Government of the People's Republic of Bangladesh

Ministry of Irrigation, Water Development and Flood Control
Flood Plan Coordination Organization

BANGLADESH ACTION PLAN FOR FLOOD CONTROL

COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

TANGAIL CPP INTERIM REPORT

ANNEX 2: AGRICULTURE

(DRAFT)

September 1992

Euroconsult/Lahmeyer International/Bangladesh Engineering & Technological Services/House of Consultants

under assignment to

DIRECTORAAT GENERAAL INTERNATIONALE SAMENWERKING
Government of the Netherlands

and

KREDITANSTALT FÜR WIEDERAUFBAU
Federal Republic of Germany

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COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

INTERIM REPORT - TANGAIL COMPARTMENT

ANNEX 2 : AGRICULTURE

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY AND CONCLUSIONS

The area of the Compartmentalization Pilot Project (CPP-FAP 20), Tangail is situated in Agro-Ecological Zone-8 (Young Brahmaputra and Jamuna Floodplain) and consists of 13,000 hectares. The area has agriculturally good nutrient-rich soil. Agro-climate favours good cropping conditions. Rainfall and groundwater availability is adequate. However, the area is flooded seasonally with crop damaging flood occurring once in every three years. Due to the availability of adequate surface water, the prime agricultural activity was till last decade in the flood prone Kharif-II season. Traditionally, Tangail is an area of Jute and Deepwater Aman.

With the introduction of STWs and DTWs to utilize ground water, a total of 3675 ha. of project area is under irrigation. This facility has shifted agricultural activity in the Rabi season. Presently, Boro HYVs are planted on 3390 ha. producing 54% of total rice production of the area. With a net cultivable area of 9197 ha., cropping is already intensive (203%). The cropping pattern is mainly rice-based. Other major crops are Jute, Wheat, Sugarcane and Mustard. Commercial vegetable cultivation is becoming popular. Being well connected to Dhaka and other trading centres, inputs supply situation is satisfactory and opportunities for marketing of agricultural produce are adequate. There is a shortage of livestock. Natural forests in the project area are non-existent.

One of the main objectives of the CPP is to facilitate agricultural production through effective water management. In literal translation, this is to change from 'Live with flood' to 'Live and flourish with beneficial flood'. To a farmer, this means a permanent opportunity to derive economic benefits from agriculture in a risk free crop environment. This realisation among farmers will start a new batch of agricultural activities:

a) a shift from direct seeded to transplanted Deepwater Aman (an innovation of the region).
b) a shift from Deepwater Aman to local Aman.
c) a shift from local to HYV Aman, special BR11, BR22, BR23 and BR25.
d) use of high yielding BR17 as direct seeded Aus.

This means that the cropping intensity will gradually increase to 215%.

There will be slight increase of Boro HYV area from 3390 ha. to 3634 ha. A substantial increase from 1070 ha to 1982 ha., will occur in area of transplanted Aman (both local and HYV). In the 'With Project' situation, a modest increase of 712 ha. in rice area with an increase of 3000 tons of rice production is projected. The area to non-rice crops such as Wheat, Mustard, Potato and Pulses will increase whereas the areas cropped with Jute and Sugarcane will decrease. The projected areas with vegetables and spices has been kept constant. However, a provision has been made to accomodate a sudden change in areas with vegetables and spices, influenced by market demand, without offsetting the projected areas of rice and other non-rice crops.

GLOSSARY OF TERMS AND ACRONYMS

Glossary

Aus	-	A group of photoperiod-insensitive rice varieties sown during March-April and harvested during June-August.
Boro	-	A group of photoperiod-insensitive but fairly cold tolerant rice varieties transplanted in December-January and harvested in April-May.
Braus	-	In between Aus and Boro. Rice varieties planted between February 15 and March 15.
Transplanted Aman		A group of photoperiod-sensitive rice planted in July-August in non-flooded areas and harvested in November-December.
Deepwater Aman		A group of photoperiod-sensitive varieties adapted in water depth ranging from 1 to 3m and above. These are either direct seeded in February-May or transplanted in July-August and harvested in October-December.

Abbreviations

AEZ	-	Agro-Ecological Zone
BADC	-	Bangladesh Agricultural Development Corporation
BARI	-	Bangladesh Agricultural Research Institute
BARC	-	Bangladesh Agricultural Research Council
BAU	-	Bangladesh Agricultural University
BBS	-	Bangladesh Bureau of Statistics
BJRI	-	Bangladesh Jute Research Institute
BRDB	-	Bangladesh Rural Development Board
BRRI	-	Bangladesh Rice Research Institute
BWDB	-	Bangladesh Water Development Board
CPP	-	Compartmentalization Pilot Project
DAE	-	Department of Agricultural Extension
DTW	-	Deep Tube Well
FAP	-	Flood Action Plan
GIS	-	Geographic Information System (FAP 19)
HYV	-	High Yielding Variety
ISPAN	-	Irrigation Support Project for Asia and the Near East
LFP	-	Lohajang Flood Plain
LLP	-	Low-lift Pump
MIWDFC	-	Ministry of Irrigation, Water Development and Flood Control
MOA	-	Ministry of Agriculture
MPO	-	Master Plan Organization
NCA	-	Net Cultivable Area
SRDI	-	Soil Resources Development Institute
SRTI	-	Sugarcane Research and Training Institute
STW	-	Shallow Tube Well

1. LAND AND CLIMATE

1.1 Area

The Tangail Pilot Project area is located on the left bank of the Brahmaputra, in the vicinity of Tangail town. The area is bounded by a horse-shoe embankment along the Dhaleswari and Elanjani rivers in the West, the Lohajang and Gala Khals in the North and the Pungli river in the East (Figure 1A). The Southern boundary is formed by an earthen road between Silimpur and Karatia. The project area comprises 13,000 ha., (Table 1.1) over three Thanas of Tangail District: Tangail (83%), Delduar (14%) and Bashail (3%). The Tangail Pilot Project area has, so far, been divided into 17 sub-compartments.

TABLE:1.1 AREA IN COMPARTMENTALIZATION PILOT PROJECT OF TANGAIL#

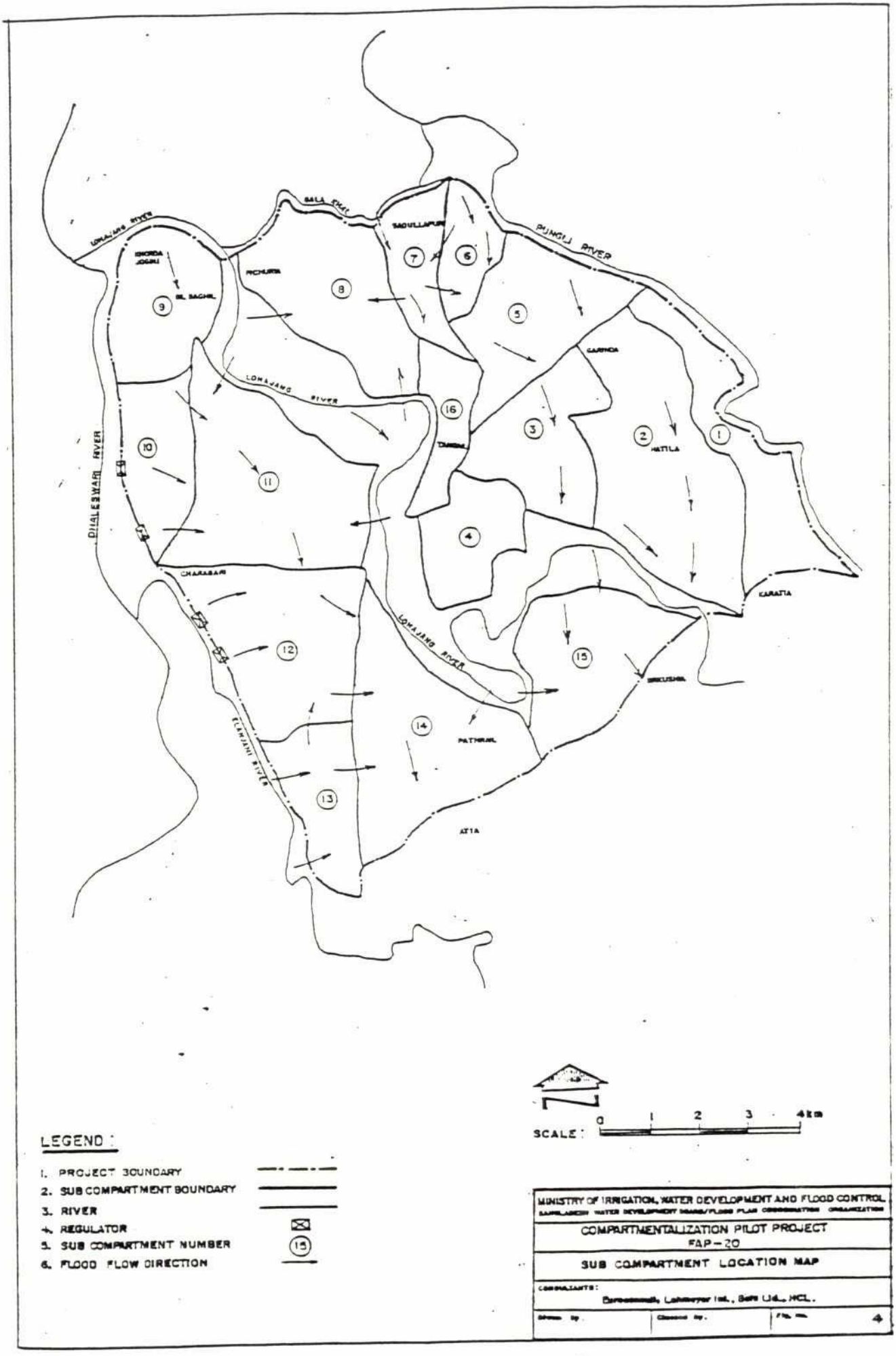
Sub-Compart-ment	Gross Area (ha.)	Net cultivable area (ha.)	Not available for culti-vation(ha.)*	Water bodies (ha.)	River bodies (ha.)
1	687	553	133	1	0
2	1280	1002	278	0	0
3	631	410	199	22	0
4	418	210	204	4	0
5	753	506	235	12	0
6	242	173	68	1	0
7	360	269	90	0	1
8	904	692	203	9	0
9	606	448	148	10	0
10	487	353	132	2	0
11	1125	821	290	14	0
12	1021	754	267	0	0
13	424	330	94	0	0
14	1143	852	263	28	0
15	691	450	240	0	1
16	260	3	234	23	0
LFP**	1968	1371	425	7	165
Total	**13000**	**9197**	**3503**	**133**	**167**
% of Gross Area		70.8	26.9	1.0	1.3

* Includes, homesteads, markets, brickfields, homestead vegetation etc

** Lohajang Flood Plain.

Data source, GIS (FAP 19), Dhaka.

LOCATION MAP



1.2 Climate

The Tangail Compartmentalization Pilot Project area is located between latitude 24° and 24.25° North and between longitude 90° and 90.25° east. The area shows fairly homogeneous climatic features. The climate is dominated by the monsoon.

The northeast monsoon coming from the Siberian anticyclones, blows during the winter months, giving weather that is generally dry and cool: typical temperatures range between 12°C to 28°C from December to February, rainfall in this period amounts to 4% of the annual and average wind speed is also at its lowest value (Table 1.2). The availability of soil moisture during this period falls short of crop requirements. Solar radiation is high during this dry season (rabi). Agronomically, Kharif-II crops are harvested in this season, and the rabi crops are planted.

During the following months, from March to June, pre-monsoon (Kharif-I), rainfall is 36% of the annual total (2014mm for Atia station); temperatures rise to a maximum of 34°C; humidity, which was minimum in February/March increases quickly; the wheather is generally unstable, with a succession of sunny and rainy days and high average wind speeds. Erratic distribution of rainfall during this period also causes soil-moisture deficits, but heavy thunder showers may sometimes damage the crops. Agronomically, the rabi (winter) crops are harvested in this period, and Kharif-I crops are started.

The south-west monsoon winds usually begin to blow in the month of June and last until October. During that season (Kharif-II) heavy rains fall over the region (60% of the annual total), relative humidity remains very high, between 80 and 90%, temperatures remain stable on average with a lower diurnal range, typically between 25°C and 31°C, solar radiation is low. This is the period when soil moisture availability is in excess of crop requirements. Agronomically, the Kharif-I crops are harvested and the Kharif-II crops are planted beginning roughly in mid-June. In October rainfall starts to decline and reaches a minimum during January.

The critical aspects of climate in relation to crops are:

- the occurrence and reliability of the pre-monsoon rains and the onset of the monsoon
- the occurrence of storms and cyclones that damage standing crops (boro and aus HYV rice)
- the reliability of the monsoon rains, and the rise, duration and cecession of floods associated with the monsoon rains; and
- the reliability, amount and distribution of the end-of-monsoon rains.

The crop environment during the monsoon season (Kharif-II) is not favourable for achieving full potential yields because of uneven distribution of rainfall, flooding at variable depths, insect attack, low solar radiation and high temperatures and humidity. In contrast, the rabi season has favourable conditions for achieving full potential yields: high solar radiation, low humidity and wide variation in day and night temperatures.

Table:1.2 Climatological parameters of the CPP Area, Tangail

Altitude: 9.8m			Longitude: 90-90.25E			Latitude: 24-24.25N		
Month	Temperature (oC) Max.	Min.	Rainfall* (mm.)	Sunshine hours/day	Humidity (%) 9 a.m	6 p.m	Wind Speed (km/hr.)	ETo (mm/day)#
January	25	12	3	8.8	62	62	2.3	2.58
February	28	14	23	8.8	77	54	2.8	3.49
March	32	18	45	8.6	73	49	3.9	4.47
April	34	22	110	8.4	76	56	5.2	5.16
May	32	24	263	8.7	82	74	5.0	5.26
June	31	25	314	5.0	87	82	5.0	3.99
July	31	26	407	5.4	87	81	6.0	4.20
August	31	26	212	5.6	88	81	4.6	4.07
September	31	25	353	5.9	85	82	3.7	3.99
October	31	24	224	7.3	85	79	3.0	3.64
November	29	18	43	9.2	81	73	2.3	3.17
December	26	14	17	9.1	84	67	1.9	2.51

Source: Mymensingh Station, quoted from Manalo, E.M., Agro-climatic Survey of Bangladesh, BRRI/IRRI, 1976.
* Atia Station, Tangail, Average of seven years 1985-86 to 1991-92.
# Evapotranspiration following Karim and Akand 1982.

1.3 Agro-Ecological Zones (AEZ)

Bangladesh includes a wide range of environmental conditions. Environmental diversity occurs not only at national and regional levels, it occurs also at Thana and village levels. In fact, small scale complexity of soil and hydrological conditions is an important characteristic of Bangladesh's environment. Thirty agro-ecological regions and 88 sub-regions are known.

The Tangail pilot project area is situated in two sub-regions namely (a) the High Jamuna Floodplain (AEZ 8c) and (b) the Low Jamuna Floodplain (AEZ 8d) of Young Brahmaputra and Jamuna Floodplain (AEZ 8). They have been differential mainly on the basis of relative age, nature of deposits and characteristics of relief within the area.

The High Jamuna Floodplain (AEZ 8c), located in the south-west part of the project, has mainly a smooth relief and is partly protected from river flooding by an embankment. It covers about 54% of the CPP, Tangail. The highest ridge soils lie above normal flood-levels, but are submerged for a few weeks in years with exceptionally high floods, the medium high land and medium lowland are mainly subject to shallow flooding. The western part of the floodplain is generally higher than the eastern part so drainage is away from the Jamuna and Dhaleswari rivers towards the south east. Ridge tops generally have permeable sandy loam or silt loam soils, downslope soils become progressively heavier and less permeable. These are silty clay loams and silty clays.

Much of the land is inundated in the monsoon season. Flooding is mainly by rain water, a combination of local run-off from ridges into depressions, river floods and the gradual raising of the groundwater table above the ground surface as a result of heavy monsoon rainfall. Tangail has an average annual rainfall of 2014mm, falling mainly between May and October (1773mm). Overland drainage within the project area is impeded by the low overall gradient, the presence of crops on the land, raised boundaries around fields, inefficient drainage channels, road embankments with inadequate bridges/culverts, and sometimes by high levels in the major rivers. Depth and duration of seasonal flooding vary with the position on the relief, the intensity of the rainfall and on the flood levels in the major rivers. Flooding of depressions normally begins in May/June and reaches its peak in July/August, sometimes September. In years of high river floods, river water spills over the land from the Dhaleswari, the Lohajang and the Pungli rivers.

With the recent extension of irrigation possibilities from deep and shallow tube wells, rabi-season Boro-rice has become the principal crop but winter vegetables are important on permeable soils. In the Kharif-II season, T. Aman is widely grown on the high land and medium highland, mostly without irrigation and deep water aman is both broadcasted and transplanted, on the low-lands. However much of the lowland remains fallow in the Kharif-II season because of the risk of rapidly rising flood water. The Boro crop is widely preceeded by mustard on land, which is not used for T.Aman and which become free from floodwater before the end of October.

The uncertain timing, depth and duration of seasonal flooding make monsoon season crop production hazardous, occasionally Boro paddy might be damaged in years when heavy rainfall in May/June floods the lands before the crop can be harvested.

The Low Jamuna Floodplain area (AEZ 8d), located in the north-eastern part of the project, covers 46% of Tangail CPP area. The northern part is largely a medium highland, shallow flooded in the rainy season whereas in eastern and southern parts mainly medium lowland. The latter parts are moderately deeply flooded inthe monsoon season. Basin centres are subject to early and rapid flooding by run-off from adjoining

higher land when heavy premonsoon or early monsoon rainfall occurs locally or in adjacent regions whose run-off drains into this region. At other times flood levels are controlled by levels in the Jamuna river. Flooding is almost entirely by rainwater or the raised groundwater table pounded on the land by high external floodlevels.

Drainage is impeded by bunds on the fields on slowly permeable soils in medium highland areas, road embankments with inadequate bridges/culverts. Ridge tops have silt loams and silty clay loam soils and heavy clays occur in the lower basins.

The cropping patterns generally do not differ much from those of the area covered by the High Jamuna Floodplain.

1.4 Soils

In the Tangail Pilot Project area, following major soil associations can be identified:

A. The *Sonatala-Dhamrai* association is covering most of the gently undulating area in the N.W. of the project area. Soils are mostly grey to brownish coloured silt loam; silty sandy loam on the permeable top of the ridges, downslope becoming more clayey. The area is flooded to shallow, locally moderate depth and remains moist fairly long in the dry season. This association has only minor limitations for agricultural development. With good management and irrigation, high to very high yields could be obtained on most of this land. Provided controlled flooding and drainage are available, three crops, two rice crops and a short duration rabi crop, can be planted every year. The land can be classified as agriculturally good.

B. Like the *Sonatala-Dhamrai* association the *Dhamrai-Sabhar Bazar* association is situated on the High Jamuna Floodplain in the western and south-western parts of the project area. On top of the ridges, soils are permeable sandy loam to grey silt loam, changing progressively into heavier and less permeable silty clay loam and silt clay in basins and depressions. The major limitation for agricultural development is the moderate depth of flood over most of the basins and part of the ridges. With flood and drainage controlled and given good management, and the use of HYVs and irrigation, the land could produce two wetland crops and sometimes a short duration rabi crop every year. The land can be classified as good to moderate agricultural land. T. Aman could partly replace deepwater Aman, increasing yields considerably.

C. The *Silmandi-Sabhar Bazar* association is located on the Low Jamuna Floodplain in the eastern and southern parts of the project area. It consists of numerous basins and an intricate network of relatively high floodplain areas, occupying about equal proportions. The major soils of the floodplain ridges consist of grey to brownish silt loam to silty clay loam. Along the Lohajang river there are some recent silt deposits. Top soils in the basins and depressions are impermeable grey clay to silty clay; the more larger, nearly level basin areas have usually more firm silty clay to clay sub-soils. Much of the area is flooded to moderate depth, many basin areas for 4-7 months. The soils remain moist long into the dry season. Only the highest areas become dry by the middle of the dry season. The major limitation for agricultural development is the moderate to, even sometimes, great flood depths in the basins and over many of the ridges. With controlled flooding, and drainage, most of this land could increase the agricultural output by growing Boro and Aman (direct seeded or transplanted) and on the higher ridges an additional short duration rabi crop. The land can be classified as good to moderate agricultural land.

1.5 Land Types

Following the Soil Resources Development Institute and Soil Data Processing System, the net cultivable area (NCA) is classified according to normal flooding depth as follows:

F0 = Highland with no inundation or inundation less the 30cm.
F1 = Medium highland, shallowly inundated from 30-90cm.
F2 = Medium low-land, inundated from 90-180cm.
F3 = Low land, flooded from 180-300cm.
F4 = Very low-land, flooded more than 300cm.

For the NCA of the CPP Tangail, 10% is estimated as F0, 36% as F1, 45% as F2 and 9% as F3 (Table 1.3).

T. Aman crops are cultivated in the F0 and F1 land types where there are less risks of flooding, deep water transplanted aman in F2 areas flooded to upto 120cm. and deep water direct seeded aman in the deeper flooded area. Aus is cultivated on the F0-F2 land types. Boro is planted when irrigation is available or in depressions (beels) following receeding water. Table 1.4 shows the maximum flood depth tolerance of major crops.

TABLE:1.3 LAND TYPES OF NET CULTIVABLE AREA (NCA) IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL*

Sub-Compartment	Net cultivable Area (ha.)	Land Types			
		F0 (0-30cm)	F1 (30-90cm)	F2 (90-180cm)	F3 (180-300cm)
1	553	9	155	274	115
2	1002	0	0	611	391
3	410	0	0	328	82
4	210	0	0	171	39
5	506	0	73	394	39
6	173	0	106	67	0
7	269	0	84	177	8
8	692	107	246	283	56
9	448	303	97	48	0
10	353	74	156	123	0
11	821	248	444	129	0
12	754	144	499	111	0
13	330	40	167	116	7
14	852	0	337	454	61
15	450	0	113	287	50
16	3	0	0	1	2
LFP	1371	0	820	535	16
Total	**9197**	**925**	**3297**	**4109**	**866**
% of NCA		10.1	35.8	44.7	9.4

* Source: Project Computations.

TABLE: 1.4 MAXIMUM FLOOD-DEPTH TOLERANCE (IN CM.) OF MAJOR CROPS

CROP	Jan		Feb		Mar		Apr		May		June		July		Aug		Sep		Oct		Nov		Dec	
	1-15	16-31	1-15	16-29	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31
HYV Boro	Planting		15	15	15	20	30	30	30	30 Harvest														
Local Boro	Planting		15	15	20	20	30	40	50	50 Harvest														
HYV T.Aman													Planting	15			15	30	30	50	50	00 Harvest		
Local T.Aman													Planting	15			30	30	50	70	70	00 Harvest		
HYV T.Aus								Planting 15	15	30	30	50	50 Harvest											
Local Aus							Sowing 00		15	30	40	50	70	70 Harvest										
B.DW.Aman							Sowing 00		15	30	50	50	70	90	180	180	300	300	180	90	70	00 Harvest		
TR.DW.Aman										Planting 15			30	50	70	90	180	180	120	90	70	00 Harvest		
Jute							Sowing 00		15	30	60	70	90	180 Harvest										
Wheat*	00	00	15	15	15	00 Harvest																Sowing	00	
Mustard	00	00	00	00 Harvest																		Sowing	00	
Potato	00	00	00	00	00	00 Harvest																Planting	00	
Pulses	00	00	00	00	00	00 Harvest																Sowing	00	
Oilseeds	00	00	00	00	00	00 Harvest																Sowing	00	
Sugarcane*	00	00	00	00	00	00	15	15	30	30	50	50	70	70	90	90	90	90	00	00 Harvest		Planting	00	

Based on Data and Figures of Matsushima (1967) & Stansel (1975), and MPO (Table-5.6) for Rice Crops. *Continuous flooding not desired.

2. PRESENT SITUATION

2.1 Cropping Seasons

There are three climatic seasons which are interrelated with three overlapping cropping seasons as:

Kharif-I (end of March to mid-June):
This season is characterised by moderate humidity and high temperatures and evaporation rates. Rainfall in this season consists of occassional heavy showers. The crop environment during this season is less favourable for high yield because of uneven distribution of rainfall, high temperature and humidity.

Kharif-II (mid-June through to the end of November):
The most important of all cropping seasons is characterized by high humidity, low solar radiation, frequent rainy periods and by both monsoon and riverine floods. The depth and nature of flooding determine the crops that can be grown in a given area.

Rabi (November to March):
This season is characterized by scanty or no rainfall, low temperatures and clear skies. Crop environment during this season is very favourable for high yields because of high solar radiation, low humidity and greater sunshine hours. Crops are limited to areas of adequate residual soil moisture. Because of favourable crop weather, extensive irrigation facilities are utilized to obtain an economically profitable crop yield.

A crop calender its relation to climate prevalent in the CPP, Tangail area is presented in Figure 2A.

