	84.37	1446.58	63.28	23.3	1.5	966.8
24C	RS3B1C+RS4	1530.89	696.03	84.37	1446.58	63.28	23.3	1.5	966.8
25S	RS3B1S+RS3B2S	1251.23	567.50	69.24	1175.97	51.93	19.4	1.3	831.4
25C	RS3B1C+RS3B2C	1311.56	705.41	75.19	1335.93	56.39	20.3	1.3	831.4
26S	RS3B1S+RS3B2S+RS4	2272.63	987.76	123.84	2071.81	92.88	34.1	2.2	1463.0
26C	RS3B1C+RS3B2C+RS4	2332.96	1125.67	129.79	2220.51	97.34	35.0	2.2	1463.0
27S	RS3B1S+RS6B2S	944.33	506.67	54.09	958.51	40.57	15.6	1.0	592.6
27C	RS6B1C+RS6B2C	945.46	509.27	54.21	961.53	40.65	15.7	1.0	592.6
28S	RS6B1S+RS6B2S+RS4	2209.40	1065.60	123.75	2132.50	92.81	32.7	2.1	1382.2
28C	RS6B1C+RS6B2C+RS4	2210.54	1068.20	123.86	2135.52	92.89	32.8	2.1	1382.2
29	RS2	747.68	452.38	44.10	816.39	33.08	11.3	0.7	478.1
30	RS2+RS4	2012.75	1011.30	113.75	1990.37	85.31	28.4	1.8	1267.7
31S	RS2+RS3B1S	1122.80	651.68	65.57	1199.52	49.18	14.1	0.8	438.0
31C	RS2+RS3B1C	1122.80	651.68	65.57	1199.52	49.18	14.1	0.8	438.0
32S	RS2+RS3B1S+RS4	2052.76	986.03	114.51	1988.37	85.89	32.3	2.0	1298.5
32C	RS2+RS3B1C+RS4	2052.76	986.03	114.51	1988.37	85.89	32.3	2.0	1298.5
33S	RS2+RS3B1S+RS3B2S	1998.90	1019.88	113.34	1992.36	85.01	30.7	2.0	1309.5
33C	RS2+RS3B1C+RS3B2C	2059.24	1157.79	119.29	2152.31	89.47	31.6	2.0	1309.5
34S	RS2+RS3B1S+RS3B2S+RS4	2794.49	1277.77	153.99	2613.60	115.49	43.1	2.7	1794.6
34C	RS2+RS3B1C+RS3B2C+RS4	2854.83	1415.68	159.93	2762.31	119.95	44.0	2.7	1794.6
35s	RS2+RS6B1S+RS6B2S	1692.00	959.05	98.19	1774.90	73.65	26.9	1.7	1070.7
35C	RS2+RS6B1C+RS6B2C	1693.14	961.65	98.31	1777.92	73.73	27.0	1.7	1070.7
36S	RS2+RS6B1S+RS6B2S+RS4	2731.26	1355.61	153.89	2674.29	115.42	41.7	2.6	1713.8
36C	RS2+RS6B1C+RS6B2C+RS4	2732.40	1358.21	154.01	2677.31	115.50	41.8	2.6	1713.8

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TABLE X.4.7
Protected Area without Jamuna Bridge

Senarios	Project	% of protected area							Future average damage
		PU1	PU2	PU4	PU6	PU7	PU8	PU10	
0A	No								288.51
1	RS1bN	0.66							261.60
2	RS1cN	0.20							261.60
3	RS1dN	0.66							261.60
4	RS4								288.51
5S	RS3A1S				0.64				268.05
5C	RS3A1C				0.64				268.05
6S	RS3A1S+RS4				0.64				268.05
6C	RS3A1C+RS4				0.64				268.05
7S	RS3A1S+RS3A2S				0.64	1.00			209.46
7C	RS3A1C+RS3A2C				0.64	1.00			209.46
8S	RS3A1S+RS3A2S+RS4				0.64	1.00			209.46
8C	RS3A1C+RS3A2C+RS4				0.64	1.00			209.46
9S	RS6A1S+RS6A2S				0.36			1.00	270.20
9C	RS6A1C+RS6A2C				0.36			1.00	270.20
10S	RS6A1S+RS6A2S+RS4				0.36			1.00	270.20
10C	RS6A1C+RS6A2C+RS4				0.36			1.00	270.20
11	RS2		1.00	1.00					255.71
12	RS1bY+RS2	0.66	1.00	1.00					246.03
13	RS1cY+RS2	0.20	1.00	1.00					252.78
14	RS1dY+RS2	0.66	1.00	1.00					246.03
15	RS2+RS4		1.00	1.00					255.71
16S	RS2+RS3A1S		1.00	1.00	0.64				235.25
16C	RS2+RS3A1C		1.00	1.00	0.64				235.25
17S	RS2+RS3A1S+RS4		1.00	1.00	0.64				235.25
17C	RS2+RS3A1C+RS4		1.00	1.00	0.64				235.25
18S	RS2+RS3A1S+RS3A2S		1.00	1.00	0.64	1.00			176.66
18C	RS2+RS3A1C+RS3A2C		1.00	1.00	0.64	1.00			176.66
19S	RS2+RS3A1S+RS3A2S+RS4		1.00	1.00	0.64	1.00			176.66
19C	RS2+RS3A1C+RS3A2C+RS4		1.00	1.00	0.64	1.00			176.66
20S	RS2+RS6A1S+RS6A2S		1.00	1.00	0.36			1.00	237.39
20C	RS2+RS6A1C+RS6A2C		1.00	1.00	0.36			1.00	237.39
21S	RS2+RS6A1S+RS6A2S+RS4		1.00	1.00	0.36			1.00	237.39
21C	RS2+RS6A1C+RS6A2C+RS4		1.00	1.00	0.36			1.00	237.39
37C	RS1bY+RS2+RS3A1C+RS3A2C	0.66	1.00	1.00	0.64	1.00			166.98
38C	RS1bY+RS2+RS3A1C+RS3A2C+RS4	0.66	1.00	1.00	0.64	1.00			166.98

TABLE X.4.8
Protected Area with Jamuna Bridge

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Senario	Project	% of protected area							Future average damage
		PU1	PU2	PU4	PU6	PU7	PU8	PU10	
0B	No								288.51
22	RS4								288.51
23S	RS3B1S				0.64				268.05
23C	RS3B1C				0.64				268.05
24S	RS3B1S+RS4				0.64				268.05
24C	RS3B1C+RS4				0.64				268.05
25S	RS3B1S+RS3B2S				0.64	1.00			209.46
25C	RS3B1C+RS3B2C				0.64	1.00			209.46
26S	RS3B1S+RS3B2S+RS4				0.64	1.00			209.46
26C	RS3B1C+RS3B2C+RS4				0.64	1.00			209.46
27S	RS3B1S+RS6B2S				0.36			1.00	270.20
27C	RS6B1C+RS6B2C				0.36			1.00	270.20
28S	RS6B1S+RS6B2S+RS4				0.36			1.00	270.20
28C	RS6B1C+RS6B2C+RS4				0.36			1.00	270.20
29	RS2		1.00	1.00					255.71
30	RS2+RS4		1.00	1.00					255.71
31S	RS2+RS3B1S		1.00	1.00	0.64				235.25
31C	RS2+RS3B1C		1.00	1.00	0.64				235.25
32S	RS2+RS3B1S+RS4		1.00	1.00	0.64				235.25
32C	RS2+RS3B1C+RS4		1.00	1.00	0.64				235.25
33S	RS2+RS3B1S+RS3B2S		1.00	1.00	0.64	1.00			176.66
33C	RS2+RS3B1C+RS3B2C		1.00	1.00	0.64	1.00			176.66
34S	RS2+RS3B1S+RS3B2S+RS4		1.00	1.00	0.64	1.00			176.66
34C	RS2+RS3B1C+RS3B2C+RS4		1.00	1.00	0.64	1.00			176.66
35s	RS2+RS6B1S+RS6B2S		1.00	1.00	0.36			1.00	237.39
35C	RS2+RS6B1C+RS6B2C		1.00	1.00	0.36			1.00	237.39
36S	RS2+RS6B1S+RS6B2S+RS4		1.00	1.00	0.36			1.00	237.39
36C	RS2+RS6B1C+RS6B2C+RS4		1.00	1.00	0.36			1.00	237.39

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TABLE X.4.9
Anticipated Impact of Scenarios on Fishery without Jamuna Bridge

Scenario	Fish capture in flood plain									Fishery production value			
	PU1	PU2	PU4	PU6	PU7	PU8	PU10	Others	Total	Flood Plain	Beels & Rivers	Fish Culture	Total Fishery
1 OA	1581.0	1020.0	919.0	1417.0	1091.0	439.0	716.0	7683.0	14866.0	371.65	414.50	295.90	1082.05
2 1	1237.3	1020.0	919.0	1417.0	1091.0	439.0	716.0	7683.0	14522.3	363.06	414.50	295.90	1073.46
3 2	1374.8	1020.0	919.0	1417.0	1091.0	439.0	716.0	7683.0	14659.8	366.49	414.50	295.90	1076.89
4 3	1099.8	1020.0	919.0	1417.0	1091.0	439.0	716.0	7683.0	14384.8	359.62	414.50	295.90	1070.02
5 4	1581.0	930.0	919.0	1417.0	1007.1	418.9	670.1	7683.0	14626.1	365.65	414.50	295.90	1076.05
6 5S	1581.0	1020.0	919.0	1744.0	1342.8	458.3	908.8	7683.0	15656.9	391.42	414.50	295.90	1101.82
7 5C	1581.0	1020.0	919.0	1029.0	1342.8	392.8	890.4	7683.0	14858.0	371.45	414.50	295.90	1081.85
8 6S	1581.0	930.0	919.0	1744.0	1342.8	447.4	881.2	7683.0	15528.4	388.21	414.50	295.90	1098.61
9 6C	1581.0	930.0	919.0	994.1	1342.8	371.0	872.1	7683.0	14692.9	367.32	414.50	295.90	1077.72
10 7S	1581.0	1020.0	919.0	1744.0	939.9	458.3	917.9	7683.0	15263.2	381.58	414.50	295.90	1091.98
11 7C	1581.0	1020.0	919.0	889.4	604.2	338.3	917.9	7683.0	13952.9	348.82	414.50	295.90	1059.22
12 8S	1581.0	930.0	919.0	1744.0	886.2	436.5	917.9	7683.0	15097.7	377.44	414.50	295.90	1087.84
13 8C	1581.0	930.0	919.0	872.0	523.7	327.4	917.9	7683.0	13754.0	343.85	414.50	295.90	1054.25
14 9S	1581.0	1020.0	919.0	1744.0	1342.8	458.3	899.6	7683.0	15647.7	391.19	414.50	295.90	1101.59
15 9C	1581.0	1020.0	919.0	1116.2	1342.8	392.8	899.6	7683.0	14954.4	373.86	414.50	295.90	1084.26
16 10S	1581.0	930.0	919.0	1744.0	1342.8	436.5	872.1	7683.0	15508.3	387.71	414.50	295.90	1098.11
17 10C	1581.0	930.0	919.0	1098.7	1329.3	371.0	872.1	7683.0	14784.1	369.60	414.50	295.90	1080.00
18 11	1581.0	480.0	848.3	1351.6	1074.2	436.5	706.8	7683.0	14161.4	354.04	414.50	295.90	1064.44
19 12	1306.0	480.0	848.3	1351.6	1074.2	436.5	706.8	7683.0	13886.5	347.16	414.50	295.90	1057.56
20 13	1443.5	480.0	848.3	1351.6	1074.2	436.5	706.8	7683.0	14024.0	350.60	414.50	295.90	1061.00
21 14	1237.3	480.0	848.3	1351.6	1074.2	436.5	706.8	7683.0	13817.7	345.44	414.50	295.90	1055.84
22 15	1581.0	540.0	834.2	1417.0	990.3	426.5	670.1	7683.0	14142.0	353.55	414.50	295.90	1063.95
23 16S	1581.0	660.0	904.9	1918.4	1678.5	464.1	908.8	7683.0	15798.6	394.96	414.50	295.90	1105.36
24 16C	1581.0	660.0	636.2	1046.4	1678.5	401.4	890.4	7683.0	14576.9	364.42	414.50	295.90	1074.82
25 17S	1581.0	660.0	890.7	2092.8	1477.0	451.5	881.2	7683.0	15717.3	392.93	414.50	295.90	1103.33
26 17C	1581.0	660.0	622.1	981.0	1409.9	376.3	872.1	7683.0	14185.3	354.63	414.50	295.90	1065.03
27 18S	1581.0	660.0	876.6	2027.4	939.9	451.5	917.9	7683.0	15137.4	378.44	414.50	295.90	1088.84
28 18C	1581.0	660.0	636.2	893.8	587.5	351.2	917.9	7683.0	13310.6	332.77	414.50	295.90	1043.17
29 19S	1581.0	660.0	890.7	2027.4	872.8	439.0	917.9	7683.0	15071.9	376.80	414.50	295.90	1087.20
30 19C	1581.0	660.0	622.1	872.0	486.8	301.0	917.9	7683.0	13123.8	328.10	414.50	295.90	1038.50
31 20S	1581.0	660.0	904.9	1983.8	1510.6	464.1	899.6	7683.0	15687.0	392.17	414.50	295.90	1102.57
32 20C	1581.0	660.0	636.2	1111.8	1443.5	401.4	899.6	7683.0	14416.5	360.41	414.50	295.90	1070.81
33 21S	1581.0	660.0	848.3	1940.2	1443.5	451.5	872.1	7683.0	15479.6	386.99	414.50	295.90	1097.39
34 21C	1581.0	660.0	622.1	1090.0	1393.1	376.3	872.1	7683.0	14277.6	356.94	414.50	295.90	1067.34
34a 37C	1306.0	480.0	848.3	893.8	587.5	351.2	917.9	7683.0	13067.8	326.69	414.50	295.90	1037.09
34b 38C	1306.0	480.0	848.3	872.0	486.8	301.0	917.9	7683.0	12895.1	322.38	414.50	295.90	1032.78

TABLE X.4.10
Anticipated Impact of Scenarios on Fishery with Jamuna Bridge

Scenario	Runs	Fish capture in flood plain (tons)									Fishery production value			
		PU1	PU2	PU4	PU6	PU7	PU8	PU10	Others	Total	Flood Plain	Beels & Rivers	Fish Culture	Total Fishery
35 0B	0	1581.0	1020.0	919.0	697.6	839.2	338.7	587.5	7683.0	13666.0	341.65	414.50	295.90	1052.05
36 22	0	1581.0	960.0	919.0	680.2	792.2	316.5	550.8	7683.0	13482.6	337.07	414.50	295.90	1047.47
37 23S	0	1581.0	1020.0	919.0	1046.4	1342.8	381.9	807.8	7683.0	14781.9	369.55	414.50	295.90	1079.95
38 23C	0	1581.0	1020.0	919.0	906.9	1342.8	381.9	807.8	7683.0	14642.4	366.06	414.50	295.90	1076.46
39 24S	0	1581.0	960.0	919.0	1011.5	1141.4	360.1	771.1	7683.0	14427.1	360.68	414.50	295.90	1071.08
40 24C	0	1581.0	960.0	919.0	872.0	1141.4	360.1	771.1	7683.0	14287.5	357.19	414.50	295.90	1067.59
41 25S	0	1581.0	1020.0	919.0	1116.2	778.8	371.0	826.2	7683.0	14295.1	357.38	414.50	295.90	1067.78
42 25C	0	1581.0	1020.0	919.0	854.6	523.7	338.3	917.9	7683.0	13837.5	345.94	414.50	295.90	1056.34
43 26S	0	1581.0	960.0	919.0	1098.7	725.1	349.2	881.2	7683.0	14197.2	354.93	414.50	295.90	1065.33
44 26C	0	1581.0	960.0	919.0	837.1	456.5	316.5	917.9	7683.0	13671.1	341.78	414.50	295.90	1052.18
45 27S	0	1581.0	1020.0	919.0	1168.5	1235.3	392.8	826.2	7683.0	14825.8	370.65	414.50	295.90	1081.05
46 27C	0	1581.0	1020.0	919.0	994.1	1248.8	381.9	835.3	7683.0	14663.1	366.58	414.50	295.90	1076.98
47 28S	0	1581.0	960.0	919.0	1151.0	1168.2	371.0	789.4	7683.0	14622.7	365.57	414.50	295.90	1075.97
48 28C	0	1581.0	960.0	919.0	959.2	1195.1	360.1	817.0	7683.0	14474.3	361.86	414.50	295.90	1072.26
49 29	16	1581.0	540.0	622.1	588.6	839.2	338.7	587.5	7683.0	12780.1	319.50	414.50	295.90	1029.90
50 30	17	1581.0	540.0	608.0	566.8	772.1	326.1	550.8	7683.0	12627.7	315.69	414.50	295.90	1026.09
51 31S	10	1581.0	660.0	664.5	959.2	1426.7	376.3	807.8	7683.0	14158.5	353.96	414.50	295.90	1064.36
52 31C	8	1581.0	660.0	664.5	850.2	1426.7	376.3	807.8	7683.0	14049.5	351.24	414.50	295.90	1061.64
53 32S	20	1581.0	660.0	636.2	828.4	1191.7	351.2	771.1	7683.0	13702.6	342.57	414.50	295.90	1052.97
54 32C	19	1581.0	660.0	636.2	915.6	1174.9	351.2	771.1	7683.0	13773.0	344.33	414.50	295.90	1054.73
55 33S	6	1581.0	660.0	650.4	1090.0	755.3	363.7	826.2	7683.0	13609.6	340.24	414.50	295.90	1050.64
56 33C	4	1581.0	660.0	664.5	850.2	486.8	351.2	917.9	7683.0	13194.6	329.87	414.50	295.90	1040.27
57 34S	21	1581.0	660.0	636.2	1046.4	688.2	351.2	881.2	7683.0	13527.2	338.18	414.50	295.90	1048.58
58 34C	22	1581.0	660.0	636.2	850.2	436.4	326.1	917.9	7683.0	13090.9	327.27	414.50	295.90	1037.67
59 35S	32	1581.0	660.0	664.5	1177.2	1292.4	388.8	826.2	7683.0	14273.1	356.83	414.50	295.90	1067.23
60 35C	29	1581.0	660.0	636.2	981.0	1326.0	376.3	835.3	7683.0	14078.8	351.97	414.50	295.90	1062.37
61 36S	31	1581.0	660.0	636.2	1111.8	1225.3	363.7	789.4	7683.0	14050.5	351.26	414.50	295.90	1061.66
62 36C	30	1581.0	660.0	622.1	937.4	1275.6	351.2	817.0	7683.0	13927.3	348.18	414.50	295.90	1058.58

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TABLE X.4.11
Economic Analysis of Scenarios without Jamuna Bridge

Scenarios	Projects	Public costs (Tk,000,000)			Fishery net income (Tk,000,000)		Ag. net inc. (Tk,000,000)		Flood damage (Tk,000,000)		IRR	NPV	NPVR(1)	IRR * with 1.25 factor
		Capital	O & M	at market price	Capital	O & M	at econ. price	at econ. price	at market price	at econ. price				
OA	No	0.0	0.0		0.0	0.0	941.4	11023.6	288.5	251.0				
1	RS1bN	1391.0	49.9		928.5	37.4	933.9	11186.6	261.6	227.6	10.1%	-142	-0.099	11.4%
1a	RS1bN with 40% agr. benefits	1381.0	49.9		928.5	37.4	933.9	11251.8	261.6	227.6	13.9%	158	0.110	14.8%
1b	RS1bN ex. Flood proof	1217.2	42.4		812.5	31.8	933.9	11186.6	261.6	227.6	11.8%	-13	-0.011	12.8%
2	RS1cN	1661.8	62.4		1093.9	46.8	936.9	11100.0	266.0	231.4	0.4%	-739	-0.426	
3	RS1dN	3828.1	129.9		2791.0	97.4	930.9	11191.8	261.6	227.6	-1.2%	-2013	-0.515	
4	RS4	1824.0	69.7		1174.0	52.2	936.2	11197.3	288.5	251.0	6.0%	-509	-0.266	
5S	RS3A1S	930.7	34.7		616.2	26.0	938.6	10902.2	268.1	233.2	-ve	-1019	-1.050	
5C	RS3A1C	946.4	35.2		628.9	26.4	941.2	11332.7	268.1	233.2	24.4%	850	0.863	
6S	RS3A1S+RS4	2406.2	89.3		1511.0	67.0	955.8	11011.5	268.1	233.2	-ve	-1512	-0.604	
6C	RS3A1C+RS4	2421.9	89.8		1523.7	67.3	937.6	11470.9	268.1	233.2	15.5%	485	0.193	
7S	RS3A1S+RS3A2S	2175.0	82.5		1409.0	61.9	920.0	10997.4	209.5	182.2	-ve	-1203	-0.529	
7C	RS3A1C+RS3A2C	2389.0	88.9		1581.6	66.7	921.5	11702.2	209.5	182.2	22.4%	1725	0.693	
8S	RS3A1S+RS3A2S+RS4	3650.5	137.1		2303.8	102.8	946.4	11139.7	209.5	182.2	0.2%	-1546	-0.406	
8C	RS3A1C+RS3A2C+RS4	3864.5	143.5		2476.4	107.6	917.2	11869.7	209.5	182.2	18.2%	1496	0.372	
9S	RS6A1S+RS6A2S	1806.5	67.3		1190.9	50.5	958.4	10892.0	270.2	235.1	-ve	-1695	-0.900	
9C	RS6A1C+RS6A2C	1825.9	67.9		1206.6	50.9	943.3	11256.2	270.2	235.1	10.8%	-121	-0.064	
10S	RS6A1S+RS6A2S+RS4	3630.5	136.9		2364.9	102.7	955.4	11009.0	270.2	235.1	-ve	-2450	-0.646	
10C	RS6A1C+RS6A2C+RS4	3649.9	137.5		2380.6	103.1	939.6	11384.6	270.2	235.1	7.3%	-828	-0.217	
11	RS2	1200.1	44.1		816.4	33.1	926.1	11298.7	255.7	222.5	18.1%	476	0.382	
12	RS1bY+RS2	2591.0	94.0		1744.9	70.5	920.1	11447.8	246.1	214.1	13.3%	195	0.073	
13	RS1cY+RS2	2861.9	106.5		1910.3	79.9	923.1	11359.7	252.8	219.9	9.2%	-422	-0.142	
14	RS2+RS1dY	5028.2	174.0		3607.4	130.5	918.6	11467.8	246.1	214.1	5.6%	-1599	-0.310	
15	RS2+RS4	2635.9	99.8		1715.8	74.8	925.6	11366.9	255.7	222.5	10.6%	-201	-0.073	
16S	RS2+RS3A1S	2130.7	78.8		1432.6	59.1	961.7	11118.2	235.3	204.7	4.3%	-708	-0.320	
16C	RS2+RS3A1C	2146.5	79.3		1445.2	59.4	935.1	11717.7	235.3	204.7	24.1%	1893	0.848	
17S	RS2+RS3A1S+RS4	3218.1	119.4		2052.8	89.6	959.9	11124.7	235.3	204.7	0.1%	-1381	-0.412	
17C	RS2+RS3A1C+RS4	3233.8	119.9		2065.4	89.9	926.6	11752.4	235.3	204.7	18.5%	1312	0.390	
18S	RS2+RS3A1S+RS3A2S	3375.0	126.6		2225.4	94.9	947.3	11228.8	176.7	153.7	6.5%	-848	-0.241	
18C	RS2+RS3A1C+RS3A2C	3589.0	133.0		2398.0	99.7	907.6	12107.2	176.7	153.7	23.1%	2832	0.758	
19S	RS2+RS3A1S+RS3A2S+RS4	4462.4	167.2		2845.6	125.4	945.9	11252.6	176.7	153.7	4.3%	-1439	-0.309	
19C	RS2+RS3A1C+RS3A2C+RS4	4676.3	173.6		3018.2	130.2	903.5	12167.1	176.7	153.7	19.9%	2394	0.492	
20S	RS2+RS6A1S+RS6A2S	3006.5	111.4		2007.3	83.5	959.2	11114.3	237.4	206.5	-0.2%	-1369	-0.438	
20C	RS2+RS6A1C+RS6A2C	3026.0	112.0		2023.0	84.0	931.6	11640.8	237.4	206.5	16.7%	887	0.282	
21S	RS2+RS6A1S+RS6A2S+RS4	4442.3	167.1		2906.7	125.3	954.7	11115.3	237.4	206.5	-6.3%	-2379	-0.513	
21C	RS2+RS6A1C+RS6A2C+RS4	4461.8	167.7		2922.4	125.8	928.6	11672.8	237.4	206.5	12.1%	28	0.006	
37C	RS1bY+RS2+RS3A1C+RS3A2C	4980.0	182.9		3326.5	137.1	915.3	12120.7	149.8	130.3	19.2%	2342	0.453	
38C	RS1bY+RS2+RS3A1C+RS3A2C+RS4	6067.3	223.5		3946.7	167.6	911.3	12224.9	149.8	130.3	17.1%	1872	0.311	

