

Table VII.5.5 Reasons for Water Logging by Group

Reasons (Code)		* LL (115)	S (103)	M (101)	L (95)	VL (63)	LE (91)	NGO Co-op (73)	FM (60)	AS (64)	Total (765)
Code I	No.	1	8	7	13	15	14	14	4	-	76
	(%)	(1)	(8)	(7)	(14)	(24)	(15)	(19)	(7)	(-)	(10)
Code II	No.	-	5	10	8	13	12	14	-	1	63
	(%)	(-)	(5)	(10)	(8)	(21)	(13)	(19)	(-)	(2)	(8)
Code III	No.	1	1	7	6	8	8	13	1	-	45
	(%)	(1)	(1)	(7)	(6)	(13)	(9)	(18)	(2)	(-)	(6)
Code IV	No.	2	4	4	8	6	9	7	-	-	40
	(%)	(2)	(4)	(4)	(8)	(10)	(10)	(10)	(-)	(-)	(5)
Code V	No.	-	9	10	18	17	14	17	2	1	88
	(%)	(-)	(9)	(10)	(19)	(27)	(15)	(23)	(3)	(2)	(12)
Code VI	No.	-	1	3	3	7	19	17	-	-	50
	(%)	(-)	(1)	(3)	(3)	(11)	(21)	(23)	(-)	(-)	(7)
Code VII	No.	-	2	4	7	8	12	9	-	-	42
	(%)	(-)	(2)	(4)	(7)	(13)	(13)	(12)	(-)	(-)	(6)
Code VIII	No.	-	3	6	5	8	10	9	-	-	41
	(%)	(-)	(3)	(6)	(5)	(13)	(11)	(12)	(-)	(-)	(5)
Code IX	No.	-	7	7	11	12	12	15	9	1	74
	(%)	(-)	(7)	(7)	(12)	(19)	(13)	(21)	(15)	(2)	(10)
Code X	No.	4	5	4	11	9	1	1	2	-	37
	(%)	(4)	(5)	(4)	(12)	(14)	(1)	(1)	(3)	(-)	(5)
Code XI	No.	3	6	9	12	12	22	20	3	2	89
	(%)	(3)	(6)	(9)	(13)	(19)	(24)	(27)	(5)	(3)	(12)
Code XII	No.	-	1	-	-	-	4	5	-	-	10
	(%)	(-)	(1)	(-)	(-)	(-)	(4)	(7)	(-)	(-)	(1)
Code XIII	No.	5	18	20	11	15	4	6	5	11	95
	(%)	(4)	(18)	(20)	(12)	(24)	(4)	(8)	(8)	(17)	(12)

Note : LL=Landless, S=Small, M=Medium, L=Large, VL=Very Large, FM=Fisherman, AS=Artisan, LE=Local Elite.

Code :

- I Rivers have been silted up
- II Absence of link-canals
- III Regulators not functioning properly
- IV Long time required in the drainage of water
- V Absence of proper drainage system
- VI Inadequacy of vents in the regulators
- VII Construction of roads in an unplanned way
- VIII Absence of rings/culverts in the places where necessary
- IX Silting up of Beels, Khals and Drainage channels
- X Heavy showers
- XI Lowlying area
- XII Obstruction created by the embankment in the normal drainage of water
- XIII Water logging does not occur

Table VII.5.6 Response on Countermeasures to Water Logging at Different Flooded Conditions

Mesures Taken		F0 (288)	F1 (324)	F2&3 (153)	Total (765)
1. We cut the roads	No.	24	19	13	56
	(%)	(8)	(6)	(9)	(7)
2. No Scope for taking any action	No.	43	59	9	111
	(%)	(15)	(18)	(6)	(15)
3. Action not necessary (Because of Water Logging of low level)	No.	39	39	34	112
	(%)	(14)	(12)	(22)	(15)
Total		106 (37)	117 (36)	56 (37)	279 (36)

Source : Public Consultation Survey, JICA

Table VII.5.7 Response on Countermeasures to Water Logging by Group

Mesures Taken		* LL (115)	S (103)	M (101)	L (95)	VL (63)	LE (91)	NGO Co-op (73)	FM (60)	AS (64)	Total (765)
1. We cut the roads	No.	2	5	7	13	16	7	4	1	1	56
	(%)	(2)	(5)	(7)	(14)	(25)	(8)	(5)	(2)	(2)	(7)
2. No Scope for taking any action	No.	6	11	22	19	11	25	14	2	1	111
	(%)	(5)	(11)	(22)	(20)	(17)	(27)	(19)	(3)	(2)	(15)
3. Action not necessary (Because of Water Logging of low level)	No.	2	18	26	31	15	12	5	1	2	112
	(%)	(2)	(17)	(26)	(33)	(24)	(13)	(7)	(2)	(3)	(15)
Total		10 (9)	34 (33)	55 (54)	63 (66)	42 (67)	44 (48)	23 (32)	4 (7)	4 (6)	279 (36)