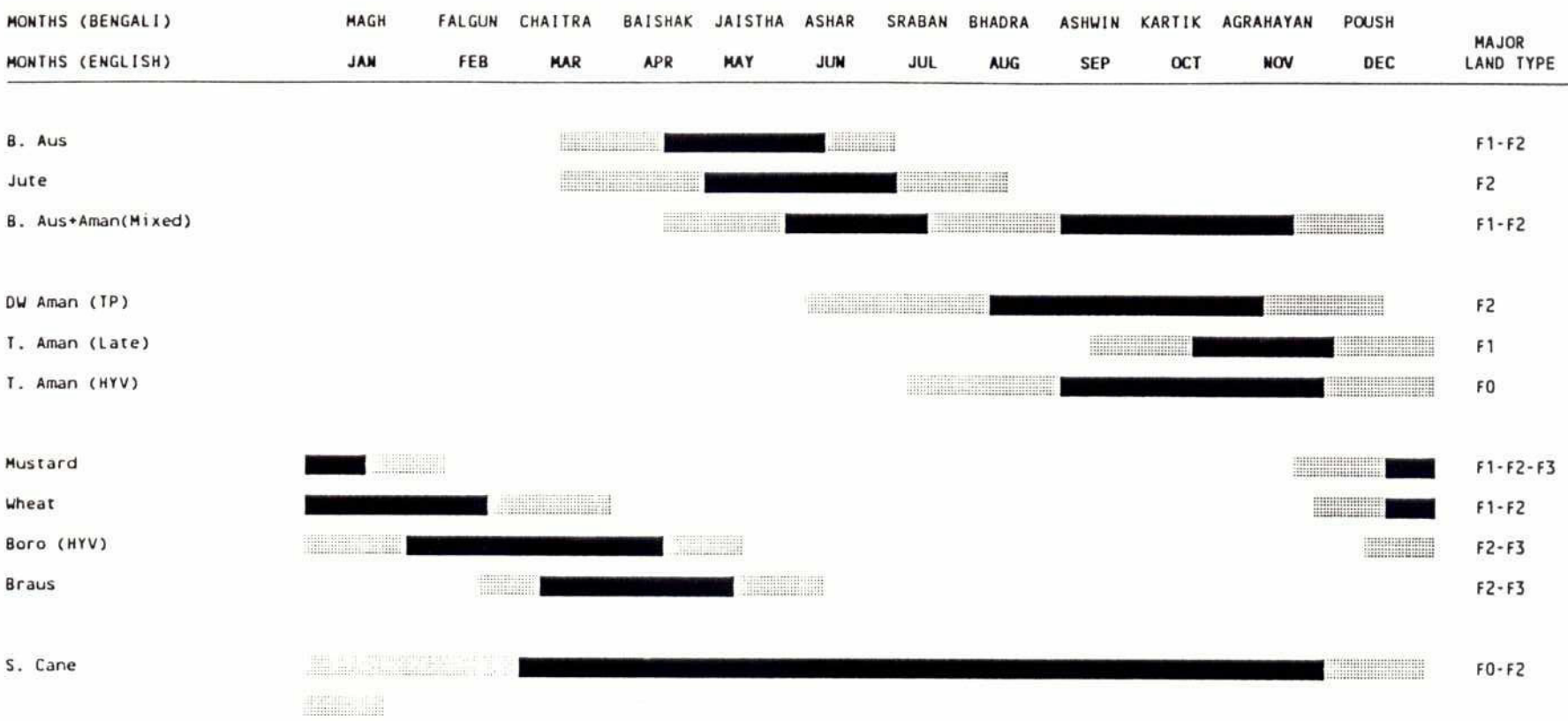
2.2 Crops

Agriculture in the Tangail Pilot Project Area is dominated by rice crops. Data on land utilization (Table 2.1) and irrigation per sub-compartment is presented. Irrigation within the project boundary is intensive (40% of NCA). As a result, entire Boro rice is irrigated and covered with high yielding varieties. Cropping intensity of the area is 203 with 26, 38 and 34% of NCA is planted to single, double and triple crops, respectively only 2% of the NCA remain fallow. Other crops, apart from rice, are jute, wheat, mustard, vegetables, sugarcane and pulses. Area and production of different crops in the project area is presented (Table 2.2).

2.2.1 Rice

Rice is the most important crop and is grown throughout the year. It can be grown on all soil types prevalent in the project area. The traditional rice crops Aus, Aman and Boro are grown in Kharif-I, Kharif-II and Rabi seasons respectively.

Aus: Aus is a photo-period insensitive group of rice varieties. It is generally direct seeded, rainfed and traditionally competes with jute. Direct seeded Aus is sown in March-April and harvested in June-August. Due to uncertain environmental condition (unpredictable and irregular rainfall pattern), the Aus varieties have evolved to a quickly-maturing, low-input crop with lower yield. Local varieties are predominant (20.3% of NCA) and covers about 1864 ha. (Table 2.2). In the CPP Tangail area, farmers mix seeds of both Aus and Aman varieties and directly seed them in April. Yields of direct seeded varieties range from 1.1-1.9 t/ha (Table 2.3).



Rainfall (min.)	3	23	45	110	263	314	407	212	353	224	43	17
Sunshine (hrs.)	8.8	8.8	8.6	8.4	8.7	5.0	5.4	5.6	5.9	7.3	9.2	9.1
Temperature (oc) (Maximum)	25	28	32	34	32	31	31	31	31	31	29	26
(Minimum)	12	14	18	22	24	25	26	26	25	24	18	14

FIG: 2A - CROP CALENDER AND WEATHER IN THE CPP, TANGAIL

TABLE:2.1 LAND UTILISATION AND IRRIGATION IN COMPARTMENTALIZATION PILOT PROJECT AREA OF TANGAIL (1991-92)

SC. No.	Gross Area (ha.)	NCA	Fallow (ha.)	Single cropped (ha.)	Double cropped (ha.)	Triple cropped (ha.)	Cropped Area (ha.)	Cropping Intensity	Irrigation	
									Area (ha)	% NCA
1.	687	553	11	151	177	214	1147	207	146	26
2.	1280	1002	20	212	412	358	2110	211	521	52
3.	631	410	8	89	147	166	881	215	183	45
4.	418	210	4	39	73	94	467	222	100	48
5.	753	506	10	131	150	215	1076	213	250	49
6.	242	173	2	47	56	68	363	209	66	38
7.	360	269	5	78	91	95	545	202	86	32
8.	904	692	14	187	206	285	1454	210	310	45
9.	606	448	9	152	145	142	870	194	172	38
10.	487	353	7	129	111	106	669	189	176	50
11.	1125	821	16	251	269	285	1644	200	312	38
12.	1021	754	15	171	252	316	1623	215	340	45
13.	424	330	6	81	177	66	633	192	90	27
14.	1143	852	17	181	463	191	1680	197	395	46
15.	691	450	8	79	255	108	913	203	226	50
16.	260	3	0	0	3	0	6	200	0	0
LFP*	1968	1371	29	449	529	364	2599	190	302	22
Total	13000	9197	181	2427	3516	3073	18678	203	3675	40

Source: BAE Unionwise statistics adjusted to sub compartments and cross checked through field surveys

2 26 38 37

TABLE:2.2 AREA, PRODUCTION OF DIFFERENT CROPS IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL (1991-92)

Crops	Area (ha.)	% of NCA*	Mean Yield (t/ha.)	Production (t)
Rice				
Aus Direct Seeded (Local)	1864	20.3	1.45	2702
Aus Transplanted (HYV)	356	3.9	2.75	980
Aman Transplanted (Local)	848	9.2	2.16	1835
Aman Transplanted (HYV)	222	2.4	3.24	719
DW Aman Direct Seeded	1464	15.9	1.52	2232
DW Aman Transplanted	2254	24.5	1.81	4087
Boro (Local)	167	1.8	2.92	487
Boro (HYV)	3390	36.9	4.47	15144
Total Rice:	10565	114.9		28186
Jute	1514	16.5	1.73	2614
Wheat	1963	21.4	2.26	4444
Oilseeds (Mustard)	1267	13.8	0.86	1089
Potato	495	5.4	9.84	4871
Pulses	733	8.0	1.07	781
Minor Crop (Vegetables)	651	7.1	9.99	6504
Sugarcane	691	7.5	30.77	21262
Spices (Onion etc.)	228	3.1	3.56	1025
Others	511	5.6	-	-
Total:	18678	203.3	-	-

Source: DAE Statistics, adjusted to compartment and cross checked through field surveys.

* NCA : 9197 ha.

TABLE:2.3 AREA, PRODUCTION AND YIELD OF KHARIF-I RICE (AUS) IN THE COMPARTMENTALIZATION PILOT PROJECT AREA, TANGAIL (1991-92)

Sub-Compartment	NCA (ha.)	Direct Seeded Aus (Local)			Transplanted Aus (HYV)			Total	
		Area (ha.)	Yield (t/ha)	Production(t)	Area (ha.)	Yield (t/ha)	Production(t)	Area (ha.)	Production (t)
1	553	122	1.1	134	10	2.6	26	132	160
2	1002	296	1.2	355	50	2.7	135	346	490
3	410	100	1.2	120	13	2.8	36	113	156
4	210	66	1.9	125	5	3.0	15	71	140
5	506	96	1.7	163	25	2.5	63	121	226
6	173	51	1.2	61	14	2.6	36	65	97
7	269	70	1.1	77	12	2.8	34	82	111
8	692	122	1.4	171	41	2.8	115	163	286
9	448	85	1.2	102	33	2.6	86	118	188
10	353	62	1.6	99	21	2.7	57	83	156
11	821	161	1.8	290	36	2.8	101	197	391
12	754	141	1.6	226	27	3.0	81	168	307
13	330	78	1.2	94	6	2.5	15	84	109
14	852	176	1.9	334	34	2.9	99	210	433
15	450	56	1.4	78	4	2.7	11	60	89
16	3	0	0.0	0	0	0.0	0	0	0
LFP	1371	182	1.5	273	25	2.8	70	207	343
Total:	**9197**	**1864**		**2702**	**356**		**980**	**2220**	**3682**

Source: Local DAE Unionwise statistics, adjusted to sub-compartments and cross-checked through field-surveys.

Aman: Aman varieties are traditionally photo-period sensitive i.e. they flower during 1st week of November irrespective of their seeding or transplanting date. They are of different types adapted to different micro-environments of Kharif-II season. Direct seeded, usually adapted to deep flood condition, mixed with B. Aus and sown in March-April. Transplanted, also adapted to deep flood condition, transplanted usually after the harvest of Jute, or Boro or Braus (late transplanted Boro). There is another of transplanted type, locally known as sail group, not adapted to deep flood and can be transplanted anytime but usually late transplanted till end of September.

The area covered with direct seeded and transplanted deep water Aman are of the order of 1464 ha. and 2254ha, respectively (Table 2.4). Direct seeding of Aus and Aman crop is relatively hazardous, with sowing taking place in April/May. Early monsoon flood, damage shorter Aus crops and other less submergence tolerant Aman seedlings. Normally, Aman is harvested in November/December. The yield obtained from the local varieties is about 2.0 t/ha. On the other hand, HYVs yield about 3.0-3.5 t/ha. Area planted to HYV Aman is 222 ha. which is 2.4% of NCA.

Boro: About 3557 ha. of the project area are under Boro (Table 2.5) which is irrigated, transplanted from December to February and harvested in April/June. About 95% of this area are covered by HYVs. This HYV Boro area is 36.9% of NCA (Table 2.2) and produces 53.7% of the total rice production.

Boro is transplanted from December to early February. Aus is generally transplanted after mid-March until early May. As high yielding Boro varieties can also be grown as Aus because of their photo-insensitivity, some farmers plant these varieties through February and March. A new term Braus, designates the rice crops transplanted between February 15 and March 15 (BRRI).

HYV rices in Aus, Aman & Boro: Proportional area and production of local and HYV rices in the CPP, Tangail area is presented in Table 2.6. In the CPP Tangail area, HYVs are planted mainly in Boro season. Through proper water management, area planted to HYV Aman can be greatly increased. HYV Aman varieties are usually photoperiod insensitive or moderately sensitive and of shorter seedling height, thus with limited suitability in all areas of Bangladesh. However, with the release of photoperiod sensitive taller seedling height varieties BR 22 and BR 23, it will be possible to cover more areas. BRRI has also developed direct seeded Aus HYV varieties with yield advantage.

2.2.2 Jute

Two type of jute, white and tossa, are cultivated for commercial production of fibre. White jute (*Corchorus capsularis*) is grown on medium low to high land, while tossa jute (*Corchorus olitorius*) is a medium high to high land crop. Land which are suitable for Aus and Aman rices are also suitable for jute.

Last week of March to mid-April is the recommended sowing time for white jute, while third week of April to mid-May is ideal for sowing of tossa. Jute varieties are sensitive to day-lengths. Growing jute earlier than the recommended time leads to premature flowering, stunted growth and low yield. Photoinsensitive varieties (cc-45, 0=9897) of jute have been released that could be planted in February/early March without the risk of early flowering.
In the project area 1514 ha. of land is planted to jute with annual production is 2614 ha. tonnes and an average yield of 1.73 t/ha. (Table 2.7) which is quite low comparing to yields obtained at the experimental stations.

TABLE:2.4 AREA, PRODUCTION AND YIELD OF KHARIF-II RICE (AMAN) IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL (1991-92)

Sub-Compartment	NCA (ha.)	Transplanted Aman (HYV)			Transplanted Aman (Local)			DW Aman (Direct Seeded)			DW Aman (Transplanted)			Total	
		Area (ha.)	Yield (t/ha.)	Production(t)	Area (ha.)	Yield (t/ha.)	Production(t)	Area (ha.)	Yield (t/ha.)	Production(t)	Area (ha.)	Yield (t/ha.)	Production(t)	Area (ha.)	Production (t)
1	553	10	3.3	33	42	1.7	71	153	1.4	214	116	1.6	186	321	504
2	1002	8	3.4	27	60	1.9	114	247	1.6	395	70	1.8	126	385	662
3	410	6	3.2	19	34	1.8	61	54	1.4	76	167	1.7	284	261	440
4	210	3	3.1	9	14	2.2	31	22	1.5	33	57	2.0	114	96	187
5	506	9	2.9	26	50	2.2	110	106	1.3	138	124	1.8	223	289	497
6	173	4	3.4	14	18	2.9	52	26	1.5	39	58	1.7	99	106	204
7	269	5	3.0	15	20	1.7	34	55	1.4	77	130	1.6	208	210	334
8	692	12	3.2	38	56	2.3	129	94	1.4	132	200	1.7	340	362	639
9	448	8	3.1	25	39	2.4	94	85	1.5	128	145	1.7	247	277	494
10	353	7	3.5	25	20	1.8	36	57	1.5	86	99	1.8	178	183	325
11	821	13	3.0	39	59	2.2	130	163	1.7	277	229	2.0	458	464	904
12	754	8	3.3	26	50	2.7	135	129	1.7	219	236	2.1	496	423	876
13	330	26	3.4	88	30	1.6	48	17	1.5	26	78	1.7	133	151	295
14	852	57	3.3	188	100	2.6	260	27	1.6	43	74	1.8	133	258	624
15	450	16	3.2	51	62	2.6	161	48	1.6	77	140	1.9	266	266	555
16	3	0	-	-	0	-	0	0	-	0	3	2.0	6	3	6
LFP	1371	30	3.2	96	194	1.9	369	181	1.5	272	328	1.8	590	733	1327
Total:	**9197**	**222**		**719**	**848**		**1835**	**1464**		**2232**	**2254**		**4087**	**4788**	**8873**

Source: Local DAE Extension workers, adjusted to sub-compartment and crop-wise by field survey.

TABLE:2.5 AREA, PRODUCTION AND YIELD OF BORO RICE IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL, 1991-92

Sub-Compartment	NCA (ha.)	Boro (Local)			Boro (HYV)			Total	
		Area (ha.)	Yield (t/ha)	Production(t)	Area (ha.)	Yield (t/ha)	Production(t)	Area (ha.)	Production (t)
1	553	37	3.1	115	131	4.7	616	168	731
2	1002	6	2.9	17	451	4.4	1984	457	2001
3	410	6	2.8	17	179	4.2	752	185	769
4	210	4	2.9	12	98	4.2	412	102	424
5	506	10	3.2	32	238	4.5	1071	248	1103
6	173	12	3.1	37	56	4.6	258	68	295
7	269	0	-	0	75	4.4	330	75	330
8	692	8	2.9	23	285	4.7	1340	293	1363
9	448	5	2.8	14	169	4.5	761	174	775
10	353	13	2.7	35	161	4.5	725	174	760
11	821	26	2.9	75	308	4.3	1324	334	1399
12	754	28	2.8	78	335	4.6	1541	363	1619
13	330	5	2.2	11	85	4.4	374	90	385
14	852	7	3.0	21	367	4.5	1652	374	1673
15	450	0	-	0	202	4.6	929	202	929
16	3	0	-	0	0	-	0	0	0
LFP	1371	0	-	0	250	4.3	1075	250	1075
Total:	**9197**	**167**		**487**	**3390**		**15144**	**3557**	**15631**

Source: Local DAE Upazilawise statistics, adjusted to sub-compartments and cross-checked through field surveys.

28

TABLE:2.6 PROPORTIONAL AREA AND PRODUCTION (IN %) OF LOCAL AND HYV RICES IN THE COMPARTMENTALIZATION PILOT PROJECT AREA, TANGAIL (1991-92)

	Local	HYV	Total
Area			
Aus	17.6	3.4	21.0
Aman	43.2	2.1	45.3
Boro	1.6	32.1	33.7
Total	**62.4**	**37.6**	**100.0**
Production			
Aus	9.6	3.5	13.1
Aman	28.9	2.6	31.5
Boro	1.7	53.7	55.4
Total	**40.2**	**59.8**	**100.0**

TABLE:2.7 AREA, PRODUCTION AND YIELD OF JUTE IN THE COMPARTMENTALIZATION PILOT PROJECT AREA, TANGAIL (1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	62	1.5	93
2	1002	152	2.1	319
3	410	64	1.8	115
4	210	36	2.1	76
5	506	81	1.8	146
6	173	28	1.9	53
7	269	45	1.8	81
8	692	88	2.0	176
9	448	58	1.8	104
10	353	47	1.6	75
11	821	131	1.6	210
12	754	106	1.7	180
13	330	73	1.9	139
14	852	139	1.8	250
15	450	78	1.8	140
16	3	1	2.0	2
LFP	1371	325	1.4	455
Total:	9197	1514		2614

Source: Local DAE Unionwise statistics, adjusted to sub-compartments and cross-checked through field surveys

Jute is obtained from the bark of the plants. The crop can, therefore, be harvested at any stage of maturity between 80 and 120 days. Plants that are harvested in August at average flowering to early fruit stage (120-130 days) produce higher yield and good quality fibre. Early harvest will reduce yield. In the flood prone low lands, white jute is harvested in June. In some medium low to high lands the farmers harvest jute early in order to release lands for T.Aman. Jute for seed is harvested in October-November.

In the rice based cropping pattern jute plays an important role. Rice land is rotated with jute. The farmers believe that growing of deep rooted jute after a few rice cultivations improves fertility of the soil. Leaves of jute that fall on the ground adds organic matter to the soil.

Jute is a cash crop to farmers. It is the main foreign exchange earning crop of Bangladesh. Jute sticks are extensively used for making walls and fences. It is also the main source of fuel in the villages.

For extraction of good quality fibre, there should be plenty of water close to jute fields. Slow flowing water is ideal for retting of jute. Bundles of plants (3-4m long) are steeped in water of the canals, rivers, beels, road side ditches or in the standing flood water on the field. It has been found that for retting of green plants of 1 acre, about 27000 liters of water is necessary. For complete retting the plants are to be steeped in water for 18-21 days. Stagnant water enhances the retting process but it lowers the quality of fibre. Low quality jute has no local or export market. In the years of low rainfall and low flood (e.g. monsoon of 1992), farmers face scarcity of water for retting.

2.2.3 Wheat

Wheat is the second largest food or cereal crop next to rice. It is cultivated in the rabi season. As the flood water recedes, the farmers start ploughing the lands (medium low to medium high) for rabi crops (wheat, mustard, pulses, boro) cultivation. Farmers choice of wheat cultivation depends on the price and availability of seed, time of releasing of land after flood, rainfall during October to November, price and demand of rice, etc. If rain stops early farmers plant mustard but in case of unfavourable weather and if they fail to sow mustard, the next choice is wheat. With available irrigation, the farmers give up wheat and plant boro rice.

The sowing time for wheat is very short. It is recommended that seeds to be sown between second week of November and first week of December. Delayed sowing reduces yield and grain quality. In late sown crop high temperature and high rainfall at the end of February or in early March, when the plants are at anthesis stage, may cause sterility of the florets resulting in grain shriveling and very low yield.

In the CPP Tangail area, wheat is planted on 1963 ha. (21% of NCA) producing 4444 tons with a mean yield of 2.3 t/ha.(Table 2.8)

HYV Sonalika, introduced in 1975, is still largely cultivated by the farmers despite its low yield and less tolerance to insect pests and disease as compared to the newly released varietties of the Research Institute namely Kanchan, Akbar, Aghrani, Barkat, and Ananda (Appendix C). Growing period of these varieties are between 103 and 112 days. They are more tolerant to pests and diseases and have the yield potential of 3.0 to 4.2 tons per hectare under irrigated condition and that of 2.1 to 3.3 tons per hectare under non-irrigated condition as compared to 1.8 to 2.4 tons for Sonalika. Kanchan and Aghrani can be planted later than Sonalika.

TABLE:2.8 AREA,PRODUCTION AND YIELD OF WHEAT IN THE COMPARTMENTALIZATION PILOT PROJECT AREA, TANGAIL (1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	92	2.3	212
2	1002	229	2.5	573
3	410	80	2.5	200
4	210	49	2.3	113
5	506	157	2.5	393
6	173	48	2.1	101
7	269	59	2.2	130
8	692	160	2.5	400
9	448	67	2.1	141
10	353	56	2.5	140
11	821	121	2.0	242
12	754	147	2.4	353
13	330	45	2.2	99
14	852	143	2.0	286
15	450	97	2.0	194
16	3	1	2.3	2
LFP	1371	412	2.1	865
Total:	9197	1963	2.26	4444

Source: Local DAE Unionwise statistics, adjusted to sub-compartments and cross-checked through field-surveys.

29

2.2.4 Mustard

Mustard is extensively cultivated in the CPP Tangail area (Table 2.9). It is the major oilseed crop. Oil is extracted either by traditional bullock powered presses or by electric powered expellers. Mustard cakes are used as cattle feed.

Low, medium low to high lands are cultivated with mustard. Being a short duration crop (75-100 days) it has been well adjusted in the existing cropping patterns. The growing time is from October to mid-February. Depending on availability of land limited by water congestion, growing of mustard is always a last minute decision of farmers in the project area.

TABLE:2.9 AREA, PRODUCTION AND YIELD OF OILSEEDS (MUSTARD) IN THE COMPARTMENTALIZATION PILOT PROJECT AREA, TANGAIL (1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	107	0.7	75
2	1002	158	0.6	95
3	410	51	0.8	41
4	210	50	0.7	35
5	506	58	0.8	46
6	173	10	0.7	7
7	269	34	1.0	34
8	692	78	0.8	62
9	448	55	0.7	39
10	353	30	0.8	24
11	821	88	0.9	79
12	754	140	1.1	154
13	330	44	0.9	40
14	852	180	1.1	198
15	450	61	0.8	49
16	3	1	1.0	1
LFP	1371	122	0.9	110
Total:	9197	1267		1089

Source: Local DAE Unionwise statistics, adjusted to sub-compartments and cross-checked through field surveys.

Improved varieties of mustard (Sonali sarisha-SS-75, Kalyania-T.S.-72, Sampad-MP-12, Tori-7, Rai-5) have been developed by the agriculture research institute (Appendix C). These varieties, if properly cultivated, yield 1.5 to 2.0 tons of mustard per hectare as compared to local varieties (0.9 tons/ha.)

2.2.5 Sugarcane

Sugarcane is grown on permeable land, medium highland, highland and even on lowland. Canes are grown in the project area either for making gur (molasses) by bullock and power crushers or for chewing purpose. On soils of low water holding capacity, dry season boro cultivation by irrigation or growing of other rabi crops - wheat, mustard, potato, etc. is not economical. The farmers, therefore, go for long duration (12-15 months) sugarcane cultivation, inspite of the fact that the plants, in many areas of CPP Tangail suffer from drought in January to March and from flood in July-August. The farmers are adopting the practice of growing one or two crops of potato, vegetables,

onion, mustard and pulses in between the rows (1m wide) during the first few months of planting canes.

Recommended time of planting is between October and November, but the farmers continue planting of sets upto February, March. Very little area is irrigated. The present yield is only 30-35 tons of cane per hectare with a sugar content of 8-10%. The yield and quality would be improved if only two supplemental irrigations in February, March could be given. Plough furrow method of planting (10-15cm deep) sets are followed. Ratooning is not a widely accepted practice.

Modern varieties of sugarcane which are high yielding, superior in sugar content and more tolerant to major insect pests and diseases have been developed and released by the research institute. The varieties are: ISD-1/53, ISD-2/54, ISD-16, ISD-17, I-112/67 and L-Jaba C (Appendix C).