Note:- ve = Negative, * A 1.25 factor has been applied to the avoided flood damages to allow for indirect and macro-economic impacts

** A standard conversion factor of 0.87 has been used, for fishery and flood damage economic prices

Source: CS 1992

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TABLE X.4.12
Economic Analysis of Scenarios with Jamuna Bridge

Scenarios	Projects	Public costs (Tk.000000)				Fishery net income (Tk.000000)		Ag.net inc. (Tk.000000)	Flood damage (Tk.000000)		IRR	NPV	NPVR(1)
		at market price		at economic price		at econ. *	at econ. *	at market price	at econ. *				
		Capital	O&M	Capital	O&M					price			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0B	No	0.0	0.0	0.0	0.0	1052.0	915.3	11719.2	288.5	251.0			
22	RS4	1824.0	69.7	1174.0	52.2	1047.5	911.3	11896.6	261.6	227.6	8.2%	-333	-0.176
23S	RS3B1S	574.4	21.5	383.1	16.1	1079.9	939.6	11318.0	266.0	231.4	-ve	-1968	-3.315
23C	RS3B1C	574.4	21.5	383.1	16.1	1076.5	936.5	11421.5	261.6	227.6	-ve	-1487	-2.505
24S	RS3B1S+RS4	2226.9	84.4	1446.6	63.3	1071.1	931.8	11459.2	268.1	233.2	-ve	-2537	-1.099
24C	RS3B1C+RS4	2226.9	84.4	1446.6	63.3	1067.6	928.8	11559.6	268.1	233.2	-ve	-2096	-0.908
25S	RS3B1S+RS3B2S	1818.7	69.2	1176.0	51.9	1067.8	929.0	11444.9	209.5	182.2	-ve	-2004	-1.061
25C	RS3B1C+RS3B2C	2017.0	75.2	1335.9	56.4	1056.3	919.0	11764.6	209.5	182.2	2.5%	-746	-0.358
26S	RS3B1S+RS3B2S+RS4	3260.4	123.8	2071.8	92.9	1065.3	926.8	11550.8	209.5	182.2	-ve	-2510	-0.742
26C	RS3B1C+RS3B2C+RS4	3458.6	129.8	2220.5	97.3	1052.2	915.4	11925.5	209.5	182.2	5.3%	-999	-0.279
27S	RS6B1S+RS6B2S	1451.0	54.1	958.5	40.6	1081.0	940.5	11217.0	270.2	235.1	-ve	-3069	-2.047
27C	RS6B1C+RS6B2C	1454.7	54.2	961.5	40.7	1077.0	937.0	11345.0	270.2	235.1	-ve	-2506	-1.668
28S	RS6B1S+RS6B2S+RS4	3275.0	123.7	2132.5	92.8	1076.0	936.1	11345.3	270.2	235.1	-ve	-3786	-1.116
28C	RS6B1C+RS6B2C+RS4	3278.7	123.9	2135.5	92.9	1072.3	932.9	11486.3	270.2	235.1	-ve	-3161	-0.931
29	RS2	1200.1	44.1	816.4	33.1	1029.9	896.0	12154.6	255.7	222.5	25.1%	1199	0.971
30	RS2+RS4	3024.1	113.8	1990.4	85.3	1026.1	892.7	12222.3	255.7	222.5	13.2%	211	0.068
31S	RS2+RS3B1S	1774.5	65.6	1199.5	49.2	1064.4	926.0	11697.2	235.3	204.7	-ve	-1004	-0.549
31C	RS2+RS3B1C	1774.5	65.6	1199.5	49.2	1061.6	923.6	11790.6	235.3	204.7	4.3%	-589	-0.322
32S	RS2+RS3B1S+RS4	3038.8	114.5	1988.4	85.9	1053.0	916.1	11733.0	235.3	204.7	-ve	-1774	-0.564
32C	RS2+RS3B1C+RS4	3038.8	114.5	1988.4	85.9	1054.7	917.6	11833.3	235.3	204.7	0.6%	-1300	-0.413
33S	RS2+RS3B1S+RS3B2S	3018.8	113.3	1992.4	85.0	1050.6	914.1	11830.0	176.7	153.7	4.0%	-997	-0.319
33C	RS2+RS3B1C+RS3B2C	3217.0	119.3	2152.3	89.5	1040.3	905.0	12147.1	176.7	153.7	13.4%	259	0.078
34S	RS2+RS3B1S+RS3B2S+RS4	4072.3	154.0	2613.6	115.5	1048.6	912.3	12205.5	176.7	153.7	12.2%	41	0.010
34C	RS2+RS3B1C+RS3B2C+RS4	4270.5	159.9	2762.3	120.0	1037.7	902.8	11881.0	176.7	153.7	1.8%	-1677	-0.380
35s	RS2+RS6B1S+RS6B2S	2651.1	98.2	1774.9	73.6	1067.2	928.5	11585.5	237.4	206.5	-ve	-2135	-0.781
35C	RS2+RS6B1C+RS6B2C	2654.8	98.3	1777.9	73.7	1062.4	924.3	11730.0	237.4	206.5	-ve	-1498	-0.547
36S	RS2+RS6B1S+RS6B2S+RS4	4086.9	153.9	2674.3	115.4	1061.7	923.6	11611.3	237.4	206.5	-ve	-3038	-0.718
36C	RS2+RS6B1C+RS6B2C+RS4	4090.6	154.0	2677.3	115.5	1058.6	921.0	11774.9	237.4	206.5	-ve	-2303	-0.544

Note: -ve = Negative

* A standard conversion factor of 0.87 has been used, for fishery and flood damage economic prices

Source: CS 1992

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TABLE X.4.13
Sensitivity Analysis

Scenarios	Projects	Base case			Flood damage		Agric'tral Net Income and flood damage		Delayed implement'tn. (construct.=6 years)		Increase of capital and O&M costs increase by 40%		Delay in achieving benefits (by 2 years)		Conversion factors* (June 1992 nrs.)	
		IRR	NPV	NPVR(1)	IRR **		IRR ***		IRR	NPV	IRR	NPV	IRR	NPV	IRR	NPV
					with 0.75 factor	with 1.25 factor	with 0.75 factor	with 1.25 factor								
Without Jamuna Bridge																
1	RS1bN	10.1%	-142	-0.099	9.2%	11.2%	6.5%	13.0%	8.3%	-267	6.1%	-585	2.2%	-1239	9.4%	-212
5C	RS3A1C	24.4%	850	0.863	23.7%	25.2%	19.5%	28.7%	19.3%	494	-18.7%	575	13.5%	177	22.2%	731
6C	RS3A1C+RS4	15.5%	485	0.193	15.1%	15.9%	11.6%	18.8%	12.7%	92	-11.0%	-176	6.7%	-1144	14.2%	314
7C	RS3A1C+RS3A2C	22.4%	1725	0.693	21.3%	23.8%	17.6%	26.6%	17.9%	964	16.9%	1036	12.0%	44	20.4%	1463
8C	RS3A1C+RS3A2C+RS4	18.2%	1496	0.372	17.4%	19.2%	13.9%	22.0%	14.8%	659	13.3%	419	8.8%	-1145	16.6%	1169
9C	RS6A1C+RS6A2C	10.8%	-121	-0.064	10.3%	11.4%	7.4%	13.6%	8.9%	-313	6.7%	-725	2.8%	-1615	9.9%	-226
10C	RS6A1C+RS6A2C+RS4	7.3%	-828	-0.217	7.0%	7.6%	4.0%	9.9%	5.9%	-982	3.5%	-1889	-0.7%	-3456	6.6%	-972
11	RS2	18.1%	476	0.382	17.1%	19.3%	13.6%	21.9%	14.7%	204	13.2%	128	8.8%	-380	16.5%	370
12	RS1bY+RS2	13.3%	195	0.073	12.6%	14.1%	9.4%	16.6%	11.0%	-127	9.0%	-511	5.0%	-1546	12.2%	39
15	RS2+RS4	10.6%	-201	0.073	10.0%	11.3%	7.0%	13.6%	8.7%	-444	6.6%	-1007	2.5%	-2193	9.7%	-345
16C	RS2+RS3A1C	24.1%	1893	0.848	23.3%	25.1%	19.2%	28.4%	19.1%	1099	18.4%	1262	13.3%	354	21.9%	1624
17C	RS2+RS3A1C+RS4	18.5%	1312	0.390	17.9%	19.3%	14.2%	22.2%	15.0%	589	13.6%	409	9.1%	-903	16.9%	1031
18C	RS2+RS3A1C+RS3A2C	23.1%	2832	0.758	22.1%	24.4%	18.1%	27.3%	18.4%	1623	17.5%	1782	12.6%	275	21.0%	2410
19C	RS2+RS3A1C+RS3A2C+RS4	19.9%	2394	0.492	19.0%	21.0%	15.4%	23.9%	16.1%	1214	14.8%	1071	10.1%	-836	18.1%	1948
20C	RS2+RS6A1C+RS6A2C	16.7%	887	0.282	16.0%	17.5%	12.7%	20.2%	13.6%	305	12.0%	28	7.7%	-1225	15.3%	652
21C	RS2+RS6A1C+RS6A2C+RS4	12.1%	28	0.006	11.6%	12.7%	8.5%	15.1%	10.0%	-215	7.9%	-601	3.9%	-1524	11.1%	-97
37C	RS1bY+RS2+RS3A1C+RS3A2C	19.2%	2342	0.453	18.1%	20.5%	14.8%	22.9%	15.6%	1149	14.1%	923	9.6%	-1127	17.5%	1899
38C	RS1bY+RS2+RS3A1C+RS3A2C+RS4	17.1%	1872	0.311	16.1%	18.2%	12.9%	20.7%	13.9%	724	12.3%	196	7.9%	-2236	15.6%	1413
With Jamuna Bridge and Guide Embankment																
22	RS4	8.2%	-333	-0.176	7.3%	9.2%	4.8%	11.0%	6.6%	-432	4.3%	-858	0.2%	-1630	7.4%	-409
29	RS2	25.1%	1199	0.971	24.1%	26.1%	19.7%	29.7%	19.8%	707	19.3%	842	14.3%	342	22.6%	1015
30	RS2+RS4	13.2%	211	0.068	12.7%	13.8%	9.3%	16.5%	10.9%	-161	8.9%	-604	5.0%	-1793	12.0%	12
33C	RS2+RS3B1C+RS3B2C	13.4%	259	0.078	11.8%	15.2%	9.5%	16.7%	11.0%	-153	9.0%	-626	4.9%	-1918	12.4%	84
34S	RS2+RS3B1S+RS3B2S+RS4	12.2%	41	0.010	10.8%	13.8%	8.5%	15.3%	10.0%	-295	7.9%	-814	3.8%	-2070	11.2%	-114

Note : * The conversion factors used in the main economic analysis were based on FPCO figures of February 1992
 ** A corrective factor has been applied to the avoided flood damages, both +ve and -ve by 25%
 *** A corrective factor applied both to avoided flood damages and to increase in agricultural income, both +ve and -ve by 25%.

Source: CS 1992, see PSR X.4
 F:\MADAB\NCRSLAST\MAIN\TAB65.WK1

4.3 Indirect and Macro-Economic Impacts

4.3.1 General

Indirect and macro-economic impacts have been considered in the multicriteria analysis which assembles all economic, financial, socio-economic and environmental impacts (see Chapter 5). Indirect and macro-economic impacts are described below.

The national/regional objectives of the 1990-1995 Fourth Five Year Plan (FFYP) are briefly summarised below. These objectives are basically three in number:

- Growth in national income
- Increased self reliance (improving the ability of citizens of Bangladesh to solve their own development problems, participatory planning, local level organisation of planning, greater domestic savings, heavy reliance on the private sector)
- Poverty alleviation and employment generation (expansion of employment and income opportunities, especially for the poor).

What is specifically relevant for the present flood mitigation study is also the objective for the agricultural sector:

"Attain self sufficiency in food along with increased production of other nutritional crops (maintaining food balance for the rapidly growing population)".

How are these objectives satisfied by the various development options? Are there significant differences between these options? These questions are discussed below.

4.3.2 Gross Income and Added Value

The incremental added value with the main options is given in Table X.4.14, and compared to the W.O. situation. To simplify the analysis, only the without Jamuna bridge scenario is described. It is more difficult to interpret the results with Jamuna bridge: if a guide embankment is built downstream the bridge (as has been proposed by the Dhaleswari Mitigation Study, JMBA 1992, but not necessarily adopted by the Jamuna Bridge Authority), it will have by itself a significant impact on the reduction of flooded areas in NCR (mainly in PU6 and 7), as shown by the hydraulic model. All options added to the Jamuna bridge are thus of low profitability. However, when considering the total net benefits of options with Jamuna bridge (whether due to the bridge or to additional structures), they show a slight increase when compared with the without Jamuna bridge situation.

The added value of fisheries has been taken as 80% of their gross product.

TABLE X.4.14
Added values of Selected Scenarios

Scenarios	P.U.*	Added value (Million Tk.)			
		W.O.	W.	W-WO	% increase
RS1b	1	2,699	2,877	178	6.6
RS2	2,4	2,866	3,107	241	8.4
RS1b + RS2	1,2,4	5,565	5,955	390	7.0
RS 3.1	6	1,848	2,298	450	24.4
RS 3(1&2)	6,7	3,121	3,945	824	26.4
RS4	4,6,7,8	5,135	5,343	208	4.1
RS6	6,10	2,732	3,035	303	11.1
RS1b + RS2 + RS3(1&2)	1,2,4,6,7	8,686	10,083	1,397	16.1

* The impact of scenarios may concern other neighbouring areas. In the W.O. situation only the PUs which are mainly concerned by the scenarios are considered.

Source : CS 1992

In the best case (scenarios RS1b + RS2 + RS3*) the level of increase (26%) is significant at the regional level. However, it is probably limited at the national level. To have some rough assessment of the impact at national level, it is needed to consider the gross product. With the scenarios RS1b + RS2 + RS3, the production increase is 22% when considering the concerned PUs, and 8.7% of the total NCR product. The share of NCR in the National Gross Product is 15% (see Section 1.4.1). Assuming that the share of agriculture is the same, the variation of the Agricultural Gross Product with the above referred scenario could be around 1.3% of the national level. For the total added value increase it could be slightly higher, which is probably around 1.5% only of the national value.

4.3.3 Production Increase

The production increase has a direct impact on food availability, and an indirect impact on employment, and on activity of linked sectors.

Table X.4.15 summarises the results of the various scenarios. The most effective scenarios without Jamuna bridge are RS3.1 and RS3, the Dhaleswari-Kaliganga embankment. Impact is high on the PUs concerned (31% production increase with RS3) but the impacts seem are not so high at the regional level, indeed the assessment has to be revised when the impact on food balance, is also considered).

* RS 3 means here and below RS3, phases 1 and 2

TABLE X.4.15
Analysis of Incremental Rice Production

Scenarios	P.U.	Paddy Production			Increment % of NCR production (1)	Population in '000 (2)	Increase availability of rice in concerned PU (kg/Capita)(3)
		WO (t)	increment (t)	increment (%)			
Without Jamuna Bridge							
RS1b (no restriction at Baushi Bridge)	1	303,300	35,700	12	1.2	1,097	22 (25)
RS2	2,4	427,100	51,200	12	1.8	1,775	20 (24)
RS1b + RS2 (with restriction of Baushi Bridge)	1,2,4	730,400	83,100	11	2.9	2,872	20 (24)
RS 3.1	6	251,000	74,000	29	2.6	1,497	34 (36)
RS 3.2	6,7	429,800	134,400	31	4.7	2,733	33 (35)
RS 4	4,6,7 (4)	607,200	45,500	7	1.6	3,609	9 (12)
RS1b + RS2 + RS 3(1&2)	1,2,4,6,7	1,160,200	252,000	22	8.7	5,605	31 (34)
RS6	6,10	302,500	50,800	17	1.8	2,480	14 (16)
With Jamuna Bridge (5)							
RS 3.1	6	251,000	83,600(6)(-)	33 (-)	2.9	1,497	38 (40)
RS 3.2	6,7	429,800	150,300 (40,400)	35 (9)	5.2	2,733	37 (39)
RS 4	4,6,7	607,200	190,200 (80,200)	20 (10)	6.6	3,609	29 (32)
RS1b + RS2 + RS 3(1&2)	1,2,4,6,7	1,160,200	226,300 (116,400)	31 (13)	7.8	5,605	27 (30)
RS 6	6,10	302,500	65,100	22	2.3	2,480	18 (20)

Note:

1. Total production being estimated to 2,886,000 t
2. Present population plus 20%
3. 1 kg of rice = 0.68 kg. of paddy - Figures between brackets allow for avoided damages
4. Small impact of PU8 which has not been considered
5. Between brackets = impacts attributable to each scenario, when separating impacts of the Jamuna bridge. A second series of runs of the hydraulic model was used in the economic analysis as shown in Table X.4.11.
6. It showed lower production increases, the Jamuna bridge itself having a higher impact.

Has also a very negative impact on PU8: - 25,800 t.

Source : CS 1992

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Nutrition Levels

Table X.4.16 gives a comparison of the anticipated situation in the WO and W projects. The present food balance (as far as grain is concerned) shows a good situation in the northern part of the Jamuna and Padma floodplains and a bad situation in the downstream part. Considering all the scenarios of the NCR northern part (PU 1, 2 and 4), the W. situation remains good, even when considering the population increase.

In PU 6, or PU 6 and 7, the two scenarios RS 3.1 and RS 3.2 would just balance the food needs. There is no satisfactory solution to substantially improve the situation in the extreme south (PU 10, also 8). Consequently, there is a marked advantage to implement the scenario giving the highest surpluses (RS1b + RS2 + RS 3) to feed the southern areas which will remain deficit areas.

In addition to these effects of FCD irrigation also has a major incidence on the food balance. For the purpose of the economic analysis, irrigation has been separated from flood control. This is an arbitrary division. Concerning the farming system as a whole, particularly when implementing a flood protection project, the extension officers who will be in charge of the supervision of the agricultural component (mainly the improvement of T.Aman) will also advise on Rabi crops. Furthermore in most of the southern area, irrigation development is closely linked with flood control and drainage (and mainly to drainage). Wherever water does not drain before December it is not possible to grow Boro, and also to develop irrigation. The hydraulic model was not accurate and detailed enough to identify these phenomena: drainage has to be studied compartment wise at a later stage. Irrigation developments without flood control and drainage (northern part), or with flood control and drainage (southern part) are likely to be very significant, for improving the food balance substantially. Groundwater resources are abundant in the Jamuna -Padma floodplains for these developments.

Comparatively the increase in irrigation developments in the south of the Region can be much higher than in the north, where irrigated areas already cover around (and sometimes more than) 50% of the NCA. As an example it is anticipated that after flood protection and drainage around 40% of additional land can be irrigated in PU 10 where it is presently only 27% (see SR I, P I.2.22). This could represent an incremental rice production of around 66,000 Tons of rice, almost the same as the present production (72,000 tons). Flood control would also increase by a minimum of 25% the present production. Assuming that such a development could be reached after 10 years, production grain availability including wheat could be 165,000 tons, for a population estimated at some 980,000 inhabitants, thereby ensuring grain self sufficiency. Obviously additional studies will be needed in these areas, which face very difficult hydraulic problems.

TABLE X.4.16
Impacts of Scenarios on Nutrition Levels

Scenarios	P.U.	Present grain Production ('000 t)			Present Population ('000)	Available grain (kg/capita)	% of minimum requirements(2)	Projected Availability per capita (1)		
		Rice	Wheat	Total				Without Project (kg)	With Project (kg)	% of needs
	1	206.2	11.0	217.2	914	238	149	198		124
	2	169.5	6.5	176.0	749	235	147	196		123
	4	140.5	8.7	149.2	730	204	128	170		106
	6	170.4	19.7	190.1	1247	152	95	127		79
	7	121.6	19.6	141.2	1030	137	86	114		71
	8	61.0	1.8	62.8	486	129	81	108		67
	10	71.9	8.8	80.7	820	98	61	82		51
RS1b	1	-	-	-	-	-	-	198	223	139
RS2	2,4	-	-	-	-	-	-	183	202	126
RS1b + RS2	1,2,4	-	-	-	-	-	-	189	210	131
RS 3.1	6	-	-	-	-	-	-	127	165	103
RS 3(1&2)	6,7	-	-	-	-	-	-	121	159	99
S 4	4,6,7	-	-	-	-	-	-	133	169	106
RS1b+RS2+RS 3.2	1,2,4,6,7	-	-	-	-	-	-	165	191	119
RS 6	6,10	-	-	-	-	-	-	109	127	79

(1) Assuming a population increase of 20% in W and WO project situations

(2) 437 g of grain/capita/day or 160 kg/year, see para 1.4.2.

Source : CS 1992

4.3.4 Indirect Benefits of the Projects

Indirect benefits will appear in the sectors which are linked to agriculture. Commercial activities, and transport (of inputs and outputs), agro-industries. Table X.4.17 gives some approximate indicators of what could be the incremental turnover of these sectors, with comparisons between agricultural productions. If it is assumed that the net benefit of these sectors represent more or less the same as the benefit of the agricultural sector (or 40% of the Gross product, which for commerce is a very conservative assumption), their incremental value adds a minimum of 40% to the direct agricultural benefits. Part of these benefits is given to farmers' family through farm employment (see Section 4.3.8), and also to other categories of labourers.

TABLE X.4.17

Estimated Incremental Gross Product of Sectors Indirectly involved in Agricult. Production (mill.Tk.)¹

Scenarios	Supply of Inputs and pesticides (including transport)	Milling ²	Commerce of Rice ³	Total	% of the Gross value of incremental Rice Production
RS1b	17.9	23.0	55.2	96.1	42
RS 2	22.6	26.0	62.3	110.9	43
RS1b + RS 2	40.5	45.1	108.4	194.0	43
RS 3.1	27.2	47.7	114.4	189.3	40
RS 3.2	65.9	86.6	207.7	360.2	42
RS1b+RS2+RS 3(1&2)	106.4	131.7	316.1	554.2	42

- 1) Not including all sectors which are benefitting from the multiplier effect and supplying goods or services to the farmers or to the above sectors, due to their higher returns
- 2) 10 % of the value of rice
- 3) Quantities sold being 80% of incremental production, which is corresponding to the production of farmers assumed to be self sufficient and cultivating more than 0.5 ha (more than 1 ha for share croppers). In PU 1 distribution of holding is as follows: up to 1 ha = 31%, 1 to 3 ha = 46%, more than 3 ha = 23%. Difference between selling and buying prices assumed to be 30%, which is the usual average margin when selling rice at town markets or when storing it for 3 to 4 months before selling it.

Source : CS 1992

4.3.5 Effects of Projects on Employment

Employment will increase significantly during, the construction of structures, and, less so, for operation and maintenance. Employment will also increase due to the intensification of agricultural production and activities of linked sectors. These effects are estimated in Tables X.4.18 and X.4.19 (except for linked sectors) and compared with the WO situation.



TABLE X.4.18
Analysis of Employment

Scenarios	PU	Employment (million Work Days)						
		W.D. (1)	During Construction		During Operation			
			(2)	increase %	Agriculture	O & M	Total	increase %
RS1b	1	25.7	5.4	21	1.2	0.9	2.1	8
RS 2	2,4	42.5	3.8	9	1.1	0.7	1.8	4
RS1b + RS 2(3)	1,2,4	68.2	7.2	11	2.1	1.7	3.8	6
RS 3.1	6	33.3	2.8	8	3.5	0.5	4.0	12
RS 3(1 & 2)	6,7	53.9	3.3	6	4.6	0.8	5.4	10
RS 4	4,6,7	73.7	5.7	8	1.5	1.1	2.6	4
RS1b+RS2+RS 3(1&2)	1,2,4,6,7	122.1	8.3	7	6.7	2.5	9.2	8
RS 6	6,10	47.2	5.5	12	1.5	1.0	2.5	5

(1) Farming only

(2) See details below

(3) The total of RS1b & RS2 is different from the sum of individual components for construction and operation, due to different structures

Source : CS 1992

TABLE 4.19
Employment During Construction (Million Work-days)

Scenarios	Total	Estimated time of Construction (Years)(1)	Total per year
RS1b	16.2	3	5.4
RS 2	11.3	3	3.8
RS1b + RS2	28.6	4	7.2
RS 3.1	8.3	3	2.8
RS 3(1&2)	13.0	4	3.3
RS 4	17.1	3	5.7
RS1b+RS2+RS 3(1&2)	41.6	5	8.3
RS6	16.6	3	5.5

(1) The economic analysis has considered that the construction will take 3 years everywhere. A more realistic assumption is presented above.