Source : Public Consultation Survey, JICA

Table VII.6.1 Response on Dissatisfaction with Present Function of Embankment and Regulator

Group	F0(288)		F1(324)		F2&3(153)		Total(765)	
	No.	%	No.	%	No.	%	No.	%
Landless	5	12	17	33	3	14	25	22
Small	15	40	31	74	11	48	57	55
Medium	19	54	38	91	13	54	70	69
Large	13	41	21	49	15	75	49	52
Very Large	10	36	16	59	3	38	29	46
Sub total	62	35	123	60	45	47	230	48
Fishermen	11	42	19	76	4	44	34	57
Artisan	5	19	9	36	3	23	17	27
Co-op/NGO	12	43	18	62	7	44	37	51
Local Elite	27	82	30	77	11	58	68	75
Sub total	44	51	57	61	21	44	122	54
Total	117	41	199	61	70	46	386	51

Source : Public Consultation Survey, JICA

Table VII.6.2 Reasons for Dissatisfaction with Present Function of Embankment and Regulator

Reasons (Code)	F0 (288)	F1 (324)	F2&3 (153)	Total (765)
Code I	No. 59 (%) (21)	No. 66 (%) (20)	No. 53 (%) (35)	No. 178 (%) (23)
Code II	No. 4 (%) (1)	No. 25 (%) (8)	No. 29 (%) (19)	No. 58 (%) (8)
Code III	No. 51 (%) (18)	No. 71 (%) (22)	No. 32 (%) (21)	No. 154 (%) (20)
Code IV	No. 42 (%) (15)	No. 68 (%) (21)	No. 0	No. 110 (%) (14)
Code V	No. 6 (%) (2)	No. 14 (%) (4)	No. 0	No. 20 (%) (3)
Code VI	No. 14 (%) (5)	No. 32 (%) (10)	No. 27 (%) (18)	No. 73 (%) (10)
Code VII	No. 32 (%) (11)	No. 38 (%) (12)	No. 0	No. 70 (%) (9)
Code VIII	No. 0 (%) (0)	No. 6 (%) (2)	No. 0	No. 6 (%) (1)
Code IX	No. 29 (%) (10)	No. 23 (%) (7)	No. 0	No. 52 (%) (7)

Source : Public Consultation Survey, JICA

Code :

- | | |
|--|---|
| I The regulators are not put into operation in time | VI The number of regulators are not adequate |
| II Repair and maintenance works are not taken properly | VII The number of vents of the regulators is insufficient |
| III Regulators remain out of order and/or do not function properly | VIII Public cut on the embankment occurs |
| IV Breaches on the embankment are not repaired | IX Fish availability has come down |
| V Operators of the regulators do not do their duties properly | |

Table VII.6.3 Reasons for Public Cuts By Group

Reasons (Code)	* LL	S	M	L	VL	LE	NGO Co-op	FM	AS	Total
	(115)	(103)	(101)	(95)	(63)	(91)	(73)	(60)	(64)	(765)
Code I	No. 32 (%) (28)	No. 40 (%) (39)	No. 46 (%) (46)	No. 44 (%) (46)	No. 27 (%) (43)	No. 44 (%) (48)	No. 42 (%) (58)	No. 28 (%) (47)	No. 32 (%) (50)	No. 335 (%) (44)
Code II	No. 33 (%) (29)	No. 51 (%) (50)	No. 46 (%) (46)	No. 49 (%) (52)	No. 37 (%) (59)	No. 39 (%) (43)	No. 43 (%) (59)	No. 41 (%) (68)	No. 30 (%) (47)	No. 369 (%) (48)
Code III	No. 27 (%) (24)	No. 39 (%) (38)	No. 37 (%) (37)	No. 39 (%) (41)	No. 35 (%) (56)	No. 33 (%) (36)	No. 37 (%) (51)	No. 33 (%) (55)	No. 33 (%) (52)	No. 313 (%) (41)
Code IV	No. 19 (%) (17)	No. 28 (%) (27)	No. 38 (%) (38)	No. 37 (%) (39)	No. 35 (%) (56)	No. 29 (%) (32)	No. 30 (%) (41)	No. 27 (%) (45)	No. 32 (%) (50)	No. 275 (%) (36)
Code V	No. 25 (%) (22)	No. 33 (%) (32)	No. 28 (%) (28)	No. 30 (%) (32)	No. 23 (%) (37)	No. 29 (%) (43)	No. 31 (%) (43)	No. 26 (%) (43)	No. 25 (%) (39)	No. 250 (%) (33)
Code VI	No. 13 (%) (11)	No. 24 (%) (23)	No. 20 (%) (20)	No. 28 (%) (30)	No. 27 (%) (43)	No. 30 (%) (33)	No. 26 (%) (36)	No. 34 (%) (57)	No. 29 (%) (45)	No. 231 (%) (30)
Code VII	No. 20 (%) (17)	No. 31 (%) (30)	No. 34 (%) (34)	No. 25 (%) (26)	No. 24 (%) (38)	No. 32 (%) (35)	No. 30 (%) (41)	No. 27 (%) (45)	No. 28 (%) (44)	No. 251 (%) (33)
Code VIII	No. 22 (%) (19)	No. 26 (%) (2)	No. 35 (%) (35)	No. 28 (%) (30)	No. 29 (%) (46)	No. 37 (%) (41)	No. 33 (%) (45)	No. 36 (%) (60)	No. 23 (%) (36)	No. 269 (%) (35)