The area currently planted to sugarcane is 691 ha., 7.5% of NCA with a mean yield of very low 31 t/ha (Table 2.10).

2.2.6 Potato

Potato is the most important vegetable crop of the country. It is grown during in the rabi-season (October-March) of the year. The cultivated area is 495 ha. (Table 2.11). The average yields are low, around 8-12 t/ha, owing to the use of local varieties.

The crop is rotated with jute, rice and vegetables. Potato is also grown as an intercrop in between the rows of sugarcane. Seed potatoes are planted from October to mid-November. HYV potatoes introduced a few years back, are Cardinal, Diamant, Patrones, Multa, Morini and Rigo.

2.2.7 Other Crops

a) Pulses: Lentil, Chickpea, Mungbean, Blackgram, Pea, Khesari are the most common and the cheapest source of protein for the rural people of the CPP area. Rice and dal (Pulses) is considered as a balanced diet to the rural mass. Broken pulses, residues, wastes at crushing and dry plants are used as the concentrated cattle feed. Cows grazing on green plants of black gram and Khesari produce more milk and maintain better health. The fertility of a soil is improved if a crop of pulses is grown.

TABLE: 2.10 AREA,PRODUCTION AND YIELD OF SUGARCANE IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL (1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	65	21.0	1365
2	1002	31	26.0	806
3	410	15	25.0	375
4	210	6	28.0	168
5	506	17	27.0	476
6	173	2	28.0	54
7	269	2	27.0	56
8	692	44	28.0	1364
9	448	20	30.0	600
10	353	10	31.0	310
11	821	84	29.0	2436
12	754	29	32.0	928
13	330	50	36.0	1800
14	852	123	32.0	3936
15	450	45	28.0	1260
16	3	0	0	0
LFP	1371	148	36.0	5328
Total:	9197	691		21262

Source: Local DAE Unionwise statistics, adjusted to sub-compartments and cross-checked through field surveys.

TABLE: 2.11 AREA, PRODUCTION OF POTATO IN THE COMPARTMENTALIZATION PILOT PROJECT AREA, TANGAIL (1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	26	8.1	211
2	1002	61	9.3	567
3	410	19	10.0	190
4	210	11	10.2	112
5	506	10	9.0	90
6	173	12	11.3	136
7	269	12	9.0	108
8	692	49	8.6	421
9	448	13	12.0	156
10	353	10	9.6	96
11	821	34	10.0	340
12	754	25	10.5	263
13	330	9	9.2	83
14	852	47	10.8	508
15	450	29	10.7	310
16	3	0	0	0
LFP	1371	128	10.0	1280
Total:	9197	495		4871

Source: Local DAE Unionwise statistics, adjusted to sub-compartments and cross-checked through field surveys.

There is a huge demand of pulses in the country, but due to low yield, the area and production of pulses are declining (Table 2.12). Expansion of boro cultivation, cultivation of wheat, mustard and potato in the lands which were previously under pulses, forced the cultivation of pulses in poorer lands.

Lentil, chickpea, pea, and kheshari are grown in the Rabi season, Mungbean and black gram are short duration crops (60-70 days); they can be cultivated in rabi and Kharif seasons. In a cropping pattern pulses can be fitted in as a third crop. Pulses are grown as a mixed crop with Mustard and Wheat and as an intercrop in sugarcane.

TABLE:2.12 AREA, PRODUCTION AND YIELD OF PULSES IN THE COMPARTMENTALIZATION PILOT PROJECT,TANGAIL(1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	62	1.0	62
2	1002	60	1.1	66
3	410	32	0.9	29
4	210	18	0.7	13
5	506	46	1.1	51
6	173	10	1.0	10
7	269	12	0.9	11
8	692	56	0.7	39
9	448	28	1.0	28
10	353	25	1.0	25
11	821	95	1.1	105
12	754	80	1.2	96
13	330	20	1.1	22
14	852	73	1.2	88
15	450	30	1.1	33
16	3	0	.0	0
LFP	1371	86	1.2	103
Total:	9197	733	1.07	781

Source: Local DAE Unionwise statistics, adjusted to sub-compartments, cross-checked through field-surveys.

b) Vegetables and Spices: Vegetables and spices occupy a major place in the agriculture of the proejct area. It is estimated that these crops, cultivated in agricultural field, cover only 939 ha., 10.2% of NCA (Tables 2.13 and 2.14). However a major portion of vegetables and spices are grown around homesteads. Chilies, onions, radishes, lady's finger and brinjals are found in most gardens but the predominant crop is cauliflowers, cabbages, cucumbers, sweet gaurd etc.

2.3 Inputs

Of the different material inputs, seed, fertilizer, irrigation equipment and pesticides are essential for the rapid dissemination of HYVs of rice in the country. However these inputs are for the most part reserved for irrigated crops such as HYV Boro which occupies about 36.9% of NCA in the CPP, Tangail area. Fertilizer, specially urea is now applied on most crops.

As in entire country, agriculture in the CPP area is based on the large reserve of non-specialised labour and the use of draught animals.

o Fertilizers

The fertilizers used by the farmers are mainly Urea, TSP and MP. Urea accounts for upto 70% of the total quantity of fertilizer, TSP 20-25% and MP 3-5%. The recent privatisation of fertilizer distribution (March 1989) has given new impetus to their distribution. Actual figures on fertilizer distribution in the project area are not available but BADC data for 1981-82 to 1989-90 show that the fertilizer distribution in Tangail district has risen, considerably, urea by 100%, TSP by 12%, MP by 52%, Zn by 500% and Gypsum by 1000%. With increasing area planted to HYVs, the use of fertilizer is expected to rise steadily. However, cost of fertilizer remains excessively high for small farmers who do not have any cash in hand. Small farmers are seriously handicapped and are incapable of using fertilizers at the right time and in the right quantity, which adversely affects productivity.

Most of the farms apply fertilizers to HYV Boro. All other rice and jute crops are also fertilised, but minor crops (millet, potatoes, groundnuts) are hardly fertilised. Sugarcane is heavily fertilised. Fertilizer use in transplanted deep water Aman is not rare. Application of farm yard manure is almost absent.

o Irrigation

Irrigation in Bangladesh has a long history but modern irrigation is practised for only two decades. In the mid sixties low-lift pumps (LLPs) were introduced which made use of surface water for Boro paddy, grown in the dry season (December to April). Later in the early seventies, tube wells - deep and shallow have been installed to irrigate modern varieties of rice, grown in medium high (F1) and medium low (F2) lands where there is lack of surface water.

TABLE:2.13 AREA, PRODUCTION AND YIELD OF MINOR CROPS VEGETABLES LIKE CABBAGES, CAULIFLOWER) IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL (1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	53	10.0	530
2	1002	64	9.0	576
3	410	21	11.0	231
4	210	15	7.0	105
5	506	18	11.0	198
6	173	4	13.0	52
7	269	5	9.0	45
8	692	78	8.0	624
9	448	32	7.5	240
10	353	20	9.0	180
11	821	43	11.0	473
12	754	49	10.0	490
13	330	21	12.0	252
14	852	66	11.0	726
15	450	30	11.0	330
16	3	0	0	0
LFP	1371	132	11.0	1452
Total:	9197	651	9.99	6504

Source: Local DAE: Unionwise statistics, adjusted to sub-compartments, cross-checked through field-surveys.

TABLE:2.14 AREA, PRODUCTION AND YIELD OF SPICES (ONION, GARLIC ETC.) IN THE COMPARTMENTALIZATION PILOT PROJECT, TANGAIL(1991-92)

Sub-Compartment	NCA	Area (ha.)	Yield (t/ha.)	Production (t)
1	553	28	3.2	90
2	1002	36	3.5	126
3	410	24	3.0	72
4	210	7	3.8	27
5	506	10	4.0	40
6	173	2	3.5	7
7	269	2	3.8	7
8	692	21	3.9	82
9	448	10	3.8	38
10	353	10	3.5	35
11	821	22	3.4	75
12	754	32	3.7	118
13	330	20	3.8	76
14	852	26	3.6	94
15	450	10	3.4	34
16	3	0	0	0
LFP	1371	28	3.7	104
Total:	9197	288	3.56	1025

Source: Local DAE: Unionwise statistics, adjusted to sub-compartments, cross-checked through field surveys.

HYV rice, particularly Boro, cannot be grown without irrigation. Supplementary irrigation may be given to aman when there is drought. Potato is also irrigated. Sugarcane is only partly irrigated (10 to 15%).

There are 615 STWs, 76 DTWs and 3 LLPs are now in operation in the project area (Table- 2.15), covering 3675 ha. of land which is 40% of NCA. Of this, 3390 ha. is planted to HYV Boro.

o Labour Use

Agriculture in Bangladesh is still traditional where human labour and bullock power are widely used. Use of power tillers and tractors by common farmers is on increase in the project area. Labour use is greater in transplanting of Aman and Boro (HYV) and in weeding jute and Boro (HYV). Besides family labour, manpower is hired whenever necessary. Hiring is done mainly in the transplanting and harvesting seasons.

There are three categories of hired labour:

(i) permanent labour or labour attached to a family for a season or a year;
(ii) casual hired labour - contracted on a day to day basis;
(iii) contract labour, where labourers either individually or in a group take specific jobs under contract.

Large farm households engage permanent hands besides engaging casual labour in different farm operations.

Generally, harvesting of boro is contracted out as this is a very critical job and the time available is very short. Casual labour is the principal class of wage labour in the study area.

Regarding wages, there are different forms. Permanent hands are paid cash in addition to food and lodging provided by the farmers. Casual labour is paid on daily basis, mostly in cash plus food (2-3 times a day). Cash payment is more prevalent in the villages located near the towns. In the case of contract work, either cash or kind is paid. Kind payment is observed in the case of the harvest of boro paddy.

Wages vary from area to area and season to season. Existing wage rates are very low as supply of labour is abundant (Tk.40-50/day).

o Draught Power

Animal power is quite commonly used in agricultural operations.

The predominant use is in land operation, threshing of crops and transportation. A large number of farm households, especially the small farmers, do not possess any draught animals. Instead, they hire in or exchange draught power either on a daily basis or under contract.

Land preparation for crop growing is done by bullock-driven wooden ploughes. One pair of bullocks can plough 0.15 ha of land in a day. To prepare the land for seeding or transplanting, 4-6 ploughing are necessary.

TABLE:2.15 NUMBER OF TUBEWELLS AND PUMPS IN COMPART-MENTALIZATION PILOT PROJECT AREA OF TANGAIL(1991-92)

Sub-Compart-ment	NCA	STW (No.)	DTW (No.)	LLP (No.)	Irrigated Area (ha.)	% of NCA
1	553	24	2	1	146	26
2	1002	81	11	0	521	52
3	410	26	4	1	183	45
4	210	22	3	0	100	48
5	506	31	7	0	250	49
6	173	12	1	0	66	38
7	269	17	1	0	86	32
8	692	64	3	0	310	45
9	448	48	0	1	172	38
10	353	26	4	0	176	50
11	821	38	10	0	312	38
12	754	55	9	0	340	45
13	330	15	2	0	90	27
14	852	54	10	0	395	46
15	450	24	7	0	226	50
16	3	0	0	0	0	0
LFP	1371	79	2	0	302	22
Total:	**9197**	**615**	**76**	**3**	**3675**	**40**

Source: BADC data, field checked by Environment Study (FAP-16) processed through GIS (FAP 19). Irrigated area is based on estimates of 1991 Census of Lift Irrigation, Agricultural Sector Team.

o Pesticides

Most of the farmers are familiar with pesticides. Their application are currently limited, however, to HYVs. The major difficulty encountered in using pesticides is their selection appropriate to the crops affected and the diseases. Farmers are ignorant of the proper doses to be applied, resulting in ineffective use of the pesticides.

In the rural makrets pesticides, are not generally available, and it is necessary to go to important nearby markets to procure them. Major pesticides are Furadan, Dimecron, Diazinon and Malathion.

o Credit

Credit to finance inputs at the right time and right quantities has become an essential facility for most farmers, especially when growing HYVs. In Bangladesh, there are two main sources of rural credit - the institutional, such as private and nationalized banks and non-institutional, being money lenders, friends and relatives.

Non-institutional credit is prevalent in both rural and urban areas. About 65% of the total credit needs are met by non-institutional sources because of the relative ease of access compared to the institutional credit. The landless and marginal farmers prefer this form of credit, because of equity problems which are rather easy for medium and large farmers.

Agricultural marketing in the project area is predominantly an individual business. Traders individually or in groups participate from exporting to domestic marketing. To maintain a minimum price at farm level, state procurement of paddy/rice and wheat are done in the harvesting seasons. Jute is procured by the Bangladesh Jute Corporation and the Bangladesh Jute Mills Corporation.

Farmers in the project area, like all others in the country, dispose of their produces in the local markets which generally sit once or twice a week. The special characteristic of rice marketing in the country is that almost all producers - big and small sell during the harvest seasons and a significant number of them, specially the small ones, buy back in the off-season even at a higher price. Rich producers sometimes sell their surpluses at their homesteads. Such transactions take place at the time of bulk sale of paddy and jute.

In the marketing of agricultural commodities generally four categories of middlemen are involved at different levels of marketing channels. These intermediaries are commonly known as Faria, Bepari, Paikar (wholesaler) and Aratdars. Farias are small traders operating in local markets. They procure directly from growers and sell to Beparis on the same day or the next market day in Tangail. Baparis normally participate in the important local markets better communicated to wholesale markets and processing centres. In the wholesale or secondary markets, Aratdars operate. These Aratdars provide storage of their commodities to (paikars) wholesalers. The Aratdars instead get commissions from the Beparis. They also finance Beparis.

Available information show that rice and jute marketings in local markets are competitive. But sometimes during harvest seasons prices fall sharply because of tacit understanding among the traders or cash constrains on their parts.

2.4 Cropping Patterns and Land Use

A cropping pattern is an arrangement of crops within a cropping year and is largely determined by factors as soils, flood depths, irrigation possibilities, available inputs and market expectations. Rice being the major crop, dominates the cropping patterns of the project area especially with the rapid expansion of irrigation.

Depending on land type, soils and irrigation availability rice cropping may be single, double or even triple. Double rice cropping in the project area is practiced in 3516 ha of highlands, medium highlands and irrigated medium low-lands. In medium lowlands and in some lowlands mixed cropping of Aus and B. Aman (deep water Aman) is common practice, followed by other crops. In deeply flooded lands single cropping of B. Aman in the Kharif season and Boro in Rabi season is practiced.

The non-rice crops are generally grown as a sequential with rice. Most of the non-rice crops are dry land crops, although some crops like jute (white-type), millets (Kaon) and sugarcane can tolerate some degree of submergence at later stages of growth. Jute is grown in the Kharif-I season, competing with Aus for land and is considered a substitute crop for Aus in cropping patterns. The Rabi season crops included in the cropping patterns may be early, middle or late depending on land types, recession of floods, and dates of harvest of preceeding crops.

In rainfed, dryland areas growing of tolerant, short duration crops has been an important feature. Although high crop yields have been difficult to obtain, traditional cropping patterns do exhibit a high degree of stability. Another feature is mixed cropping and inter cropping of annual crops. These practices provide farmers with opportunities of harvesting different crops from the same land, increasing total land productivity, and maintaining and improving soil fertlity through the use of legumes and jute. The most important dryland crops are Aus, Jute, Vegetables, Potatoes, Wheat, Mustard and Sugarcane. The cultivation of mustard has been increasing rapidly. The acreage of wheat has been receeding because of the increase of Boro rice cultivation, while jute is decreasing due to low market prices.

In Table 2.16, only some major cropping patterns are included and should not be regarded as a guideline or even an average of the existing cropping system. The number of crops which are cultivated in the project area is more than 30. However, the predominance of the rice crops in all the existing cropping patterns is uniform. T. Aman crops are cultivated in the F0 and F1 flood categories where there is less risk of flooding in normal years, while deep water aman is planted in F2 and F3 areas, Aus in the F0-F2 flood categories, and some mixed with D.W. Aman in F3 areas. Boro (HYV) is planted when irrigation is available.

TABLE:2.16 PRESENT CROPPING PATTERNS IN THE CPP TANGAIL AREA

	F0=Highland 0-30cm	F1 Medium Highland <30-90cm	F2 = Medium Low land <90-180cm	F3 = Low Land <180-300cm
Single Cropped	**Rainfed:** T.Aman (L) Aus Sugarcane	**Rainfed:** T.Aman (L) Aus Jute Sugarcane	**Rainfed:** D.W.T.Aman Aus Jute	**Rainfed:** D.W.Aman Jute Boro (L) Rabi Crops
	Irrigated: Boro(HYV)	**Irrigated:** Boro(HYV)	**Irrigated:** Boro (HYV)	**Irrigated:** Boro (HYV)
Double Cropped	**Rainfed:** Aus-T.Aman (L) Aus-Rabi Crops T.Aman(L)-Rabi Crops	**Rainfed:** Aus/Jute-T.Aman(L) Jute/Aus-Rabi Crops T.Aman (L)-Rabi Crops	**Rainfed:** Aus/Jute-Rabi Crops D.W.T.Aman-Rabi Crops B. Aman + Aus	**Rainfed:** Jute/Aus+B.Aman-Rabi Crops Boro(Local)-Vegetables
	Irrigated: Boro(HYV)-T.Aman(HYV)	**Irrigated:** Boro(HYV)-T.Aman(HYV)	**Irrigated:** Aus/Jute-Boro (HYV) Mustard-Boro (HYV)	**Irrigated:** Mustard-Boro (HYV)
Triple Cropped	**Rainfed:** T.Aman-Rabi-Summer Vegetables	**Rainfed:** Aus-T.Aman(L)-Rabi Crops T.Aman(L)-Rabi Crops-Jute	**Rainfed:** Aus/Jute-Veg-Rabi Crops B.Aus+B.Aman-Boro (L)	**Rainfed:** Jute-Veg.-Boro Crops
	Irrigated: T.Aman(L)-Pulses/Mustard-Boro(HYV) T.Aman(HYV)-Veg-Boro(HYV)	**Irrigated:** T.Aman-Pulses/Mustard-Boro (HYV) T.Aman-Vegetables-Boro (HYV)	**Irrigated:** DW.Aman-Mustard-Boro (HYV)	**Irrigated:** DW Aman-Mustard-Boro (HYV)
Area(ha)	925	3297	4109	866
% of NCA	10.1	35.8	44.7	9.4

2.5 Crop Damage

Damage to crops, livestock and agriculture generally occurs at the beginning of the monsoon season, principally affecting the newly transplanted Aman fields. Early floods may also affect Boro rice, the harvest of which is usually performed in the month of June.

In order to get an estimate of the potential agricultural damage in the compartment the following method has been followed:

- The maximum 3 day mean water level per decade has been assessed for the Jugini water level station (at the mouth of the Lohajang).

- The flooded area within the compartment has been related to the water level at Jugini.

- The potential damage to the rice crops is given an index for each crop and each year based on these water levels and the following assumptions:

  - 39% of the area is cropped with Boro that is harvested from mid-May to mid-June. Damage starts when the water level rises above 10.4 + 0.3m PWD (land level + crop height) before mid-June. The damage index ranges from 0 (no damage) to 39% maximum (the flood level rises above 11.7 + 0.3m PWD before 15 of May).

  - 4% of the area is cropped with T. Aus that is harvested before mid-July. Damage starts when the water level rises above 11.0 + 0.7m PWD before mid-July. The damage index ranges from 0 to 4% (the flood level rises above 11.7 + 0.7m PWD before June).

  - 20% of the area is cropped with B. Aus that is harvested before early July. Damage starts when the water level rises above 11.0 + 0.6m PWD before early July. The damage index ranges from 0 to 20% (the flood level rises above 11.7 + 0.6m PWD before June).

  - 3% of the area is cropped with T. Aman HYV which is planted from mid-July to late August. This crop is damaged or cannot be planted when the water level stays above 11.7 + 0.3m PWD beyond late August (max damage index is then 3%).

  - 9% of the area (high land) is cropped with T. Aman local variety. The planting period is identical with the HYV, the maximum flood level is 11.7 + 0.7m PWD (max damage index is 9%).

  - 40% of the area is cropped with DW Aman. Damage is related to:
    a) water level rise above 10cm/day over 3 days or more during any period.
    b) inundation before end of May (crop not yet settled).
    c) flood level above 12.5m PWD during any period (1 in 4 year max flood level) resulting in low yield due to excessive vegetative growth (10% reduction per 0.1m above 12.5m PWD).

    The maximum damage index for DW Aman is 40%.

The maximum potential damage index is 115%. Table 1.17 gives the potential damage index as based on the above assumptions for the years from 1983 to 1991.

TABLE: 2.17 POTENTIAL DAMAGE INDEX FOR 1983 TO 1991

YEAR	BORO	T AUS	B AUS	T. AMAN	DW AMAN	TOTAL	RETURN PERIOD YEARS
Cropped area (%)	39	4	20	12	40	115	
1983	0	0	0	10	0	10	2
1984	5	1	0	10	11	27	5
1985	11	0	0	0	0	11	2
1986	0	0	0	0	0	0	1
1987	0	0	0	10	16	26	5
1988	0	2	3	10	32	47	8
1989	0	0	0	0	0	0	1
1990	2	0	0	0	0	2	1
1991	2	1	0	0	0	3	2

- The last step in this methodology is the rating of the years as per the frequency of occurence of a specific potential agricultural damage index.

2.6 Constraints to Agricultural Production

The low growth rate and even stagnation in agricultural production in the CPP Tangail area can be attributed to several problems. The main constraints are:

a. Land Availability

There are no posibilities to raise agricultural production through expanding net cultivable area in the project. Moreover, the expansion of urban areas around Tangail, Karatia and Delduar may consume more agricultural land. Hence, to feed the increasing population from limited agricultural land, the only solution is to improve the production through elevation of productivity per unit area.

b. Floods

Normal seasonal floods are regarded by the farmers as a blessing by deposing silt and recharging the water table. The depths of these floods vary from year to year. High early or late floods from the Dhaleswari occurring about once in every 5-10 years, are damaging crops like Aus, Deep Water Aman, transplanted Aman, sometimes Boro, Jute and early rabi-crops. These floods are sometimes burying good agricultural land with possibly thick layers of raw new alluvium, silting-up drainage channels and eroding riverbanks. Heavy pre-monsoon rainfall sometimes causes

flashfloods which damage crops, and even homesteads. In the project area the most affected areas are Danya Chowdhuri, Sakrail, Senhat and Darun.

c. Drainage

Besides flooding, the silted-up rivers are affecting proper drainage. Substantial areas are poorly drained, due to the low overall gradient and lack of maintenance of drainage channels. Widespread drainage problems are caused by man-made obstructions like roads and embankments without proper drainage facilities.

d. Soils

Heavy clay soils are not easy to cultivate, especially basin soils are creating problems. Soils on ridge tops have a low-moisture holding capacity which leads to drought problems in years with little rainfall. The same problem occurs in some areas with additional low natural fertility of upland soils and grey valley soils, (deficient in K,Zn and S). Puddled topsoil and strong ploughpan in soils used for transplanted aman cultivation prevents or restricts the cultivation of dryland rabi crops.

e. Irrigation

The rapid diffusion of tubewell irrigation in recent years has been covering most of the suitable land in the project area. Future development of irrigated agriculture is only feasible in areas which are being protected against floods, provided with proper drainage possibilities. Groundwater supply seems to be sufficient. Lack of spare parts of agricultural and irrigation equipment at Thana level is a problem.

f. Inputs

The availability of inputs like fertilizers and pesticides has improved considerably since the distribution and marketing of these commodities has been privatized. Sufficient and timely supply of high quality seeds is sometimes a problem.

g. Institutional Constraints

Institutional constraints regarding the functioning of the agricultural extension service and agricultural research institutions and the failure to transmit the research results to farmers are extensively dealt elsewhere.

h. Other Constraints

Some additional constraints are mentioned below:

- More than 70% of the farmers are so-called marginal (<0.40 Ha of land) or small (<0.80 Ha of land). Almost all of them are illiterate and are hiring themselves out as labourers. Resources like credit through normal channels are not available to assist them to generate additional income from agricultural activities. Prices for inputs like fertilizers and pesticides are too high to afford, reducing their yields. Reduction of input prices and provision of credit facilities could offer possibilities to produce more and so improve their standard of living.

- A sizeable portion of the cultivated land is under share cropping offers neither security of tenure nor a fair share of their produce to the share croppers.

- Heavy pressure of population has led to a shrinking of land/man ratio which provides little help to generate surplus for investment.

- Farmers are lacking security needed to invest in modern agricultural technology due to floods and drainage problems.

2.7 Livestock

Livestock in the CPP Tangail area are virtually kept on small farms. It is an integral part of the farming system. Cattle, goats and chickens are the most important animals of the rural households in the project area. Bullocks are kept mainly for draft purposes and for transportation, but cows for milk. Goats, sheep, chickens and ducks are kept for cash income and as a source of protein food. Cowdung is used as fuel in rural areas, owing to shortage of firewood.