Source : CS 1992

The increase of employment will be generally more important during the construction period than after it, particularly for the northern scenarios. Care should be taken to reserve part of construction jobs for the landless and distressed people, and to keep these people employed as much as possible for operation and maintenance. NGO's and local authorities should assist them in their participation in other activities in the project, such as farming activity (at peak demand and for post harvest operations), rice milling, cottage industries, etc.

The labour increase during construction is very significant in PU1, after construction it is more important with scenarios RS 3 concerning PU 6 and 7.

4.3.6 Balanced Development

The construction of the Jamuna bridge will change completely the patterns of development in the NCR. Any kind of project in the agricultural sector will not be sufficient to provide employment to the increasing population. It has been indicated that all efforts should be devoted to the creation of jobs in other sectors, industry and services. A major constraint to the development of such opportunities is the lack of good communications. The Jamuna bridge, and the road network linking it to Dhaka will naturally offer a strong boost to economic development in the south western part of NCR (which probably will justify the protection against floods of specific areas to create new industrial zones). There is a risk attached with southwestern third of NCR growing quickly, at the detriment of the other two thirds resulting from the movement of population that it is likely to induce (which would just increase the rural to urban migration which is already taking place towards Dhaka and the south of NCR).

An answer to this potential problem is to give priority to the development of northern areas, providing better communications, better social infrastructures (this is specifically true for the cities of Jamalpur and Mymensingh), and flood control projects. In this way implementation could start in PU1 (scenario RS1) then in PU 2 and 4 (scenario RS 2). Other actions should concern the Old Brahmaputra flood plain (PU 3), with local drainage improvement and irrigation, and the northern part of Madhupur Tract (development there not being mainly related to water management). In PU3 where the potential of groundwater resources is limited, the possibility to improve the water supply for irrigation should be analysed (groundwater resources will cover 28% of the potential needs with STW, and 59% with DTW, see SR II). A possible solution lies with an improved supply through the Old Brahmaputra river, which remains to be investigated.

4.3.7 Macro-Economic Impact on Growth Prospects

It has been shown (Maurice 1991) that if floods could be suppressed, the growth path of Bangladesh with flood control options could be above the growth path with floods, this being due to two factors:

- Capital erosion due to floods induces lower GDP in the following years;
- Output losses entails lower incomes, thus lower amounts available for financing, lowering capital and lower GDP.

The methodology developed by Maurice and Diallo (Maurice 1991) has shown that macro-economic effects can be accounted for by applying a single corrective factor to the standard expected avoided losses (capital and output losses). This corrective factor is presently tentatively estimated at 1.25. Such a corrective factor has been considered when preparing the sensitivity analysis.

(1) Controlled flooding in Bangladesh. An attempt to quantify the macro-economic impact on growth prospects. 26 September, 1991.

4.3.8 Observations on Farm Income

It was not judged advisable to prepare a farm budget analysis as it is almost impossible to separate effects of the flood control and of irrigation, which are developing in parallel. A farm budget is presented as a case study in Table X.4.20 in PU 1 for the average farm size. It combines the developments which are foreseen with flood control (see option B, chapter 3), with effects on local and HYV Aman, and with irrigation as envisaged by FAP 3.1, which could give a cropping intensity of 246%.

The farm budget which is presented does not show any other on-farm (homestead, livestock, fishery, etc.), or off-farm income. It has to be reminded that the socio-economic survey has shown the components of income for the small farms of Jamalpur district (see SR IV) to be farm income at 53% non-farm income at 31% and off-farm income at 16%. The average of off farm incomes was found to be 15% in the Jamalpur district. For small farms it was up to 23% in Mymensingh district, and up to 30% in Munshiganj district.

TABLE X.4.20
Farm Budget Analysis (at Market Prices), Case Study for PU1 (Average Farm Size)

	Cropped area (ha)		Net income/ha('000 Tk)		Farm net income('000 Tk)	
	WO	W	WO	W	WO	W
NCA	0.69	0.69	-	-	-	-
Cropping intensity(%)	211	246	-	-	-	-
Local T.Aman	0.19	0.12	10.4	104	1.98	1.25
HYV T.Aman	0.23	0.35	18.2	21.4	4.19	7.49
Local Aus	0.08	0.04	5.6	5.6	0.45	0.22
HYV Aus	0.01	0.01	7.3	7.3	0.07	0.07
HYV Boro	0.33	0.40	20.1	23.2	6.63	9.28
Wheat	0.05	0.06	7.3	7.3	0.37	0.44
Jute	0.11	0.11	9.4	9.4	1.03	1.03
Potato	0.02	0.07	27.6	36.3	0.55	2.54
Sugarcane	0.03	0.03	58.2	58.2	1.75	1.75
Onions	negl.	0.06	-	39.1	-	2.35
Others	0.40	0.44	17.0	17.0	6.80	7.48
Total	1.46	1.69	-	-	23.82	33.90
Working days	191(2)	236(2)	-	-	-	-
Net income/day	-	-	-	-	125	144

Notes: Diversification with irrigation, 77% of NCA being irrigated:

HYV Boro	=	0.40
Potato	=	0.07
Onions	=	0.06
Total	=	0.53

- (1) Agricultural production only, homestead production not considered
- (2) Family labour only. It is assumed that out of total working days 75% of labour is provided by the farmer's family and 25% is hired,

Source : CS 1992

CHAPTER 5

MULTICRITERIA ANALYSIS

5.1 Introduction

The multicriteria analysis followed has been a two stage process including, at first the impact assessment, then grouping together the criteria selected in this first stage, and ranking them (see Figure 5.1).

The impact assessment process, see Figure X.5.1, illustrates the relationship of the biophysical and socio-economic environment to flood control and water management activities. Flood control and water management projects following the water development strategy, as outlined in section 1, must be adapted to development objectives and natural and human resources of the NCR.

The procedure for the selection of development options has been described in section 1.6.2. As a result of this preliminary screening elementary projects have been identified for pre-feasibility analysis. Each elementary project (named Regional Scheme, RS) should be self supporting, i.e., to bring its own benefits and disbenefits. As such it may be carried out alone or added to other projects (with possible interactions between them) inside a "development area". This development area can coincide with a PU (for instance RS1 for the PU1) or cover several PU (for instance RS2 for the PU2 and PU4).

The Regional Schemes involved in the NCR's FAP can be classified as follows:

- No hydraulic structure. No change to surface-water regime. It includes some flood proofing which means minor interventions to provide protection such as flood shelters and elevated housing sites;
- No hydraulic structures, drainage improvements only.
- Controlled or semi-controlled hydraulic structures (no significant embankment).
- Setback embankments: no hydraulic structures,
- Major embankments: controlled or semi-controlled hydraulic structures.

A total of 16 elementary projects have been identified as follows : (See Figures 4.1 to 4.11, section 4.13)

- 4 projects concerning PU1 (RS1a to RS1d),
- 3 projects concerning PU2 and PU4 (RS2aS, RS2aC and RS2b),
- 9 projects concerning PU6 and PU7 and PU6+PU7+PU10 (RS3 phase 1, phase 2, with controlled or semi-controlled structures, RS4 drainage option, RS6 phase 1, phase 2 with controlled or semi-controlled structures).

Taking into account several possible situations with or without combination of elementary projects, with or without control structure at Baushi Bridge, and with or without construction of Jamuna Bridge our analysis has identified 64 scenarios (see Table X.5.1).

Each of these scenarios has been dealt with in an economic assessment (chapter 4), but as far as socio-economic and biophysical aspects are concerned the degree of precision of assessments does not allow to differentiate sufficiently a project from another of its kind. Multicriteria analysis has thus been made only on most contrasted scenarios in each development area (Nr.1 to Nr.6 according Table X.5.2).

The contrasted scenarios concerned are :

- Without Jamuna Bridge
 - o RS1b, RS2, RS1b+RS2, RS3.1, RS3.1+RS3.2, RS4, RS1b+RS2+RS3 (1+2), RS6
- With Jamuna Bridge
 - o RS2, RS4, RS2+RS4, RS2+RS3.1, RS2+RS3.2, RS5.2, RS6.

Figure : X.5.1
Multicriteria Analysis And Impact Assessment

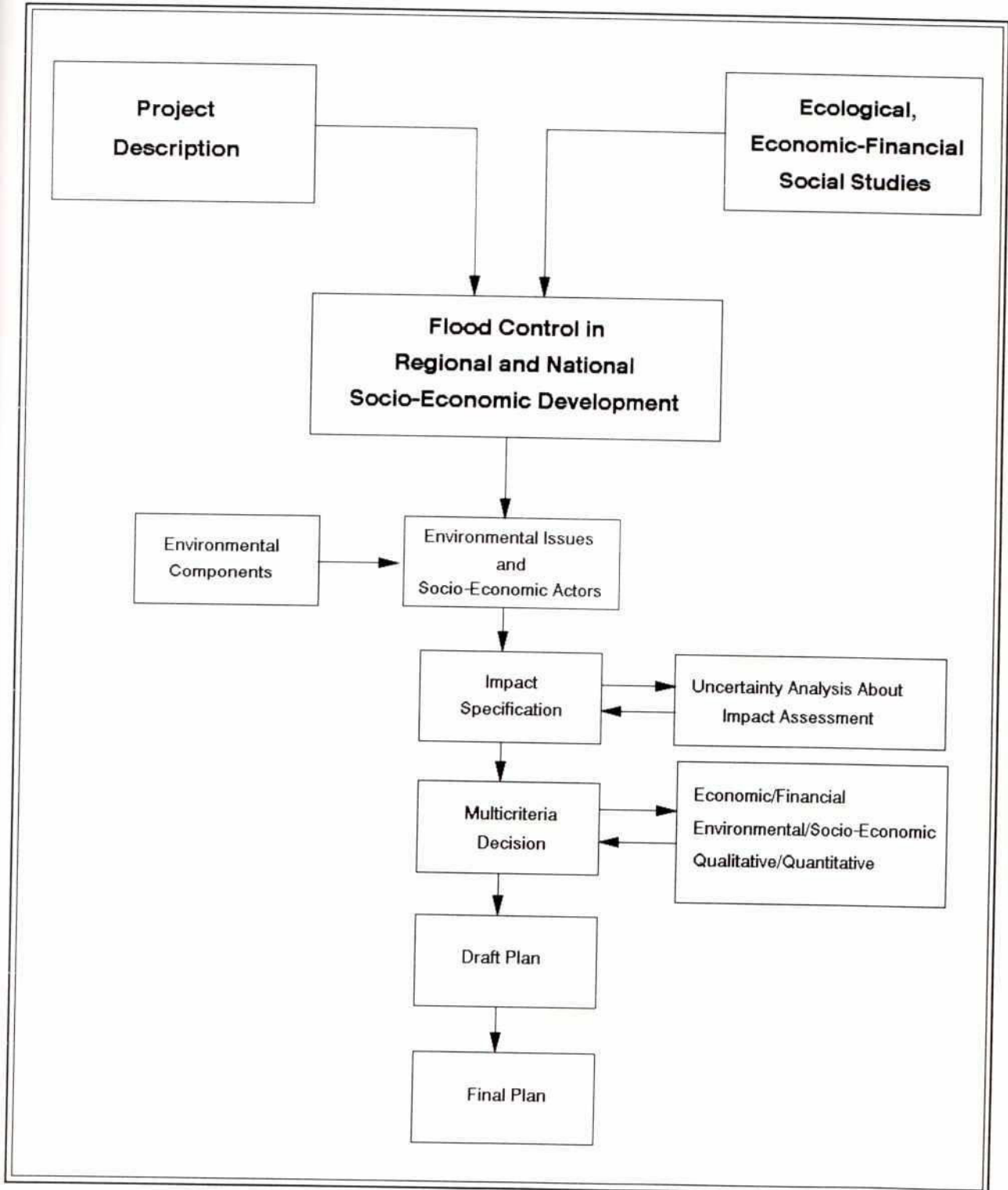


TABLE X.5.1
Regional Schemes, Scenarios and Hydraulic Model Runs

Regional Scheme Nr.	Scenario Nr.		Baushi Bridge Restricted? Yes=Y, No=N	Hydraulic Model Run Nr.			Scheme description	P.U.
	Without Jamuna Bridge	With Jamuna Bridge		Without J. Bridge	With J. Bridge			
					Semi- contr.	Contr- olled		
RS0	1A	1B		Base run			No structural development.	-
RS1a	2	*	Y & N	"	*	16	Jamalpur P.P. through flood proofing/preparedness/warning etc.	1
RS1b	3	*	Y & N	B1	*	17	Jamalpur P.P. with controlled flooding and improved drainage	1
RS1c	4	*	Y & N	C1	*		J.P.P; cont.flood.east of Chatal inc.drainage,flood proof to east.	1
RS1d	5	*	Y & N	D1	*		Jamalpur P.P. full scale polder+structures+bank prot.+drainage	1
RS2	6A	6B	Y	36			RS2 project only.	2,4
RS2+RS4	7A	7B	Y	1			RS2 project associated with the improvement of conveyance of Bangshi and lower Dhaleswari through RS4 project.	2,4,6,7,8
RS31+RS2	8A	8B	Y**	7	8	10	RS2 project only associated with RS3A1S or RS3A1C first phase of Dhaleswari embankment.	2,4,6
RS51(=RS31+RS4+RS2)	9A	9B	Y**	18	19	20	First phase of Dhaleswari embankment (RS3A1S or RS3A1C) associated with RS2 and RS4 projects.	2,4,6,7,8
RS32+RS2	10A	10B	Y**	3	5	6	First and second phases of Dhaleswari-Kaliganga embankment (RS3A1S and RS3A2S or RS3A1C and RS3A2C) associated with RS2 only	2,4,6,7
RS4	11A	11B	N		34	17	Drainage improvement of PU2, PU4, PU6, PU7 and PU8 through RS4 alternative only.	4,6,7,8
RS52(=RS32+RS4+RS2)	12A	12B	Y**	11	23	22	First and second phase of Dhaleswari-Kaliganga embankment through RS3A1S or RS3A1C followed by RS3A2S or RS3A2C and associated with RS4 for drainage improvement.	2,4,6,7,8
RS6	13A	13B	Y**	25	27	32	First and second phase of Dhaleswari-Jamuna embankment down to Harirampur through RS6A1S and RS6A2S or RS6A1C and RS6A2C only.	6,10
RS7	14A	14B	Y**	26	28	31	First and second phase of Dhaleswari-Jamuna embankment down to Harirampur through RS6A1S and RS6A2S or RS6A1C and RS6A2C only.	6,10
RS1by + RS2	-	15B	Y		BI		Jamalpur P.P. associated with RS2 with control at Baushi bridge	1,2,4
RS1cy + RS2	-	15C	Y		CI		Jamalpur P.P. east of Chatal associated with RS2 with control at Baushi bridge	1,2,4

Note :- * The Jamuna bridge is assumed to have negligible effect on the RS1.

** The effect of Baushi Bridge restriction on PUs downstream of PU 4 has been shown to be in the order of only 3% and thus specific runs for without restriction on Baushi Bridge have not been carried out.

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5.2 Impact Assessment

5.2.1 Components of the Human and Biophysical Environment

A list of the components of the human and biophysical environment¹ is given in Table X.5.2. It corresponds to a systematic approach to the NCR's environment and each component (or subsystem) concerns natural resources, biophysical constraints, economic activities, socio-economic life style, socio-economic infrastructures, cultural matter etc. It is a basic list for identifying interested parties, regional issues and consequently types of impacts on flood control and water management projects.

TABLE X.5.2
Environmental Components

<u>The Natural Environment</u>			
ea.	Hydrology :	<i>Surface</i>	- Flooding - Drainage
		<i>Groundwater</i>	- Irrigation - Domestic Water Supply
		<i>Erosion</i>	- Jamuna-Padma - Madhupur Tract
		<i>Sedimentation</i>	- Jamuna - Within Project Area (Clogging, Soil Fertility, Navigation)
eb.	Freshwater Ecology :	<i>Water Quality</i>	- Domestic Water Supply - Agricultural Irrigation Water
ec.	Land Resources :	<i>Soil</i>	- Quality/Chemistry - Erosion - Topography - Agro-Ecological subregion - Soil (structure and fertility)
ed.	Ecology :		- Flora - Fauna
ee.	Seismic Activity :		
<u>The Socio-Economic Environment</u>			
sa.	Economic Livelihood:		- Population (demography) - Risk - Settlement - Land Tenure (Scarcity, Values) - Household Structures - Common Resource Rights (Fish, Fuelwood, Grazing, Fodder) - Main Economic Activities
sb.	Agricultural Output		
sc.	Fishing		
sd.	Forestry and Fuelwood		
se.	Livestock		
sf.	Wage Paid Employment		
sg.	Industry		
sh.	Drinking Water		
si.	Human Health :		- Waterborne Diseases (Malaria, Japanese Encephalitis, Filariasis) - Drinking Water Quality - Sanitation - Nutrition
sj.	Access and Transport Infrastructure:		- Water Transport (Jamuna-Padma, Within Project Area) - Railway - Road
sk.	Archaeology and Cultural Sites		

¹ In its broader sense, including socio-economics

5.2.2 Socio-Economic and Biophysical Issues and Interested Parties

Various consequences will result from flood control and water management actions as well as regional socio-economic development projects. These environmental and socio-economic consequences will have positive and negative effects and will imply various kinds of response from the interested parties. Table X.5.3 gives a list of regional issues resulting from a Flood Action Plan. Although it may not be an exhaustive list, it illustrates the real diversity of interested parties.

For the NCR's Flood Action Plan to be successful it will be obliged to integrate all aspects of the regional development. From Table 5.3 it is possible to draw up the following list of the principal interested parties:

G	Government Authorities
LGO	Local Government Authorities
I	Institutional Actors (officials in various departments)
NGO	Non-Governmental Organizations
NB	National Funding Banks
IB	International Funding Organizations
FH	Various types of Households and Land tenure situation
L	Landless
PT	Petty Traders
RI	Rural Industry and Cottage Industry
F	Fishing and Boating Households
W	Female Headed Households

When we analyse how each socio-economic party is interested in each regional issue, directly or indirectly related to the NCR's FAP (see Table X.5.4), it becomes apparent that governmental, and national or international organizations as well as general public are involved in almost every regional issues. On the other hand economic actors have more specific interests. The points of view of these parties, however, may be different, and in some cases divergences of opinion may appear (see Table X.5.5).

Four main types of interested parties can then be differentiated:

- National and International Institutions interested by National objectives
- Environmental Protection Organizations which may have a divergent point of view with regard to the others
- Agricultural and Non-Agricultural sectors of production having above all profit objectives.
- Population and Local Communities in matters of cultural and social yearning.

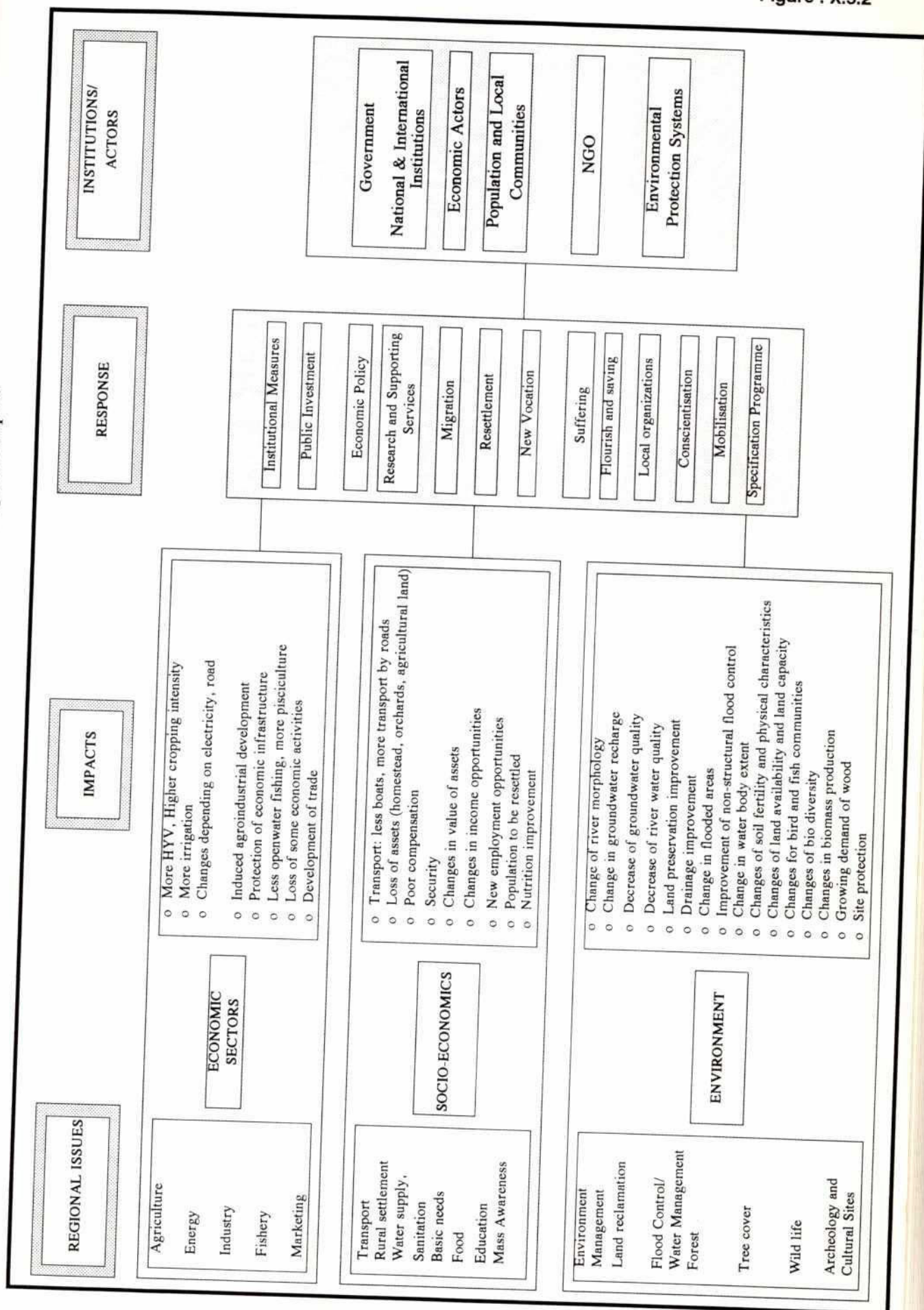
Non-Government Organizations (NGO) can co-operate and adopt the same points of view as National Institutions or Environmental Organizations or local communities.

The principal flood control and water management impacts relating to each issue involved in regional development are illustrated in Figure X.5.2. The impacts of the new situations generated by the NCR's flood control and water management projects are seen to be both positive and negative.

It seems necessary in this context, to assess each kind of projects through various points of view. In this way the assessment matrix groups together the following impacts:

- Economic Financial and Institutional Impacts which concerns specially National and International Institutions.
- Agricultural and non-agricultural impacts concerning the principal regional production sectors.
- Socio-Economic impacts which involve local communities generally speaking on their life style.
- Natural environment impacts concerning all organisation in charge of the regional environment.