Note : LL=Landless, S=Small, M=Medium, L=Large, VL=Very Large, FM=Fisherman, AS=Artisan, LE=Local Elite

Code :

- | | |
|---|--|
| I For draining out the water of the cropped land. | VI To protect ourselves against excessive pressure of water and/or high floods. |
| II In the absence of sluice gates, to drain out the flood water. | VII Because of non-functioning of sluice gates and/or regulators water can not flow out properly |
| III To protect the crop in the field. | VIII The people living on the embankment cut it for their own convenience. |
| IV To protect the houses and shelters. | |
| V To get rid of water logging created by the absence of culverts and drainage channels. | |

Table VII.6.4 Reasons for Breaches on the Embankment

Reasons (Code)	Land- less n=115		Small n=103		Medium n=101		Large n=95		Very Large n=63		Local Elite n=91		NGO Co-op n=73		Fisher- man n=60		Artisan n=64		Total n=765	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
	Code I	24	(21)	32	(31)	45	(45)	38	(40)	24	(38)	39	(43)	38	(52)	26	(43)	28	(44)	294
Code II	26	(23)	44	(43)	49	(49)	48	(51)	30	(48)	35	(39)	71	(97)	38	(63)	28	(44)	369	(48)
Code III	27	(24)	36	(35)	32	(32)	32	(34)	30	(48)	24	(26)	29	(40)	25	(42)	22	(34)	257	(34)
Code IV	17	(15)	26	(25)	28	(28)	25	(26)	28	(44)	22	(24)	26	(36)	28	(47)	20	(31)	220	(29)
Code V	18	(16)	27	(26)	24	(24)	25	(26)	21	(33)	30	(33)	21	(29)	18	(30)	16	(25)	200	(26)
Code VI	21	(18)	33	(32)	25	(25)	24	(25)	23	(37)	30	(33)	23	(32)	20	(33)	19	(30)	218	(29)
Code VII	22	(19)	35	(34)	30	(30)	26	(27)	23	(37)	30	(33)	24	(33)	23	(38)	23	(36)	236	(31)
Code VIII	23	(20)	29	(28)	29	(29)	25	(26)	25	(40)	31	(34)	25	(34)	29	(48)	21	(33)	237	(31)
Code IX	22	(19)	20	(19)	17	(17)	14	(15)	15	(24)	28	(31)	27	(37)	16	(27)	20	(31)	179	(23)
Code X	10	(9)	24	(23)	14	(14)	22	(23)	18	(29)	20	(22)	21	(29)	9	(15)	18	(28)	156	(20)
Code XI	11	(10)	17	(17)	21	(21)	19	(20)	17	(27)	20	(22)	22	(30)	13	(22)	16	(25)	156	(20)
Code XII	10	(9)	19	(18)	9	(9)	18	(19)	10	(16)	14	(15)	21	(29)	8	(13)	9	(14)	118	(15)
Code XIII	5	(4)	17	(17)	15	(15)	13	(14)	11	(18)	20	(22)	18	(25)	14	(23)	8	(13)	121	(16)
Code XIV	1	(1)	17	(17)	7	(7)	13	(14)	10	(16)	27	(30)	21	(29)	10	(17)	11	(17)	117	(15)
Code XV	6	(5)	12	(12)	16	(16)	27	(28)	7	(11)	22	(24)	21	(29)	13	(22)	11	(17)	135	(18)

Code :