Cattle are fed mainly on crop residues and by-products. Paddy straw is the main feed though cattle are grazed on temporarily fallow land after harvesting of paddy crops as well as on roadsides, canal embankments and other unused grounds. Farmers also feed their animals with cropweeds and grasses which grow on the lakes and water bodies. Goats, sheep, chickens and ducks are usually fed by scavenging.

The project area has long been a source of milk supply for urban areas, especially Dhaka through Milk Vita. Milk is collected in the villages by contact milk suppliers (cooperative societies) to the Milk Vita collecting unit in Tangail town.

Different types of epidemics generally break out during and after floods if adequate preventative measures are not taken. In case of cattle and goats Anthrax, Diarrhoea, Foot and Mouth disease, Haemorrhagic Septicaemia, Rinderpest etc. are common diseases. Ranikhet, Fowlpox, Fowl Cholera, Duck Plague, etc. are the important diseases for poultry. The average health condition of the animals in the area is not good.

There is an acute shortage of draught power and this shortage is usually made up by using cows, hire-in arrangements and through exchange among households, either on daily basis or under contract. There is a shortage of fodder and the quality is poor. Modern improved varieties of rice produce straw that farmers consider to be difficult to digest and of lower protein content.

2.8 Forestry

Natural forests are non-existent in the Compartmentalization Pilot Project Tangail area. A number of declared forests are located in Shakipur, Madhupur and Ghatail Thanas of Tangail district. These and other adjancent forests provide timber and firewood utilized in the CPP area. Growing of bamboo is common in every rural household. Common homestead and roadside trees is shown (Table 2.18).

TABLE:2.18 SOME OF ROADSIDE AND HOMESTEAD TREES GROWN IN THE CPP TANGAIL AREA

Sl.No.	English Name	Vernacular Name	Botanical Name
01.	Arjun	Arjun	*Termenalia arjuna*
02.	Bamboo	Bansh	*Bambusa spp.*
03.	Bakul	Bakul	--
04.	Banyan	Bat	--
05.	Champaka	Champa	*Michaelia Champaka*
06.	Deb Daru	Debdaru	*Polyalthia longifolia*
07.	Eucalyptus	Eucalyptus	*Eucalyptus camaldulensis*
08.	--	Gab	*Diospyros peregrina*
09.	Gold Mohr.	Krishna	*Poinciana pulcherrina*
10.	Ipil ipil	Ipil ipil	*Leucaena Leuneocephala*
11.	Jambulane	Jam	*Syzium komini*
12.	Jarul	Jarul	*Lagerstroemina flosreginae*
13.	--	Kadam	*Anthocephalus cadamba*
14.	Kapok	Shimul	*Salmalia malabarica*
15.	Mahogany	Mehogini	*Swietenia mehogini*
16.	Neem	Neem	*Asadiracta indica*
17.	Raintree	Raintree	*Samania saman*
18.	Sal	Gazari, Sal	*Shorea robusta*
19.	Sissoo	Shishu	*Dalbergia sissoo*
20.	--	Sheora	*Streblus asper*
21.	Tamarind	Tetul	*Tamarindus indicus*
22.	Common Cane	Bet	*Calamus viminalis*

3 AGRICULTURAL DEVELOPMENT POTENTIALS

3.1 Land capability potential

The tropical monsoon climate favours production of a wide range in the project area. The farmers work hard and are very resourceful. They have learned to live with floods, while producing rice and other crops for domestic requirements and for local markets. The area consists of deep moderately fertile soils.

Soils in general are already used intensively. Cropping intensities are high. F0 and F1 land has the highest agricultural potential. On such land two transplanted rice crops can be grown every year on impermeable soil (including puddled loamy soils), two HYVs on F0 and one local and one HYV on F1. F0 and F1 lands with permeable soils are suitable for a wide range of dry land cash crops; especially with irrigation: fruits and vegetables year-round on F0 land, rabi vegetables, potato, species, wheat etc. on F1 land (Table 3.1). The main development requirements for F0 and F1 land are:

- Supplementary irrigation to make transplanted Aman production more secure.

- Provision of irrigation on permeable ridge soils, especially to increase production of dryland cash crops.

- Reduction of peak flood-levels, where it is feasible, to enable T.Aman to be grown more extensively and securely on F0 and F1 land; such flood control would also benefit Aus and jute cultivation.

F2 and F3 lands generally have a lower potential than F0 and F1 lands. Development opportunities in the monsoon season are restricted by the depth of flooding and by the risk of crop damage by untimely or high floods. The greatest opportunities for increased production exist in the dry season, especially with irrigation. The main development requirements are:

- Expansion of irrigation of lands not presently irrigated in order to grow HYV Boro on impermeable soils and dryland rabi crops on some relatively higher, permeable soils;

- Improvement of drainage in basin centres, where it is feasible, to enable HYV Boro to be grown more extensively and reliably on irrigated basin lands;

- Controlled flooding, where it is feasible, to enable Aus, Jute and Deepwater Aman to be grown securely, controlled flooding would also enable deepwater aman to be transplanted more reliably after the harvesting of boro.

3.2 Agricultural Potential

If current research yields represent crop productivity potentials, average yields have reached only about 35% of the potentials for non-rice crops. The better rice farmers using HYVs and recommended inputs have attained yields of closer to research level (Table 3.2). If technology would have been fully utilized with the current cropped and irrigated area, the project area could meet food requirements, including rice, for the entire project area. Crop diversification into high yielding food crops such as potatoes, improved oilseeds and pulses offers a great potential. Optimizing the use of land and water by cultivating more suitable and profitable crops will increase productivity. Possibilities to extend the total irrigated area considerably are, however, limited. To a certain extent

TABLE:3.1 LAND TYPES OF NET CULTIVABLE AREA (NCA) IN THE CPP, TANGAIL IN 'WITH PROJECT' SITUATION*

Sub-Compartment	Net cultivable Area (ha.)	Land Types			
		F0 (0-30cm)	F1 (30-90cm)	F2 (90-180cm)	F3 (180-300cm)
1	553	146	179	228	0
2	1002	0	244	758	0
3	410	0	148	262	0
4	210	0	93	117	0
5	506	129	271	106	0
6	173	111	50	12	0
7	269	206	58	5	0
8	692	413	195	84	0
9	448	360	66	22	0
10	353	165	129	59	0
11	821	111	364	319	27
12	754	71	293	390	0
13	330	199	86	45	0
14	852	298	316	238	0
15	450	58	234	157	1
16	3	0	2	1	0
LFP	1371	263	714	384	10
Total	**9197**	**2530**	**3442**	**3187**	**38**
% of NCA		27.5	37.4	34.7	0.4

* Source: Project Computations.

TABLE : 3.2 YIELDS (MT/HA) OF CROPS

Crops	Research level	Better Farmer level	Regional Mean	Project Area Mean	Future Expecta-tion
	(1)	(1)	(2)	(3)	(3)
Rice					
Aus Direct seeded (Local)	2.0	1.6	1.08	1.45	1.48
Aus Transplanted (HYV)	4.5	3.6	2.22	2.75	2.72
Aman Transplanted (Local)	3.5	3.5	1.42	2.16	2.19
Aman Transplanted (HYV)	5.0	5.0	2.53	3.24	3.25
DW Aman Direct seeded	-		0.93	1.52	1.52
DW Aman Transplanted	-		1.00	1.81	1.84
Boro (Local)	-		1.57	2.92	2.91
Boro (HYV)	6.5	6.0	3.49	4.47	4.48
Jute	3.0	2.4	1.49	1.73	1.74
Wheat	5.5	5.0	2.32	2.26	2.34
Mustard	2.4	2.0	0.73	0.86	0.87
Potato	35.0	28.0	12.77	9.84	9.46
Pulses	2.0	1.6	0.86	1.07	1.06
Vegetables			9.46	9.99	8.07
Sugarcane			24.94	30.77	30.79
Spices (Onion)			7.70	3.55	-

(1) Estimates of BRRI-BARI
(2) Estimates of DAE, Tangail
(3) Estimates of Consultant's Survey and trend analysis.

there is still some scope for extension of irrigation, provided there is flood protection or controlled flooding. The use of shallow tubewells (STW) offers flexible and quick possibility for a rapid extension of irrigation.

Controlled flooding and improved drainage will provide possibilities for higher production levels per ha. through controlled and shorter inundation periods, combined with better farming methods, higher resource investment in inputs, the use of HYVs and the extension of the growing period (increase of number of growing months).

Possibilities to improve agricultural development are mainly dependent on the diffusion of new improved varieties, improved soil and crop management, efficient use of available water resources, given flood control and improvement of drainage is provided for.

Newly improved varieties are developed at the Agricultural Research Institute like BARI, BRRI, BJRI and other research institutes and introduced to farmers through the Agricultural Extension Services. These varieties are adapted to the local growing conditions and the preference of the consumers. Special emphasis has been laid on the improvement of crops, like rice, wheat, mustard, pulses, potato, sugarcane, jute, sweet potato, groundnut, sesame, cotton and vegetables.

Improved soil and crop management will raise the production capacity of the farms, like:

- Timely planting to make optimum use of the available growing season.
- Increased and more efficient fertilizer applications following the recommendation of the Research Institute (Appendix D).
- Use of manure/mulch to increase the organic matter content and to improve the moisture holding capacity of the soil.
- Better land preparation.
- Levelling of fields to prevent waterlogging after heavy rainfall.
- Making field-drains to speed up drying after floods and to protect dryland crops from waterlogging.
- Efficient use of pesticides and integrated plant protection.
- Promoting dibble and line sowing and transplanting of Aus and Deepwater Aman paddy.

Efficient use of water resources can maximize the outputs of the farmers fields. Some measures that can be taken are:

- Field levelling.
- Rotational irrigation.
- Round the clock pump operation.
- Growing dryland rabi crops and/or direct seeded Aus/jute instead of HYV Boro paddy on land with soils with a high permeability.

3.3 Assumptions in Potential Development

Development potentials in crop area coverages and productions assumable in with (W) and without (WO) project conditions are generally determined on the basis of inundation land category obtained in each condition. The inundation land categories (F0-F4) as modelled by MPO are usually arbitrary calibrations which are subject to shifts with the changing water level if it is manipulated by interventions, although the truth is that the lands do not shift. It may be assumed that, for example, the existing F1 (flooded 30-90cm) lands all or part might turn into F0 (flooded upto 30cm) lands with project interventions. Similar up-gradings of other categories might also be experienced. Peripheral interventions for controlled flooding to a desired level and internal water management system development determines the relocation of inundation land categories vis-a-vis the cropping patterns and the dimension of each crops to be devoted to these categories. Some other factors such as soil characteristics, farmers preference to crops, price effectiveness, availability of certain resources and inputs etc. also influence such allocations in a given location of the project. However, in general, theoretical assumptions in potential development for crops relative to the changing land category scenarios in the project is based mainly on the following facts:

- Settlements are located on the highest elevations in the sub-compartments and do not change/increase.

- HYV T.Aman can only be planted on the non-flooded (rainfed) and F0 areas which are not used for settlements.

- Local T. Aman is planted on F1 areas, inundated less than 70cm.

- Jute and sugarcane are planted on the remaining F1 and some F2 areas.

- Transplanted Deepwater Aman is planted on most of the F2 areas, inundated not more than 120cm.

- Direct seeded Deepwater Aman consumes the remaining F2 and some F3 areas.

3.4 Impacts of Controlled Flooding and Improved Drainage

If protection against flooding is provided and drainage impediments can be eliminated, a further increase of production can be attained using suggested cropping patterns (Table 3.3).

The production capacity per Ha. is increasing with the extension of the growing period. For example: An inundation with a duration of 5 months reduces the growing period to 7 months. If the inundation period can be shortened by an improved drainage system, the growing period will increase. This will make it possible for farmers to plant earlier and to harvest on time. Longer duration varieties of crops with a higher yield potential can be used or an additional crop can be grown.

With higher crop security farmers are inclined to invest more on inputs like fertilizers and irrigation. Each month of extension of the growing period will result in at least 10% increase of the total production per Ha. Improved water management can be expected to have the following impacts.

TABLE: 3.3 FUTURE CROPPING PATTERNS

	F0=0-30cm	F1<30-90cm	F2<90-180cm	F3<180-300cm
Single Cropped	**Rainfed:** T.Aman (HYV) Sugarcane Vegetables Rabi Crops	**Rainfed:** T.Aman (Local) Sugarcane Jute Vegetables	**Rainfed:** D.W.Aman (TR) Jute Aus (Local) Sugarcane	**Rainfed:** D.W.Aman (TR+B)
	Irrigated: Boro(HYV)	**Irrigated:** Boro(HYV)	**Irrigated:** Boro (HYV)	**Irrigated:** Boro (HYV)
Double Cropped	**Rainfed:** T.Aman (HYV)-Rabi Aus (Local)-T.Aman (HYV)	**Rainfed:** Jute/Aus(Local)-T.Aman(Local) T.Aman(Local)-Rabi Crops	**Rainfed:** D.W.Aman(TR)-Rabi Crops Aus/B.Aman-Rabi Crops Aus/Jute-Rabi Crops	**Rainfed:** D.W.Aman(TR+B)-Rabi Crops
	Irrigated: Boro(HYV)-T.Aman(HYV)	**Irrigated:** Boro(HYV)-T.Aman(Local)	**Irrigated:** Boro(HYV)-D.W.Aman(TR)	**Irrigated:** Boro(HYV)-Rabi Crops
Triple Cropped	**Rainfed:** T.Aman(HYV)-Rabi Crops-Summer Vegetables	**Rainfed:** Aus(Local)-T.Aman(Local)-Rabi Crops T.Aman(Local)-Rabi Crops-Vegetables	**Rainfed:** Aus-DW Aman(TR)-Rabi Crops	**Rainfed:** D.W Aman-Mustard-Vegetables
	Irrigated: Boro(HYV)-T.Aman(HYV)-Rabi Crops	**Irrigated:** Boro(HYV)-T.Aman(Local)-Rabi Crops	**Irrigated:** Boro(HYV)-D.W Aman(TR)-Rabi Crops	**Irrigated:** Boro(HYV)-DW Aman(TR)-Rabi Crops
Area(ha)	2530	3442	3187	38
% of NCA	27.5	37.4	34.7	0.4

Rainfed Agriculture

- Land which becomes F0 or F1 land will be planted to Aus or Jute followed by T.Aman, sometimes succeeded by rabi crops.

- There will be a shift from local T.Aman to HYV T.Aman and from deepwater Aman transplanted to local T.Aman due to improved flood security.

- The proportional area of transplanted Deep water Aman will increase in the less deeply flooded F1 and F2 lands.

- On F2 land mixed Aus and direct seeded Aman will be grown or jute followed by rabi crops.

- In F3 areas direct seeded deepwater Aman will remain the only crop to be grown in some areas to be followed by rabi crops.

- In some sub-compartments, sugarcane will remain as an important crop in the future cropping patterns on F0, F1 and sometimes F2 lands.

Irrigated Agriculture

- F0 and F1 land will be planted to Boro, "Braus" or Aus HYVs followed by T.Aman (HYV) and sometimes mustard/pulses.

- F2 land Boro HYV will be followed by Deepwater Aman.

- On F3 land only HYV-Boro will be grown, occasionally, preceded by a short duration rabi crop.

Other Impacts

- Due to shortage of draught animal supply for timely land preparation, use of 2 wheel power tillers will increase.

- Increasing population will create bigger demand for products like:

    - fish, encouraging aquaculture.
    - vegetables and fruits, increasing the use of F0 land for market gardening.
    - milk, meat and eggs, resulting in an expanded number of dairy and chicken units.
    - sugarcane for chewing purposes.

3.5 Some Agricultural Trends

Cereals

Rice

The average yields of rice crops according to BBS figures do not indicate any significant trend in yields, however study of the last twelve years data show an average overall increase of approximately 2.2% per year. Most of this increase is accounted for, by the shift from local varieties to HYV.

Over the period the largest rice crop (Aman) decreased in production share. The most significant increase has been the Boro crop, which has grown from 14% to 55% of the total production. This has been due mainly to a rapid increase of HYV Boro and in increased irrigated area. Aus has decreased from 26% to 13% the total production.

With improved drainage and controlled flooding however, one can imagin that the Kharif-II season rice crops will get more importance, because of a lower input level compared with the Boro rice crop.

Wheat

During the previous 5 years, the wheat area dropped. In 1991/92 the area has increased again largely due to the rise in fuel prices (this has meant a substitution of the more water efficient wheat in preference to Boro rice which has become more expensive to irrigate). Recent information indicates that yields for 1991/92 of wheat are very promising. This trend of increasing wheat production may well continue provided the price of wheat is not decreased due to imports.

Other Crops

Pulses

The area planted to pulses (such as lentils, khesari, mash and gram) in the area is limited. The yields are increasing slowly but the area has been decreasing over the last 2 decades. Decreased pulse production is unfortunate. A reduced pulse crop not only affects human beings it also adversely impacts the livestock and soil fertility.

Oilseeds

Mustard is the main oilseed grown in the project area. After a period of decline there has recently been an increase in the area and yields of mustard. In triple cropped areas, mustard is often the crop to be sown after the T. Aman rice crop. With an increase of the T.Aman area it can be expected that the present growth of mustard area will continue especially in the northern sub-compartments.

Jute

Jute has long been the major cash crop grown in the project area. Jute production has been showing wide variations over the last 12 years, varying by as much as 30% from year to year. This is the result of volatile market conditions, and accordingly while jute yield shows an upward trend the area planted to jute has shown been variable. As the export possibilities for jute are not very promising, it is anticipated that the future trend for jute area planted (and production) will be negative.

APPENDICES

82

APPENDIX-A AGRICULTURE IN THE SUB-COMPARTMENTS OF COMPARTMENTALIZATION PILOT PROJECT, TANGAIL.

Appropriate information is outlined below for each sub-compartment on the following aspects:

- Location
- Villages/Moujas
- Basic Statistics
- Soils
- Land Types
- Major Cropping Patterns
- Crops, Area and Production

Source of Data: DAE Thana Offices, Tangail and Delduar of Tangail District. Union-wise statistics, adjusted to sub-compartments were cross-checked through field surveys. Data on gross area, net cultivable area (NCA), soil classes and land types of NCA are processed through GIS, (FAP 19). Irrigated area are based on estimates of 1991 Census of Lift Irrigation, Agricultural Sector Team.

Sub-Compartment-1

Location : The area is bounded by Pungli embankment cum road in the east and Suruj-Karatia earthen road in the west. Garindha-Suruj road lies in the north and Karatia-Natkhola road in the south.

Villages/Moujas : Kumulli Namdar [Karatia Union], Dapnajor West [Khasil Union], Niogijoair (60%, Gosaijoair (65%) and Surancha (25%) [Garindha Union].

Basic Statistics :

Gross Area	:	687 ha.
Net cultivable area (NCA)	:	553 ha. (80% of gross area)
Fallow	:	11 ha.
Total cropped area	:	1147 ha.
Total rice area	:	621 ha. (112% of NCA)
Irrigated area	:	146 ha. (26% of NCA)
Cropping intensity	:	207

Soil classes of NCA : Low Jamuna Alluvium: 553 ha.(100% of NCA)

Land types of NCA :

F0 (0-30cm)	=	9 ha.	1%
F1 (30-90cm)	=	155 ha.	28%
F2 (90-180cm)	=	274 ha.	50%
F3 (180-300cm)	=	115 ha.	21%

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane/Boro (L)	Boro (HYV)	151
Double	Jute-Wheat/Mustard/Pulses/Potato/Veg.	TDW Aman-Boro (HYV)	177
Triple	Aus/Jute-T.Aman (L)/HYV)-Wheat/ Pulses/Potato/Spices/Vegetables	TDW Aman-Mustard/Pulses-Boro (HYV) B. Aus+ B. Aman/Boro (HYV)	214

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	122	22	20	1.1	134.2	9.6
Transplanted (HYV)	10	2	2	2.6	26.0	1.9
Aman Transplanted						
Local	42	7	6	1.7	71.4	5.1
HYV	10	2	2	3.3	33.0	2.4
DW Aman						
Broadcasted	153	28	25	1.4	214.2	15.4
Transplanted	116	21	19	1.6	185.6	13.3
Boro						
Local	37	6	5	3.1	114.7	8.2
HYV(includes Braus)	131	24	21	4.7	615.7	44.1
Total Rice	**621**	**112**	**100**	-	**1394.8**	**100.0**
Jute	62	11		1.5	93.0	
Wheat	92	17		2.3	211.6	
Oilseeds (Mustard)	107	20		0.7	74.9	
Potato	26	5		8.1	210.6	
Pulses	62	11		1.0	62.0	
Minor crops(Veg.)	53	10		10.0	533.0	
Sugarcane	65	11		21.0	1365.0	
Spices (Onions)	28	5		3.2	90.0	
Others	31	5		-	-	
Total:	**1147**	**207**				

Sub-Compartment-2

Location : The area is bounded by Suruj-Karatia earthen road in the east and Taratia-Gharinda earthen road in the west. Garindha-Suruj paved road lies in the north and Tangail-Karatia paved road in the south.

Villages/Moujas : Karatia (60%), Garasin, Bhatkura, Khudirampur (80%) [Karatia Union], Birnali, Hatila, Dharat (50%), Paila (60%), Niogijoair (40%), Gosaijoair (35%), Golabari [Garindha Union].

Basic Statistics :

Gross Area	:	1280 ha.
Net cultivable area (NCA)	:	1002 ha. (78% of gross area)
Fallow	:	20 ha.
Total cropped area	:	2110 ha.
Total rice area	:	1188 ha. (119% of NCA)
Irrigated area	:	521 ha. (52% of NCA)
Cropping intensity	:	211

Soil classes of NCA : Low Jamuna Alluvium: 1002 ha.(100% of NCA)

Land types of NCA :

F2 (90-180cm)	=	611 ha.	(61%)
F3 (180-300cm)	=	391 ha.	(39%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane/Boro (L)	Boro (HYV)	212
Double	Jute-Wheat/Mustard/Pulses/Vegetables	TDW Aman - Boro (HYV) Mustard - Boro (HYV)	412
Triple	Aus/Jute-T.Aman-Wheat/Potato/Pulses B.Aus+B.Aman-Mustard/Pulses	TDW Aman-Mustard/Pulses/Spices-Boro(HYV)	358

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	296	30	24	1.2	355.2	11.3
Transplanted (HYV)	50	5	4	2.7	135.0	4.3
Aman Transplanted						
Local	60	6	5	1.9	114.0	3.6
HYV	8	1	1	3.4	27.2	0.9
DW Aman						
Broadcasted	247	24	21	1.6	395.2	12.5
Transplanted	70	7	6	1.8	126.0	4.0
Boro						
Local	6	1	1	2.9	17.4	0.6
HYV(includes Braus)	451	45	38	4.4	1984.4	62.8
Total Rice	**1188**	**119**	**100**	-	**3154.4**	**100.0**
Jute	152	15		2.1	319.2	
Wheat	229	23		2.5	572.5	
Oilseeds (Mustard)	158	16		0.6	94.8	
Potato	61	6		9.3	567.3	
Pulses	60	6		1.1	66.0	
Minor crops(Veg.)	64	6		9.0	576.0	
Sugarcane	31	3		26.0	806.0	
Spices (Onions)	36	4		3.5	126.0	
Others	131	13		-	-	
Total:	**2110**	**211**				

Sub-Compartment-3

Location : The area is traingular in shape and is bounded by Paila-Gharinda earthen road in the east. Tangail-Garindha paved road lies in the north Tangail-Karatia paved road in the south.

Villages/Moujas : Aultia, Darun, Paila (40%), Dharat (50%), Gharinda (35%), Jagannath Jalfai [Gharinda Union] and Asekpur Ward [Tangail Pourasava].

Basic Statistics :

Gross Area	:	631 ha.
Net cultivable area (NCA)	:	410 ha. (65% of gross area)
Fallow	:	8 ha.
Total cropped area	:	881 ha.
Total rice area	:	559 ha. (136% of NCA)
Irrigated area	:	183 ha. (45% of NCA)
Cropping intensity	:	215

Soil classes of NCA : Low Jamuna Alluvium: 410 ha.(100% of NCA)

Land types of NCA : F2 (90-180cm) = 328 ha. (80%)
F3 (180-300cm) = 82 ha. (20%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane/Boro (L)	Boro (HYV)	89
Double	Jute-Wheat/Potato/Vegetables	TDW Aman-Mustard/Boro (HYV)	147
Triple	Jute-T.Aman-Wheat/Mustard B. Aus-T.Aman-Wheat/Potato/Pulses	TDW Aman-Mustard + Boro (HYV)	166

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	100	25	18	1.2	120.0	8.8
Transplanted (HYV)	13	3	2	2.8	36.4	2.7
Aman Transplanted						
Local	34	8	6	1.8	61.2	4.5
HYV	6	1	1	3.2	19.2	1.4
DW Aman						
Broadcasted	54	13	10	1.4	75.6	5.5
Transplanted	167	41	30	1.7	283.9	20.8
Boro						
Local	6	1	1	2.8	16.8	1.2
HYV(includes Braus)	179	44	32	4.2	751.8	55.1
Total Rice	**559**	**136**	**100**	-	**1364.9**	**100.0**
Jute	64	15		1.8	115.2	
Wheat	80	20		2.5	200.0	
Oilseeds (Mustard)	51	12		0.8	40.8	
Potato	19	5		10.0	190.0	
Pulses	32	8		0.9	28.8	
Minor crops(Veg.)	21	5		11.0	231.0	
Sugarcane	15	4		25.0	375.0	
Spices (Onions)	24	6		3.0	72.0	
Others	16	4		-	-	
Total:	**881**	**215**				

Sub-Compartment-4

Location : The area is almost traingular in shape and is bounded by Tangail-Taratia paved road in the north-east and Tangail-Bajitpur paved road in the west. Tangail-Jamalpur paved road lies in the north-west at Bajitpur-Jalpai.