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TABLE X.5.3
Environmental and Socio-Economic Issues Involving the Various Interested Parties

Components	
Involvement*	Biophysical Issues
ea to ee	Education & Mass Awareness
	ED 1 Education about health measures, diet, environment management through the secondary school
	ED 2 Professional training
	ED 3 Awareness campaigns through all forms of media about environment preservation, health, diet
ea to ee	Environment Management
	EN 1 Monitoring system implementation
	EN 2 Institutional measures
	EN 3 Flood proofing, emergency measures for any disaster (service activity)
ec	Land
	L 1 Land preservation and reclamation
	L 2 Bank protection, river training and dredging
ed	Tree Cover
	TC 1 Preservation policy
	TC 2 Fiscal policy
ed	Wild Life
	WL 1 Strengthening of the preservation organizations
	WL 2 Organization co-ordination
ea	Flood Control, Drainage and Irrigation
	FCD 1 Irrigation development (presently around 39% NCR area is irrigated)
	FCD 2 Drainage development
	FCD 3 Flood warning
	FCD 4 Hydraulic infrastructure development in the Jamuna & Padma flood plain (45% of the NCR area)
	FCD 5 Supporting services
	FCD 6 Monitoring system implementation
ed	Forest
	F 1 Institutional measures controlling over extraction in the Madhupur Tract (Garh Gazali)
	F 2 Afforestation
	Socio-Economic Issues
sa	About Basic Needs of People and economic livelihood
	BN 1 Security and life style improvement
	BN 2 Settlement
	BN 3 Flood proofing and Flood preparedness
sb	Crop Agriculture
	CA Agricultural Development Actions (CA1 Technical, CA2 Economic, CA3 Organizational and Institutional) for reducing negative effects of soil deterioration, narrowing of the cereal genetic base, indiscriminate use of pesticides, decreasing crop diversification, shortage of draught power.
sc	Fisheries
	Fi 1 Mitigation actions for reducing the loss of fish capture production
	Fi 2 Fish culture development
sd	Energy and Fuelwood
	I 6 More wider use of piped Natural Gas, & other mineral resources in order to reduce fuel wood consumption
	I 7 Increasing of biomass production.
se	Livestock and Poultry
	LV 1 Development actions for proper feeding on new cropping patterns.
sf	Wages and Employment
	EM1 Employment improvement measures (for women and men)
	EM2 Equitable income distribution for the poor
sg	Industrialization
	I 1 Thinking of Institutional & technical measures to control emissions, when creating industries-reducing pollution near Dhaka.
	I 2 Flood proofing
	I 3 Development of cottage industry for mitigating the uncertainties of livelihood among the rural poor especially in the District of Dhaka and along the Jamuna-Padma and Meghna flood plains having the highest population densities of the country.
	I 4 Development of nitrate fertilizer production
	I 5 Industrial and agro-industrial development
sh	Water and Sanitation
	WS 1 Development of domestic water supply
	WS 2 Management of the multipurpose ponds
	WS 3 Preservation of ground water resources
si	Food and Human Health
	Fo 1 Agriculture and fishery development policy in order to change the patterns of the diet towards more non-cereal crops, particularly those derived from horticulture, and to improve protein consumption.
	Fo 2 Assistance to women to improve homestead production
	Fo 3 Improvement of post harvest technologies and of grain storage.
	Fo 4 Improvement of social infrastructures
sj	Urbanization - Rural Household Assets and Transport infrastructure
	URS 1 Land use plan for reducing use of good horticultural and three crop land, deforestation and water pollution and for mitigating resettlement.
	URS 2 Proper embankments to improve transport and communication networks taking into account rural household settlement
	URS 3 Mitigation and improvement of waterway
	URS 4 Flood proofing.
sk	Archaeologic and Cultural sites
	A1 Flood proofing
sb-sg	Marketing System
	MS 1 Adjustment of marketing infrastructures(packaging,equip.,agricul.product preservation & storage)
	MS 2 Better access to small villages and land

* Refers to Table X.5.2

TABLE X.5.4

Interested Parties Involved by the Main Regional Issues

Regional Issues	Governmental, National and International Organisations						Economic Actors (Farming and Non-Farming)						Population & local communities
	G _U	I	NGO	NB	IB	FH	L	PT	RI	F	W	LC	
About Basic Needs of People	x	x	x	x	x	x	x	x		x	x	x	
Education & Mass Awareness	x	x	x	x	x	x	x			x	x	x	
Environment Management	x	x	x	x	x				x	x	x	x	
Land	x	x	x	x	x	x				x	x	x	
Tree Cover			x			x						x	
Wild Life	x	x	x										
Water Management	x	x	x	x	x	x	x			x	x	x	
Forest	x	x	x	x	x				x		x	x	
Crop Agriculture	x	x	x	x	x	x		x	x	x	x	x	
Fisheries	x	x	x	x	x	x	x	x		x	x	x	
Food	x	x	x	x	x	x	x	x		x	x	x	
Water and Sanitation	x	x	x	x	x	x	x			x	x	x	
Transport & Rural Settlement	x	x	x	x	x	x	x		x		x	x	
Industrialization	x	x	x	x	x		x		x		x	x	
Energy	x	x	x	x	x				x		x	x	
Marketing	x	x		x		x		x	x	x	x	x	
Archeology & cultural site	x	x	x	x	x			x	x	x	x	x	

Notes 1. Abbreviations : G = Government Authorities, I = Institutional Actions, NGO = Repeat same as page 58.



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TABLE X.5.5
Possible Divergence of Opinions Between Interested Parties

Interested parties	Governmental, National and International Organizations		Economic Actors				Rural Communities and Population
	I (G, NGO)	II (G, NGO, NB, IB)	III (FH)	IV (F)	V (R1, PT)	VI (T)	
I Contribution to Environmental Preservation System (G, NGO)	NA	x	x	o	x	x	x
II Contribution to Flood Control & Water Management (G, NGO, NB, IB)	x	NA	o	x			o
III Agricultural Sector (FH)	x	o	NA	x			o
IV Fishery Sector (F)	o	x	x	NA	x	o	
V Rural, Industrial and Non-Agricultural Sector (RI, PT)	x			x	NA		o
VI Transport Sector (T)	x			o		NA	
VII Population and Local Communities (LC)	x	o	o		o		NA

High divergence : x
 Moderate divergence : o
 NA : not applicable

5.2.3 Impact Specification

Except in the environmental impact matrix, both quantitative and qualitative criteria are used in determining other impact matrices. A large number of qualitative criteria can make the assessment very subjective. Thus in order to strengthen and control the quality of such an assessment some basic references have been taken into account. These references are given for each matrix and each type of impacts in Tables a, b, c and d in Annex-2. They have been considered when preparing the present impact assessment, they will be more useful when considering more detailed impact assessment in subsequent stages of the study.

Some of these qualitative references are (or will be) supported by quantitative indicators so that the assessment is less subjective than it may appear. Furthermore investigations and specialist consultations have allowed to judge assessment characteristics and make some useful reservations for the decision makers.

Beyond this problem of subjectivity there is a problem of the significance of the impacts. The matrix of valuation describes impacts in term of their magnitude, but it is necessary to give more information in terms of :

- Impact development process (because effects may be direct, cumulative or affected by synergy related to other effects).
- Geographic, chronological and temporal extent and variability
- Reliability of information for the present situation
- Sustainability
- Reversibility
- Uncertainty of long dated estimates

As far as sustainability is concerned the concept can be defined by the following logical criteria:

- The rate of resource use cannot exceed that of natural regeneration or production (by a human activity).
- The rate of development of a renewable substitute and the rate of pollution cannot exceed that of assimilation and breakdown
- The rate of development of a socio-economic event cannot exceed that of regeneration of natural or economic resources used.

Geographic extent refers to the total area affected; Geographic variability means that impacts have not the same magnitude everywhere. Temporal extent or duration refers to the length of time the impact lasts for, while chronological variability means that impacts may be different during a construction phase and after when the project is in operation. Furthermore, some impacts may decrease in magnitude over time while others are permanent and irreversible.

5.3 Multicriteria Analysis

The purpose of this chapter is to offer some explanations on the process of valuation adopted in matters of impact of the Flood Action Plan and comment on results.

5.3.1 Method of Valuation

The purpose of the multicriteria analysis at the pre-feasibility level is to compare the quantitative and qualitative criteria in their performances in alternative or complementary development scenarios. Criteria are chosen to give decision makers (National and International Institutions) the necessary elements on the major impacts. The analysis follows the presentation recommended in FPCO Guidelines for project assessment, Table 1.

- a. The Economic criteria are EIRR, NPV and NPVR1
- b. Quantitative criteria are in line with the national objectives:
 - increase of agricultural production which is partly balanced by a decrease of fish production, both being considered.
 - improvement of nutrition levels
 - employment increase.
- c. Qualitative criteria are presented with a scale from - 3 to + 3, when the impacts cannot be quantified. Five categories of impacts have been assessed:-
 - i) Mitigation measures outside protected area.
Obviously a project which leaves a lot of people outside the project area is not fully satisfactory as it is always difficult to prepare mitigation measures for the distressed people, and there is uncertainty in an emergency situation if the proposed measures will apply efficiently. The criterion considers both the number of affected people and the degree of risk they are facing.
 - ii)&iii) Socio-Economic, and Environmental impacts (these grouping together numerous effects).
A specific analysis has been prepared for each of them applying the Adkins and Burke method which is a means of displaying relative impacts by the ratio of the plus rating to the minus rating as well as the average of all algebraic ratings. For each of these two categories of impacts a specific matrix has been prepared.
 - (iv) Balanced Development
This criterion considers what could be the future of the NCR, in its broad sense, involving flood control with other elements in the overall development process. Obviously priority should be given to the most distressed areas like the Jamuna and Padma Floodplains which are located in the South-West of the NCR with high population densities, very small holdings, factor aggravated by severe flood conditions, resulting in low incomes, unemployment, and migration towards the Dhaka region. However, a new element, the Jamuna bridge construction, is foreseen to modify completely the economic future in these

areas. In such a case priorities will be reversed and should be given to the northern and north eastern parts of the NCR (see Section 4.3.6).

v) Organisation and Institutions

The larger the project the greater the difficulties to manage its construction, and subsequently to operate and maintain (as shown by FAP 12). It is known that this issue is a major concern in Bangladesh. An analysis of involved parties has been presented in section 5.2.2, and recommendations made to improve the present system (see PSR IV). It is thus justified to include this criterion.

It is believed that the Jamuna bridge will have a positive impact on the level of organisation in the NCR, and due consideration should be given to this element.

d. Financial criteria are as follows:

- investment costs
- O&M costs
- farmer net income

5.3.2 Comments

A summary of the multicriteria analysis for the potential projects is presented in Table X.5.6, with supporting Tables X.5.7 and X.5.8 on Socio-Economic and Environmental impacts. Only a few scenarios have been compared, following the results of the economic analysis (see Sections 4.2 & 5.1), their impacts being analysed and compared for the without-Jamuna Bridge scenario (some indications also being given with Jamuna Bridge scenario). The following observations are made:-

a. Economic Criteria

As already underlined in Section 4.2, RS.3 (phases 1 and 2) and RS2 have the higher EIRR, the combination of RS1bY, RS2 and RS3 (1 and 2) being also attractive (For location of these scenarios, see figures 4.11).

When considering the net present values, it is this last scenario which gives the higher NPV, and should be preferred. The NPVR values are also given, and should only be used to compare alternative scenarios (not mutually exclusive ones).

b. Quantitative Criteria

Scenarios RS 3.1 and RS 3 (Phase 1 and 2) are outstanding for the agricultural production, the grain nutrition level and the employment increases. The second criteria is obviously important since for WO there is a noticeable grain deficit in this area. However, the floodplain fish losses are high (the highest locally when compared to other PU).

At the regional level, RS1b + RS2 + RS3 (1 and 2) appears to be the best alternative as it gives significant agricultural production and employment increases. The resulting food surplus could be useful to cover the serious deficit existing in RS6 (the single area which will remain a deficit one,

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in Jamuna - Padma floodplain even W.). unfortunately it has a potentially severe detrimental impact on flood plain fisheries.

It is to be noted that employment increase during the construction phase in PU1 is noticeable, which could be a very positive factor for assisting the poor people and boosting the economic development provided efforts are made after construction to maintain the involvement of the poor in subsequent activities.

c. Qualitative Criteria

Giving the same weight to socio-economic and environmental considerations (which means adding together the overall mark given to each of these criteria) RS 3.1 is ranked first (+0.3), followed by RS1b + RS2 + RS3 (1 and 2), with 0.1 mark, then by RS1b + RS2 (its mark is 0).

Balanced development will be a major concern with Jamuna Bridge, and priority should be clearly given to the northern scenarios (specifically RS1b + RS2). When implementing the above selected project a careful attention should be paid to the mitigation of detrimental impacts outside the project area, and the institutional and organizational aspects. In this respect, among the best scenarios selected above, RS 3.1 is the least affected, followed by RS1b, then RS1b + RS2, then RS1b + RS2 + RS3 (1 and 2).

d. Financial

The financial constraint could be a determining factor. A logical choice could be to select the Scenario RS1bY + RS2 + RS3 (1 and 2), giving due consideration to the mitigation of negative impacts and problems highlighted above. From the economic point of view, and considering also the socio-economic and environmental assessment, this scheme should be split into 2 parts, RS3.1 and 3.2 on one side, RS1bY plus RS2 on the other, of more or less the same cost, priority being given to the first one.

However RS3 cannot start quickly, as it involves the resolution of difficult hydraulic problems which require additional studies to be made. Fishery impacts will also require a long and careful assessment. It is thus advisable to start with RS1b + RS2, which is also logical because these areas are located upstream of RS3, and their improvement will also bring some envisaged improvements downstream. Since RS2 has better prospects than RS1b it appears, to have a higher priority, however hydraulic considerations linking together the downstream part of RS1b, and the upstream one of RS2 recommend the simultaneous development of RS1bn and RS2.

These problems can be better resolved following more detailed hydraulic, economic and financial analyses at the feasibility level. As the feasibility study of RS1 is already going on under FAP 3.1, it is advisable to recommend an early start of the feasibility study of RS2. Due to the very positive results obtained from RS3 it is also advisable to start soon the corresponding feasibility study. In this area, the increase of farmers income, the last criterion shown in Table X.5.6, will be higher, which adds on to the other advantages previously described in favour of scenario RS3.

TABLE X.5.6
Multicriteria Analysis, Summary of Project Results

Data Type	Criteria	Scenario ^{(1)*}	RS1bn	RS2	RS1bY + RS2	RS 3.1	RS 3.1 + RS 3.2	RS 4	RS 6	RS1bY + RS2+RS3 (1+2)
		PU ^a *								
1. Economic	EIRR (%)									
	NPV (Million Tk)12%									
	NPVR 1 12%									
2. Quantitative	Agricultural Production Increase:									
	- in PU %									
	- in NCR %									
	- WO									
	- W									
3. Qualitative	Grain Nutrition Level ^{(2)*}									
	(% of basic needs)									
	Eloyment Increase									
	- in PU% ^{(4)*}									
	- in NCR %									
4. Financial	Floodplain Fish Losses									
	- in PU %									
	- in NCR %									
	Mitigation Measures outside protected area ^{(3)*}									
	Socio-Economic ^{(6)*}									
	Environmental ^{(7)*}									
	Balanced development ^{(8)*}									
	Organizational/Institutional ^{(9)*}									
	Investment costs(Million Tk)									
	O&M Costs (Million Tk)									
	Net Income/Day ^{(10)*}									
	- WO									
	- W									
	- increase %									

Notes on Table 5.6

(1) Scenarios described here are as follows (see also table 5.2 chapter 5):

RS1bn: Jamalpur P.P. with controlled flooding, improved drainage and no restriction at Bauzhi bridge

RS2 : Controlled flooding by improving the railway embankment from Jamalpur to the fertilizer factory, then rehabilitating and completing the Jamuna embankment to Bhuapur (restriction at Bauzhi bridge, when associated or not with RS1b, option RS1bY).

RS 3.1 Controlled flooding with Dhaleswari left embankment from Joker Char to Barinda river.

RS 3.2 Controlled flooding with Dhaleswari left embankment from Barinda river to Kalatia, at confluence with the Bangali river.

RS4 Drainage improvement along the Bangali river from east of Basail to Kalatia.

RS6 Controlled flooding with first and second phase of Dhaleswari-Jamuna embankment down to Hariampur.

Between brackets: quoted PU is also concerned to some extent

Considering a population increase of 20% WO and W (could be after around 10 years).

Employment increase in concerned PU : first figure at full development, second figure between brackets during construction.

from - 3 to + 3

Average of ratings of 13 criteria resulting from the detailed analysis, see Table 5.9 (range for each of them being from - 3 to +3)

Average of ratings of 18 criteria from the detailed analysis see Table 5.10 (range for each of them being from - 3 to +3)

In case Jamuna Bridge is being built

from - 3 to + 3. Between brackets revised figures assuming that Jamuna bridge is being built.

Including hired labour.

Source : CS 1992

TABLE X.5.7
Socio-Economic Assessment I

Assessment Criteria	Regional Schemes without Jamuna Bridge Effects														Regional Schemes with Jamuna Bridge															
	RS1b		RS2		RS1b+RS2		RS3-1		RS3-1+RS3-2		RS4		RS6		RS1b+RS2 RS3(1+2)		RS2		RS4		RS2+RS4		RS2+RS3-1		RS2+RS3-2		RS52		RS6	
	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
Quantitative Income (Changes with respect to situation without intervention): - Floodplain Capture fishery (%)	- 2.3 (0)		- 3.0 (-1)		- 4.7 (-1)		- 2.6 (0)		- 6.1 (-2)		- 0.7 (0)		- 1.9 (0)		- 10.9 (-3)		- 4.8 (-3)		- 3.2 (-2)		- 5.2 (-3)		- 1.9 (-1)		- 3.8 (-2)		- 3 (-2)		- 1.8 (-1)	
Resettlement - Popul. to be resettled 000.hab.	4.1 (-1)		3.0 (0)		7.1 (-1)		2.0 (0)		7.9 (-2)		4.6 (-1)		7.6 (-2)		15.0 (-3)		3.0 (-1)		4.6 (-1)		7.6 (-2)		5.0 (-1)		8.9 (-3)		11.7 (-3)		7.5 (-2)	
Qualitative Population affected - Flood pl.fishery - Agricul.labour - Rickshaw,petty trader - Farm household	-1		-1		-2		-1		-3		0		-2		-3		-1		0		-1		-2		-3		-3		-3	
	+1		+1		+2		+2		+3		+1		+3		+3		+1		+1		+2		+2		+3		+3		+3	
	+1		+1		+1		+2		+3		+1		+3		+3		+1		+1		+2		+3		+3		+3		+3	
	-1		+1		-2		-1		-3		-2		-2		-3		-1		-1		-2		-1		-3		-3		-2	
Transport - Waterways - Roads - Railways	-1		-1		-1		-1		-2		-2		0		-2		-1		-2		-2		-3		-3		-3		-1	
	+2		+1		+2		+1		+3		+1		+2		+3		+1		+1		+2		+1		+3		+3		+2	
	+3		0		+3		0		0		0		0		+1		0		0		0		0		0		0		0	
Life Style - Security - Nutrition - Health - Water supply - Women condition	+1		+1		+2		+1		+1		0		+2		+3		+1		0		+1		+1		+3		+3		+2	
	+1		+2		+2		+3		+2		+1		+2		+3		+2		+2		+2		+2		+2		+2		+2	
	-1		-1		-1		0		-1		+1		-2		-2		-1		+1		+1		-2		-2		-2		-2	
	-1		-1		-1		-1		-1		0		-3		-2		-1		0		0		-1		-1		-2		-2	
Qualitative criteria analysis Nr. of plus rating Nr. of minus rating Algebraic sum of rating Average of rating	+1		+1		+2		+3		+2		+1		+2		+3		+1		+1		+1		+3		+3		+3		+2	
	- 8		7		- 8		7		7		-		7		9		-		8		-		8		-		8		-	
	2		5		5		3		5		2		4		5		2		5		2		5		2		5		5	
	-2		+4		-3		10		-1		+8		-3		+11		-2		+1		-2		0		-6		+9		-4	
	-1		+0.3		-1.5		+0.8		-0.5		+0.6		-1.5		-3		+0.9		+0.1		-1		+0.5		-2		+0.7		-3	

Note : 1. When quantitative, an equivalent qualitative assessment is given between brackets with a mark between - 3 and +3
2. C = Construction phase; O = Operation phase
Source : CS 1992

TABLE X.5.8
Environmental Assessment

Assessment Criteria	Regional Schemes without Jamuna Bridge						Regional Schemes with Jamuna Bridge								
	RS1b	RS2	RS1b+RS2	RS3-1	RS3-1+RS3-2	RS4	RS6	RS1b+RS2 RS3(1+2)	RS2	RS4	RS4+RS2	RS31+RS2	RS32+RS2	RS52	RS6
Bio-diversity	-1	-2	-2	-1	-1	-1	-1	-2	-2	-1	-3	-2	-2	-2	-2
Endangered Species	-1	-1	-1	-2	-2	-1	-1	-2	-1	-1	-2	-1	-2	-2	-2
Fauna	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2
Fish Habitat	-2	-2	-2	-1	-2	-1	-3	-3	-2	-1	-3	-3	-3	-3	-3
Fish Migration (pathway)	-2	-2	-3	-2	-2	0	-3	-3	-3	0	-3	-3	-3	-3	-3
Birds (Migratory)	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2	-2
Flora	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Homestead Trees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wetland	-2	-2	-2	-1	-2	-2	-2	-2	-2	-2	-2	-2	-3	-3	-3
Water Quality															
Beels	-2	-2	-2	-1	-2	0	-3	-2	-2	-2	0	-3	-3	-3	-3
River	-2	-2	-2	0	0	-2	-1	-2	-2	-2	-2	0	-1	0	-2
Ground water	-1	-1	-2	-1	-2	0	-1	-2	-1	0	-1	-2	-3	-2	-1
Soils Fertility and Structure	0	0	-1	-1	-1	0	-1	-1	0	0	-1	-1	-1	-1	-1
Induced Drought	-2	-1	-2	-1	-1	0	-1	-2	-2	0	-2	-2	-1	-1	-1
Flood damage to land	+2	+1	+2	+1	+1	+1	+1	+3	+2	+1	+1	+2	+2	+2	+1
Erosion/Jamuna	+2	+1	+3	+1	+1	0	+2	+3	+1	0	+1	+2	+1	+1	+2
/within area	+2	+1	+2	+1	+2	0	+2	+3	+1	0	+1	+2	+1	+1	+2
Qualitative criteria analysis															
Nr.of plus rating	3	3	3	3	3	1	3	3	3	1	3	3	3	3	3
Nr. of minus rating	12	12	13	12	12	8	13	13	12	9	12	12	13	12	13
Algebraic sum of rating	-12	-15	-15	-11	-14	-9	-15	-15	-16	-11	-21	-17	-23	-21	-21
Average of rating	-0.67	-0.83	-0.83	-0.61	-0.78	-0.50	-0.83	-0.83	-0.89	-0.61	-1.17	-0.94	-1.28	-1.17	-1.17

Source : CS 1992

C:\123\ENGINV-LAG.WK1

CHAPTER 6

CONCLUSION

6.1 General

Before summarizing the conclusions of this report, three important issues have to be mentioned:

- i) The consultant has used existing basic data, and has produced as reliable results as possible, at this pre-feasibility level of study, by cross-checking information and conducting field survey to arrive at a better interpretation of the data. However, at feasibility study level additional investigations will be needed in such fields as topography, classification of flood phases, analysis of fishery activities, environmental impact assessment, etc. More consideration of people living on char land is also needed.
- ii) The hydraulic model needs substantial improvements, based on a better knowledge of flooding conditions (depth, durations), basically linked to topography and hydrology. Improvements will also have to be considered in more detail in the existing and planned structures, such as embankments and compartments and boundary conditions for typical flood events. This model is considered essential to project the W. project flood conditions, thus the W changes in flood patterns which are determining the project benefits.
- iii) A multicriteria analysis implies to some extent subjective judgements. They have been made to the best of the consultant expertise with the manpower resources allocated to the project. With the improvement of the basic socio-economic and environmental knowledge, it will be possible to refine some of the analyses. As far as the choice of development alternatives is concerned within the proposed plan, results are considered as being contrasted enough to give a good picture of development priorities.

The North Central Region suffers heavily from flooding in its western part (Jamuna and Padma flood plains), on around 45% of its total area, severity of flooding increasing towards the south. Analyzing the present conditions by Planning Unit (PU), it was found that flood control measures including embankments, control structures, drainage and water management were likely to improve substantially the situation in the above two flood plains. In the Old Brahmaputra flood plain and the southern part of Madhupur Tract only local drainage improvements are needed. Refining the analysis of possible solutions in homogeneous areas (taking consideration of socio-economic and environmental factors), 64 alternative scenarios were defined for screening and comparison.

A multicriteria analysis was then prepared. Following the FPCO Guidelines for project assessment, it has classified the project impacts into four categories: economic, quantitative, qualitative and financial. All considered the forecast "social" benefits in a broad sense, quantitative and qualitative analyses being mainly devoted to an assessment of socio-economic and environmental impacts.

6.2 Recommended Scenarios

Two scenarios appear very promising :

RS3 = With embankment along the Dhaleswari-Kaliganga from Pungli river to the Bangshi river (at Kalatia),

RS2 = With controlled flooding along the railway line from Jamalpur to the Jamuna fertilizer factory (near Sarishabari), and embankment along the Jamuna down to Bhuapur (mainly improvement of existing or ongoing structures). The corresponding costs of investments are (respectively 2.4 and 1.2 billion Taka (approximately 70 and 35 million US \$)). Both will have some detrimental consequences on environment and fish resources which shall have to be addressed carefully and if possible compensated (these aspects needing a more detailed assessment during further stages of the study). Both will require that institutional and organizational problems linked to their implementation are properly solved.

RS 3 has higher economic prospects, and more generally slightly better performances than RS 2.

However RS 3 cannot start quickly as it has complicated hydraulic implications which require further study (embankment location and embankment impact in its very downstream part, and interrelation with the Jamuna bridge in the northern part if the decision to build this bridge is finalised).

Thus it is recommended to start with RS2.

In the overall NCR context, the best scenario was found to be RS1b + RS2 + RS3, adding to the two above referred scenarios the development of the Jamalpur Priority Project. Due to the hydraulic linkages between RS1b and RS2 (including the need to optimize the control structure of Baushi bridge) it is recommended to develop these two scenarios in parallel. In terms of balanced development RS1b and RS2 have the highest priority in the Region. If the Jamuna bridge is built, this will help prevent large scale migrations of population toward Dhaka and the south of the Region.

The group RS1b and RS2 has a good economic prospect. For most of the parts of this area the level of distress is fairly high (except in the eastern part of Jamalpur priority area), partly due to the small size of farms. A very favourable factor is the role played by local initiative in PU1, which has already given very good results as far as the construction of the Jamuna embankment and the recent development of irrigation are concerned.

6.3 Other Considerations

When performing the economic analysis the development of irrigation was not considered, as it is only partly linked with flood control. Irrigation is dependent on flood control only where the Rabi crop (and mainly Boro rice) cannot be grown due to water being still on the land in December, for poor drainage conditions. In the Jamuna-Padma flood plains, it was not possible to assess with enough accuracy the local drainage conditions and a refinement of the hydraulic model will be needed to assess these circumstances.

In fact when considering the farming systems, it is arbitrary to separate irrigated crops. Any development project that includes a flood control element should consider all aspects of production within an integrated development project. Without irrigation it will not be possible to reach any satisfactory development level within the NCR, to fulfil the basic objectives, such as increased productions, good nutrition levels and raised incomes.

In the long term it is however believed that without the development of sources of income other than agricultural ones it will not be possible to solve the very difficult employment problems already existing. Industries are badly needed. The conditions for their development will probably be linked to the construction of better communications, and better social infrastructures in secondary towns, which will have in turn a very positive impact on all other projects including flood control and agricultural ones.

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SR X
Annex I
Agro-Economic Survey Results

ANNEX I

AGRO-ECONOMIC SURVEY RESULTS

I.1 Introduction

An Agro-economic sample survey was undertaken in July 1991 as a part of the North Central Regional Study-FAP 3. Its main objective was to supplement available data on farming systems over different land categories and for different farmer groups. It was also to provide a basis for cross-checking with other sources of data.

It was however not conceived as an actual bench mark survey which will be required at the feasibility stage, when project areas are clearly identified and statistically representative samples can be designed for each of them.

Farm households were sampled with a view to covering the different types of land with respect of flood depth and the different farmer groups reflected by the size of land holdings.

The content of questionnaires was limited to subjects on which objective answers might be expected.

I.2 General Framework of the Survey

The sample area covers the whole NCRS area limited by Old Brahmaputra, Lakhya, Padma, and Jamuna rivers. It involves a total of 47 Thana with some of them only partly included in the study area.

The sampling procedure was organized in 4 steps as follows:

- (i) Classification of Thana within 4 classes according to the main land type, i.e. F0, F1, F2 and F3 using MPO definitions and maps; 11 Thana have then been selected on the basis of about 1 out of 4 in the classified list of Thana;
- (ii) Selection at random of one Union per Thana using the list of Unions shown in Small Atlas of Bangladesh, BBS 1985-1986;
- (iii) Within the sampled Unions, listing of villages with the number of households provided by the same BBS document; updating of the number of households by using a factor of 1.118; in each sampled Union selection of one village with a number of households between 400 and 500 so as to simplify the sampling of 40 households per village;
- (iv) In the 11 selected villages, census of all households with the identification of their social status, i.e. landless labourers, pure sharecroppers, very small farmers cultivating less than 0.4 hectare, small farmers with 0.4 to 1 hectare, medium farmers with 1 to 2 hectares, and large farmers with more than 2 hectares; landless labourers were excluded from the sample while the others were selected at random at a rate of 40 households per village for arriving at a total sample of 440 farm households.

The result of the sampling procedure is shown in Table X.I.1.

TABLE X.I.1
List of Sampled villages

Thana	Union	Village	No. of H/H *	Land Type	P.U.
Ghatail	Digar	Digar	490	F0	4
Kapasias	Durgapur	Fulbaria	307	F0	9
Basail	Fulki	Jashihati	467	F1	4
Tangail	Katuli	Alokdia	457	F1	6
Delduar	Elasin	Shanbari	353	F1	6
Sharishabari	Mahadan	Karagram	605	F1	1
Muktagacha	Kashempur	Banbangla	513	F1	3
Manikganj	Garpara	Panjankhara	533	F1	7
Mirzapur	Jamurki	Gunatia	423	F2	6
Nawabganj	Bandura	Mahabatpur	413	F3	10
Tongibari	Kathadia- Shimulia	Aldi	488	F3	13
Total			5049		

Source : CS 1992

* 1991 estimates

The questionnaire is divided into 7 subjects as follows;

- (i) Land use and status,
- (ii) Irrigation development and cost,
- (iii) Crop area and production, with and without irrigation,
- (iv) Livestock,
- (v) Marketing,
- (vi) Credit,
- (vii) Crop budgets.

Field work was conducted during 2 months with 2 teams of 3 enumerators under the guidance and supervision of an agro-economist who checked the reliability and consistency of farmers' answers throughout each questionnaire. Questions relating to past flood damage to crops were discarded as their quantification appeared poorly objective.

The results have been tabulated by computer and are given at the end of this Annex under the following headings:

- o Table X.A.1a to f : Average land use and status
- o Table X.A.2 : Average land ownership and farmed area
- o Table X.A.3 : Average cropped area according to farm size
- o Table X.A.4 : Average cropped area according to the size of land ownership
- o Table X.A.5 : Average cropping intensity
- o Table X.A.6 : Average transfer of land during the last 3 years
- o Table X.A.7 : Irrigation development
- o Table X.A.8a to f : Average Kharif crop area
- o Table X.A.9a to f : Average Rabi and perennial crop area
- o Table X.A.10a to f : Average yield of Kharif crops
- o Table X.A.11a to f : Average yield of Rabi and perennial crops
- o Table X.A.12 : Average livestock per farm
- o Table X.A.13 : Availability of animal feed
- o Table X.A.14 : Marketing of agricultural products
- o Table X.A.15 : Situation of credit
- o Table X.A.16 a to f : Average use of farm inputs per hectare

I.3 Land Use and Status

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The average area of land owned and/or operated by farmers in the survey sample is shown in Table X.I.2 hereafter. Within this area about 15% is farmers' residential area and 85% is cultivated land on the average. High variations are however observed between villages.

The average size of cultivated land is 0.629 hectare per farm household with an uneven distribution between and within villages, see Figure X.I.1. A similar distribution of cropped areas is also observed which shows that there is no significant correlation between cropping intensity and farm size.

Total cultivated land area appears significantly higher than the area owned by farmers. It means that probably more than 20% of cultivable land is owned by non-farmer landlords. Variations between villages are high and seem to be independent of local flooding conditions.

The leasing of agricultural land is quite exceptional. The most frequent arrangement between landowners and tenants is by share cropping which might concern about 30% of the total cultivated area.

The distribution of land ownership amongst farmers is still more unequal than that of farm size, as demonstrated by Figure X.I.1, with about 55% of farmers owning only 12% of the available land.

TABLE X.I.2
Average Land Area According to Status

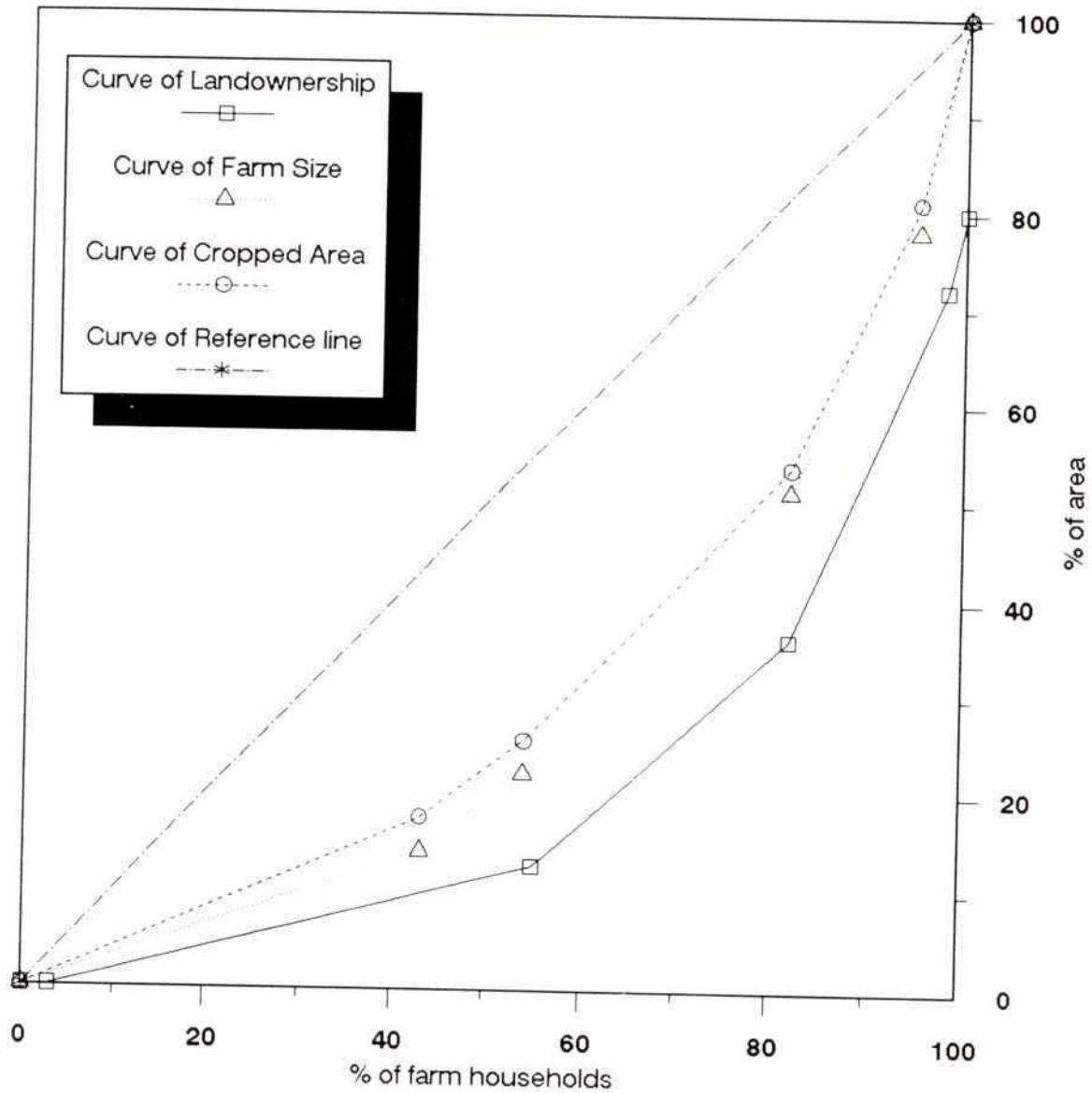
(ha/farm (hectare/household))

	Large farms	Med. farms	Small farms	V.Sm. farms	Pure Share cropp.	All farms
Owned						
Homest.	0.151	0.099	0.073	0.063	0.042	0.073
Orchard	0.028	0.073	0.040	0.018	0.002	0.030
Pond	0.071	0.011	0.004	0.008	0.002	0.010
Cultiv.	1.795	1.148	0.547	0.208	0.021	0.486
Sharecr						
in	0.954	0.297	0.157	0.021	0.434	0.182
out	0.193	0.093	0.056	0.031	0.	0.051
Leased						
in	0.014	0	0.004	0.	0.	0.002
out	0	0	0.002	0.	0.	0.001
Mortgag						
in	0.110	0.069	0.033	0.023	0.065	0.039
out	0.024	0.075	0.035	0.020	0.	0.030
T. land farmed	2.656	1.346	0.648	0.201	0.518	0.629
% of H/H	5.2	12.5	28.2	44.5	9.5	100

Source : CS 1992

Figure X.I.1
Concentration of Land Ownership and Farm Size

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Source : Agro-Economic Survey, CS 1992

The sales of land during the last 3 years, i.e. from mid-1988 to mid-1991 concerned about 3.5% of the total cultivated area and seem to have affected mainly F0 and F1 categories of land as can be seen in Table X.A.6. The different social groups of farmers sold areas more or less proportional to the size of their land ownership.

The areas purchased by farmers are of the same order of magnitude as the sold areas and the survey does not reveal an increased concentration of land in the hands of the larger farmers or in the hands of non-farmers. The market value of agricultural land has been fluctuating around Taka 200,000.

I.4 Irrigation Development

About 76% of farmers in the survey sample are presently using irrigation, see Table X.A.7 almost exclusively for Rabi crops. Traditional means such as doan, swing basket, handpump or paddle pump are used by 6% of farmers and modern equipment by 70%.

Only 7.7% of farmers use their own pump, while about 49% use the pump of others and 13.4 % use a community pump. BADC equipment appears to be very rarely used.

The irrigated area may be estimated at 44.4% of the total farmed area. Shallow tubewells provide irrigation water to almost 28%, deep tubewells to around 9% . The remaining area receives water by low lift pumps and traditional means. A few villages may have till 95% of their cultivated area under irrigation.

The farmers using irrigation do not irrigate all their land. It appears that only 52.6% of the land cultivated by them is actually irrigated in the surveyed sample.

Average irrigation costs are reported at about taka 6,000 per hectare with local variations.

I.5 Crop Area and Production

The average Cropping Intensity found in the sample amounts at 1.81 with a minimum of 1.38 in the village of Fulbaria and a maximum of 2.07 in the village of Banbangla (see Table X.A.5).

Irrigated and non-irrigated crop areas and yields are detailed in Tables X.A.8 to 11.

Deep Water Aman is grown alone or combined with local varieties of broadcast Aus. They are more or less equally distributed in F1, F2 and F3 villages to cover about 27% of the total farmed area without significant differences between farmers' groups. Average reported yield is 0.76 tons/ha for Aman only and 1.40 ton/ha for the association of Aus and D.W.Aman. It is highly variable from village to village and reported to be lower than normal in F2 and F3 areas.

Aus is mainly broadcast with local varieties and more or less equally distributed in all villages, except in the F1 village of Banbangla where it is mainly transplanted with locally improved varieties. The total area covers approximately 35% of the farmed area. The average reported yield is 0.39 ton/ha for broadcast LV, 1.09 ton/ha for broadcast HYV, 1.63 tons/ha for transplanted LV, 1.81 ton/ha for transplanted LIV and 2.03 ton/ha for transplanted

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HYV yields which are probably under-estimated. High variations are observed in relation with flood damage in low lying areas.

The transplanted Aman covers approximately 27% of the farmed area with about 30% in high yielding varieties. As expected it is rarely grown in F2 and F3 villages where flood prone areas are more extensive. The proportion of LV and HYV broadly varies with villages. There is no appearance of a link between the adoption of HYV and the farm size. Average reported yields are respectively 1.56 and 2.66 tons/ha for LV and HYV. They seem to have been frequently 20% lower than normal due to climatic conditions in 1991. Local variations are still high and make the average estimate approximate.

Jute appears to be an important Kharif crop with almost 16% of the farmed area. It is mainly of the White variety. There is one village worth noting, where jute is almost the only kharif crop and covers about 50% of the farmed area: that is the F3 village of Aldi, south of Dhaka, which is mainly producing rabi crops for the Dhaka market.

Average reported yields are 1.43 tons/ha for the white variety and 1.55 tons/ha for Tosa.

Other kharif crops cover less than 0.3% of the farmed area and are negligible. All kharif crops are grown without any irrigation except very small areas of transplanted Aus and transplanted Aman.

The main rabi crop is Boro which covers about 44% of the farmed area. It is almost exclusively grown in HYV and under irrigation. The observed differences between villages are clearly linked with the variations in the availability of irrigation water or of irrigation facilities. Average reported yield is 4.23 tons/ha.

Wheat is grown without irrigation over 5.6% of the farmed area. Variations between villages are quite high and seem to be mainly due to the competition of other rabi crops and/or to problems of soil suitability. The average reported yield is 1.38 ton/ha varying between 1.12 and 1.92 according to sampled villages.

About 6.7% of the farmed area is used for growing potatoes, with irrigation over around 30% of this area. HYV are used over about 90% of the growing area. Potatoes are very unequally distributed between villages with some of them highly specialized like Aldi, south of Dhaka. Average yields vary between 7 tons/ha for non-irrigated local varieties, about 28 tons/ha for non-irrigated HYV and about 36 tons/ha for irrigated HYV.

Other rabi crops including pulses, oilseeds, vegetables and condiments, grown without irrigation, cover a little more than 36% of the farmed area. Like for potatoes there is an apparent village specialization. Average reported yields are 0.41 tons/ha for pulses that are concurrently used for feeding animals, 0.53 tons/ha for oilseeds and a very low 1.43 tons/ha for onions on a very small sample probably not representative of the whole region and possibly including green onions.

Sugarcane is the only perennial crop recorded over cultivated land. It has been reported in only 3 villages out of 11. The resulting average for the whole survey sample is only 2.25% of the farmed area, which is probably an underestimate. The average reported yield is 30.5 tons/ha which mainly concerns chewing varieties.

I.6 Livestock

Average livestock per farm household in sampled villages is reported in Tables X.A.12 and 13. For the whole sample it amounts at 1.81 heads of cattle per farm household with 17% bullock, 17.5 % oxen, 42.5% cows and 22.5% calves. Buffaloes are much less with only one head per 50 farm households. Goats are fairly widespread with about 10 heads per 18 farm households while sheep are infrequent. Poultry and ducks are quite popular with an average of 5.54 fowls per farm household.

The average density of draft animals amounts at 2.05 heads/ha of farmed land with a fairly regular distribution between villages. The village of Aldi is an exception and has only one pair of draft animals per 6 hectares. That can be explained by the cropping pattern in use in that village where a high percentage of potatoes and vegetables is grown requiring land preparation by hand labour. The increasing use of power tillers is also contributing to this local situation.

Cattle is mainly fed by grazing and by the supply of straw, bran and oil cake. The supply of straw is mostly from farm self-production although small quantities may be purchased at an average price of about Tk 1.15/kg. The average supply by head is around 445 kg. Bran is generally purchased at an average price of tk 3.94/kg. It seems to be mainly given to milk cows at a very variable rate averaging 300 kg/head per year. Oil cake also is mostly purchased for the feeding of milk cows at an average price of Tk 6.18/kg. The average supply is around 50 kg/head per year.

I.7 Marketing

The results of the sample survey are shown in Table X.A.14.

The average sales of paddy amount to 436kg/farm and mainly consist of Boro. They are minimal in very small and pure sharecroppers farms and higher in medium and large farms. Less than 1 farm out of 3 is actually selling paddy. Average selling price comes at 6.80 tk/kg.

It is fairly surprising to observe that the purchase of paddy is a common practice with 70% of farmers concerned, including a number of medium and large farms. The average quantity purchased amounts to 619kg/farm and thus exceeds the average quantity sold. This negative balance of -182kg/farm does not look consistent with the average declared production of about 1750 kg/farm and a likely family consumption of around 1200 kg/year. The total difference between the two estimates of 550 kg/farm which can only be explained by the allocation of paddy to hired labourers and by gifts to urban resident relatives.

Jute sold at an average price of 7.37 Tk/kg by 42 % of farm households is the second source of cash income after potatoes sold by 12% of the sampled farmers at an average price of 2.11 tk/kg. The sale of sugarcane is reported by only 8.4% of farmers with an average selling price of 1.07 Tk/kg but it is worth mentioning that the survey sample did not include any area concerned by the supply to Dewanganj sugar mill.

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I.8 Credit Situation

The credit situation of farmers is reported in Table X.A.15 according to their landownership position.

About 28.4 % of all farmers have received loans averaging Tk 4850. They were only or mainly agricultural loans from institutional sources for large and medium landowners having more than 1 hectare of land. They were mainly loans for private use from institutional sources for landless farmers who have the highest level of indebtedness with about 38.5% of them concerned and an overall average of Tk 1925 borrowed per household. The widest range of loan sources is observed with small and very small landowners.

The average interest rate requested by banks and co-operatives for agricultural loans is reported at 16.86%. From friends, relatives and others the rates of interest are highly variable between 0 and 120%.

The total indebtedness in the survey sample may be estimated at about Tk 1,375 about 55% of which has been already repaid.

I.9 Use of Labour and Farm Inputs

The average use of farm inputs per hectare of the main crops is reported in appendix Table X.A.16.

The field data generally confirm the estimates published by BARI and BIDS for rice crops. For other crops, present local practices may differ from statistics collected in other producing areas of Bangladesh with respect of labour and other input requirements. The variability of actual practices is still fairly high and the adjustment of previous average estimates remains subject to further improvement for meeting very local conditions. Presently revised estimates are given further with crop budgets.