Villages/Moujas : Mirer Betka and Nandir Betka of Karatia Union.

Basic Statistics :

Gross Area	:	418 ha.
Net cultivable area (NCA)	:	210 ha. (50% of gross area)
Fallow	:	4 ha.
Total cropped area	:	467 ha.
Total rice area	:	269 ha. (128% of NCA)
Irrigated area	:	100 ha. (48% of NCA)
Cropping intensity	:	222

Soil classes of NCA : High Jamuna Floodplain: 53 ha.(25% of NCA)

Land types of NCA : F2 (90-180cm) = 171 ha. (81%)
F3 (180-300cm) = 39 ha. (19%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	39
Double	TDW Aman-Wheat/Mustard/Pulse	Mustard+Boro (HYV) TDW Aman-Boro (HYV)	73
Triple	Aus/Jute-T.Aman-Wheat/Pulse/Potato B.Aus + B. Aman-Mustard/Pulses	TDW Aman-Mustard + Boro (HYV)	94

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	66	31	25	1.9	125.4	16.7
Transplanted (HYV)	5	2	2	3.0	15.0	2.0
Aman Transplanted						
Local	14	7	5	2.2	30.8	4.1
HYV	3	1	1	3.1	9.3	1.2
DW Aman						
Broadcasted	22	10	8	1.5	33.0	4.4
Transplanted	57	28	21	2.0	114.0	15.2
Boro						
Local	4	2	1	2.9	11.6	1.6
HYV(includes Braus)	98	47	37	4.2	411.6	54.8
Total Rice	**269**	**128**	**100**	-	**750.7**	**100.0**
Jute	36	17		2.1	75.6	
Wheat	49	23		2.3	112.7	
Oilseeds (Mustard)	50	24		0.7	35.0	
Potato	11	5		10.2	112.2	
Pulses	18	9		0.7	12.6	
Minor crops(Veg.)	15	7		7.0	85.0	
Sugarcane	6	3		28.0	168.0	
Spices (Onions)	7	3		3.8	26.6	
Others	6	3		-	-	
Total:	**467**	**222**				

Sub-Compartment-5

Location : The area is bounded by Pungli embankment road in the north-east and Tangail-Jamalpur paved road in the west. Tangail-Suruj paved road lies in the south-east and Sibpur-Pasbetar earthen road in the north-west.

Villages/Moujas : Baruria, Gharinda (65%), Suruj (25%), Parkushia [Gharinda Union], Khaladbari, Barshila, Kandila, Bertha and Baman Kushia [Gala Union].

Basic Statistics :

Gross Area	:	753 ha.
Net cultivable area (NCA)	:	506 ha. (67% of gross area)
Fallow	:	10 ha.
Total cropped area	:	1076 ha.
Total rice area	:	658 ha. (131% of NCA)
Irrigated area	:	250 ha. (49% of NCA)
Cropping intensity	:	213

Soil classes of NCA : Low Jamuna Floodplain: 506 ha.(100% of NCA)

Land types of NCA :

F1 (30-90cm)	=	73 ha. (14%)
F2 (90-180cm)	=	394 ha. (78%)
F3 (180-300cm)	=	39 ha. (8%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane/Boro (L)	Boro (HYV)	131
Double	Aus/Jute-T.Aman Jute-Wheat/Pulses	TDW Aman/T.Aman-Boro (HYV)	150
Triple	B.Aus-T.Aman-Mustard/Vegetables	T.Aman-Mustard+Boro (HYV)	215

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	96	19	15	1.7	163.2	8.9
Transplanted (HYV)	25	5	4	2.5	62.5	3.4
Aman Transplanted						
Local	50	10	8	2.2	110.0	6.0
HYV	9	2	1	2.9	26.1	1.4
DW Aman						
Broadcasted	106	21	16	1.3	137.8	7.6
Transplanted	124	25	19	1.8	223.2	12.2
Boro						
Local	10	2	1	3.2	32.0	1.8
HYV(includes Braus)	238	47	36	4.5	1071.0	58.7
Total Rice	**658**	**131**	**100**	-	**1825.8**	**100.0**
Jute	81	16		1.8	145.8	
Wheat	157	31		2.5	392.5	
Oilseeds (Mustard)	58	12		0.8	46.4	
Potato	10	2		9.0	90.0	
Pulses	46	9		1.1	50.6	
Minor crops(Veg.)	18	3		11.0	198.0	
Sugarcane	17	3		28.0	476.0	
Spices (Onions)	10	2		4.0	40.0	
Others	21	4		-	-	
Total:	**1076**	**213**				

Sub-Compartment-6

Location : The area is bounded by Pungli embankment in the east and Tangail-Jamalpur paved road in the west Sibpur-Pasbetar earthen road lies in the south and Gala khal embankment in the north.

Villages/Moujas : Pasbetair, Shibpur, Rabana (35%), Pas Bikramhati and Ag Bikramhati of Gala Union.

Basic Statistics :

Gross Area	:	242 ha.
Net cultivable area (NCA)	:	173 ha. (72% of gross area)
Fallow	:	2 ha.
Total cropped area	:	363 ha.
Total rice area	:	239 ha. (138% of NCA)
Irrigated area	:	66 ha. (38% of NCA)
Cropping intensity	:	209

Soil classes of NCA : High Jamuna Floodplain: 8 ha.(5% of NCA)
: Low Jamuna Floodplain : 165 ha. (95% of NCA)

Land types of NCA : F1 (30-90cm) = 106 ha. (61%)
F2 (90-180cm) = 67 ha. (39%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Boro (L)	Boro (HYV)	47
Double	Jute-Mustard/Wheat/Veg. Vegetable-Vegetable	Mustard + Boro (HYV) TDW Aman - Boro (HYV)	56
Triple	B.Aus/Jute-T.Aman-Wheat/Veg. T.Aus -T.Aman-Wheat/Potato	TDW Aman-Mustard+Boro (HYV)	68

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	51	30	21	1.2	61.2	10.3
Transplanted (HYV)	14	8	6	2.6	36.4	6.1
Aman Transplanted						
Local	18	10	8	2.9	52.2	8.8
HYV	4	2	2	3.4	13.6	2.3
DW Aman						
Broadcasted	26	15	11	1.5	39.0	6.5
Transplanted	58	34	24	1.7	98.6	16.6
Boro						
Local	12	7	5	3.1	37.2	6.2
HYV(includes Braus)	56	32	23	4.6	257.6	43.2
Total Rice	**239**	**138**	**100**	-	**595.8**	**100.0**
Jute	28	16		1.9	53.2	
Wheat	48	27		2.1	100.8	
Oilseeds (Mustard)	10	6		0.7	7.0	
Potato	12	7		11.3	135.6	
Pulses	10	6		1.0	10.0	
Minor crops(Veg.)	4	2		13.0	52.0	
Sugarcane	2	1		27.0	54.0	
Spices (Onions)	2	1		3.5	7.0	
Others	8	5		-	-	
Total:	**363**	**209**				

Sub-Compartment-7

Location : The area is bounded by Tangail-Jamalpur paved road in the east and Gala khal in the west. Gala khal embankment lies in the north and Tangail-Enayetpur paved road in the south.

Villages/Moujas : Eastern part of Sadullapur, Rabna (65%), Rasulpur [Gala Union] and Dhulpara of Tangail Pourasava.

Basic Statistics :

Gross Area	:	360 ha.
Net cultivable area (NCA)	:	269 ha. (75% of gross area)
Fallow	:	5 ha.
Total cropped area	:	545 ha.
Total rice area	:	367 ha. (136% of NCA)
Irrigated area	:	86 ha. (32% of NCA)
Cropping intensity	:	202

Soil classes of NCA : High Jamuna Floodplain: 4 ha.(1% of NCA)
: Low Jamuna Floodplain : 265 ha. (99% of NCA)

Land types of NCA :

F1 (30-90cm)	=	84 ha.	(31%)
F2 (90-180cm)	=	177 ha.	(66%)
F3 (180-300cm)	=	8 ha.	(3%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	78
Double	B.Aus/Jute-Wheat/Mustard/Potato Vegetable-Vegetable	TDW Aman-Boro (HYV) Mustard + Boro (HYV)	91
Triple	B.Aus/Jute-T.Aman-Wheat/Pulses	TDW Aman-Mustard+Boro (HYV)	95

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	70	26	20	1.1	77.0	9.9
Transplanted (HYV)	12	4	3	2.8	33.6	4.3
Aman Transplanted						
Local	20	7	5	1.7	34.0	4.4
HYV	5	2	1	3.0	15.0	1.9
DW Aman						
Broadcasted	55	20	15	1.4	77.0	9.9
Transplanted	130	49	36	1.6	208.0	26.9
Boro						
Local	0	0	0	0.0	0.0	0.0
HYV(includes Braus)	75	28	20	4.4	330.0	42.7
Total Rice	**367**	**136**	**100**	-	**774.6**	**100.0**
Jute	45	17		1.8	81.0	
Wheat	59	22		2.2	129.8	
Oilseeds (Mustard)	34	13		1.0	34.0	
Potato	12	4		9.0	108.0	
Pulses	12	4		0.9	10.8	
Minor crops(Veg.)	5	2		9.0	45.0	
Sugarcane	2	1		28.0	56.0	
Spices (Onions)	2	1		3.8	7.6	
Others	7	2		-	-	
Total:	545	202				

Sub-Compartment-8

Location : The area is bounded by Gala khal in the east and Tangail-Gala bazar paved road in the west. Gala khal embankment lies in the north and Tangail town in the south-east.

Villages/Moujas : Western part of Sadullapur, Brachanda [Gala Union], Dariabari, Dharerbari and Pichuria [Baghil Union].

Basic Statistics :

Gross Area	:	904 ha.
Net cultivable area (NCA)	:	692 ha. (77% of gross area)
Fallow	:	14 ha.
Total cropped area	:	1454 ha.
Total rice area	:	818 ha. (118% of NCA)
Irrigated area	:	310 ha. (45% of NCA)
Cropping intensity	:	210

Soil classes of NCA : High Jamuna Floodplain: 365 ha.(53% of NCA)
Low Jamuna Floodplain : 327 ha.(47% of NCA)

Land types of NCA :

F0 (0-30cm)	=	107 ha.	(15%)
F1 (30-90cm)	=	246 ha.	(36%)
F2 (90-180cm)	=	283 ha.	(41%)
F3 (180-300cm)	=	56 ha.	(8%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	187
Double	T.Aman-Vegetables/Spices B.Aus/Jute-Wheat/Mustard/Potato	TDW Aman/T.Aman-Boro (HYV) Mustard + Boro (HYV)	206
Triple	Jute - T.Aman - Wheat	T. Aman-Mustard + Boro (HYV)	285

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	122	18	15	1.4	170.8	7.5
Transplanted (HYV)	41	6	5	2.8	114.8	5.0
Aman Transplanted						
Local	56	8	7	2.3	128.8	5.6
HYV	12	2	1	3.2	38.4	1.7
DW Aman						
Broadcasted	94	13	12	1.4	131.6	5.8
Transplanted	200	29	24	1.7	340.0	14.9
Boro						
Local	8	1	1	2.9	23.2	1.0
HYV(includes Braus)	285	41	35	4.7	1339.5	58.5
Total Rice	**818**	**118**	**100**	-	**2287.1**	**100.0**
Jute	88	13		2.0	176.0	
Wheat	160	24		2.5	400.0	
Oilseeds (Mustard)	78	11		0.8	62.4	
Potato	49	7		8.6	421.4	
Pulses	56	8		0.7	39.2	
Minor crops(Veg.)	78	11		8.0	624.0	
Sugarcane	44	6		31.0	1364.0	
Spices (Onions)	21	3		3.9	81.9	
Others	62	9		-	-	
Total:	1454	210				

Sub-Compartment-9

Location : The area is bounded by Lohajang river embankment in the north and east. Dhaleswari embankment in the west and Dhalan-Baghil earthen road in the south.

Villages/Moujas : Khorda-Jugini, Krishnapur (west), Ramdebpur, Kathua Jugini, Dhalan [Baghil Union), Sripalihata, Goalpara, Sapua [Dannya Union].

Basic Statistics :

Gross Area	:	606 ha.
Net cultivable area (NCA)	:	448 ha. (74% of gross area)
Fallow	:	9 ha.
Total cropped area	:	870 ha.
Total rice area	:	569 ha. (127% of NCA)
Irrigated area	:	172 ha. (38% of NCA)
Cropping intensity	:	194

Soil classes of NCA : Low Jamuna Floodplain : 448 ha.(100% of NCA)

Land types of NCA :

F0 (0-30cm)	=	303 ha.	(68%)
F1 (30-90cm)	=	97 ha.	(21%)
F2 (90-180cm)	=	48 ha.	(11%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	152
Double	Aus/Jute-T. Aman	TDW Aman/T.Aman-Boro (HYV)	145
Triple	B.Aus-T.Aman-Wheat/Veg/Pulses Jute-T.Aman-Mustard/Wheat/Veg. B.Aus+B.Aman-Wheat/Mustard	TDW Aman-Mustard+Boro (HYV)	142

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcast	85	19	15	1.2	102.0	7.0
Transplanted (HYV)	33	7	6	2.6	85.8	5.9
Aman Transplanted						
Local	39	8	7	2.4	93.6	6.4
HYV	8	2	1	3.1	24.8	1.7
DW Aman						
Broadcast	85	19	15	1.5	127.5	8.8
Transplanted	145	33	25	1.7	246.5	16.9
Boro						
Local	5	1	1	2.8	14.0	1.0
HYV(includes Braus)	169	38	30	4.5	760.5	52.3
Total Rice	**569**	**127**	**100**	-	**1454.7**	**100.0**
Jute	58	13		1.8	104.4	
Wheat	67	15		2.1	140.7	
Oilseeds (Mustard)	55	13		0.7	38.5	
Potato	13	3		12.0	156.0	
Pulses	28	6		1.0	28.0	
Minor crops(Veg.)	32	7		7.5	240.0	
Sugarcane	20	4		30.0	600.0	
Spices (Onions)	10	2		3.8	38.0	
Others	18	4		-	-	
Total:	**870**	**194**				

Sub-Compartment-10

Location : The area is bounded by Charabari-Baghil earthen road in the west, Dhaleswari embankment in the east and Dhalan-Baghil earthen road in the north.

Villages/Moujas : Dannya Rampal, Chak Choubaria, Alisakanda, Fatepur, Maisakanda [Dannya Union] and Gopalpur of Baghil Union.

Basic Statistics :

Gross Area	:	487 ha.
Net cultivable area (NCA)	:	353 ha. (73% of gross area)
Fallow	:	7 ha.
Total cropped area	:	669 ha.
Total rice area	:	440 ha. (125% of NCA)
Irrigated area	:	176 ha. (50% of NCA)
Cropping intensity	:	189

Soil classes of NCA : Low Jamuna Floodplain : 353 ha.(100% of NCA)

Land types of NCA :

F0 (0-30cm)	=	74 ha.	(21%)
F1 (30-90cm)	=	156 ha.	(44%)
F2 (90-180cm)	=	123 ha.	(35%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	129
Double	T.Aman-Veg/Mustard/Wheat	TDW Aman/T.Aman(L)-Boro (HYV) Mustard + Boro (HYV)	111
Triple	B.Aus-T.Aman(L)-Mustard/Wheat	TDW Aman-Mustard + Boro (HYV)	106

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	62	18	14	1.6	99.2	8.0
Transplanted (HYV)	21	6	5	2.7	56.7	4.6
Aman Transplanted						
Local	20	6	4	1.8	36.0	2.9
HYV	7	2	1	3.5	24.5	2.0
DW Aman						
Broadcasted	57	16	13	1.5	85.5	6.9
Transplanted	99	27	23	1.8	178.2	14.4
Boro						
Local	13	4	3	2.7	35.1	2.8
HYV(includes Braus)	161	46	37	4.5	724.5	58.4
Total Rice	**440**	**125**	**100**	-	**1239.7**	**100.0**
Jute	47	13		1.6	75.2	
Wheat	56	15		2.5	140.0	
Oilseeds (Mustard)	30	8		0.8	24.0	
Potato	10	3		9.6	96.0	
Pulses	25	7		1.0	25.0	
Minor crops(Veg.)	20	6		9.0	180.0	
Sugarcane	10	3		31.0	310.0	
Spices (Onions)	10	3		3.5	35.0	
Others	21	7		-	-	
Total:	**669**	**189**				

Sub-Compartment-11

Location : The area is bounded by Baghil Bazar-Tangail earthen road in the north, Charabari-Tangail paved road in the south and west and Charabari-Baghil earthen road in the west.

Villages/Moujas : Dannya Shibram, Dannya Chowdhury, Paikpara, Khanpur, Choto Binyafair [Danya Union], Digulia, Santosh Palpara, Santosh (40%), Sakrail [Tangail Pourasava] and Choto Binyafair (20%) [Porabari Union].

Basic Statistics :

Gross Area	:	1125 ha.
Net cultivable area (NCA)	:	821 ha. (73% of gross area)
Fallow	:	16 ha.
Total cropped area	:	1644 ha.
Total rice area	:	995 ha. (121% of NCA)
Irrigated area	:	312 ha. (38% of NCA)
Cropping intensity	:	200

Soil classes of NCA : Low Jamuna Floodplain : 821 ha.(100% of NCA)

Land types of NCA :

F0 (0-30cm)	=	248 ha. (30%)
F1 (30-90cm)	=	444 ha. (54%)
F2 (90-180cm)	=	129 ha. (16%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	251
Double	B.Aus-Mustard/Wheat/Pulses/Veg	B/TDW Aman-Boro (HYV) Mustard + Boro (HYV)	269
Triple	T.Aus-T.Aman(L)/(HYV)-Mustard/Wheat	T.Aman/TDW Aman-Mustard+Boro (HYV)	285

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Produc-tion(t)	% of rice production
Aus						
Broadcasted	161	20	16	1.8	289.8	10.8
Transplanted (HYV)	36	4	4	2.8	100.8	3.7
Aman Transplanted						
Local	59	7	6	2.2	129.8	4.8
HYV	13	2	1	3.0	39.0	1.4
DW Aman						
Broadcasted	163	20	16	1.7	277.1	10.3
Transplanted	229	28	23	2.0	458.0	17.0
Boro						
Local	26	3	3	2.9	75.4	2.8
HYV(includes Braus)	308	37	31	4.3	1324.4	49.2
Total Rice	**995**	**121**	**100**	-	**2694.3**	**100.0**
Jute	131	16		1.6	209.6	
Wheat	121	15		2.0	242.0	
Oilseeds (Mustard)	88	11		0.9	79.2	
Potato	34	4		10.0	340.0	
Pulses	95	12		1.1	104.5	
Minor crops(Veg.)	43	5		11.0	473.0	
Sugarcane	84	10		29.0	2436.0	
Spices (Onions)	22	3		3.4	88.4	
Others	31	3		-	-	
Total:	**1644**	**200**				

Sub-Compartment-12

Location : The area is bounded by Kagmari-Silimpur paved road in the east, Baruha-Charabari Bazar embankment road in the west, Kagmari-Charabari paved road in the north and Baruha-Bera paved road in the south.

Villages/Moujas : Bara Belta, Paniabandha, Belta Pakshit, Gadurgati, Kabilapara [Porabari Union], Charpara (25%), Sonhat [Silimpur Union], Santosh (60%), Aloa Tarini (15%), Santosh Baluchar (65%), Aloa Bhabani [Tangail Pourasava].

Basic Statistics :

Gross Area	:	1021 ha.
Net cultivable area (NCA)	:	754 ha. (80% of gross area)
Fallow	:	15 ha.
Total cropped area	:	1623 ha.
Total rice area	:	954 ha. (127% of NCA)
Irrigated area	:	340 ha. (45% of NCA)
Cropping intensity	:	215

Soil classes of NCA : High Jamuna Floodplain : 754 ha.(100% of NCA)

Land types of NCA :

F0 (0-30cm)	=	144 ha.	(19%)
F1 (30-90cm)	=	499 ha.	(66%)
F2 (90-180cm)	=	111 ha.	(15%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	171
Double	B.Aus-Mustard/Wheat/Veg. B.Aman/TDW Aman-Mustard/Pulses/ Wheat	TDW Aman - Boro (HYV)	252
Triple	B.Aus/Jute-T.Aman-Mustard/Pulses/ Wheat	TDW Aman - Mustard + Boro (HYV)	316

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	141	19	15	1.6	225.6	8.1
Transplanted (HYV)	27	4	2	3.0	81.0	2.9
Aman Transplanted						
Local	50	7	5	2.7	135.0	4.8
HYV	8	1	1	3.3	26.4	0.9
DW Aman						
Broadcasted	129	17	14	1.7	219.3	7.8
Transplanted	236	31	25	2.1	495.6	17.7
Boro						
Local	28	4	3	2.8	78.4	2.8
HYV(includes Braus)	335	44	35	4.6	1541.0	55.0
Total Rice	**954**	**127**	**100**	-	**2802.3**	**100.0**
Jute	106	14		1.7	180.2	
Wheat	147	19		2.4	352.8	
Oilseeds (Mustard)	140	19		1.1	154.0	
Potato	25	3		10.5	262.5	
Pulses	80	11		1.2	96.0	
Minor crops(Veg.)	49	6		10.0	490.0	
Sugarcane	29	4		32.0	928.0	
Spices (Onions)	32	4		3.7	118.4	
Others	61	8		-	-	
Total:	**1623**	**215**				

Sub-Compartment-13

Location : The area is bounded by Tangail-Silimpur paved road in the east, Silimpur-Baruha bazar earth embankment in the west and Baruha-Bera paved road in the north.

Villages/Moujas : Baruha (75%), Charpara (75%), Ruposijatra (30%), Kuchiamari [Silimpur Union], Bhurbhuria, Mamudpur, Ghonikishore [Atia Union of Delduar Thana].

Basic Statistics :

Gross Area	:	424 ha.
Net cultivable area (NCA)	:	330 ha. (78% of gross area)
Fallow	:	6 ha.
Total cropped area	:	633 ha.
Total rice area	:	325 ha. (98% of NCA)
Irrigated area	:	90 ha. (27% of NCA)
Cropping intensity	:	192

Soil classes of NCA : High Jamuna Floodplain : 330 ha.(100% of NCA)

Land types of NCA :

F0 (0-30cm)	=	40 ha.	(12%)
F1 (30-90cm)	=	167 ha.	(51%)
F2 (90-180cm)	=	116 ha.	(35%)
F3 (180-300cm)	=	7 ha.	(2%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	81
Double	B.Aus/Jute-Wheat/Potato/Mustard/Pulses	TDW Aman - Boro (HYV)	177
Triple	B.Aus/Jute-T.Aman-Wheat/Mustard B.Aus+B.Aman-Mustard/Wheat/Potato	TDW Aman/T.Aman-Mustard+Boro (HYV)	66

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	78	24	24	1.2	93.6	11.9
Transplanted (HYV)	6	1	2	2.5	15.0	1.9
Aman Transplanted						
Local	30	9	9	1.6	48.0	6.1
HYV	26	8	8	3.4	88.4	11.2
DW Aman						
Broadcasted	17	5	5	1.5	25.5	3.2
Transplanted	78	24	24	1.7	132.6	16.8
Boro						
Local	5	1	2	2.2	11.0	1.4
HYV(includes Braus)	85	26	26	4.4	374.0	47.5
Total Rice	325	98	100	-	**788.1**	**100.0**
Jute	73	22		1.9	138.7	
Wheat	45	14		2.2	99.0	
Oilseeds (Mustard)	44	14		0.9	39.6	
Potato	9	3		9.2	82.8	
Pulses	20	6		1.1	22.0	
Minor crops(Veg.)	21	6		12.0	252.0	
Sugarcane	50	15		36.0	1800.0	
Spices (Onions)	20	6		3.8	76.0	
Others	26	8		-	-	
Total:	633	192				

Sub-Compartment-14

Location : It is a triangle shaped area bounded by Kagmari-Pathrail earthen embankment in the north-east. Elasin-Tangail paved road in the east and Silimpur-Karatia earthen road in the south.

Villages/Moujas : Aloa Tarini (85%), Santosh Baluchar (85%) of Tangail Pourashava, Bakultala [Atia Union], Bandabari, Parijatpur, Chinakhola, Kumaria, Baratia, Mangalhar, Dasakia, Araola and Deojan [Pathrail Union].