TABLE X.A.1a
Average Land Use and Status (Large Farms)

	Digar F0	Fulbaria F0	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Benbanga F1	Panjankhara F1	Gumatia F2	Mahabbatpur F3	Aldi F3	Region
% of households	2.5	2.5	2.5	7.5	2.5	2.5	2.5	2.5	5	2.5	2.5	5.2
Homestead	0.469	0.235	0.223	0.088	0.219	0.158	0.117	0.020	0.114	0.146	0.085	0.151
Orchard	0.000	0.190	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.000	0.028
Pond	0.186	0.000	0.283	0.000	0.081	0.055	0.036	0.000	0.000	0.071	0.283	0.071
Cultivated land												
Total owned	3.064	1.700	4.047	2.188	4.047	1.473	1.501	0.219	2.667	1.101	2.339	1.795
Shared in	0.000	3.683	0.000	0.000	0.000	0.615	0.312	1.639	0.340	1.501	0.000	0.954
Shared out	0.093	0.000	0.971	0.089	1.955	0.000	0.000	0.000	0.184	0.078	0.000	0.193
Leased in	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.000	0.014
Leased out	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mortgaged in	0.000	0.000	0.000	0.135	0.000	0.000	0.603	0.437	0.227	0.062	0.000	0.110
Mortgaged out	0.502	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.000	0.000	0.024
Total farmed	2.469	5.383	3.076	2.234	2.092	2.088	2.416	2.295	3.021	2.618	2.339	2.656

TABLE X.A.1b
Average Land Use and Status (Medium Farms)

	Digar F0	Fulbaria F0	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Benbanga F1	Panjankhara F1	Gumatia F2	Mahabbatpur F3	Aldi F3	Region
% of households	5.0	22.5	12.5	15.0	5.0	7.5	10.0	12.5	22.5	17.5	7.5	12.5
Homestead	0.024	0.091	0.099	0.114	0.142	0.098	0.100	0.145	0.094	0.065	0.123	0.099
Orchard	0.010	0.387	0.000	0.000	0.081	0.040	0.000	0.026	0.000	0.000	0.032	0.073
Pond	0.000	0.028	0.005	0.000	0.000	0.013	0.012	0.004	0.011	0.000	0.035	0.011
Cultivated land												
Total owned	0.798	1.180	1.431	1.416	1.441	1.354	1.361	1.184	0.971	0.496	1.577	1.148
Shared in	0.065	0.099	0.121	0.166	0.000	0.432	0.000	0.326	0.432	0.919	0.158	0.297
Shared out	0.000	0.047	0.162	0.022	0.000	0.105	0.000	0.437	0.019	0.030	0.285	0.093
Leased in	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Leased out	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mortgaged in	0.203	0.000	0.000	0.055	0.358	0.000	0.000	0.107	0.203	0.000	0.000	0.069
Mortgaged out	0.000	0.052	0.156	0.138	0.000	0.229	0.139	0.000	0.063	0.000	0.081	0.075
Total farmed	1.065	1.181	1.234	1.477	1.799	1.452	1.222	1.179	1.524	1.385	1.371	1.346

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TABLE X.A.1c
Average Land Use and Status (Small Farms)

	Digar F0	Fulbaria F0	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjankhara F1	Gurania F2	Mahabhatpur F3	Aldi F3	Region
% of households	30.0	32.5	30.0	30.0	25.0	27.5	32.5	40.0	30.0	17.5	15.0	28.2
Homestead	0.051	0.067	0.080	0.085	0.083	0.033	0.075	0.079	0.079	0.089	0.070	0.073
Orchard	0.011	0.306	0.000	0.000	0.000	0.012	0.001	0.015	0.000	0.041	0.020	0.040
Pond	0.000	0.000	0.000	0.000	0.000	0.006	0.014	0.001	0.004	0.000	0.032	0.004
Cultivated land												
Total owned	0.492	0.572	0.543	0.630	0.439	0.591	0.741	0.541	0.508	0.593	0.567	0.547
Shared in	0.191	0.106	0.134	0.100	0.247	0.029	0.000	0.186	0.425	0.297	0.000	0.157
Shared out	0.041	0.005	0.005	0.237	0.024	0.000	0.000	0.158	0.000	0.100	0.012	0.056
Leased in	0.000	0.000	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Leased out	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.002
Mortgaged in	0.000	0.011	0.033	0.111	0.026	0.029	0.027	0.032	0.038	0.000	0.061	0.033
Mortgaged out	0.025	0.000	0.071	0.039	0.030	0.028	0.077	0.014	0.033	0.000	0.047	0.035
Total farmed	0.618	0.684	0.678	0.564	0.638	0.620	0.691	0.587	0.698	0.790	0.569	0.648

TABLE X.A.1d
Average Land Use and Status (Very Small Farms)

	Digar F0	Fulbaria F0	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjankhara F1	Gurania F2	Mahabhatpur F3	Aldi F3	Region
% of households	52.5	40.0	45.0	40.0	60.0	55.0	52.5	40.0	27.5	15.0	62.5	44.5
Homestead	0.027	0.064	0.204	0.048	0.052	0.038	0.052	0.072	0.044	0.072	0.044	0.063
Orchard	0.011	0.129	0.000	0.017	0.000	0.012	0.006	0.021	0.002	0.032	0.000	0.018
Pond	0.006	0.000	0.000	0.000	0.034	0.003	0.002	0.006	0.000	0.041	0.005	0.008
Cultivated land												
Total owned	0.182	0.210	0.185	0.232	0.254	0.238	0.170	0.144	0.356	0.277	0.161	0.208
Shared in	0.022	0.005	0.034	0.008	0.029	0.029	0.000	0.006	0.078	0.035	0.000	0.021
Shared out	0.014	0.000	0.037	0.000	0.041	0.066	0.000	0.017	0.206	0.018	0.003	0.031
Leased in	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Leased out	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Mortgaged in	0.016	0.000	0.018	0.024	0.015	0.021	0.003	0.014	0.035	0.000	0.079	0.023
Mortgaged out	0.017	0.007	0.004	0.045	0.046	0.021	0.027	0.000	0.026	0.000	0.009	0.020
Total farmed	0.188	0.208	0.217	0.220	0.209	0.199	0.147	0.146	0.216	0.295	0.229	0.201

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TABLE X.A.1e
Average Land Use and Status (Pure Share Crooper)

	Digar F0	Fulbaria F0	Jashibati F1	Aloklia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjankhara F1	Gumatia F2	Mahabhatpur F3	Aldi F3	Region
% of households	10.0	2.5	10.0	7.5	7.5	7.5	2.5	5.0	15.0	25.0	12.5	9.5
Homestead	0.021	0.105	0.039	0.059	0.067	0.030	0.008	0.018	0.036	0.060	0.022	0.042
Orchard	0.000	0.089	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Pond	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.002
Cultivated land												
Total owned	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.087	0.000	0.021
Shared in	0.121	0.075	0.192	0.165	0.540	0.105	0.142	0.263	0.519	1.074	0.111	0.434
Shared out	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Leased in	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Leased out	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mortgaged in	0.000	0.000	0.134	0.231	0.084	0.000	0.000	0.000	0.076	0.000	0.160	0.065
Mortgaged out	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total farmed	0.121	0.075	0.326	0.595	0.424	0.105	0.142	0.252	0.595	1.160	0.270	0.518

TABLE X.A.1f
Average Land Use and Status (All Farms)

	Digar F0	Fulbaria F0	Jashibati F1	Aloklia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjankhara F1	Gumatia F2	Mahabhatpur F3	Aldi F3	Region
% of households	100	100	100	100	100	100	100	100	100	100	100	100
Homestead	0.045	0.076	0.138	0.073	0.070	0.049	0.065	0.080	0.068	0.089	0.052	0.073
Orchard	0.010	0.245	0.000	0.007	0.004	0.013	0.004	0.018	0.001	0.025	0.005	0.010
Pond	0.008	0.006	0.008	0.000	0.022	0.005	0.008	0.004	0.004	0.026	0.018	0.030
Cultivated land												
Total owned	0.359	0.578	0.526	0.658	0.435	0.431	0.504	0.427	0.537	0.529	0.363	0.486
Shared in	0.084	0.153	0.099	0.070	0.105	0.080	0.011	0.172	0.541	0.862	0.026	0.182
Shared out	0.022	0.012	0.063	0.081	0.079	0.044	0.000	0.125	0.070	0.045	0.025	0.051
Leased in	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.002
Leased out	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.006	0.000	0.000	0.001
Mortgaged in	0.019	0.004	0.031	0.079	0.038	0.019	0.026	0.043	0.089	0.016	0.079	0.641
Mortgaged out	0.029	0.014	0.043	0.050	0.035	0.036	0.053	0.005	0.039	0.000	0.019	12.938
Total farmed	0.411	0.707	0.565	0.676	0.464	0.449	0.488	0.510	0.852	1.369	0.424	0.629

TABLE X.A.2 : Average land ownership and farmed area

(Hectare/household)

	Digar F0	Fulbaria F0	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbangla F1	Panjankhara F1	Gunatia F2	Mahabhatpur F3	Aldi F3	Region
Landless farmers												
Number %	5.0	0.0	5.0	0.0	0.0	2.5	2.5	5.0	2.5	0.0	10.0	3.0
Owned area	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.01
Farmed area	0.11	0.00	0.29	0.00	0.00	0.05	0.14	0.16	0.41	0.00	0.30	0.22
Very small landowners												
Number %	62.5	30.0	60.0	40.0	65.0	57.5	45.0	50.0	57.5	47.5	57.5	52.0
Owned area	0.15	0.26	0.22	0.16	0.19	0.19	0.15	0.19	0.20	0.19	0.15	0.18
Farmed area	0.23	0.20	0.35	0.25	0.27	0.21	0.12	0.40	0.53	1.34	0.21	0.57
Small landowners												
Number %	22.5	32.5	17.5	37.5	20.0	30.0	30.0	37.5	17.5	55.0	20.0	27.5
Owned area	0.63	0.63	0.78	0.58	0.54	0.73	0.65	0.62	0.63	0.65	0.55	0.63
Farmed area	0.56	0.48	0.64	0.60	0.44	0.67	0.58	0.59	0.82	1.12	0.49	0.65
Medium landowners												
Number %	7.5	35.0	15.0	22.5	12.5	10.0	22.5	2.5	22.5	15.0	10.0	15.9
Owned area	1.27	1.52	1.93	2.03	1.55	1.71	1.40	1.08	1.72	1.68	1.69	1.65
Farmed area	0.97	1.32	1.01	1.56	1.17	1.26	1.15	1.15	1.74	1.93	1.26	1.57
Large landowners												
Number %	2.5	2.5	2.5	0.0	2.5	0.0	0.0	5.0	0.0	2.5	2.5	1.8
Owned area	3.72	3.54	4.55	0.00	4.35	0.00	0.00	5.52	0.00	4.05	3.02	5.78
Farmed area	2.47	1.15	3.08	0.00	2.09	0.00	0.00	0.98	0.00	2.06	2.02	1.85
All farm households												
Number	40	40	40	40	40	40	40	40	40	40	40	440
Owned area	0.42	0.91	0.67	0.74	0.53	0.50	0.58	0.55	0.61	0.67	0.44	0.60
Farmed area	0.41	0.71	0.57	0.68	0.46	0.45	0.49	0.51	0.85	1.37	0.42	0.63

Owned area including Homestead, Orchard and Pond

Landless: Less than 0.02 ha

V. Small landowners: 0.02 to 0.4 ha

Small landowners: 0.4 to 1 ha

Medium landowners: 1 to 3 ha

Large landowners: More than 3 ha

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TABLE X.A.3 : Average cropped area according to farm size

(Hectare/household)

	DIGAR F0	FULBARIA F0	JASHIHATI F1	ALOKDIA F1	SHANBARI F1	KARAGRAM F1	BANBANGLA F1	PANJANKHARA F1	GUNATIA F2	MAHABHATPUR F3	ALDI F3	REGION
Pure Sharecroppers												
Single crop land	0.000	0.075	0.157	0.077	0.162	0.000	0.000	0.081	0.103	0.289	0.000	0.121
Double crop land	0.091	0.000	0.169	0.318	0.262	0.105	0.000	0.182	0.492	0.856	0.270	0.389
Triple crop land	0.030	0.000	0.000	0.000	0.000	0.000	0.142	0.000	0.000	0.016	0.000	0.010
Total cropped area	0.273	0.075	0.495	0.713	0.685	0.211	0.426	0.445	1.086	2.048	0.541	0.928
V. Small Farms												
Single crop land	0.025	0.086	0.047	0.008	0.080	0.020	0.005	0.050	0.082	0.082	0.021	0.041
Double crop land	0.119	0.122	0.170	0.208	0.126	0.179	0.118	0.096	0.134	0.213	0.208	0.152
Triple crop land	0.043	0.000	0.000	0.004	0.003	0.000	0.026	0.000	0.000	0.000	0.000	0.008
Total cropped area	0.393	0.330	0.587	0.436	0.340	0.378	0.317	0.242	0.350	0.508	0.437	0.369
Small Farms												
Single crop land	0.101	0.474	0.194	0.044	0.183	0.025	0.000	0.215	0.249	0.163	0.014	0.161
Double crop land	0.443	0.188	0.484	0.510	0.444	0.570	0.654	0.341	0.374	0.626	0.555	0.456
Triple crop land	0.074	0.000	0.000	0.011	0.031	0.025	0.037	0.051	0.076	0.000	0.000	0.028
Total cropped area	1.208	0.850	1.161	1.096	1.164	1.241	1.419	0.990	1.223	1.415	1.124	1.158
Medium Farms												
Single crop land	0.000	0.976	0.178	0.252	0.510	0.000	0.000	0.162	0.291	0.235	0.000	0.314
Double crop land	0.601	0.205	0.801	1.181	1.038	1.452	1.170	1.017	1.235	1.128	1.314	0.969
Triple crop land	0.464	0.000	0.255	0.045	0.251	0.000	0.053	0.000	0.000	0.023	0.057	0.064
Total cropped area	2.593	1.586	2.545	2.747	3.339	2.903	2.497	2.197	2.757	2.558	2.798	2.442
Large Farms												
Single crop land	1.032	0.708	1.546	0.022	0.324	0.000	0.000	1.311	0.652	0.606	0.000	0.557
Double crop land	1.109	4.674	1.530	2.123	1.769	1.493	2.416	0.983	2.257	1.965	2.339	2.037
Triple crop land	0.328	0.000	0.000	0.089	0.000	0.595	0.000	0.000	0.114	0.047	0.000	0.082
Total cropped area	4.234	10.056	4.606	4.535	3.862	4.771	4.832	3.277	5.505	4.677	4.678	4.857
All Farmers												
Single crop land	0.070	0.428	0.156	0.062	0.139	0.018	0.002	0.163	0.211	0.306	0.015	0.143
Double crop land	0.262	0.273	0.577	0.596	0.302	0.409	0.452	0.336	0.613	1.044	0.404	0.461
Triple crop land	0.079	0.000	0.052	0.018	0.022	0.022	0.035	0.012	0.028	0.020	0.004	0.025
Total cropped area	0.832	0.973	1.005	1.309	0.810	0.902	1.009	0.872	1.522	2.453	0.856	1.138

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TABLE X.A.4 : Average cropped area according to the size of landownership

(Hectare/household)

	DIGAR FO	FULBARIA FO	JASHIHATI FI	ALOKDIA FI	SHANBARI FI	KARAGRAM FI	BANBANGLA FI	PANJANKHARA FI	GUNATIA F2	MAHABATPUR F3	ALDI F3	REGION
Landless Farmers												
Single Crop Land	0.000		0.237			0.000	0.000	0.081	0.000		0.000	0.049
Double Crop Land	0.105		0.051			0.053	0.000	0.110	0.405		0.303	0.169
Triple Crop Land	0.000		0.000			0.000	0.142	0.000	0.000		0.000	0.011
Total cropped area	0.210		0.338			0.106	0.426	0.300	0.810		0.605	0.420
V. Small Landowners												
Single Crop Land	0.013	0.172	0.084	0.028	0.088	0.020	0.003	0.200	0.168	0.318	0.014	0.096
Double Crop Land	0.174	0.028	0.267	0.220	0.181	0.193	0.089	0.202	0.551	1.010	0.193	0.267
Triple Crop Land	0.046	0.000	0.000	0.004	0.003	0.000	0.023	0.000	0.015	0.008	0.000	0.010
Total cropped area	0.498	0.228	0.619	0.480	0.459	0.406	0.251	0.605	0.914	2.364	0.399	0.658
Small Landowner												
Single Crop Land	0.090	0.342	0.186	0.083	0.085	0.023	0.000	0.158	0.152	0.302	0.036	0.139
Double Crop Land	0.414	0.139	0.400	0.504	0.317	0.620	0.527	0.404	0.586	0.792	0.453	0.476
Triple Crop Land	0.056	0.000	0.049	0.009	0.039	0.023	0.051	0.033	0.081	0.050	0.000	0.030
Total cropped area	1.086	0.621	1.132	1.118	0.834	1.333	1.209	1.063	1.568	1.976	0.943	1.182
Medium Landowners												
Single Crop Land	0.202	0.756	0.150	0.086	0.454	0.000	0.000	0.000	0.390	0.231	0.000	0.286
Double Crop Land	0.367	0.545	0.704	1.418	0.616	1.108	1.126	1.145	1.327	1.700	1.259	1.024
Triple Crop Land	0.395	0.000	0.156	0.059	0.100	0.149	0.023	0.000	0.025	0.000	0.000	0.060
Total cropped area	2.122	1.846	2.026	3.101	1.987	2.662	2.323	2.290	3.119	3.631	2.517	2.514
Large Landowners												
Single Crop Land	1.032	0.000	1.546	0.000	0.324	0.000	0.000	0.000	0.000	0.567	0.000	0.434
Double Crop Land	1.109	1.133	1.530	0.000	1.769	0.000	0.000	0.984	0.000	1.279	1.854	1.330
Triple Crop Land	0.328	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.210	0.170	0.089
Total cropped area	4.234	2.266	4.606	0.000	3.862	0.000	0.000	1.967	0.000	3.755	4.218	3.359
All Farmers												
Single Crop Land	0.070	0.428	0.156	0.062	0.139	0.018	0.002	0.163	0.211	0.306	0.015	0.143
Double Crop Land	0.262	0.273	0.377	0.596	0.302	0.409	0.452	0.336	0.613	1.044	0.404	0.461
Triple Crop Land	0.079	0.000	0.052	0.018	0.022	0.022	0.055	0.012	0.028	0.020	0.004	0.025
Total cropped area	0.832	0.973	1.005	1.309	0.810	0.902	1.009	0.872	1.522	2.453	0.836	1.138

File : A:\TABUL_F2.WK1

TABLE X.A.5 : Average cropping intensity

	DIGAR FO	FULBARIA FO	JASHIHATI FI	ALOKDIA FI	SHANBARI FI	KARAGRAM FI	BANBANGLA FI	PANJANKHARA FI	GUNATIA F2	MAHABATPUR F3	ALDI F3	REGION
Pure sharecroppers	2.26	1.00	1.52	1.81	1.62	2.01	3.00	1.92	1.83	1.77	2.00	1.79
V. Small farmers	2.09	1.59	1.78	1.98	1.63	1.90	2.16	1.66	1.62	1.72	1.91	1.84
Small farmers	1.95	1.24	1.71	1.94	1.77	2.00	2.05	1.69	1.75	1.79	1.98	1.79
Medium farmers	2.43	1.17	2.06	1.86	1.86	2.00	2.04	1.86	1.81	1.85	2.04	1.81
Large farmers	1.71	1.87	1.50	2.03	1.85	2.28	2.00	1.43	1.82	1.79	2.00	1.83
Landless farmers	2.00		1.18			2.00	3.00	1.88	2.00		2.00	1.88
V. Small landowners	2.14	1.14	1.76	1.90	1.69	1.92	2.18	1.50	1.71	1.77	1.93	1.77
Small landowners	1.94	1.29	1.78	1.88	1.89	2.00	2.09	1.79	1.91	1.76	1.92	1.83
Medium landowners	2.20	1.40	2.00	1.98	1.70	2.12	2.02	2.00	1.79	1.88	2.00	1.83
Large landowners	1.71	2.00	1.50		1.85			2.00		1.83	2.08	1.81
All farms	2.02	1.38	1.78	1.94	1.75	2.01	2.07	1.71	1.79	1.79	1.97	1.81

File : A:\TABUL_F2.WK1

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TABLE X.A.6 : Average transfer of land within the last 3 years

	DIGAR	FULBARIA	JASHIHATI	ALOKDIA	SHANBARI	KARAGRAM	BANBANGLA	PANJANKHARA	GUNATIA	MAHABBATPUR	ALDI	REGION
	F0	F0	F1	F1	F1	F1	F1	F1	F2	F3	F3	
(per average household)												
Landless farmers												
Area sold (ha)	0.081											0.012
Value (Tk)	10000											1538
Tk/hectare	123457											123205
Area purchased (ha)												
Value (Tk)												
Tk/hectare												
V. Small farmers	2	2	2	2	2	2	2	2	2	2	2	2
Area sold (ha)	0.015	0.021	0.004	0.019	0.033	0.003	0.01	0.018	0.009	0.009	0.006	0.013
Value (Tk)	3648	6667	992	875	8238	530	2639	4550	1809	1737	2391	3072
Tk/hectare	243200	317460	247917	46053	249450	174812	263889	252778	200946	192982	398551	236312
Area purchased (ha)	0.007		0.02		0.014	0.004	0.004	0.019	0.009		0.003	0.008
Value (Tk)	1920		6075		3423	239	833	4400	2174		1391	2047
Tk/hectare	274284		303750		244506	39855	208333	231579	241546		463748	258352
Small farmers	3	3	3	3	3	3	3	3	3	3	3	3
Area sold (ha)	0.044	0.005	0.058	0.02	0.004	0.053	0.031	0.017	0.025	0.014		0.024
Value (Tk)	11444	769	21284	1000	875	9843	4942	4480	5571	3429		5130
Tk/hectare	248792	153846	366995	50000	218750	185715	159409	263529	222857	214286		213755
Area purchased (ha)	0.021	0.006	0.086	0.049	0.014	0.007	0.022	0.011	0.023	0.006		0.021
Value (Tk)	5889	1769	12814	4600	2938	1766	4708	1933	3000	1643		3407
Tk/hectare	280423	294872	149003	93878	209821	152284	214015	175758	130435	273810		162259
Medium farmers	4	4	4	4	4	4	4	4	4	4	4	4
Area sold (ha)	0.012	0.073	0.07	0.035		0.092	0.038		0.017		0.064	0.042
Value (Tk)	3000	7321	17167	3278		19135	4222		5333		13750	6593
Tk/hectare	250000	100294	245238	93651		207984	111111		313725		214844	156986
Area purchased (ha)	0.108	0.081	0.011	0.024	0.107	0.045	0.063	0.243	0.035			0.051
Value (Tk)	27100	8250	4167	2889	23380	22000	8733	70000	4589			9180
Tk/hectare	250926	101852	378788	111111	218505	488889	138624	288066	131111			180000
Large farmers	5	5	5	5	5	5	5	5	5	5	5	5
Area sold (ha)	0.251		0.413									0.083
Value (Tk)	53000		135000									23500
Tk/hectare	211155		324877									283133
Area purchased (ha)	0.15	0.21	0.121									0.06
Value (Tk)	39000	72000	45000									19500
Tk/hectare	260000	342857	371901									325000
All farmers												
Area sold (ha)	0.031	0.034	0.034	0.023	0.022	0.027	0.023	0.014	0.013	0.01	0.01	0.022
Value (Tk)	6905	4813	10270	1463	5530	5171	3620	3955	3215	2025	2750	4520
Tk/hectare	222742	141544	302059	63587	251364	191531	157391	247188	247308	202500	275000	205439
Area purchased (ha)	0.021	0.036	0.032	0.024	0.025	0.01	0.023	0.019	0.017	0.002	0.002	0.019
Value (Tk)	5533	5263	7638	2375	5735	2867	3753	4675	2808	575	800	3820
Tk/hectare	263452	146181	238472	98958	229400	286730	163152	246053	165147	287500	400000	201052

File : A:\TABUL_F2.WK1

TABLE X.A.7 : Irrigation development

	DIGAR	FULBARIA	JASHIHATI	ALOKDIA	SHANBARI	KARAGRAM	BANBANGLA	PANJANKHARA	GUNATIA	MAHABBATPUR	ALDI	REGION
	F0	F0	F1	F1	F1	F1	F1	F1	F2	F3	F3	
% farmers using irrigat.												
Traditional	2.5	45	0	0	0	5	5	2.5	0	0	7.5	6.1
Modern												
Owa pump	5	2.5	2.5	5	42.5	5	0	0	5	10	7.5	7.7
Other's pump	42.5	20	82.5	45	17.5	85	17.5	25	72.5	70	60	48.9
Community pump	47.5	0	2.5	0	25	5	47.5	12.5	5	2.5	0	13.4
BADC	2.5	0	0	0	0	0	0	0	0	0	0	0.2
Total	100	67.5	87.5	50	85	100	70	40	82.5	82.5	75	76.4
% of area irrigated												
Traditional	0.0	15.9	0.0	0.2	2.0	1.3	0.3	0.2	0.3	0.0	32.3	3.9
STW	68.9	16.6	55.7	10.2	25.7	92.0	0.0	11.8	21.2	25.9	10.6	27.9
LLP	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	2.3	6.5	29.6	3.4
DTW	27.5	0.0	1.0	0.0	20.3	0.9	48.1	12.1	5.1	4.1	0.0	9.1
Gravity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.1
Total	96.4	32.5	56.7	10.9	48.0	94.2	48.4	24.1	50.1	36.4	72.6	44.4
% irrigated area is irrigated farms	96.4	41.9	58.8	16.3	53.6	94.2	62.6	38.9	32.6	42.1	81.7	52.6
Avg. irrig. cost (tk/ha)												
requested by owners		8069	6916	6175	6175	6247	3582			7235	6175	6022
paid to owners		7771	6299	7254	8870	5646	4073	2929	8667	6973	7074	6479
paid to community		7524		8645		3013	4755	3717	6138	7410	7904	5345
paid to BADC		3952										3952

File : A:\TABUL_F2.WK1

Table X.A.8: Average irrigated & Non-irrigated Area of Kharif Crop (All Farm)

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		(In Hectare)					
		Large Farm	Medium Farm	Small Farm	V.Small Farm	P.Share Farm	All Farm
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.419	0.337	0.033	0.011	0.005	0.079
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.001	0.000	0.000
	Non-Irrigated	0.033	0.019	0.009	0.006	0.006	0.011
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.021	0.015	0.001	0.000	0.007
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.001	0.005	0.000	0.000	0.002
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.216	0.216	0.095	0.038	0.069	0.088
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.043	0.016	0.014	0.006	0.000	0.011
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.733	0.299	0.070	0.023	0.186	0.124
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.281	0.063	0.043	0.009	0.066	0.043
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.001	0.000	0.000
	Non-Irrigated	0.444	0.245	0.169	0.042	0.016	0.121
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.005	0.000	0.000	0.001
	Non-Irrigated	0.103	0.090	0.062	0.026	0.015	0.047
Others (Veg., Maize)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.009	0.000	0.001	0.000	0.002
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.005	0.002	0.000	0.002
	Non-Irrigated	2.317	1.313	0.515	0.163	0.364	0.538

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.8a: Average irrigated & Non-irrigated Area of Kharif Crop By Strata (Large Farm)

Crops		Digar FO	Fulbaria FO	Jashikati FI	Alokdia FI	Shanbari FI	Karagran FI	Dasabanga FI	Panjabkhara FI	Guzatia F2	Mahabhatpur F3	Akdi F3	Region
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.312	0.603	0.368	0.000	0.546	0.000	0.719	0.000	0.419
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.275	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.055
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.012	0.383	0.000	0.000	0.117	0.000	0.670	0.067	0.680	0.216
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.202	0.000	0.000	0.227	0.117	0.437	0.000	0.000	0.000	0.043
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.243	0.973	0.000	0.000	0.000	0.000	1.445	1.127	0.000	0.753
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.406	0.733	0.000	0.000	0.000	0.000	0.428	0.227	0.281
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.109	4.674	0.728	0.000	0.737	0.000	2.024	0.000	0.369	0.020	0.000	0.444
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.328	0.000	0.000	0.000	0.000	2.088	0.000	0.000	0.000	0.000	0.000	0.103
Others (Veg.,Maize)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.437	5.949	2.183	2.073	2.093	2.683	2.258	0.983	2.484	2.361	0.907	2.317

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.8b: Average irrigated & Non-irrigated Area of Kharif crops by Strata(Medium Farm)

(In Hectare)

Crops		Digar F0	Fulberia F0	Jashikati F1	Alakdia F1	Shanbari F1	Karagran F1	Basabangla F1	Panjanakura F1	Guanati F2	Mahabhatpur F3	Aldi F3	Region
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.167	0.000	0.168	0.119	0.000	0.000	0.197	1.374	0.088	0.000	0.337
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.019	0.000	0.000	0.000	0.000	0.218	0.000	0.000	0.000	0.000	0.019
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.281	0.000	0.000	0.000	0.000	0.020
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.001
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.345	0.410	0.565	0.000	0.251	0.024	0.589	0.000	0.645	0.216
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.040	0.000	0.000	0.135	0.000	0.000	0.052	0.000	0.000	0.016
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.125	0.555	0.081	0.000	0.000	0.522	0.678	0.514	0.000	0.299
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.041	0.086	0.146	0.000	0.000	0.000	0.000	0.325	0.057	0.065
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.622	0.245	0.519	0.010	0.233	0.507	0.911	0.097	0.158	0.000	0.000	0.245
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.512	0.052	0.000	0.000	0.000	0.944	0.261	0.000	0.000	0.000	0.000	0.090
Others (Veg. Maize)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.955	0.555	1.070	1.226	1.145	1.587	1.928	0.840	2.810	0.927	0.700	1.315

C:\SURVEY\OUTPUT\TABUL1.WK1

Table X.A.8c: Average irrigated & Non-irrigated area by Kharif Crops by Strata(Small Farm)

(In Hectare)

Crops		Digar F0	Fulberia F0	Jashikati F1	Alakdia F1	Shanbari F1	Karagran F1	Basabangla F1	Panjanakura F1	Guanati F2	Mahabhatpur F3	Aldi F3	Region
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.101	0.000	0.011	0.012	0.000	0.000	0.126	0.022	0.029	0.000	0.055
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.007	0.017	0.000	0.000	0.000	0.000	0.064	0.000	0.000	0.000	0.000	0.009
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.016	0.000	0.000	0.000	0.000	0.128	0.000	0.000	0.000	0.000	0.015
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.051	0.000	0.000	0.000	0.000	0.005
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.165	0.159	0.237	0.000	0.061	0.027	0.191	0.050	0.507	0.095
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.005	0.000	0.016	0.046	0.000	0.058	0.012	0.010	0.017	0.000	0.000	0.014
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.040	0.202	0.012	0.000	0.000	0.114	0.190	0.217	0.000	0.070
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.054	0.058	0.229	0.000	0.000	0.000	0.000	0.284	0.000	0.045
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.449	0.188	0.252	0.000	0.009	0.052	0.604	0.041	0.076	0.000	0.000	0.169
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.051	0.000	0.000	0.000	0.005
	Non-Irrigated	0.047	0.058	0.000	0.000	0.000	0.525	0.066	0.000	0.000	0.000	0.000	0.062
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.031	0.000	0.000	0.000	0.005
	Non-Irrigated	0.508	0.361	0.505	0.476	0.502	0.615	0.987	0.319	0.495	0.560	0.507	0.516

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.8d: Average irrigated & Non-irrigated Area of Kharif Crops by Strata (V.Small Farm)

(In Hectare)

Crops	Digar P0	Fulberia P0	Jashikati P1	Alokdis P1	Shanberi P1	Karagran P1	Banbangla P1	Panpakhsa P1	Guanis P2	Mahabhatpur P3	Akti P3	Region
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.066	0.000	0.017	0.018	0.006	0.011	0.000	0.000	0.000	0.011
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.001
	Non-Irrigated	0.018	0.009	0.000	0.000	0.001	0.030	0.000	0.000	0.000	0.000	0.006
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.005	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.001
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.005	0.000	0.010	0.005	0.002	0.000	0.032	0.001	0.000	0.000	0.006
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.019	0.000	0.021	0.101	0.018	0.000	0.037	0.030	0.028	0.000	0.023
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.010	0.000	0.008	0.048	0.000	0.000	0.000	0.026	0.014	0.009
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.001
	Non-Irrigated	0.081	0.120	0.072	0.004	0.016	0.108	0.000	0.023	0.000	0.000	0.042
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.038	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.000	0.156	0.026
	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.004	0.000	0.000	0.000	0.005	0.005	0.002	0.000	0.000	0.000	0.001
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.002
	Non-Irrigated	0.168	0.209	0.155	0.208	0.153	0.198	0.093	0.103	0.054	0.555	0.162

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.8c: Average irrigated & Non-irrigated Area of Kharif Crops by Strata (P.Share Crop)

(In Hectare)

Crops	Digar P0	Fulberia P0	Jashikati P1	Alokdis P1	Shanberi P1	Karagran P1	Banbangla P1	Panpakhsa P1	Guanis P2	Mahabhatpur P3	Akti P3	Region
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.076	0.000	0.000	0.000	0.000	0.000	0.000	0.005
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.030	0.000	0.000	0.000	0.000	0.142	0.000	0.000	0.000	0.000	0.006
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.114	0.061	0.169	0.000	0.000	0.112	0.020	0.176	0.069
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.140	0.000	0.000	0.000	0.200	0.618	0.000	0.186
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.043	0.081	0.000	0.000	0.000	0.241	0.000	0.066
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.033	0.000	0.028	0.000	0.059	0.018	0.142	0.000	0.008	0.000	0.017
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.089	0.000	0.000	0.000	0.000	0.088	0.000	0.000	0.000	0.000	0.015
	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.152	0.000	0.143	0.320	0.309	0.105	0.284	0.000	0.312	0.886	0.176

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.8F : Average Irrigated & Non-Irrigated area of Kharif Crops by Village(All farm)

(In Hectare)

		Digar P0	Fulbari P0	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Basbanga F1	Paspankhara F1	Guanatia F2	Mahabhatpur P3	Aldi P3
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.239	0.000	0.139	0.086	0.023	0.009	0.234	0.891	0.495	0.000
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000	0.000
	Non-Irrigated	0.036	0.112	0.000	0.000	0.002	0.000	0.153	0.000	0.000	0.000	0.000
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.018	0.000	0.000	0.000	0.000	0.180	0.000	0.000	0.000	0.000
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.000	0.000	0.000	0.000
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.004	0.000	0.373	0.426	0.283	0.003	0.151	0.048	0.528	0.066	0.323
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.011	0.000	0.044	0.037	0.003	0.063	0.017	0.079	0.031	0.000	0.000
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.025	0.000	0.107	0.661	0.045	0.000	0.000	0.322	0.801	1.413	0.000
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.010	0.038	0.166	0.292	0.000	0.000	0.000	0.000	0.695	0.030
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000
	Non-Irrigated	0.592	0.695	0.479	0.008	0.114	0.132	0.991	0.071	0.203	0.017	0.000
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.030	0.000	0.000	0.000
	Non-Irrigated	0.165	0.060	0.000	0.000	0.000	0.916	0.143	0.000	0.000	0.000	0.000
Others (Veg., Maize)	Irrigated(IRT)	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.002	0.029	0.000	0.000	0.006	0.000	0.004	0.000	0.000	0.000	0.000

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.8F: Average irrigated & Non-irrigated Area of Kharif Crops by Strata(ALL FARM)

(In Hectare)

Crops		Digar P0	Fulbari P0	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Basbanga F1	Paspankhara F1	Guanatia F2	Mahabhatpur P3	Aldi P3	Region
B.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LIV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(White)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(Tosa)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aus & Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B.Aman	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aman(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aman(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Others (Veg., Maize)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRI)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.9: Average irrigated & Non-irrigated Area of Rabi Crop (All Farm)

(In Hectare)

		Large farm	Medium farm	Small farm	Very Small farm	Pure Share Cropper	All farm
Boro(LV)	Irrigated(IRT)	0.000	0.000	0.006	0.001	0.000	0.002
	Irrigated(IRIM)	0.000	0.000	0.001	0.000	0.000	0.000
	Non-irrigated	0.000	0.022	0.008	0.000	0.000	0.003
Boro(HYV)	Irrigated(IRT)	0.000	0.042	0.007	0.006	0.000	0.010
	Irrigated(IRIM)	1.147	0.462	0.295	0.091	0.191	0.260
	Non-irrigated	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.155	0.070	0.034	0.015	0.021	0.035
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.008	0.009	0.004	0.002	0.002	0.004
Potato(HYV)	Irrigated(IRT)	0.042	0.047	0.003	0.003	0.011	0.012
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.062	0.033	0.026	0.021	0.021	0.026
Khajuri	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.563	0.183	0.060	0.012	0.152	0.089
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.011	0.000	0.000	0.000	0.000	0.001
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.262	0.179	0.060	0.016	0.074	0.067
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.049	0.019	0.030	0.003	0.012	0.019
Total Area	Irrigated(IRT)	0.042	0.089	0.017	0.012	0.011	0.024
	Irrigated(IRIM)	1.147	0.462	0.295	0.091	0.191	0.260
	Non-irrigated	1.150	0.316	0.223	0.071	0.283	0.246

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.9A: Average irrigated & Non-irrigated Area of Rabi Crop by Strata(Large Farm)

(In Hectare)

		Digar FO	Fulbaria FO	Jashikati FI	Ajodhia FI	Shanabari FI	Karagran FI	Bashangla FI	Pasankhara FI	Guanatia F2	Mahabubpur F3	Aldi F3	Region
Boro(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Boro(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	2.469	3.399	1.619	0.155	1.166	2.088	2.024	0.656	0.567	0.993	1.433	1.147
	Non-irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.000	0.405	0.583	0.000	0.000	0.000	0.000	0.283	0.145	0.000	0.155
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.077	0.000	0.029	0.005	0.000	0.008
Potato(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.963	0.042
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.109	0.000	0.000	1.319	0.062
Khajuri	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.000	0.000	0.297	0.000	0.000	0.105	0.219	0.799	1.014	0.000	0.563
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.021	0.000	0.011
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.328	0.000	0.397	0.379	0.113	0.000	0.103	0.328	0.227	0.237	0.000	0.262
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-irrigated	0.000	0.708	0.000	0.000	0.000	0.000	0.000	0.656	0.340	0.000	0.000	0.089
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.963	0.042
	Irrigated(IRIM)	2.469	3.399	1.619	0.155	1.166	2.088	2.024	0.656	0.567	0.993	1.433	1.147
	Non-irrigated	0.328	0.708	0.802	1.258	0.113	0.000	0.287	1.312	1.697	1.442	1.319	1.150

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.9B: Average irrigated & Non-Irrigated Area of Rabi Crop by Strata(Medium Farm)

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(In Hectare)

		Dagar FO	Fulberia FO	Jashikati FI	Alokdia FI	Shanberi FI	Karagram FI	Banbanga FI	Pasajukhara FI	Gunatia F2	Mahabhatpur F3	Akdi F3	Region
Boro(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.154	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
Boro(HYV)	Irrigated(IRT)	0.000	0.256	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042
	Irrigated(IRIM)	1.065	0.022	0.764	0.117	0.692	1.317	0.355	0.389	0.456	0.421	0.671	0.462
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.106	0.296	0.195	0.000	0.000	0.000	0.091	0.047	0.000	0.070
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.005	0.101	0.000	0.000	0.000	0.031	0.000	0.000	0.009
Potato(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.859	0.047
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.064	0.011	0.000	0.000	0.511	0.053
Khesari	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.203	0.122	0.188	0.000	0.000	0.121	0.316	0.659	0.000	0.183
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.262	0.385	0.484	0.000	0.000	0.214	0.291	0.205	0.057	0.179
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.008	0.049	0.000	0.000	0.000	0.000	0.113	0.021	0.000	0.000	0.019
Total Area	Irrigated(IRT)	0.000	0.256	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.859	0.089
	Irrigated(IRIM)	1.065	0.022	0.764	0.117	0.692	1.317	0.355	0.389	0.456	0.421	0.671	0.462
	Non-Irrigated	0.000	0.142	0.620	0.306	0.967	0.000	0.064	0.459	0.752	0.891	0.568	0.516

C:\SURVEY\OUTPUT\TABLE2.WK1

Table X.A.9C: Average irrigated & Non-irrigated Area of Rabi Crop by Strata(Small Farm)

(In Hectare)

		Dagar FO	Fulberia FO	Jashikati FI	Alokdia FI	Shanberi FI	Karagram FI	Banbanga FI	Pasajukhara FI	Gunatia F2	Mahabhatpur F3	Akdi F3	Region
Boro(LV)	Irrigated(IRT)	0.000	0.059	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.001
	Non-Irrigated	0.000	0.078	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
Boro(HYV)	Irrigated(IRT)	0.000	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
	Irrigated(IRIM)	0.613	0.058	0.395	0.106	0.265	0.602	0.317	0.167	0.266	0.307	0.219	0.295
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.112	0.104	0.104	0.000	0.006	0.000	0.056	0.014	0.000	0.034
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.008	0.000	0.001	0.000	0.025	0.000	0.009	0.000	0.000	0.004
Potato(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.072	0.003
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.004	0.019	0.002	0.000	0.000	0.000	0.485	0.026
Khesari	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.046	0.038	0.079	0.000	0.020	0.125	0.083	0.338	0.000	0.060
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.062	0.000	0.025	0.215	0.054	0.006	0.006	0.058	0.152	0.085	0.000	0.060
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRIM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.041	0.059	0.000	0.000	0.000	0.000	0.113	0.058	0.000	0.043	0.050
Total Area	Irrigated(IRT)	0.000	0.124	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.072	0.017
	Irrigated(IRIM)	0.613	0.058	0.395	0.106	0.265	0.602	0.323	0.167	0.266	0.307	0.219	0.295
	Non-Irrigated	0.062	0.120	0.250	0.355	0.224	0.025	0.059	0.296	0.338	0.437	0.526	0.223

C:\SURVEY\OUTPUT\TABLE2.WK1

Table X.A.9D: Average irrigated & Non-Irrigated Area of Rabi Crop by Strata(V.Small Farm)

		(In Hectare)											
		Digar FO	Fulberia FO	Jashikati F1	Alakdia F1	Shanberi F1	Karagran F1	Banbangla F1	Pasjankhara F1	Guania F2	Mahabubpur F3	Aldi F3	Region
Boro(LV)	Irrigated(IRT)	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Irrigated(IRM)	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Boro(HYV)	Irrigated(IRT)	0.000	0.024	0.000	0.002	0.015	0.010	0.003	0.003	0.000	0.000	0.000	0.006
	Irrigated(IRM)	0.163	0.037	0.109	0.014	0.104	0.169	0.063	0.011	0.077	0.222	0.068	0.091
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.039	0.064	0.039	0.000	0.008	0.000	0.007	0.000	0.000	0.013
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.013	0.002	0.001	0.000	0.003	0.000	0.000	0.000	0.000	0.002
Potato(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.003
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Kharai	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.006	0.031	0.012	0.000	0.009	0.035	0.021	0.095	0.000	0.012
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.022	0.000	0.041	0.048	0.007	0.000	0.004	0.003	0.028	0.061	0.003	0.016
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Area	Irrigated(IRT)	0.000	0.036	0.000	0.002	0.015	0.010	0.003	0.003	0.000	0.000	0.010	0.005
	Irrigated(IRM)	0.163	0.037	0.111	0.014	0.104	0.169	0.063	0.011	0.077	0.222	0.068	0.091
	Non-Irrigated	0.022	0.020	0.106	0.145	0.039	0.000	0.023	0.061	0.061	0.156	0.177	0.071

C:\SURVEY\OUTPUT\TABUL2.WK1

Table X.A.9E: Average irrigated & Non-Irrigated Area of Rabi Crop by Strata(P.Share Crop)

		(In Hectare)											
		Digar FO	Fulberia FO	Jashikati F1	Alakdia F1	Shanberi F1	Karagran F1	Banbangla F1	Pasjakhara F1	Guania F2	Mahabubpur F3	Aldi F3	Region
Boro(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Boro(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.121	0.000	0.187	0.066	0.221	0.105	0.142	0.263	0.148	0.359	0.094	0.191
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.040	0.077	0.097	0.000	0.000	0.000	0.019	0.011	0.000	0.021
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.002
Potato(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.091	0.011
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.180	0.021
Kharai	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.032	0.034	0.000	0.000	0.000	0.144	0.531	0.000	0.152
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.116	0.065	0.000	0.000	0.000	0.182	0.236	0.068	0.000	0.074
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.073	0.000	0.022	0.000	0.000	0.000	0.000	0.059	0.000	0.000	0.012
Total Area	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.091	0.011
	Irrigated(IRM)	0.121	0.000	0.187	0.066	0.221	0.105	0.142	0.263	0.148	0.359	0.094	0.191
	Non-Irrigated	0.000	0.073	0.133	0.196	0.131	0.000	0.000	0.182	0.475	0.609	0.180	0.283

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Table X.A.9F: Average irrigated & Non-Irrigated Area of Rabi Crop by Strata(ALL FARM)

	Digar F0	Fulbaria F0	Jashihati F1	Alokda F1	Shasbari F1	Karagram F1	Bambangla F1	Panjakhara F1	Gusatia F2	Mahabubpur F3	Aldi F3	Region
Boro(LV)	Irrigated(IRT)	0.000	0.024	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002
	Irrigated(IRRM)	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
Boro(HYV)	Irrigated(IRT)	0.000	0.088	0.000	0.001	0.009	0.006	0.001	0.000	0.000	0.000	0.010
	Irrigated(IRRM)	0.596	0.117	0.522	0.071	0.209	0.417	0.247	0.254	0.499	0.173	0.260
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.079	0.136	0.067	0.000	0.006	0.050	0.050	0.000	0.035
Potato(LV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.008	0.002	0.006	0.000	0.012	0.014	0.001	0.000	0.004
Potato(HYV)	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.137	0.012
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.001	0.005	0.007	0.000	0.000	0.268	0.026
Khesari	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.042	0.067	0.039	0.000	0.014	0.164	0.571	0.000	0.089
Onion	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.005	0.000	0.001
Mustard	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.038	0.000	0.080	0.189	0.040	0.002	0.007	0.165	0.141	0.006	0.067
Sugarcane	Irrigated(IRT)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Irrigated(IRRM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.041	0.021	0.002	0.000	0.000	0.084	0.049	0.000	0.013	0.019
Total Area	Irrigated(IRT)	0.000	0.112	0.000	0.001	0.009	0.006	0.001	0.000	0.000	0.137	0.024
	Irrigated(IRRM)	0.596	0.117	0.523	0.071	0.209	0.417	0.249	0.254	0.499	0.173	0.260
	Non-Irrigated	0.038	0.098	0.229	0.394	0.153	0.007	0.045	0.443	0.769	0.287	0.246

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Table X.A.9F: Average irrigated & Non-Irrigated Area of Rabi Crop by Strata(ALL FARM)

(In Hectare)

	Digar F0	Fulbaria F0	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjankhara F1	Gunatia F2	Mahabostpur F3	Akdi F3	Region
Boro(LV)												
Irrigated(IR.T)	0.000	0.024	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Irrigated(IR.M)	0.000	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
Boro(HYV)												
Irrigated(IR.T)	0.000	0.088	0.000	0.001	0.009	0.006	0.001	0.001	0.000	0.000	0.000	0.010
Irrigated(IR.M)	0.396	0.117	0.322	0.071	0.209	0.417	0.247	0.149	0.254	0.499	0.173	0.260
Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.000	0.079	0.136	0.067	0.000	0.006	0.000	0.050	0.050	0.000	0.035
Potato(LV)												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.000	0.008	0.002	0.006	0.000	0.012	0.000	0.014	0.001	0.000	0.004
Potato(HYV)												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.137	0.012
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.000	0.000	0.000	0.001	0.005	0.007	0.004	0.000	0.000	0.268	0.026
Khesari												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.000	0.042	0.067	0.039	0.000	0.014	0.085	0.164	0.571	0.000	0.089
Onion												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.005	0.000	0.001
Mustard												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.038	0.000	0.080	0.189	0.040	0.002	0.007	0.069	0.165	0.141	0.006	0.067
Sugarcane												
Irrigated(IR.T)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Irrigated(IR.M)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Irrigated	0.000	0.041	0.021	0.002	0.000	0.000	0.000	0.084	0.049	0.000	0.013	0.019
Total Area												
Irrigated(IR.T)	0.000	0.112	0.000	0.001	0.009	0.006	0.001	0.001	0.000	0.000	0.137	0.024
Irrigated(IR.M)	0.396	0.117	0.323	0.071	0.209	0.417	0.249	0.149	0.254	0.499	0.173	0.260
Non-Irrigated	0.038	0.098	0.229	0.394	0.133	0.007	0.045	0.242	0.443	0.769	0.287	0.246



Table X.A.10: Average Irrigated & Non-irrigated Yield of Kharif Crops by Strata

(In Tons)

		Large Farm	Medium Farm	Small Farm	V.Small Farm	P.Share Cropper	All Farm
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.405	0.211	0.830	1.002	1.150	0.392
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	1.087	0.000	1.087
T.Aus(LV)	Irrigated	0.000	0.000	0.000	2.872	0.000	2.872
	Non-Irrigated	1.317	2.082	1.410	1.775	1.559	1.625
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.990	1.553	3.128	0.000	1.807
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	2.811	0.000	2.811
	Non-Irrigated	0.000	2.679	1.979	2.679	0.000	2.034
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.608	1.449	1.423	1.240	1.567	1.431
Jute(Tosa)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.558	1.550	1.426	1.735	0.000	1.549
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.364	1.266	1.456	1.456	1.689	1.401
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.620	0.902	0.874	0.686	0.764	0.764
T.Aman(LV)	Irrigated	0.000	0.000	0.000	1.977	0.000	1.977
	Non-Irrigated	1.195	1.698	1.613	1.845	1.186	1.584
T.Aman(HYV)	Irrigated	0.000	0.000	1.556	0.000	0.000	1.556
	Non-Irrigated	2.471	2.070	2.659	3.244	3.199	2.656

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Table X.A.10A: Average Yield of Kharif Crops by Strata(Large Farm)

(In Tons)

		Digar FO	Fulbaria FO	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Bambanga F1	Pasankhara F1	Gunstia F2	Mahabhatpur F3	Akdi F3	Region
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.918	0.929	0.000	0.000	0.855	0.000	0.280	0.000	0.405
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.317	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.317
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	2.215	1.559	0.000	0.000	1.436	0.000	1.225	1.174	2.005	1.608
Jute(Tosa)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.109	0.000	0.000	0.824	1.598	2.135	0.000	0.000	0.000	1.558
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	2.305	1.177	0.000	0.000	0.000	0.000	1.795	1.281	0.000	1.364
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.705	0.595	0.000	0.000	0.000	0.000	0.589	0.824	0.620
T.Aman(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.010	1.078	2.306	0.000	0.658	0.000	1.844	0.000	0.202	0.000	0.000	1.195
T.Aman(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	2.049	0.000	0.000	0.000	0.000	2.558	0.000	0.000	0.000	0.000	0.000	2.471