Basic Statistics :

Gross Area	:	1143 ha.
Net cultivable area (NCA)	:	852 ha. (75% of gross area)
Fallow	:	17 ha.
Total cropped area	:	1680 ha.
Total rice area	:	842 ha. (99% of NCA)
Irrigated area	:	395 ha. (46% of NCA)
Cropping intensity	:	197

Soil classes of NCA : High Jamuna Floodplain : 663 ha.(78% of NCA)
Low Jamuna Floodplain : 189 ha.(12% of NCA)

Land types of NCA :

F1 (30-90cm)	=	337 ha.	(40%)
F2 (90-180cm)	=	454 ha.	(53%)
F3 (180-300cm)	=	61 ha.	(7%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane, Pulses/Veg, Boro (L)	Boro (HYV)	181
Double	B.Aus/Jute-Wheat/Potato/Pulses	T. Aman - Boro (HYV)	463
Triple	B.Aus+B.Aman-Wheat/Spices/Mustard	TDW Aman-Mustard+Boro (HYV)	191

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	176	21	21	1.9	334.4	12.2
Transplanted (HYV)	34	4	4	2.9	98.6	3.6
Aman Transplanted						
Local	100	12	12	2.6	260.0	1.6
HYV	57	6	7	3.3	188.1	4.9
DW Aman						
Broadcasted	27	3	3	1.6	43.2	0.8
Transplanted	74	9	9	1.8	133.2	60.5
Boro						100.0
Local	7	1	1	3.0	21.0	
HYV(includes Braus)	367	43	43	4.5	1651.5	
Total Rice	**842**	**99**	**100**	-	**2730.0**	
Jute	139	16		1.8	250.2	
Wheat	143	17		2.0	286.0	
Oilseeds (Mustard)	180	21		1.1	198.0	
Potato	47	5		10.8	507.6	
Pulses	73	9		1.2	87.6	
Minor crops(Veg.)	66	8		11.0	726.0	
Sugarcane	123	14		32.0	3936.0	
Spices (Onions)	26	3		3.6	93.6	
Others	41	5		-	-	
Total:	**1680**	**197**				

Sub-Compartment-15

Location : The area is bounded by Silimpur-Karatia earthen road in the south-east, Delduar-Tangail paved road in the west and Koijuni-Khagjana earthen road in the north and north-west.

Villages/Moujas : Tetulia, Fusukia, Birkushia (50%), Latifpur (40%), Gosaibari, Khagjana [Karatia Union], Akandapara, Bishnapur, Narunda, Chandigram, Gopalpur, Kaijuri, Pathrail (80%), Nalsunda, Paikpara [Pathrail Union].

Basic Statistics :

Gross Area	:	691 ha.
Net cultivable area (NCA)	:	450 ha. (65% of gross area)
Fallow	:	8 ha.
Total cropped area	:	913 ha.
Total rice area	:	528 ha. (117% of NCA)
Irrigated area	:	226 ha. (50% of NCA)
Cropping intensity	:	203

Soil classes of NCA : High Jamuna Floodplain : 36 ha.(8% of NCA)
Low Jamuna Floodplain : 414 ha.(92% of NCA)

Land types of NCA :

F1 (30-90cm)	=	113 ha.	(25%)
F2 (90-180cm)	=	287 ha.	(64%)
F3 (180-300cm)	=	50 ha.	(11%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	79
Double	Aus/Jute-Wheat/Potato/Veg. TDW Aman-Pulses/Mustard/Potato	T. Aman - Boro (HYV)	255
Triple	Aus/Jute-T.Aman-Mustard/Wheat B.Aus+B.Aman-Mustard/Spices/Potato	TDW Aman-Mustard/Pulses+Boro(HYV)	108

Crops, Area and Production : 1991-92

Name of Crops	Area(ha)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	56	12	11	1.4	78.4	5.0
Transplanted (HYV)	4	1	1	2.7	10.0	0.6
Aman Transplanted						
Local	62	14	12	2.6	161.2	10.2
HYV	16	3	3	3.2	51.2	3.2
DW Aman						
Broadcasted	48	11	9	1.6	76.8	4.9
Transplanted	140	31	26	1.9	266.0	16.9
Boro						
Local	0	0	0	0	0	0
HYV(includes Braus)	202	45	38	4.6	929.2	59.2
Total Rice	**528**	**117**	**100**	-	**1572.8**	**100.0**
Jute	78	17		1.8	140.4	
Wheat	97	22		2.0	194.0	
Oilseeds (Mustard)	61	14		0.8	48.8	
Potato	29	6		10.7	310.3	
Pulses	30	7		1.1	33.0	
Minor crops(Veg.)	30	7		11.0	330.0	
Sugarcane	45	10		28.0	1260.0	
Spices (Onions)	10	2		3.4	34.0	
Others	5	1		-	-	
Total:	**913**	**203**				

Sub-Compartment-16

Location : The area is bounded by Lohajang river in the west, Tangail-Jamalpur road in the east, Kandapara road in the south and Sabalia in the north.

Villages/Moujas : Tangail Pourashava comprising six Wards.

Basic Statistics :

Gross Area	:	260 ha.
Net cultivable area (NCA)	:	3 ha. (1% of gross area)
Fallow	:	0 ha.
Total cropped area	:	6 ha.
Total rice area	:	3 ha. (100% of NCA)
Irrigated area	:	0 ha. (0% of NCA)
Cropping intensity	:	200

Soil classes of NCA : High Jamuna Floodplain : 3 ha.(100% of NCA)

Land types of NCA : F2 (90-180cm) = 1 ha. (33%)
F3 (180-300cm) = 2 ha. (67%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single			0
Double	Jute-DW Aman (TP) DW Aman (TP)-Wheat/Mustard		3
Triple			0

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	0	0	0			
Transplanted (HYV)	0	0	0			
Aman Transplanted						
Local	0	0	0			
HYV	0	0	0			
DW Aman						
Broadcasted	0	0	0			
Transplanted	3	100	100	2.0	6.0	100.0
Boro						
Local	0	0	0	-	-	-
HYV(includes Braus)	0	0	0	-	-	-
Total Rice	**3**	**100**	**100**	-	6.0	**100.0**
Jute	1	33		2.0	2.0	
Wheat	1	33		2.3	2.3	
Oilseeds (Mustard)	1	34		1.0	1.0	
Potato						
Pulses						
Minor crops(Veg.)						
Sugarcane						
Spices (Onions)						
Others						
Total:	**6**	**200**				

Sub-Compartment- Lohajang Flood Plain (LFP)

Location : Areas on both sides of Lohajang river not included in any other sub-compartments. This LFP divides the compartment into eastern and western parts.

Villages/Moujas : Patal, Bajitpur, Kazipur [Tangail Pourashava], Jalfai, Khudirampur, Taratia, Latifpur (60%) [Karatia Union], Krishnapur, Konabari [Baghil Union].

Basic Statistics :

Gross Area	:	1968 ha.
Net cultivable area (NCA)	:	1371 ha. (70% of gross area)
Fallow	:	29 ha.
Total cropped area	:	2599 ha.
Total rice area	:	1190 ha. (87% of NCA)
Irrigated area	:	302 ha. (22% of NCA)
Cropping intensity	:	190

Soil classes of NCA : High Jamuna Floodplain : 1144 ha.(83% of NCA)
Low Jamuna Floodplain : 227 ha.(17% of NCA)

Land types of NCA :

F1 (30-90cm)	=	820 ha. (60%)
F2 (90-180cm)	=	535 ha. (39%)
F3 (180-300cm)	=	16 ha. (1%)

Major Cropping Patterns :

	Rainfed	Irrigated	Area (ha.)
Single	Sugarcane	Boro (HYV)	449
Double	B.Aus/Jute-Wheat/Pulses/Potato	T.Aman - Boro (HYV) Mustard + Boro (HYV)	529
Triple	B.Aus/Jute-T.Aman-Mustard/Wheat B.Aus+B.Aman-Pulses/Wheat/Mustard	TDW Aman-Mustard+Boro (HYV)	364

Crops, Area and Production : 1991-92

Name of Crops	Area(ha.)	% of NCA	% of rice area	Yield (t/ha.)	Production(t)	% of rice production
Aus						
Broadcasted	182	13	15	1.5	273.0	9.9
Transplanted (HYV)	25	2	2	2.8	70.0	2.6
Aman Transplanted						
Local	194	14	16	1.9	368.6	13.4
HYV	30	3	2	3.2	96.0	3.5
DW Aman						
Broadcasted	181	13	15	1.5	271.5	9.9
Transplanted	328	24	28	1.8	590.4	21.5
Boro						
Local	0	0	0	0	0	0
HYV(includes Braus)	250	18	22	4.3	1075.0	39.2
Total Rice	**1190**	**87**	**100**	-	**2744.5**	**100.0**
Jute	325	24		1.4	520.0	
Wheat	412	30		2.1	865.2	
Oilseeds (Mustard)	122	9		0.9	109.8	
Potato	128	9		10.0	1280.0	
Pulses	86	6		1.2	103.0	
Minor crops(Veg.)	132	10		11.0	1452.0	
Sugarcane	148	11		36.0	5328.0	
Spices (Onions)	32	2		3.7	118.4	
Others	24	2		-	-	
Total:	2599	190				

ANNEX-B: AGRONOMIC CHARACTERISTICS OF RECOMMENDED HIGH YIELDING VARIETIES OF RICE

Variety	Recommended Season	Optimum Planting Time	Seedling age (Days)	Seedling Height (cm)	Plant Height (cm)	Duration (Days)	Yield ton/ha (Paddy)	Year of recommendation	Remarks
BR 1(Chandina)	T. Aus Boro	15.04-15.05 01.01-15.02	20-25 40-45	20-24 14-16	80-90 75-85	115-120 145-150	4.0-4.5 4.5-5.5	1970	Most disease tolerant variety
BR 2 (Mala)	Boro	01.01-15.02	40-45	17-18	100-150	150-160	5.0-5.5	1971	-
BR 3 (Biplab)	T. Aus	15.04-15.05	25-30	18-20	95-100	125-130	4.0-5.0	1973	-
BR 4 (Brrisail)	T. Aman	15.07-31.07	30-35	30-32	120-125	140-145	5.0-5.5	1975	Photoperiod insensitive, most disease tolerant, not suitable for late planting
BR 5(Dulhabhog)	T. Aman	15.07-15.08	30-35	20-25	110-130	145-150	2.5-3.0	1976	Strongly photoperiod sensitive, fine quality rice
BR 6	Boro	01.01-15.02	40-45	13-14	95-100	135-140	3.5-4.5	1977	-
BR 7(Brribalam)	Boro	01.01-15.02	40-45	14-15	100-125	135-155	4.0-4.5	1977	-
BR 8 (Asha)	Boro	01.01-15.02	40-45	15-16	110-125	155-160	5.0-5.5	1978	-
BR 9 (Sufala)	T. Aus Boro	15.04-15.05 01.01-15.02	20-25 40-45	30-35 13-15	115-130 110-120	115-120 150-155	4.0-4.5 5.0-5.5	1978	-
BR 10(Progoti)	T. Aman	15.07-15.08	30-35	35-40	120-125	145-150	5.0-6.0	1980	Photoperiod insensitive, can be planted upto August 30 with 40-45 days old seedlings
BR 11(Mukta)	T. Aman	15.07-15.08	30-35	30-35	120-125	140-145	5.5-6.0	1980	Most popular T. Aman variety, submergence tolerant upto 7 days in clear water, photo-period insensitive
BR 12 (Moyna)	Boro	01.01-15.02	40-45	11-12	80-85	160-165	4.5-5.5	1983	Photoperiod insensitive, most disease tolerant
BR 14 (Gazi)	T. Aus Boro	15.04-15.05 01.01-15.02	20-25 40-45	30-35 18-20	115-120 100-105	120-125 155-160	4.0-5.0 5.0-6.0	1983	Most disease tolerant, often grown as T. Aman by farmers.
BR 15 (Mohini)	T. Aus Boro	15.04-15.05 01.01-15.02	20-25 40-45	20-25 13-14	80-85 95-100	120-125 150-160	4.0-5.0 5.0-5.5	1983	Disease tolerant
BR 16 (Shahi Balam)	T. Aus Boro	15.04-15.05 01.01-15.02	20-25 40-45	20-25 13-14	100-105 85-90	125-130 160-165	5.0-5.0 5.0-6.0	1983	Most disease tolerant, duration too long
BR 17 (Hashi)	Boro	15.12-15.01	40-45	25-30	110-130	150-155	5.0-5.5	1985	Special for Haor areas and river basins
BR 18(Shahjalal)	Boro	15.12-15.01	40-45	20-25	100-115	165-170	5.0-5.5	1985	Special for Haor areas and river basins

BR 19 (Mangol)	Boro	15.12-15.01	40-45	20-25	105-115	160-165	5.0-5.5	1985	Special for Haor areas and river basins
BR 20 (Nizami)	B. Aus	25.03-30.04			110-120	110-115	3.0-3.5	1986	Recommended for rainfed upland cultivation, may also be sown in line
BR 21 (Niamat)	B. Aus				90-100	95-105	2.5-3.0	1986	Recommended for rainfed upland cultivation, also can be sown in line
BR 22 (Kiron)	T. Aman	15.07-30.08	30-35	30-35	110-115	155-160	4.5-5.5	1988	Strongly photoperiod sensitive, can be used for late planting upto Sept.30 with higher aged seedlings
BR 23 (Dishari)	T. Aman	15.07-30.08	30-35	35-40	115-120	155-160	4.5-5.5	1988	Strongly photoperiod sensitive, can be used for late planting upto Sept.30 with higher aged seedlings
BR 24	B. Aus	25.03-30.04			100-110	100-107	2.5-3.0	1990	Earlier than BR20, can also be sown in line
BR 25	T. Aman	15.07-30.08				130-135		1990	Improved Pajam. Suitable for early planting tolerant to blast, natures earlier than Pajam and BR11

Proposed

IR-44595-70-2-3 (BR 26)	T. Aus				100-110	105-107	4.0		

Source: Dr. N.M. Mian, Plant Breeding Division, Bangladesh Rice Research Institute, Joydevpur, Gazipur.

ANNEX-C: IMPROVED VARIETIES OF JUTE, SUGARCANE, WHEAT AND MUSTARD

JUTE

White Jute (C. Capsularis)

CC	-	45	:	Photoinsensitive, height 4 meter, yield potential 5.2 tons/ha.
CVE	-	3	:	Duration 105-110 days, height 4 meter, yield potential 4.5 tons/ha.
CVL	-	1	:	Duration 125-135 days, height 4 meter, yield potential 5.2 tons/ha.
D	-	154	:	Duration 120-125 days, height 3.5 meter, yield potential 4.9 tons/ha.

Tossa Jute (C.Olitorius)

0-4	-		:	Suitable for high lands. Duration 130-135 days, height 4-4.2 meter, yield potential 4.5 tons/ha.
0-9897	-		:	Photoinsensitive, height 4.5 meter, yield potential 4.6 tons/ha.

Sugarcane Varieties

ISD	-	1/53	:	Growing period 14 months. Tolerant to water logging. Resistant to red rot, smut, red stripe and wilt. Sugar recovery 9.75%. Yield 60-80 tons/ha.
ISD	-	2/54	:	Duration 15 months. Good tillering habit, resistant to red not, smut, and wilt. Sugar recovery percens 9.44. Yield 62-90 tons/ha.
ISD	-	16	:	Duration 14 months. Good for molasses. Tolerant to mosaic and white leaf disease and stem borer. Sugar recovery percent 10-20. Yield potential 82-119 tons/ha.
ISD	-	17	:	Duration 14 months. Good germination capacity. Tolerant to white leaf, red rot, mosaic and stem borer. Sugar recovery 10%. Yield potential 80-115 tons/ha.
I	-	112/67	:	Duration 15.5 months. Resistant to red rot, smut, red stripe and wilt. Sugar recovery 11.73%.
L	-	Jaba - C	:	Duration 15 months. Resistant to red rot, red stripe and wilt. Sugar recovery 9.70%. Yield 60-90 tons/ha.

WHEAT

Sonalika	:	Approved in 1973. Duration 100-104 days. Yield with irrigation 3.2-3.4 t/ha; without irrigation 2.2-2.7 t/ha.

Pavan	:	Approved in 1979. Duration 112-117 days. Yield with irrigation 3.7-4.2 t/ha. Suitable for early planting.
Kanchan	:	Released in 1983. Duration 106-112 days. Yield potential with irrigation 3.5-4.4 t/ha; without irrigation 2.2-2.8 t/ha.
Akbar	:	Released in 1983. Duration 103-108 days. Yield with irrigation 3.5-4.2 t/ha, without irrigation 2.1-2.8 t/ha.
Barkat	:	Released in 1983. Duration 105-113 days. Yield with irrigation 3.4-3.8 t/ha; without irrigation 2.1-2.8 t/ha.
Ananda	:	Released in 1983. Duration 103-108 days. Yield with irrigation 3.4-3.8 t/ha; without irrigation 2.1-2.7 t/ha.
Aghrani	:	Released in 1987. Duration 103-107 days. Suitable variety for late planting. Yield with irrigation 3.4-3.8 t/ha; without irrigation 2.1-2.6 t/ha.

MUSTARD

Sonali Sarisha SS-75	:	Height 90-105cm. Duration 90-100 days. Yield potential 1.8-2.2 t/ha. Oil content 44%.
Kalyania-TS-72	:	Height 75-90cm. Duration 75-85 days. Yield potential 1.4-1.6 t/ha. Oil content 41-42%.
Tori-7	:	Height 60-75cm. Duration 70-80 days. Yield potential 1.0-1.1 t/ha. Oil content 40-41%.
Rai-5	:	Height 120-135cm. Duration 90-100 days. Yield potential 1.0-1.2 t/ha. Oil content 40%.

Source: BARI, BJRI, BSRI.

ANNEX-D: RECOMMENDED FERTILIZER DOSES FOR MAJOR CROPS GROWN IN THE TANGAIL REGION (AEZ-8)

Crops	Fertilizers (Kg/Ha)*				
	Urea	TSP	MP	Gypsum	Zine Sulphate
Irrigated					
Boro (HYV)	217	89	50	55	8
T. Aman (HYV)	152	33	33	55	-
T. Aus (HYV)	152	44	33	55	8
Rainfed					
B. Aus (Local)	65	67	33	-	-
T. Aman (Local)	109	89	33	55	-
T. Aman (HYV)	152	44	33	55	-
Boro (Local)	130	89	33	55	8
Wheat	130	67	67	-	-
Jute	87	22	33	-	-
Mustard	174	89	67	111	-
Potato	174	89	134	111	-
Sugarcane	348	178	167	167	28

* Source: Fertilizer Recommendation Guide, BARC, 1989

APPENDIX E AGRO-ECONOMIC ANALYSIS

This appendix provides an economic analysis of components related to agriculture in 'present (P)' and 'with project (W)' situations of the CPP area, Tangail. The result of this analysis is presented in two sets of six tables elaborated as:

Table 1: An overview of the general situation of agricultural production in the project area in terms of gross area, cultivable area and cropped area. In addition areas to single, double and triple crops have been identified showing over all cropping intensity.

Table 2: Details as to the composition of rice crops and the respective hectareage per rice type and sub-compartment.

Table 3: Total rice production broken down into quantities as per rice types grown and their respective yields per unit.

Table 4: Repeats the same type of information given in Tables 2 and 3, now referring, however, to other major non-rice crops.

Table 5: Economic parameters in both economic and financial prices. Important calculations such as gross margins and value added are shown. Sub-tables 5.1 and 5.2 indicate agricultural prices (in Taka/kg) and conversion factors as suggested in FPCO Guidelines for Project Assessment (May 1992).

Table 6: Summarizes the impact on agricultural production in terms of changes in absolute and relative terms as to cropped area, total production and yield per crop grown. It further specifics two important variables i.e. ratio between local/HYV rice and between rice/non-rice.

A detailed cost-benefit analysis including benefit coming from agricultural production, broadened in order to reach a Multi-criteria Analysis is presented in Chapter 8 of Interim Report, Main Volume.

Agro-Economic Analysis of 'Present (P)' Situation

Table 1 : Land utilization in the project area - present situation 1991/92

Sub-Compartment	Gross area Ha	Non cultivable area Ha	% 1)	Cultivable area Ha	% 1)	Fallow Ha	% 2)	Cropped area Ha	% 2)	Single crop Ha	% 3)	Double crop Ha	% 3)	Triple crop Ha	% 3)	Cropping intensity %
1	687	134	19.5	553	80.5	11	2.0	1,147	98.0	151	27.8	177	32.7	214	39.5	207
2	1,280	278	21.7	1,002	78.3	20	2.0	2,110	98.0	212	21.6	412	42.0	358	36.5	211
3	631	221	35.0	410	65.0	8	2.0	881	98.0	88	22.0	147	36.7	166	41.3	215
4	418	208	49.8	210	50.2	4	2.0	466	98.0	39	18.9	73	35.6	94	45.5	222
5	753	247	32.8	506	67.2	10	2.0	1,076	98.0	131	26.4	150	30.3	215	43.3	213
6	242	69	28.5	173	71.5	3	2.0	363	98.0	45	26.4	56	33.3	68	40.3	210
7	360	91	25.3	269	74.7	5	2.0	545	98.0	77	29.3	91	34.5	95	36.1	203
8	904	212	23.5	692	76.5	14	2.0	1,454	98.0	187	27.5	206	30.4	285	42.0	210
9	606	158	26.1	448	73.9	9	2.0	868	98.0	152	34.5	146	33.2	142	32.3	194
10	487	134	27.5	353	72.5	7	2.0	670	98.0	128	37.1	111	32.2	106	30.7	190
11	1,125	304	27.0	821	73.0	16	2.0	1,643	98.0	251	31.2	269	33.4	285	35.4	200
12	1,021	267	26.2	754	73.8	15	2.0	1,623	98.0	171	23.1	252	34.1	316	42.8	215
13	424	94	22.2	330	77.8	7	2.0	632	98.0	81	24.9	177	54.7	66	20.3	191
14	1,143	291	25.5	852	74.5	17	2.0	1,680	98.0	181	21.7	463	55.4	191	22.9	197
15	691	241	34.9	450	65.1	9	2.0	911	98.0	79	17.8	255	57.7	108	24.5	203
16 4)	260	257	98.8	3	1.2	0	0.0	6	100.0	0	0.0	3	100.0	0	0.0	200
17 5)	1,968	597	30.3	1,371	69.7	27	2.0	2,603	98.0	449	33.4	529	39.4	365	27.2	190
Total	13,000	3,803	29.3	9,197	70.7	184	2.0	18,679	98.0	2,421	26.3	3,518	38.3	3,074	33.4	203

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey
1) of total area 2) of cultivable area 3) of cropped area 4) urban Tangail 5) Lohajang Flood Plain

Table 2 : Area of rice crops in the project area - 1991/92

Sub-Compartment	Boro area						Aman area						Deep Water Aman area						Aus area						Total rice area	
	HYV		local		Total		HYV		local		Total		broadcasted		transplanted		Total		HYV		local		Total			
	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 2)
1	131	78.0	37	22.0	168	14.7	10	19.2	42	80.8	52	4.5	153	56.9	116	43.1	269	23.5	10	7.6	122	92.4	132	11.5	621	54.1
2	452	98.7	6	1.3	458	21.7	8	11.8	60	88.2	68	3.2	247	77.9	70	22.1	317	15.0	50	14.5	296	85.5	346	16.4	1,190	56.4
3	179	96.7	6	3.3	185	20.9	6	15.0	34	85.0	40	4.5	54	24.6	167	75.4	221	25.1	13	11.5	100	88.5	113	12.8	559	63.4
4	98	96.1	4	3.9	102	21.8	3	17.6	14	82.4	17	3.6	22	27.9	57	72.1	79	17.0	5	7.0	66	93.0	71	15.3	269	57.7
5	238	96.0	10	4.0	248	23.0	9	15.3	50	84.7	59	5.5	106	46.1	124	53.9	230	21.4	25	20.7	96	79.3	121	11.2	658	61.2
6	56	82.2	12	17.8	68	18.6	4	18.2	18	81.8	22	6.1	26	30.5	58	69.5	84	23.0	14	21.5	51	78.5	65	18.0	238	65.7
7	75	100.0	0	0.0	75	13.8	5	20.0	20	80.0	25	4.6	55	29.8	130	70.2	185	34.0	12	14.7	70	85.3	82	15.0	367	67.3
8	285	97.3	8	2.7	293	20.1	12	17.6	56	82.4	68	4.7	94	32.1	200	67.9	294	20.2	41	25.1	122	74.9	163	11.2	819	56.3
9	169	97.1	5	2.9	174	20.0	8	17.0	39	83.0	47	5.4	85	37.0	145	63.0	230	26.5	33	28.0	85	72.0	118	13.6	569	65.5
10	161	92.5	13	7.5	174	25.9	7	25.9	20	74.1	27	4.0	57	36.5	99	63.5	156	23.3	21	25.2	62	74.8	83	12.5	440	65.7
11	308	92.2	26	7.8	334	20.3	13	18.1	59	81.9	72	4.4	162	41.4	229	58.6	391	23.8	36	18.3	161	81.7	197	12.0	993	60.4
12	336	92.3	28	7.7	364	22.4	8	13.8	50	86.2	58	3.6	129	35.4	236	64.6	365	22.5	27	16.1	141	83.9	168	10.3	955	58.8
13	85	94.4	5	5.6	90	14.2	26	46.4	30	53.6	56	8.9	17	18.0	78	82.0	95	15.0	6	7.2	78	92.8	84	13.2	324	51.3
14	368	98.1	7	1.9	375	22.3	57	36.3	100	63.7	157	9.3	27	26.9	74	73.1	101	6.0	34	16.2	176	83.8	210	12.5	843	50.2
15	202	100.0	0	0.0	202	22.1	16	20.5	62	79.5	78	8.6	48	25.7	140	74.3	188	20.7	4	6.7	56	93.3	60	6.6	528	58.0
16	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0	3	50.0	0	0.0	0	0.0	0	0.0	3	50.0
17	250	100.0	0	0.0	250	9.6	30	13.4	194	86.6	224	8.6	180	35.5	328	64.5	508	19.5	25	12.1	182	87.9	207	8.0	1,189	45.7
Total	3,390	95.3	167	4.7	3,557	19.0	222	20.7	848	79.3	1,070	5.7	1,464	39.4	2,254	60.6	3,717	19.9	356	16.0	1,864	84.0	2,220	11.9	10,564	56.6