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Table X.A.10B: Average Yield of Kharif crop by Strata(Medium Farm)

(In Tons)

		Digar FO	Fulbaria FO	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjanakura F1	Gusatia F2	Mahabhatpur F3	Akdi F3	Region
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.218	0.000	0.667	0.471	0.000	0.000	0.570	0.013	0.880	0.000	0.211
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.318	0.000	0.000	0.000	0.000	2.231	0.000	0.000	0.000	0.000	2.082
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	1.990	0.000	0.000	0.000	0.000	1.990
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.679	0.000	0.000	0.000	0.000	2.679
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.949	1.337	1.157	0.000	1.191	2.471	1.433	0.000	1.411	1.449
Jute(Tons)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.480	0.000	0.000	1.936	0.000	0.000	1.049	0.000	0.000	1.550
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.917	1.259	2.303	0.000	0.000	1.043	1.284	1.245	0.000	1.266
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.267	0.763	1.028	0.000	0.000	0.000	0.000	0.804	1.977	0.902
T.Aman(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.711	2.186	1.523	0.000	0.402	2.649	1.536	0.461	1.538	0.000	0.000	1.698
T.Aman(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	2.693	2.864	0.000	0.000	0.000	1.668	2.431	0.000	0.000	0.000	0.000	2.070

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Table X.A.10C : Average Yield of Kharif Crops by Strata(Small Farm)

(In Tons)

		Digar FO	Fulbaria FO	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjanakura F1	Gusatia F2	Mahabhatpur F3	Akdi F3	Region
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.601	0.000	0.836	1.546	0.000	0.000	0.831	1.297	1.267	0.000	0.830
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.383	1.341	0.000	0.000	0.000	0.000	1.432	0.000	0.000	0.000	0.000	1.410
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.424	0.000	0.000	0.000	0.000	1.570	0.000	0.000	0.000	0.000	1.553
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	1.979	0.000	0.000	0.000	0.000	1.979
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.712	1.286	1.285	0.000	1.077	1.110	1.577	1.243	1.491	1.423
Jute(Tons)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.230	0.000	2.204	0.673	0.000	2.149	1.184	1.500	1.475	0.000	0.000	1.426
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.730	1.294	3.397	0.000	0.000	0.961	1.866	1.452	0.000	1.456
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.478	1.278	0.587	0.000	0.000	0.000	0.000	0.938	0.000	0.874
T.Aman(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.370	1.774	1.224	0.000	0.000	2.501	1.920	1.252	1.111	0.000	0.000	1.613
T.Aman(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.127	1.371	0.000	0.000	0.000	1.556
	Non-Irrigated	2.854	2.623	0.000	0.000	0.000	2.711	2.209	0.000	0.000	0.000	0.000	2.659

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Table X.A.10D: Average Yield of Kharif Crops by Strata(V.Small Farm)

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(In Tons)

		Digar F0	Fulbaria F0	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjanakura F1	Gusatia F2	Mahabhatpur F3	Akdi F3	Region
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.167	0.000	0.564	0.870	0.000	1.317	0.805	0.000	0.000	0.000	1.002
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	1.087	0.000	0.000	0.000	0.000	0.000	0.000	1.087
T.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.872	0.000	0.000	0.000	0.000	2.872
	Non-Irrigated	1.607	1.355	0.000	0.000	0.000	0.000	2.041	0.000	0.000	0.000	0.000	1.773
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	2.562	0.000	0.000	0.000	0.000	3.446	0.000	0.000	0.000	0.000	3.128
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.811	0.000	0.000	0.000	0.000	2.811
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.679	0.000	0.000	0.000	0.000	2.679
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.918	0.000	1.467	1.014	1.253	1.875	1.348	1.023	1.161	0.000	1.275	1.240
Jute(Tosa)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	2.290	0.000	1.434	0.755	1.415	0.000	0.000	1.814	1.850	0.000	0.000	1.735
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.884	0.000	1.701	1.209	1.794	0.000	0.000	1.026	1.728	1.795	0.000	1.436
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.214	0.000	0.896	0.489	0.000	0.000	0.000	0.000	1.300	0.000	0.686
T.Aman(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	1.977	0.000	0.000	0.000	0.000	1.977
	Non-Irrigated	1.876	2.131	1.232	0.569	0.541	0.000	2.294	0.000	1.106	0.000	0.000	1.845
T.Aman(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	2.544	0.000	0.000	0.000	0.000	3.538	1.768	0.000	0.000	0.000	0.000	3.244

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Table X.A.10E: Average Yield of Kharif Crops by Strata(P.Share Crop)

(In Tons)

		Digar F0	Fulbaria F0	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjanakura F1	Gusatia F2	Mahabhatpur F3	Akdi F3	Region
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	1.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.150
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.231	0.000	0.000	0.000	0.000	0.000	1.838	0.000	0.000	0.000	0.000	1.559
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.551	2.670	1.881	0.000	0.000	0.000	1.223	0.954	1.566	1.567
Jute(Tosa)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	1.062	0.000	0.000	0.000	0.000	2.362	1.600	0.000	1.689
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	1.439	0.613	0.000	0.000	0.000	0.000	0.743	0.000	0.764
T.Aman(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	2.300	0.000	1.655	0.000	0.000	2.811	1.317	0.000	0.000	0.000	0.000	1.186
T.Aman(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	3.048	0.000	0.000	0.000	0.000	3.403	0.000	0.000	0.000	0.000	0.000	3.199

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Table X.A.10F: Average Yield of Kharif Crops by Strata(ALL Farm)

(In Tons)													
		Digar FO	Fulbaria FO	Jashihati F1	Alokdia F1	Shanbari F1	Karagran F1	Banbanga F1	Panjankhara F1	Gunatia F2	Mahabhatpur F3	Aldi F3	Region
B.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.994	0.000	0.799	0.886	0.000	1.317	0.765	0.036	0.352	0.000	0.392
B.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	1.087	0.000	0.000	0.000	0.000	0.000	0.000	1.087
T.Aus(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.872	0.000	0.000	0.000	0.000	2.872
	Non-Irrigated	1.498	1.323	0.000	0.000	0.000	0.000	1.893	0.000	0.000	0.000	0.000	1.625
T.Aus(LIV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.717	0.000	0.000	0.000	0.000	1.815	0.000	0.000	0.000	0.000	1.807
T.Aus(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.811	0.000	0.000	0.000	0.000	2.811
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.034	0.000	0.000	0.000	0.000	2.034
Jute(White)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.918	0.000	1.815	1.339	1.315	1.875	1.199	1.297	1.400	1.147	1.441	1.431
Jute(Tosa)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.920	0.000	1.547	0.680	1.415	1.780	1.360	1.884	1.251	0.000	0.000	1.549
Aus & Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.884	0.000	1.872	1.229	2.178	0.000	0.000	1.012	1.617	1.380	0.000	1.401
B.Aman	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.214	1.407	0.910	0.593	0.000	0.000	0.000	0.000	0.745	1.085	0.764
T.Aman(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	1.977	0.000	0.000	0.000	0.000	1.977
	Non-Irrigated	1.476	1.627	1.434	0.303	0.476	2.613	1.873	0.915	1.068	0.000	0.000	1.584
T.Aman(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	2.127	1.371	0.000	0.000	0.000	1.556
	Non-Irrigated	2.651	2.739	0.000	0.000	0.000	2.717	2.233	0.000	0.000	0.000	0.000	2.656

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Table X.A.11: Average Yield of Rabi & Perennial Crop by Strata(Tons)

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		(In Tons)					
		Large Farm	Medium Farm	Small Farm	V.Small Farm	P.Share Cropper	ALL Farm
Boro(LV)	Irrigated	0.000	0.000	1.425	3.324	0.000	1.845
	Non-Irrigated	0.000	1.974	2.160	4.096	0.000	2.124
Boro(HYV)	Irrigated	4.149	4.458	4.190	4.278	3.850	4.235
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.327	1.338	1.456	1.409	1.393	1.384
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	3.791	8.228	6.476	8.371	4.802	7.010
Potato(HYV)	Irrigated	33.948	33.322	38.785	37.180	35.508	35.730
	Non-Irrigated	29.663	24.556	31.743	26.769	28.188	28.267
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.209	0.584	0.607	0.571	0.255	0.410
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	1.048	9.375	3.500	0.000	0.000	1.434
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.378	0.443	0.948	0.384	0.288	0.534
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	31.404	24.811	32.224	33.196	20.563	30.515

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Table X.A.11A: Average Yield of Rabi & Perennial Crop by Strata(Large Farm)

		Dugar FO	Fulberia FO	Jashikati F1	Alokdia F1	Shanberi F1	Karagram F1	Banabanga F1	Panjabkhara F1	Gumtina F2	Mahabhatpur F3	(In Tons) Aldi F3 Region	
Boro(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Boro(HYV)	Irrigated	2.403	5.270	4.150	5.526	3.744	4.290	4.056	4.552	3.952	4.235	3.672	4.149
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	2.765	1.235	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	4.844	0.000	3.281	2.811	0.000	3.791
Potato(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	33.948	33.948
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	31.124	29.663
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	1.426	0.000	0.000	0.533	0.680	0.421	0.055	0.000	0.209
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.875	0.891	0.000	1.048
	Non-Irrigated	0.454	0.000	0.471	0.473	0.664	0.000	0.352	0.683	0.660	0.189	0.000	0.378
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	16.867	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
									54.046	24.697	0.000	0.000	31.404

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Table X.A.11D: Average Yield of Rabi & Perennial Crop by Strata(V.Small Farm)

(In Tons)

		Digar FO	Fulbaria FO	Jashikati F1	Alekda F1	Shanbari F1	Karagram F1	Bambunga F1	Pasajakhara F1	Gunatia F2	Mahabubpur F3	Aldi F3	Region
Boro(LV)	Irrigated	0.000	2.955	4.978	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.324
	Non-Irrigated	0.000	4.096	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.096
Boro(HYV)	Irrigated	4.953	5.720	4.573	3.663	4.241	4.699	3.819	4.603	4.267	4.349	2.356	4.278
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.549	1.087	1.644	0.000	1.418	0.000	1.534	0.000	0.000	1.409
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	6.762	4.656	24.000	0.000	9.185	0.000	0.000	0.000	0.000	8.371
Potato(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	57.180	57.180
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	26.769	26.769
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.627	1.171	0.000	0.202	0.737	0.634	0.261	0.000	0.571
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.449	0.000	0.529	0.414	0.303	0.000	0.247	0.000	0.365	0.000	0.882	0.384
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	24.092	14.034	0.000	0.000	0.000	0.000	55.926	0.000	0.000	28.251	33.196

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Table X.A.11E: Average Yield of Rabi & Perennial Crop by Strata(P.Share Crop.)

(In Tons)

		Digar FO	Fulbaria FO	Jashikati F1	Alekda F1	Shanbari F1	Karagram F1	Bambunga F1	Pasajakhara F1	Gunatia F2	Mahabubpur F3	Aldi F3	Region
Boro(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Boro(HYV)	Irrigated	5.307	0.000	4.840	5.657	4.160	4.842	4.204	3.548	2.272	3.852	2.104	3.850
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.184	1.294	1.340	0.000	0.000	0.000	1.982	0.886	0.000	1.593
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.802	0.000	0.000	4.802
Potato(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	55.508	55.508
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	28.188	28.188
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.959	1.475	0.000	0.000	0.000	0.259	0.218	0.000	0.255
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.444	0.764	0.000	0.000	0.000	0.000	0.211	0.360	0.000	0.288
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	25.562	0.000	0.000	0.000	0.000	0.000	0.000	23.324	0.000	0.000	20.563

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Table X.A.11B: Average Yield of Rabi & Perennial Crop by Strata(Medium Farm)

		Digar P0	Fulbaria P0	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Banabangla F1	Panjabkhara F1	Gunatia F2	Mahabubpur F3	Aldi F3	Region
		(In Tons)											
Boro(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	1.974	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.974
Boro(HYV)	Irrigated	4.295	3.607	5.480	4.771	5.528	4.961	1.983	5.282	4.683	4.876	2.782	4.458
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.813	1.176	1.535	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	4.656	9.238	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Potato(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	35.322	35.322
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	27.492	24.556
	Non-Irrigated	0.000	0.000	2.131	0.560	1.192	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.641	0.683	0.232	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	27.044	58.362	0.000	0.000	0.000	0.000	15.166	9.821	0.000	0.000	24.811

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Table X.A.11C: Average Yield of Rabi & Perennial Crop by Strata(Small Farm)

		Digar P0	Fulbaria P0	Jashikati F1	Alokdia F1	Shanbari F1	Karagram F1	Banabangla F1	Panjabkhara F1	Gunatia F2	Mahabubpur F3	Aldi F3	Region
		(In Tons)											
Boro(LV)	Irrigated	0.000	1.268	0.000	3.125	0.000	0.000	2.429	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	2.160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.423
Boro(HYV)	Irrigated	3.879	3.185	4.868	4.534	4.465	4.851	3.604	3.459	4.604	4.168	2.666	4.190
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.993	1.346	1.072	0.000	1.208	0.000	1.222	0.773	0.000	0.000
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	19.667	0.000	15.583	0.000	2.883	0.000	4.956	0.000	0.000	0.000
Potato(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	38.785	38.785
	Non-Irrigated	0.000	0.000	0.000	0.000	3.725	22.214	6.208	0.000	0.000	0.000	33.032	31.743
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.949	0.967	0.952	0.000	0.567	0.764	0.449	0.284	0.000	0.607
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.577	0.000	0.882	0.731	0.596	40.565	0.136	0.343	0.615	0.062	0.000	0.948
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	35.547	17.628	0.000	0.000	0.000	0.000	32.833	49.049	0.000	5.855	32.224

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Table X.A.11F: Average Yield of Rabi & Perennial Crop by Strata(All Farm)

		Digar FO	Fulbaria FO	Jashihati F1	Alokdia F1	Shanbari F1	Karagram F1	Banbanga F1	Panjakhara F1	Gusatia F2	Mahabhatpur F3	Aldi F3	Region
Boro(LV)	Irrigated	0.000	1.621	4.978	3.125	0.000	0.000	2.429	0.000	0.000	0.000	0.000	1.845
	Non-Irrigated	0.000	2.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.124
Boro(HYV)	Irrigated	3.980	4.240	4.913	4.752	4.440	4.772	3.373	4.216	4.332	4.261	2.794	4.235
	Non-Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.923	1.216	1.393	0.000	1.349	0.000	1.251	1.121	0.000	1.384
Potato(LV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	10.466	4.656	11.260	0.000	4.086	0.000	6.265	2.811	0.000	7.010
Potato(HYV)	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	35.730	35.730
	Non-Irrigated	0.000	0.000	0.000	0.000	3.725	22.214	9.896	10.827	0.000	0.000	29.218	28.267
Khesari	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	1.604	0.945	1.085	0.000	0.439	0.784	0.508	0.131	0.000	0.410
Onion	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	0.000	0.000	0.000	3.500	0.000	0.000	0.000	3.125	0.891	0.000	1.434
Mustard	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.512	0.000	0.588	0.626	0.349	40.565	0.255	0.304	0.449	0.155	1.028	0.534
Sugarcane	Irrigated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Non-Irrigated	0.000	24.242	29.047	0.000	0.000	0.000	0.000	36.311	30.927	0.000	16.964	30.515

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Table X.A.12A: Average Livestock per household

	P.Share Crop	V.Small farm	Small farm	Medium farm	Large farm
BUL_DRANO	0.071	0.122	0.423	0.636	0.913
COW_DRANO	0.357	0.132	0.325	0.327	0.652
COW_MILNO	0.071	0.112	0.065	0.164	0.130
COW_DRCMIL	0.310	0.178	0.585	0.745	0.870
COW_CALVES	0.262	0.269	0.512	0.618	0.826
OXEN_DRANO	0.429	0.183	0.301	0.582	0.696
BUFF_DRANO	0.000	0.000	0.024	0.000	0.174
SHP_NUMBER	0.000	0.041	0.065	0.075	0.130
GT_NUMBER	0.524	0.523	0.577	0.818	0.217
DCK_NUMBER	1.571	0.970	1.073	1.382	2.087
PTY_NUMBER	3.952	3.959	3.984	5.855	7.087

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Table X.A.12B: Average Livestock per farm

	DIGAR FO	FULBARIA FO	JASHIHATI F1	ALOKDIA F1	SHANBARI F1	KARAGRAM F1	BANBANGLA F1	PANJANKHARA F1	GUNATIA F2	MAHABBATPUR F3	ALDI F3	REGION
BUL_DRANO	0.55	0.45	0.35	0.23	0.30	0.40	0.55	0.05	0.25	0.28	0.00	0.51
COW_DRANO	0.18	0.25	0.30	0.30	0.10	0.38	0.05	0.45	0.20	0.58	0.10	0.26
COW_MILNO	0.00	0.05	0.08	0.00	0.10	0.00	0.15	0.00	0.15	0.15	0.45	0.10
COW_DRCMIL	0.05	0.40	0.40	0.55	0.45	0.25	0.35	0.58	0.63	0.90	0.00	0.41
COW_CALVES	0.08	0.35	0.38	0.40	0.40	0.20	0.55	0.60	0.50	0.70	0.55	0.41
OXEN_DRANO	0.05	0.43	0.60	0.53	0.23	0.18	0.10	0.25	0.63	0.45	0.05	0.32
BUFF_DRANO	0.05	0.00	0.00	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.02
SHP_NUMBER	0.08	0.00	0.03	0.00	0.13	0.00	0.05	0.13	0.10	0.08	0.00	0.05
GT_NUMBER	0.45	0.95	0.55	1.05	0.28	0.55	0.58	0.38	0.80	0.48	0.10	0.56
DCK_NUMBER	1.78	0.50	0.55	1.30	1.70	2.23	0.80	0.08	0.80	2.05	1.28	1.17
PTY_NUMBER	5.28	2.25	3.13	4.45	5.88	4.35	3.00	4.25	4.30	6.80	6.35	4.37

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Table X.A.13 : Availability of animal feed (Average per farm)

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Purchased(Tons)	DKGAR F0	FULBARIA F0	JASHIHATI F1	ALOKDIA F1	SHANBARI F1	KARAGRAM F1	BANBANGLA F1	PANJANKHARA F1	GUNATIA F2	MAHABBATPUR F3	ALDI F3	REGION
Straw	0.03	0.06	0.08	0.16	0.09	0.04	0.04	0.09	0.15	0.12	0.11	0.09
Bran	0.01	0.00	0.04	0.08	0.13	0.06	0.02	0.07	0.13	0.36	0.35	0.11
Oil-Cake	0.00	0.00	0.01	0.03	0.01	0.01	0.01	0.00	0.01	0.01	0.10	0.02
<u>Average Value(Tk)</u>												
Straw	23.00	45.00	90.00	186.00	106.00	27.00	28.00	105.00	156.00	171.00	148.00	99.00
Bran	79.00	16.00	224.00	404.00	586.00	121.00	125.00	199.00	721.00	1155.00	1310.00	449.00
Oil-Cake	5.00	0.00	93.00	171.00	36.00	79.00	70.00	22.00	63.00	60.00	552.00	105.00
<u>Owned(Tons)</u>												
Straw	0.41	0.62	1.14	0.38	0.75	0.55	0.67	0.34	1.45	1.49	0.19	0.73
Bran	0.04	0.04	0.00	0.00	0.02	0.05	0.02	0.01	0.02	0.12	0.02	0.05
Oil-Cake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.01
<u>Total Used</u>												
Straw	0.44	0.69	1.22	0.53	0.83	0.59	0.72	0.42	1.60	1.60	0.30	0.81
Bran	0.05	0.04	0.04	0.08	0.16	0.11	0.04	0.08	0.14	0.47	0.37	0.14
Oil-Cake	0.00	0.00	0.01	0.03	0.02	0.01	0.01	0.09	0.01	0.01	0.10	0.05

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Table X.A.14: Marketing of Agricultural Products

	Quantity (kg)																	
	PURE SHARE CROPPER			VERY SMALL FARMER			SMALL FARMER			MEDIUM FARMER			LARGE FARMER			ALL FARMER		
	SOLD	BOUGHT	BALANCE	SOLD	BOUGHT	BALANCE	SOLD	BOUGHT	BALANCE	SOLD	BOUGHT	BALANCE	SOLD	BOUGHT	BALANCE	SOLD	BOUGHT	BALANCE
AUS	9	21	-12	1	43	-42	9	49	-40	54	23	11	130	0	130	15	38	-23
AMAN	42	181	-140	33	227	-194	130	135	-5	276	134	142	333	107	226	107	179	-72
BORO	103	423	-320	68	509	-441	306	335	-29	708	272	436	1900	115	1785	314	402	-88
TOTAL PADDY	154	626	-472	102	779	-677	445	520	-75	1018	430	588	2363	222	2140	436	619	-182
WHEAT	0	22	-22	0	19	-18	0	7	-7	1	25	-24	10	10	0	1	16	-15
JUTE	100	0	100	64	0	64	152	0	152	324	0	324	402	0	402	142	0	142
POTATO	655	9	644	663	3	660	776	0	776	2068	0	2068	3164	0	3164	1000	2	998
S.CANE	240	0	240	173	0	173	882	0	882	448	0	448	2758	0	2758	549	0	549
<u>% of farmers</u>																		
AUS	7.1	9.5		0.5	15.8		3.2	9.7		9.1	7.3		39.1	0.0		5.0	6.8	
AMAN	9.5	38.1		7.1	40.8		16.1	23.4		18.2	25.5		34.8	17.4		12.7	52.5	
BORO	21.4	47.6		12.2	57.7		35.5	41.9		49.1	27.3		82.6	13.0		28.0	68.9	
TOTAL PADDY	26.2	83.3		14.3	86.7		39.5	58.9		58.2	45.5		87.0	30.4		31.8	70.5	
WHEAT	0.0	11.9		0.5	11.7		0.0	3.2		1.8	7.3		4.3	4.3		0.7	8.4	
JUTE	42.9	0.0		34.7	0.0		46.8	0.0		52.7	0.0		52.2	0.0		42.0	0.0	
POTATO	11.9	2.4		14.3	2.6		10.5	0.0		10.9	0.0		4.3	0.0		125.7	1.4	
S.CANE	4.8	0.0		6.1	0.0		12.9	0.0		7.3	0.0		13.0	0.0		8.4	0.0	

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Table X.A.15: Credit situation per average farm for last year (1990 /91)

	Large Landowners	Medium Landowners	Small Landowners	Very Small Landowners	Landless Farmers	All Farmers
	8	69	121	229	13	440
Agricultural Loans						
From Institutional Source:						
amount received	1250.00	1386.96	522.56	321.51	192.31	556.94
interest rate	16.00	16.24	15.39	19.06	16.00	16.86
repayment position	0.00	49.99	32.24	29.90	0.00	36.82
From Friends/Relative:						
amount received	0.00	28.99	74.38	47.16	0.00	49.55
interest rate		100.00	0.00	18.52		18.35
repayment position		0.00	100.00	7.41		44.95
From Others:						
amount received	0.00	0.00	118.18	110.04	384.62	101.14
interest rate			47.17	55.87	13.00	48.26
repayment position			108.39	84.13	68.00	90.11
Private Loans						
From Institutional Source:						
amount received	0.00	43.48	223.14	699.56	1346.15	472.05
interest rate		0.00	28.93	17.90	18.74	19.15
repayment position		0.00	66.67	70.96	93.03	71.23
From Friends/Relative:						
amount received	0.00	0.00	107.44	46.94	0.00	53.98
interest rate			15.38	64.00		37.39
repayment position			24.62	106.98		61.89
From Others:						
amount received	0.00	0.00	148.76	192.14	0.00	140.91
interest rate			120.00	38.42		62.11
repayment position			33.33	56.71		49.92
% Number of borrowers						
Agricultural loans:	12.50	27.54	16.53	15.72	15.38	17.73
Private loans:	0.00	1.45	7.44	17.90	23.08	12.27
Both	0.00	1.45	0.00	2.62	0.00	1.59

Amount received and repayment position in Tk.

Interest rate in %

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