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey
1) of specific rice-crop area 2) of total cropped area

Table 3 : Rice production (Paddy) in the project area - 1991/92

Sub-Compartment	Boro						Aman						Deep Water Aman						Aus						Total production	
	HYV		local		Total		HYV		local		Total		broadcasted		transplanted		Total		HYV		local		Total			
	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha
1	617	4,700	115	3,100	732	4,348	33	3,300	71	1,700	104	2,008	214	1,400	186	1,600	400	1,486	26	2,600	134	1,100	160	1,214	1,396	2,248
2	1,990	4,400	17	2,900	2,007	4,380	27	3,400	114	1,900	141	2,076	396	1,600	126	1,800	522	1,644	135	2,700	355	1,200	490	1,417	3,160	2,657
3	750	4,200	17	2,800	767	4,154	19	3,200	61	1,800	80	2,010	76	1,400	284	1,700	360	1,626	36	2,800	120	1,200	156	1,384	1,363	2,439
4	410	4,200	12	2,900	421	4,149	9	3,100	31	2,200	40	2,359	33	1,500	114	2,000	147	1,860	15	3,000	126	1,900	141	1,977	750	2,786
5	1,070	4,500	32	3,200	1,102	4,448	26	2,900	110	2,200	136	2,307	138	1,300	223	1,800	361	1,569	63	2,500	163	1,700	226	1,865	1,825	2,774
6	255	4,600	37	3,100	293	4,333	14	3,400	52	2,900	66	2,991	38	1,500	99	1,700	137	1,639	36	2,600	61	1,200	98	1,501	593	2,489
7	330	4,400	0	1,500	330	4,400	15	3,000	34	1,700	49	1,960	77	1,400	208	1,600	285	1,540	34	2,800	77	1,100	110	1,350	775	2,111
8	1,340	4,700	23	2,900	1,363	4,651	38	3,200	129	2,300	167	2,459	132	1,400	340	1,700	472	1,604	115	2,800	171	1,400	286	1,751	2,288	2,795
9	759	4,500	14	2,800	773	4,451	25	3,100	94	2,400	118	2,519	128	1,500	247	1,700	374	1,626	86	2,600	102	1,200	188	1,592	1,453	2,556
10	722	4,500	35	2,700	757	4,365	25	3,500	36	1,800	61	2,241	85	1,500	178	1,800	264	1,690	57	2,700	100	1,600	157	1,877	1,238	2,815
11	1,322	4,300	75	2,900	1,398	4,191	39	3,000	130	2,200	169	2,344	275	1,700	458	2,000	733	1,876	101	2,800	289	1,800	390	1,983	2,689	2,709
12	1,546	4,600	78	2,800	1,624	4,462	26	3,300	135	2,700	161	2,783	220	1,700	496	2,100	715	1,958	81	3,000	225	1,600	306	1,825	2,807	2,939
13	373	4,400	11	2,200	384	4,277	88	3,400	48	1,600	136	2,436	26	1,500	132	1,700	157	1,664	15	2,500	93	1,200	108	1,293	786	2,426
14	1,657	4,500	21	3,000	1,678	4,472	188	3,300	260	2,600	448	2,854	44	1,600	133	1,800	177	1,746	99	2,900	334	1,900	433	2,062	2,736	3,244
15	928	4,600	0	0	928	4,600	51	3,200	161	2,600	212	2,723	78	1,600	266	1,900	344	1,823	11	2,700	78	1,400	89	1,487	1,573	2,978
16	0	0	0	0	0	0	0	0	0	0	0	2,000	0	0	6	2,000	6	2,000	0	0	0	0	0	0	6	2,000
17	1,074	4,300	0	0	1,074	4,300	96	3,200	369	1,900	465	2,074	270	1,500	590	1,800	861	1,694	70	2,800	274	1,500	344	1,657	2,743	2,306
Total	15,142	4,467	488	2,921	15,630	4,394	720	3,244	1,835	2,163	2,555	2,388	2,229	1,523	4,085	1,813	6,314	1,699	978	2,748	2,704	1,450	3,682	1,659	28,181	2,668

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey

Table 4.1 : Non-rice-crops in the project area - 1991/92

Sub-Compartment	Potato				Sugarcane				Wheat				Jute			
	Area ha	ton	Kg/ha	%*	Area ha	ton	Kg/ha	%*	Area ha	ton	Kg/ha	%*	Area ha	ton	Kg/ha	%*
1	26	211	8,100	2.3	65	1,365	21,000	5.7	92	212	2,300	8.0	62	93	1,500	5.4
2	61	567	9,300	2.9	31	806	26,000	1.5	229	573	2,500	10.9	152	319	2,100	7.2
3	19	0	b	2.2	15	375	25,000	1.7	80	200	2,500	9.1	64	115	1,800	7.3
4	11	112	10,200	2.4	6	168	28,000	1.3	49	113	2,300	10.5	36	76	2,100	7.7
5	10	90	9,000	0.9	17	476	28,000	1.6	157	393	2,500	14.6	81	146	1,800	7.5
6	12	136	11,300	3.3	2	54	27,000	0.6	48	101	2,100	13.2	28	53	1,900	7.7
7	12	108	9,000	2.2	2	56	28,000	0.4	59	130	2,200	10.8	45	81	1,800	8.3
8	49	421	8,600	3.4	44	1,364	31,000	3.0	160	400	2,500	11.0	88	176	2,000	6.1
9	13	156	12,000	1.5	20	600	30,000	2.3	67	141	2,100	7.7	58	104	1,800	6.7
10	10	96	9,600	1.5	10	310	31,000	1.5	56	140	2,500	8.4	47	75	1,600	7.0
11	34	340	10,000	2.1	84	2,436	29,000	5.1	121	242	2,000	7.4	131	210	1,600	8.0
12	25	263	10,500	1.5	29	928	32,000	1.8	147	353	2,400	9.1	106	180	1,700	6.5
13	9	83	9,200	1.4	50	1,800	36,000	7.9	45	99	2,200	7.1	73	139	1,900	11.6
14	47	508	10,800	2.8	123	3,936	32,000	7.3	143	286	2,000	8.5	139	250	1,800	8.3
15	29	310	10,700	3.2	45	1,260	28,000	4.9	97	194	2,000	10.6	78	140	1,800	8.6
16	0	0	0	0.0	0	0	0	0.0	1	2	2,300	16.7	1	2	2,000	16.7
17	128	1,280	10,000	4.9	148	5,328	36,000	5.7	412	865	2,100	15.8	325	455	1,400	12.5
Total	495	4,680	9,455	2.7	691	21,262	30,770	3.7	1,963	4,442	2,263	10.5	1,514	2,615	1,727	8.1

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey
*) of total cropped area

Table 4.1 : Non-rice-crops in the project area - 1991/92

Sub-Compartment	Mustard				Pulses				Vegetables 2)				Other 3)				Total non-rice-crops	
	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)
1	107	9.3	75	700	62	5.4	62	1,000	83	7.2	626	7,542	29	2.5	145	4,962	526	45.9
2	158	7.5	95	600	60	2.8	66	1,100	106	5.0	723	6,821	124	5.9	615	4,962	921	43.6
3	51	5.8	41	800	32	3.6	29	900	41	4.7	291	7,098	20	2.3	101	4,962	322	36.6
4	50	10.7	35	700	18	3.9	13	700	19	4.1	111	5,821	8	1.8	41	4,962	197	42.3
5	58	5.4	46	800	46	4.3	51	1,100	28	2.6	238	8,500	21	1.9	103	4,962	418	38.8
6	10	2.8	7	700	10	2.8	10	1,000	6	1.7	59	9,833	8	2.3	41	4,962	124	34.3
7	34	6.2	34	1,000	12	2.2	11	900	3	0.6	22	7,267	11	2.1	56	4,962	178	32.7
8	78	5.4	62	800	56	3.9	39	700	99	6.8	706	7,130	62	4.2	306	4,962	636	43.7
9	55	6.3	39	700	28	3.2	28	1,000	38	4.4	248	6,526	20	2.4	102	4,962	299	34.5
10	30	4.5	24	800	25	3.7	25	1,000	28	4.2	241	8,607	24	3.5	118	4,962	230	34.3
11	88	5.4	79	900	95	5.8	105	1,100	69	4.2	561	8,136	28	1.7	141	4,962	650	39.6
12	140	8.6	154	1,100	80	4.9	96	1,200	87	5.4	631	7,248	54	3.3	268	4,962	668	41.2
13	44	7.0	40	900	20	3.2	22	1,100	41	6.5	328	8,000	26	4.1	129	4,962	308	48.7
14	180	10.7	198	1,100	73	4.3	88	1,200	96	5.7	834	8,688	36	2.1	178	4,962	837	49.8
15	61	6.7	49	800	30	3.3	33	1,100	31	3.4	295	9,529	12	1.3	60	4,962	383	42.0
16	1	16.7	1	1,000	0	0.0	0	0	0	0.0	0	0	-0	-0.0	-0	4,962	3	50.0
17	122	4.7	110	900	86	3.3	103	1,200	164	6.3	1,570	9,576	28	1.1	141	4,962	1,413	54.3
Total	1,267	6.8	1,088	859	733	3.9	779	1,063	939	5.0	7,484	7,970	513	2.7	2,543	4,962	8,115	43.4

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey

1) of total croppd area 2) cabbage, cauliflower, radish, onion, garlic 3) tobacco...

Table 5: Crop Procuction - Economic Parameters (economic prices)

(present situation)

Crop	Output			variable costs															Gross margin	Value added
	Yield	By-prod.	Gross return	Seed		Fertilizer				Plant prot		family labour		Labour hired labour		oxen labour	Irrigat	Total var. costs		
	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	Urea Kg/ha	TSP Kg/ha	MP Kg/ha	Sub-total Tk/ha	Kg/ha	Tk/ha	m.d/ha	ratio % 2)	m.d/ha	Tk/ha	o.d/ha	Tk/ha	Tk/ha	Tk/ha	Tk/ha
Boro HYV	4,467	3,573	27,991	80	704	185	103	32	2,536	0.9	406	116	75	87	3,263	50	3150	12,016	15,976	23,588
Boro local	2,921	2,921	18,889	90	792	60	29	7	750	0.1	46	88	50	44	1,650	40	1512	6,316	12,573	17,523
T Aman HYV	3,244	2,920	21,300	60	528	151	96	21	2,149	0.7	285	96	66	63	2,376	45	976.5	8,076	13,223	19,199
T Aman local	2,163	2,812	15,070	60	528	60	29	7	845	0.1	46	88	50	44	1,650	42	0	4,713	10,357	15,307
DW Aman broad.	1,523	1,523	10,151	80	704	33	16	6	431	0.2	73	93	60	56	2,093	42	0	4,945	5,207	10,787
DW Aman transpl.	1,813	1,631	11,902	60	528	65	16	6	643	0.2	73	100	65	65	2,438	42	0	5,326	6,576	12,763
Aus HYV	2,748	3,573	18,264	60	449	185	103	32	2,536	0.9	406	116	75	87	3,263	42	0	8,297	9,966	17,579
Aus local	1,450	2,031	9,784	80	739	34	20	3	453	0.2	88	95	60	57	2,138	35	0	4,788	4,996	10,696
Jute	1,727	1,727	16,396	11	280	120	70	50	1,917	0.8	329	80	100	80	3,000	40	0	7,091	9,305	15,305
Potato	9,455	0	37,675	1,500	11,093	140	70	50	2,049	0.8	329	120	74	89	3,330	38	504	18,792	18,883	26,713
Wheat	2,263	2,037	20,462	145	2,245	130	100	30	2,124	0.0	0	85	45	38	1,434	36	378	7,590	12,871	17,493
Mustard	859	1,031	11,209	16	268	120	60	30	1,651	0.0	0	80	20	16	600	28	378	3,993	7,216	10,816
Pulses	1,063	1,382	15,182	35	402	0	0	0	0	0.0	0	68	20	14	510	30	378	2,464	12,718	15,778
Vegetables 1)	7,970	0	28,452	1	218	120	50	30	2,100	0.5	219	100	140	140	5,250	48	2520	12,186	16,266	25,266
Sugarcane	30,770	0	27,091	1,000	880	120	50	30	1,550	0.5	219	95	150	143	5,344	50	1890	11,841	15,250	24,156
Other crops	4,962	0	26,749	175	4,105	108	59	23	1,503	0.4	177	102	69	71	2,646	43	2520	12,631	14,118	20,586

Source: Project computations based on official statistics and project surveys (subcompartmet, House-hold)

1) incl. manure (veg. = 1.100 Kg a 0.5 Tk/kg, lobal T.Aman = 190 Kg)

2) of family labour

Value added	
TK/ho average	17,722

Table 5 Crop Procuction - Economic Parameters (financial prices)

(present situation)

Crop	Output			variable costs																
	Yield	By-prod.	Gross return	Seed		Fertilizer Urea	Fertilizer TSP	Fertilizer MP	Sub-total	Plant prot.		family labour	ratio	Labour hired labour		oxen labour	Irrigat.	Total var. costs	Gross margin	Value added
	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	Kg/ha	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	m/d/ha	% 2)	m/d/ha	Tk/ha	o/d/ha	Tk/ha	Tk/ha	Tk/ha	Tk/ha
Boro HYV	4,467	3,573	31,321	80	800	185	103	32	1,533	0.9	466	116	75	87	4,350	50	5000	14,399	16,922	27,072
Boro local	2,921	2,921	21,067	90	900	60	29	7	460	0.1	53	88	50	44	2,200	40	2400	7,813	13,254	19,854
T Aman HYV	3,244	2,920	23,806	60	600	151	96	21	1,295	0.7	328	96	66	63	3,168	45	1550	8,966	14,841	22,809
T Aman local	2,163	2,812	16,742	60	600	60	29	7	555	0.1	53	88	50	44	2,200	42	0	5,298	11,444	18,044
DW Aman broad.	1,523	1,523	11,328	80	800	33	16	6	262	0.2	84	93	60	56	2,790	42	0	5,826	5,502	12,942
DW Aman transpl.	1,813	1,631	13,303	60	600	65	16	6	408	0.2	84	100	65	65	3,250	42	0	6,233	7,070	15,320
Aus HYV	2,748	3,573	20,267	60	510	185	103	32	1,533	0.9	466	116	75	87	4,350	42	0	8,749	11,517	21,667
Aus local	1,450	2,031	10,841	80	840	34	20	3	276	0.2	101	95	60	57	2,850	35	0	5,642	5,199	12,799
Jute	1,727	1,727	15,566	11	264	120	70	50	1,130	0.8	378	80	100	80	4,000	40	0	7,572	7,994	15,994
Potato	9,455	0	43,305	1,500	12,750	140	70	50	1,222	0.8	378	120	74	89	4,440	38	800	21,300	22,005	32,445
Wheat	2,263	2,037	16,320	145	1,740	130	100	30	1,257	0.0	0	85	45	38	1,913	36	600	7,129	9,190	15,353
Mustard	859	1,031	12,597	16	304	120	60	30	995	0.0	0	80	20	16	800	28	600	3,959	8,638	13,438
Pulses	1,063	1,382	17,244	35	462	0	0	0	0	0.0	0	68	20	14	680	30	600	3,092	14,152	18,232
Vegetables 1)	7,970	0	32,703	1	250	120	50	30	1,491	0.5	252	100	140	140	7,000	48	4000	15,153	17,550	29,550
Sugarcane	30,770	0	31,139	1,000	1,012	120	50	30	941	0.5	252	95	150	143	7,125	50	3000	14,580	16,559	28,434
Other crops	4,962	0	30,746	175	4,718	108	59	23	906	0.4	203	102	69	71	3,528	43	4000	15,286	15,460	24,084

Source: Project computations based on official statistics and project surveys (subcompartmet, House-hold)

1) incl. manure (veg. = 1.100 Kg à 0.5 Tk/kg, lobal T.Aman = 190 Kg)

2) of family labour

Value added	
TK/ha average	20,502

Table 5.1 : Economic Prices - Comversion Factors

Crop	Market price	By-product	Seed	Labour Man/d	Ox/d	Fertilizer Urea	TSP	MP	Plant protect.	Irrig.
Boro HYV	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Boro local	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Aman HYV	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Aman (T)	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Aman (DW)	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Aus HYV	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Aus local	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Jute	1.06	0.87	1.06	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Potato	0.87	0.87	0.87	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Wheat	1.29	0.87	1.29	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Mustard	0.88	0.87	0.88	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Pulses	0.87	0.87	0.87	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Vegetables	0.87	0.87	0.87	0.75	0.87	1.45	1.88	2.02	0.87	0.63
Other crops	0.87	0.87	0.87	0.75	0.87	1.45	1.88	2.02	0.87	0.63

Source: FAP, Guidelines for Project Assessment

Table 5.2: Agricultural Prices (in Tk/Kg)

Crop	Market price	By-product	Seed	Labour Man. d	Ox/d	Fertilizer Urea	TSP	MP	Plant protect.	Irrig. Tk/ha
Boro HYV	6.21	0.7	10.0	50.0	45.0	4.58	5.40	4.05	504.0	5,000
Boro local	6.21	1.0	10.0	50.0	45.0	4.58	5.40	4.05	504.0	2,400
Aman HYV	6.44	0.7	10.0	50.0	45.0	4.58	5.40	4.05	504.0	1,550
Aman (T)	6.44	1.0	10.0	50.0	45.0	4.58	5.40	4.05	504.0	0
Aman (DW)	6.44	1.0	10.0	50.0	45.0	4.58	5.40	4.05	504.0	0
Aus HYV	6.07	0.7	8.5	50.0	45.0	4.58	5.40	4.05	504.0	0
Aus local	6.07	1.0	10.5	50.0	45.0	4.58	5.40	4.05	504.0	0
Jute	8.01	2.6	21.0	50.0	45.0	4.58	5.40	4.05	504.0	0
Potato	4.58	0.0	8.5	50.0	45.0	4.58	5.40	4.05	504.0	800
Wheat	6.31	0.4	12.0	50.0	45.0	4.58	5.40	4.05	504.0	600
Mustard	13.47	0.6	19.0	50.0	45.0	4.58	5.40	4.05	504.0	600
Pulses	14.92	0.7	13.2	50.0	45.0	4.58	5.40	4.05	504.0	600
Vegetables	4.10	0.0	500.0	50.0	45.0	4.58	5.40	4.05	504.0	4,000
Sugarcane	1.01	0.0	5.0	50.0	45.0	4.58	5.40	4.05	504.0	3,000
Other crops	6.20	0.0	26.9	50.0	45.0	4.58	5.40	4.05	504.0	4,000

Source: FAP, Guidelines for Project Assessment

Table 8: Summary of Impact on Agricultural Production (present situation)

Criteria	Present situation Area ha	Product. tons	Yield Kg/ha	Future situation Area ha	Product. tons	Kg/ha	Changes Area ha	%	Production tons	%	Yield %
Cultivated area	9,197			9,197				0.0			
Cropped area	18,679			18,679				0.0			
Fallow	184			184				0.0			
Crop.intensity %	203			203				0.0			
Rice area											
- total	10,564	28,181	2,668	10,564	28,181	2,668	0	0.0	0	0.0	0.0
- Boro	3,557	15,630	4,394	3,557	15,630	4,394	0	0.0	0	0.0	0.0
* HYV	3,390	15,142	4,467	3,390	15,142	4,467	0	0.0	0	0.0	0.0
* local	167	488	2,921	167	488	2,921	0	0.0	0	0.0	0.0
- T.Aman	1,070	2,555	2,388	1,070	2,555	2,388	0	0.0	0	0.0	0.0
* HYV	222	720	3,244	222	720	3,244	0	0.0	0	0.0	0.0
* local	848	1,835	2,163	848	1,835	2,163	0	0.0	0	0.0	0.0
- DW.Aman	3,717	6,314	1,699	3,717	6,314	1,699	0	0.0	0	0.0	0.0
* broadcasted	1,464	2,229	1,523	1,464	2,229	1,523	0	0.0	0	0.0	0.0
* transplanted	2,254	4,085	1,813	2,254	4,085	1,813	0	0.0	0	0.0	0.0
- Aus	2,220	3,682	1,659	2,220	3,682	1,659	0	0.0	0	0.0	0.0
* HYV	356	978	2,748	356	978	2,748	0	0.0	0	0.0	0.0
* local	1,864	2,704	1,450	1,864	2,704	1,450	0	0.0	0	0.0	0.0
- Jute	1,514	2,615	1,727	1,514	2,615	1,727	0	0.0	0	0.0	0.0
- Potato	495	4,680	9,455	495	4,680	9,455	0	0.0	0	0.0	0.0
- Sugarcane	691	21,262	30,770	691	21,262	30,770	0	0.0	0	0.0	0.0
- Wheat	1,963	4,442	2,263	1,963	4,442	2,263	0	0.0	0	0.0	0.0
- Mustard	1,267	1,088	859	1,267	1,088	859	0	0.0	0	0.0	0.0
- Pulses	733	779	1,063	733	779	1,063	0	0.0	0	0.0	0.0
- Vegetables	939	7,484	7,970	939	7,484	7,970	0	0.0	0	0.0	0.0
- Other crops	513	2,543	4,962	513	2,543	4,962	0	0.0	0	0.0	0.0
Ratio											
Local/HYV (rice)	1 :	0.60		1 :	0.60						
Other crops/rice	1 :	1.30		1 :	1.30						

Source: Project computations

Agro-Economic Analysis of 'With Project (W)' Situation

Table 1 : Land utilization in the project area - future situation with project

Sub-Compartment	Gross area Ha	Non cultivable area Ha	% 1)	Cultivable area Ha	% 1)	Fallow Ha	% 2)	Cropped area Ha	% 2)	Single crop Ha	% 3)	Double crop Ha	% 3)	Triple crop Ha	% 3)	Cropping intensity %
1	687	134	19.5	553	80.5	10	1.9	1,213	98.1	109	20.1	196	36.1	237	43.7	219
2	1,280	278	21.7	1,002	78.3	19	1.9	2,234	98.1	129	13.2	457	46.5	397	40.4	223
3	631	221	35.0	410	65.0	8	1.9	934	98.1	55	13.6	163	40.6	184	45.7	228
4	418	208	49.8	210	50.2	4	1.9	495	98.1	21	10.2	81	39.4	104	50.3	236
5	753	247	32.8	506	67.2	10	1.9	1,139	98.1	92	18.5	166	33.5	238	48.0	225
6	242	69	28.5	173	71.5	3	1.9	384	98.1	32	18.6	63	36.9	76	44.6	222
7	360	91	25.3	269	74.7	5	1.9	576	98.1	58	21.8	101	38.2	106	40.0	214
8	904	212	23.5	692	76.5	13	1.9	1,539	98.1	134	19.8	229	33.7	316	46.5	222
9	606	158	26.1	448	73.9	8	1.9	915	98.1	121	27.5	162	36.8	157	35.7	204
10	487	134	27.5	353	72.5	7	1.9	705	98.1	105	30.4	123	35.6	118	34.0	200
11	1,125	304	27.0	821	73.0	16	1.9	1,735	98.1	192	23.8	298	37.0	316	39.2	211
12	1,021	267	26.2	754	73.8	14	1.9	1,719	98.1	110	14.9	279	37.7	350	47.3	228
13	424	94	22.2	330	77.8	6	1.9	666	98.1	55	16.9	196	60.6	73	22.5	202
14	1,143	291	25.5	852	74.5	16	1.9	1,773	98.1	111	13.3	513	61.3	212	25.4	208
15	691	241	34.9	450	65.1	9	1.9	963	98.1	40	9.0	282	63.9	120	27.1	214
16 4)	260	257	98.8	3	1.2	0	0.0	6	100.0	0	0.0	3	100.0	0	0.0	200
17 5)	1,968	597	30.3	1,371	69.7	26	1.9	2,740	98.1	354	26.3	586	43.6	404	30.1	200
Total	13,000	3,803	29.3	9,197	70.7	174	1.9	19,733	98.1	1,719	18.7	3,898	42.4	3,406	37.0	215

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey
1) of total area 2) of cultivable area 3) of cropped area 4) urban Tangail 5) Lohajang Flood Plain

Table 2 : Area of rice crops in the project area - future situation with project

Sub-Compartment	Boro area						Aman area						Deep Water Aman area						Aus area						Total rice area	
	HYV		local		Total		HYV		local		Total		broadcasted		transplanted		Total		HYV		local		Total			
	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 1)	Ha	% 1)	Ha	% 2)	Ha	% 2)
1	141	80.0	35	20.0	176	14.5	32	33.7	63	66.3	95	7.8	138	56.9	104	43.1	242	20.0	10	7.8	117	92.2	127	10.5	641	52.8
2	485	98.8	6	1.2	491	22.0	26	22.1	90	77.9	116	5.2	223	77.9	63	22.1	286	12.8	50	14.9	286	85.1	336	15.0	1,228	55.0
3	191	97.1	6	2.9	197	21.1	19	27.4	51	72.6	70	7.5	49	24.6	150	75.4	199	21.3	13	11.9	97	88.1	110	11.7	576	61.7
4	105	96.5	4	3.5	108	21.9	10	31.4	21	68.6	31	6.2	20	27.9	51	72.1	71	14.4	5	7.2	64	92.8	69	14.0	279	56.5
5	255	96.4	10	3.6	264	23.2	29	27.7	75	72.3	104	9.1	96	46.1	112	53.9	207	18.2	25	21.2	93	78.8	118	10.3	693	60.9
6	59	83.9	11	16.1	71	18.5	13	32.2	27	67.8	40	10.4	23	30.5	52	69.5	75	19.6	14	22.1	49	77.9	63	16.5	249	65.0
7	80	100.0	0	0.0	80	14.0	16	34.8	30	65.2	46	8.0	50	29.8	117	70.2	167	29.0	12	15.1	67	84.9	79	13.8	372	64.7
8	306	97.6	8	2.4	313	20.3	38	31.4	84	68.6	122	8.0	85	32.1	180	67.9	265	17.2	41	25.7	118	74.3	159	10.3	860	55.9
9	181	97.4	5	2.6	186	20.3	26	30.4	59	69.6	84	9.2	77	37.0	131	63.0	207	22.6	33	28.7	82	71.3	115	12.6	592	64.7
10	172	93.3	12	6.7	184	26.2	22	42.7	30	57.3	52	7.4	51	36.5	89	63.5	140	19.9	21	25.8	60	74.2	81	11.5	458	65.0
11	330	93.0	25	7.0	354	20.4	42	32.0	89	68.0	130	7.5	145	41.4	206	58.6	351	20.3	36	18.8	155	81.2	191	11.0	1,027	59.2
12	360	93.1	27	6.9	387	22.5	26	25.4	75	74.6	101	5.9	116	35.4	212	64.6	329	19.1	27	16.6	136	83.4	163	9.5	979	56.9
13	91	95.0	5	5.0	96	14.4	83	64.9	45	35.1	128	19.3	15	18.0	70	82.0	85	12.8	6	7.4	75	92.6	81	12.2	390	58.6
14	395	98.3	7	1.7	401	22.6	182	54.9	150	45.1	332	18.8	24	26.9	67	73.1	91	5.1	34	16.7	170	83.3	204	11.5	1,029	58.0
15	216	100.0	0	0.0	216	22.5	51	35.5	93	64.5	144	15.0	44	25.7	126	74.3	170	17.6	4	6.9	54	93.1	58	6.0	588	61.1
16	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0	3	45.0	0	0.0	0	0.0	0	0.0	3	45.0
17	268	100.0	0	0.0	268	9.8	96	24.8	291	75.2	387	14.1	162	35.5	295	64.5	457	16.7	25	12.4	176	87.6	201	7.3	1,313	47.9
Total	3,634	95.8	159	4.2	3,793	19.2	710	35.8	1,272	64.2	1,982	10.0	1,317	39.4	2,028	60.6	3,346	17.0	356	16.5	1,801	83.5	2,157	10.9	11,278	57.2

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey
1) of specific rice-crop area 2) of total cropped area

Table 3 : Rice production (Paddy) in the project area - future situation with project

Sub-Compartment	Boro						Aman						Deep Water Aman						Aus						Total production	
	HYV		local		Total		HYV		local		Total		broadcasted		transplanted		Total		HYV		local		Total			
	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha	ton	Kg/ha
1	663	4,709	109	3,085	771	4,384	106	3,303	109	1,724	214	2,256	193	1,401	169	1,622	362	1,497	26	2,569	131	1,119	157	1,232	1,505	2,350
2	2,137	4,409	16	2,886	2,154	4,391	87	3,403	173	1,927	261	2,254	357	1,602	115	1,825	472	1,651	133	2,668	349	1,220	482	1,436	3,368	2,744
3	805	4,208	16	2,786	821	4,167	62	3,203	93	1,825	155	2,202	69	1,401	259	1,724	328	1,645	36	2,766	118	1,220	154	1,404	1,457	2,530
4	440	4,208	11	2,886	451	4,162	30	3,103	47	2,231	77	2,504	30	1,502	104	2,028	134	1,881	15	2,964	124	1,932	139	2,007	800	2,865
5	1,149	4,509	30	3,184	1,180	4,461	84	2,903	167	2,231	251	2,417	124	1,301	204	1,825	328	1,583	62	2,470	160	1,729	222	1,886	1,981	2,857
6	274	4,609	35	3,085	310	4,363	44	3,403	79	2,941	123	3,089	34	1,502	90	1,724	124	1,656	36	2,569	60	1,220	96	1,518	653	2,620
7	354	4,409	0	1,493	354	4,409	48	3,003	52	1,724	100	2,169	70	1,401	190	1,622	260	1,556	33	2,766	75	1,119	108	1,368	822	2,208
8	1,439	4,709	22	2,886	1,461	4,665	123	3,203	196	2,332	319	2,605	119	1,401	310	1,724	429	1,620	113	2,766	168	1,424	282	1,769	2,491	2,897
9	816	4,509	13	2,786	829	4,465	79	3,103	142	2,434	222	2,637	115	1,502	225	1,724	340	1,642	85	2,569	100	1,220	185	1,608	1,575	2,662
10	776	4,509	33	2,687	809	4,387	78	3,504	55	1,825	133	2,543	77	1,502	163	1,825	240	1,707	56	2,668	98	1,627	154	1,896	1,336	2,914
11	1,420	4,309	71	2,886	1,492	4,209	125	3,003	197	2,231	322	2,478	247	1,702	418	2,028	665	1,893	100	2,766	284	1,831	384	2,007	2,863	2,787
12	1,660	4,609	74	2,786	1,735	4,483	85	3,303	205	2,738	290	2,882	198	1,702	452	2,129	650	1,978	80	2,964	221	1,627	301	1,849	2,976	3,039
13	401	4,409	10	2,189	411	4,298	283	3,403	73	1,622	356	2,778	23	1,502	120	1,724	143	1,684	15	2,470	91	1,220	106	1,313	1,017	2,608
14	1,780	4,509	20	2,985	1,800	4,484	603	3,303	395	2,636	998	3,002	39	1,602	122	1,825	161	1,765	97	2,865	329	1,932	426	2,068	3,385	3,289
15	997	4,609	0	0	997	4,609	164	3,203	245	2,636	409	2,838	70	1,602	243	1,927	313	1,843	11	2,668	77	1,424	88	1,509	1,806	3,071
16	0	0	0	0	0	0	0	0	0	0	0	1,976	0	0	5	2,028	5	2,028	0	0	0	0	0	0	5	2,028
17	1,154	4,309	0	0	1,154	4,309	308	3,203	561	1,927	868	2,243	244	1,502	539	1,825	782	1,710	69	2,766	269	1,526	338	1,680	3,142	2,392
Total	16,265	4,476	463	2,906	16,727	4,410	2,307	3,247	2,790	2,194	5,097	2,571	2,008	1,524	3,728	1,838	5,736	1,715	967	2,715	2,656	1,475	3,623	1,680	31,184	2,765

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey

Table 4.1 : Non rice crops in the project area - future situation with project

Sub-Compartment	Potato				Sugarcane				Wheat				Jute			
	Area ha	ton	Kg/ha	%*	Area ha	ton	Kg/ha	%*	Area ha	ton	Kg/ha	%*	Area ha	ton	Kg/ha	%*
1	27	217	8,100	2.2	52	1,103	21,210	4.3	95	219	2,300	7.9	53	80	1,514	4.3
2	63	584	9,300	2.8	25	645	26,000	1.1	237	616	2,593	10.6	129	274	2,119	5.8
3	20	0	b	2.1	12	300	25,000	1.3	83	215	2,593	8.9	54	99	1,816	5.8
4	11	115	10,200	2.3	5	134	28,000	1.0	51	121	2,385	10.3	31	65	2,119	6.2
5	10	93	9,000	0.9	14	381	28,000	1.2	163	422	2,593	14.3	69	125	1,816	6.0
6	12	140	11,300	3.2	2	43	27,000	0.4	50	108	2,178	13.0	24	46	1,917	6.2
7	12	111	9,000	2.1	2	45	28,000	0.3	61	140	2,281	10.6	38	69	1,816	6.6
8	50	434	8,600	3.3	35	1,091	31,000	2.3	166	430	2,593	10.8	75	151	2,018	4.9
9	13	161	12,000	1.5	16	480	30,000	1.7	69	151	2,178	7.6	49	90	1,816	5.4
10	10	99	9,600	1.5	8	248	31,000	1.1	58	151	2,593	8.2	40	64	1,614	5.7
11	35	350	10,000	2.0	67	1,949	29,000	3.9	125	260	2,074	7.2	111	180	1,614	6.4
12	26	270	10,500	1.5	23	742	32,000	1.3	152	379	2,489	8.9	90	155	1,715	5.2
13	9	85	9,200	1.4	40	1,440	36,000	6.0	47	106	2,281	7.0	62	119	1,917	9.3
14	48	522	10,800	2.7	98	3,149	32,000	5.6	148	308	2,074	8.4	118	215	1,816	6.7
15	30	319	10,700	3.1	36	1,008	28,000	3.7	101	209	2,074	10.4	66	120	1,816	6.9
16	0	0	0	0.0	0	0	0	0.0	1	2	2,385	17.3	1	2	2,018	14.2
17	132	1,317	10,000	4.8	118	4,262	36,000	4.3	427	930	2,178	15.6	276	390	1,413	10.1
Total	509	4,816	9,455	2.6	553	17,021	30,790	2.8	2,036	4,769	2,343	10.3	1,287	2,242	1,743	6.5

Source: offical statistics, CPP Subcompartmental - and CCP House-hold survey
*) of total cropped area

Table 4.2 : Non-rice crops in the project area - future situation with project

Sub-Compartment	Mustard				Pulses				Vegetables 2)				Other 3)				Total non-rice-crops	
	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)	ton	Kg/ha	Area ha	% 1)
1	118	9.7	83	706	64	5.3	64	1,001	83	6.8	634	7,633	81	6.7	404	4,980	573	47.2
2	174	7.8	105	605	62	2.8	68	1,101	106	4.7	732	6,903	210	9.4	1,046	4,980	1,006	45.0
3	56	6.0	45	807	33	3.5	30	901	41	4.4	294	7,183	59	6.3	292	4,980	358	38.3
4	55	11.1	39	706	19	3.7	13	701	19	3.8	112	5,891	25	5.1	126	4,980	215	43.5
5	64	5.6	51	807	47	4.2	52	1,101	28	2.5	241	8,602	51	4.5	255	4,980	446	39.1
6	11	2.9	8	706	10	2.7	10	1,001	6	1.6	60	9,951	19	5.1	97	4,980	134	35.0
7	37	6.5	38	1,009	12	2.1	11	901	3	0.5	22	7,354	37	6.5	186	4,980	203	35.3
8	86	5.6	69	807	58	3.7	40	701	99	6.4	714	7,216	111	7.2	551	4,980	679	44.1
9	61	6.6	43	706	29	3.1	29	1,001	38	4.2	251	6,605	48	5.2	238	4,980	323	35.3
10	33	4.7	27	807	26	3.6	26	1,001	28	4.0	244	8,710	43	6.2	216	4,980	246	35.0
11	97	5.6	88	908	98	5.6	108	1,101	69	4.0	568	8,234	105	6.0	522	4,980	707	40.8
12	154	9.0	171	1,110	82	4.8	99	1,201	87	5.1	638	7,335	125	7.3	625	4,980	740	43.1
13	48	7.3	44	908	21	3.1	23	1,101	41	6.2	332	8,096	8	1.2	38	4,980	276	41.4
14	198	11.2	220	1,110	75	4.2	90	1,201	96	5.4	844	8,792	-39	-2.2	-193	4,980	744	42.0
15	67	7.0	54	807	31	3.2	34	1,101	31	3.2	299	9,643	13	1.3	63	4,980	374	38.9
16	1	18.3	1	1,009	0	0.0	0	0	0	0.0	0	0	0	5.2	2	4,985	3	55.0
17	134	4.9	122	908	88	3.2	106	1,201	164	6.0	1,589	9,691	87	3.2	432	4,980	1,427	52.1
Total	1,394	7.1	1,208	867	754	3.8	803	1,064	939	4.8	7,574	8,066	984	5.0	4,900	4,980	8,455	42.8

Source: offical statistics, CPP Subcompartmental - and CCP House-Hold survey

1) of total croppd area 2) cabbage, cauliflower, radish, onion, garlic 3) tobacco...

Table 5: Crop Procuction - Economic Parameters (financial prices)

(future situation with project)

Crop	Output			variable costs																
	Yield	By-prod.	Gross return	Seed		Fertilizer Urea	TSP	MP	Sub-total	Plant prot.		family labour	ratio	Labour hired labour		oxen labour	Irrigat.	Total var. costs	Gross margin	Value added
	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	Kg/ha	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	m/d/ha	% 2)	m/d/ha	Tk/ha	o/d/ha	Tk/ha	Tk/ha	Tk/ha	Tk/ha
Boro HYV	4,476	3,581	31,384	80	800	185	103	32	1,533	0.9	466	116	75	87	4,350	50	5000	14,399	16,985	27,135
Boro local	2,906	2,906	20,962	90	900	60	29	7	460	0.1	53	88	50	44	2,200	40	2400	7,813	13,149	19,749
T Aman HYV	3,247	2,923	23,830	60	600	151	96	21	1,295	0.7	328	96	66	63	3,168	45	1550	8,966	14,864	22,832
T Aman local	2,194	2,852	16,976	60	600	60	29	7	555	0.1	53	88	50	44	2,200	42	0	5,298	11,678	18,278
DW Aman broad.	1,524	1,524	11,339	80	800	33	16	6	262	0.2	84	93	60	56	2,790	42	0	5,826	5,513	12,953
DW Aman transpl.	1,838	1,654	13,489	60	600	65	16	6	408	0.2	84	100	65	65	3,250	42	0	6,233	7,256	15,506
Aus HYV	2,715	3,530	20,024	60	510	185	103	32	1,533	0.9	466	116	75	87	4,350	42	0	8,749	11,274	21,424
Aus local	1,475	2,065	11,025	80	840	34	20	3	276	0.2	101	95	60	57	2,850	35	0	5,642	5,384	12,984
Jute	1,743	1,743	15,706	11	264	120	70	50	1,130	0.8	378	80	100	80	4,000	40	0	7,572	8,134	16,134
Potato	9,455	0	43,305	1,500	12,750	140	70	50	1,222	0.8	378	120	74	89	4,440	38	800	21,300	22,005	32,445
Wheat	2,343	2,108	16,895	145	1,740	130	100	30	1,257	0.0	0	85	45	38	1,913	36	600	7,129	9,765	15,928
Mustard	867	1,040	12,710	16	304	120	60	30	995	0.0	0	80	20	16	800	28	600	3,959	8,751	13,551
Pulses	1,064	1,383	17,261	35	462	0	0	0	0	0.0	0	68	20	14	680	30	600	3,092	14,169	18,249
Vegetables 1)	8,066	0	33,095	1	250	120	50	30	1,491	0.5	252	100	140	140	7,000	48	4000	15,153	17,942	29,942
Sugarcane	30,790	0	31,159	1,000	1,012	120	50	30	941	0.5	252	95	150	143	7,125	50	3000	14,580	16,579	28,454
Other crops	4,980	0	30,856	175	4,718	108	59	23	906	0.4	203	102	69	71	3,528	43	4000	15,286	15,570	24,194

Source: Project computations based on official statistics and project surveys (subcompartmet, House-hold)

1) incl. manure (veg. = 1.100 Kg à 0.5 Tk/kg, lobal T.Aman = 190 Kg)

2) of family labour

Value added	
Tk/ha average	20,610

Table 5: Crop Procuction - Economic Parameters (economic prices)

(future situation with project)

Crop	Output			variable costs															Irrigat.	Total var. costs	Gross margin	Value added
	Yield	By-prod.	Gross return	Seed		Fertilizer Urea	TSP	MP	Sub-total	Plant prot.		family labour	ratio	Labour hired labour		oxen labour					
	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	Kg/ha	Kg/ha	Kg/ha	Tk/ha	Kg/ha	Tk/ha	m/d/ha	% 2)	m/d/ha	Tk/ha	o/d/ha	Tk/ha	Tk/ha	Tk/ha	Tk/ha	
Boro HYV	4,476	3,581	28,047	80	704	185	103	32	2,536	0.9	406	116	75	87	3,263	50	3150	12,016	16,032	23,644	
Boro local	2,906	2,906	18,795	90	792	60	29	7	750	0.1	46	88	50	44	1,650	40	1512	6,316	12,479	17,429	
T Aman HYV	3,247	2,923	21,321	60	528	151	96	21	2,149	0.7	285	96	66	63	2,376	45	976.5	8,076	13,245	19,221	
T Aman local	2,194	2,852	15,281	60	528	60	29	7	845	0.1	46	88	50	44	1,650	42	0	4,713	10,568	15,518	
DW Aman broad.	1,524	1,524	10,162	80	704	33	16	6	431	0.2	73	93	60	56	2,093	42	0	4,945	5,217	10,797	
DW Aman transpl.	1,838	1,654	12,069	60	528	65	16	6	643	0.2	73	100	65	65	2,438	42	0	5,326	6,742	12,930	
Aus HYV	2,715	3,530	18,044	60	449	185	103	32	2,536	0.9	406	116	75	87	3,263	42	0	8,297	9,747	17,360	
Aus local	1,475	2,065	9,950	80	739	34	20	3	453	0.2	88	95	60	57	2,138	35	0	4,788	5,162	10,862	
Jute	1,743	1,743	16,544	11	280	120	70	50	1,917	0.8	329	80	100	80	3,000	40	0	7,091	9,453	15,453	
Potato	9,455	0	37,675	1,500	11,093	140	70	50	2,049	0.8	329	120	74	89	3,330	38	504	18,792	18,883	26,713	
Wheat	2,343	2,108	21,183	145	2,245	130	100	30	2,124	0.0	0	85	45	38	1,434	36	378	7,590	13,592	18,214	
Mustard	867	1,040	11,310	16	268	120	60	30	1,651	0.0	0	80	20	16	600	28	378	3,993	7,317	10,917	
Pulses	1,064	1,383	15,197	35	402	0	0	0	0	0.0	0	68	20	14	510	30	378	2,464	12,733	15,793	
Vegetables 1)	8,066	0	28,793	1	218	120	50	30	2,100	0.5	219	100	140	140	5,250	48	2520	12,186	16,607	25,607	
Sugarcane	30,790	0	27,108	1,000	880	120	50	30	1,550	0.5	219	95	150	143	5,344	50	1890	11,841	15,268	24,174	
Other crops	4,980	0	26,845	175	4,105	108	59	23	1,503	0.4	177	102	69	71	2,646	43	2520	12,631	14,214	20,682	

Source: Project computations based on official statistics and project surveys (subcompartmet, House-hold)

1) incl. manure (veg. = 1.100 Kg à 0.5 Tk/kg, lobal T.Aman = 190 Kg)

2) of family labour

Value added	
TK/ha average	17,832

Table 6: Summary of Impact on Agricultural Production (future situation with project)

Criteria	Present situation Area ha	Product. tons	Yield Kg/ha	Future situation Area ha	Product. tons	Kg/ha	Changes Area ha	%	Production tons	%	Yield %
Cultivated area	9,197			9,197				0.0			
Cropped area	18,679			19,733				5.6			
Fallow	184			174				-5.3			
Crop.intensity %	203			215				5.6			
Rice area											
- total	10,564	28,181	2,668	11,278	31,184	2,765	714	6.8	3,003	10.7	3.7
- Boro	3,557	15,630	4,394	3,793	16,727	4,410	236	6.6	1,097	7.0	0.4
* HYV	3,390	15,142	4,467	3,634	16,265	4,476	244	7.2	1,123	7.4	0.2
* local	167	488	2,921	159	463	2,906	-8	-4.7	-25	-5.2	-0.5
- T.Aman	1,070	2,555	2,388	1,982	5,097	2,571	912	85.3	2,543	99.5	7.7
* HYV	222	720	3,244	710	2,307	3,247	488	220.0	1,587	220.3	0.1
* local	848	1,835	2,163	1,272	2,790	2,194	424	50.0	956	52.1	1.4
- DW.Aman	3,717	6,314	1,699	3,346	5,736	1,715	-372	-10.0	-578	-9.2	0.9
* broadcasted	1,464	2,229	1,523	1,317	2,008	1,524	-146	-10.0	-221	-9.9	0.1
* transplanted	2,254	4,085	1,813	2,028	3,728	1,838	-225	-10.0	-357	-8.7	1.4
- Aus	2,220	3,682	1,659	2,157	3,623	1,680	-63	-2.9	-59	-1.6	1.3
* HYV	356	978	2,748	356	967	2,715	0	0.0	-12	-1.2	-1.2
* local	1,864	2,704	1,450	1,801	2,656	1,475	-63	-3.4	-48	-1.8	1.7
- Jute	1,514	2,615	1,727	1,287	2,242	1,743	-227	-15.0	-372	-14.2	0.9
- Potato	495	4,680	9,455	509	4,816	9,455	14	2.9	136	2.9	0.0
- Sugarcane	691	21,262	30,770	553	17,021	30,790	-138	-20.0	-4,241	-19.9	0.1
- Wheat	1,963	4,442	2,263	2,036	4,769	2,343	73	3.7	327	7.4	3.5
- Mustard	1,267	1,088	859	1,394	1,208	867	127	10.0	120	11.0	0.9
- Pulses	733	779	1,063	754	803	1,064	21	2.9	23	3.0	0.1
- Vegetables	939	7,484	7,970	939	7,574	8,066	0	0.0	90	1.2	1.2
- Other crops	513	2,543	4,962	984	4,901	4,980	472	92.0	2,357	92.7	0.4
Ratio:											
Local/HYV (rice)	1 :	0.60		1 :	0.71						
Other crops/rice	1 :	1.30		1 :	1.33						

Source: Project computations

Table 7 : Incremental Benefit (agricultural) (future situation with project)

Crops	Additional Production			Additional Labour			Add. animal traction		
	tons	Value added Tk/ha	million Tk	addit. area ha	m/d/ha	total year man/d	addit. area ha	Oxen/ day/ha	total year pair/d
- Boro									
* HYV	1,123	23,644	5.8	244	203	49,548	244	50	12,204
* local	-25	17,429	-0.1	-8	132	-1,036	-8	40	-314
- T. Aman									
* HYV	1,587	19,221	9.4	488	159	77,831	488	45	21,978
* local	956	15,518	6.6	424	132	55,968	424	42	17,808
- DW. Aman									
* broadcasted	-221	10,797	-1.6	-146	149	-21,780	-146	42	-6,148
* transplanted	-357	12,930	-2.9	-225	165	-37,184	-225	42	-9,465
- Aus									
* HYV	-12	17,360	0.0	0	203	0	0	42	0
* local	-48	10,862	-0.7	-63	152	-9,633	-63	35	-2,218
Total rice 1)	3,003	16,695	16.4	714	170	113,714	714	44	33,845
- Jute	-372	15,453	-3.5	-227	160	-36,336	-227	40	-9,084
- Potato	136	26,713	0.4	14	209	2,997	14	38	545
- Sugarcane	-4,241	24,174	-3.3	-138	238	-32,822	-138	50	-6,910
- Wheat	327	18,214	1.3	73	123	8,952	73	36	2,615
- Mustard	120	10,917	1.4	127	96	12,163	127	28	3,548
- Pulses	23	15,793	0.3	21	82	1,735	21	30	638
- Vegetables	90	25,607	0.0	0	240	0	0	48	0
- Other crops	2,357	20,682	9.8	472	172	81,328	472	43	20,239
Total			22.7	1,055		151,731	1,055		45,435
$US (000)	38		598.6	add emmpl. (No)		506	add. pairs		516

Source: Project computations

1) value added, man/day/ha and oxen/pair/ha are average values for rice