- | | |
|---|--|
| I Excessive rainfall. | IX Drainage problem created by absence of regulators in proper places/pressure of water in the rainy season. |
| II River erosion/pressure and current of high flood. | X Habitation on the embankment. |
| III Sandy soils are easily washed away by rains. | XI Lack of proper dressing/maintenance of the embankment. |
| IV Entry of water through rat-holes. | XII Movement of transports. |
| V Water seepage through the rotten roots of bananatrees weakens the embankment. | XIII Not known/No breach. |
| VI Failure to repair the breaches in time before rainy season. | XIV Zigzag way of the rivers/khals within the project area. |
| VII Scratching out grass, damage and cutting of trees/absence of trees on the embankment. | XV Damage done by the horn-dashing of the cattle. |
| VIII Excessive pressure of water created by inadequacy of vents in the regulators. | |

Table VII.6.5 Respondents Living on the Embankment

Group	F0		F1		F2&3		Total	
	Yes	%	Yes	%	Yes	%	Yes	%
Landless	6	14	3	6	1	5	10	9
Small	0	0	0	0	2	9	2	2
Medium	1	3	0	0	3	13	4	4
Large	0	0	0	0	1	5	1	1
Very Large	0	0	0	0	0	0	0	0
Sub Total	7	4	3	2	7	7	17	4
Fishermen	2	8	0	0	0	0	2	3
Artisan	1	4	1	4	0	0	2	3
Co-op./NGO	0	0	0	0	0	0	0	0
Local Elite	0	0	0	0	1	5	1	1
Sub Total	1	1	1	1	1	2	3	1
Total	10	4	4	1	8	5	22	3

Source : Public Consultation Survey, JICA

Table VII.6.6 Habitants on Embankment without Legal Right

Group	F0 n=10		F1 n=4		F2&3 n=8		Total n=22	
	No.	%	No.	%	No.	%	No.	%
Landless	6	60	3	75	1	13	10	46
Small	0	0	0	0	2	25	2	9
Medium	1	10	0	0	3	38	4	18
Large	0	0	0	0	1	13	1	5
Very Large	0	0	0	0	0	0	0	0
Sub total	7	70	3	75	7	88	17	77
Fishermen	2	20	0	0	0	0	2	9
Artisan	1	10	1	25	0	0	2	9
Co-op./NGO	0	0	0	0	0	0	0	0
Local Elite	0	0	0	0	1	12	1	5
Sub total	1	10	1	25	1	12	3	9
Total	10	100	4	100	8	100	22	100

Source : Public Consultation Survey, JICA

Table VII.6.7 Habitants on Embankment willing to Get the Legal Right

Group	F0 n=10		F1 n=4		F2&3 n=7		Total n=22	
	Yes	%	Yes	%	Yes	%	Yes	%
Landless	6	60	3	75	1	13	10	46
Small	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0
Large	0	0	0	0	0	0	0	0
Very Large	0	0	0	0	0	0	0	0
Sub Total	6	60	3	75	1	13	10	46
Fishermen	2	20	0	0	0	0	2	9
Artisan	1	10	1	25	0	0	2	9
Co-op./NGO	0	0	0	0	0	0	0	0
Local Elite	0	0	0	0	0	0	0	0
Sub Total	1	10	1	25	0	0	2	9
Total	9	90	4	100	1	13	14	64

Source : Public Consultation Survey, JICA

Table VII.6.8 Habitants without Consideration of Damage to Embankment

Group	F0 n=10		F1 n=4		F2&3 n=8		Total n=22	
	No	%	No	%	No	%	No	%
Landless	6	60	3	75	1	13	10	46
Small	0	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0
Large	0	0	0	0	0	0	0	0
Very Large	0	0	0	0	0	0	0	0
Sub Total	6	60	3	75	1	13	10	46
Fishermen	2	20	0	0	0	0	2	9
Artisan	1	10	1	25	0	0	2	9
Co-op./NGO	0	0	0	0	0	0	0	0
Local Elite	0	0	0	0	0	0	0	0
Sub Total	1	10	1	25	0	0	2	9
Total	9	90	4	100	1	13	14	64

Source : Public Consultation Survey, JICA

Table VII.6.9 Habitants taking Embankment Maintenance Care

Group	F0 n=10		F1 n=4		F2&3 n=8		Total n=22	
	No	%	No	%	No	%	No	%
Landless	6	60	3	75	1	13	10	46
Small	0	0	0	0	2	25	2	9
Medium	1	10	0	0	3	38	4	18
Large	0	0	0	0	1	13	1	5
Very Large	0	0	0	0	0	0	0	0
Sub total	7	70	3	75	7	88	17	77
Fishermen	2	20	0	0	0	0	2	9
Artisan	1	10	1	25	0	0	2	9
Co-op./NGO	0	0	0	0	0	0	0	0
Local Elite	0	0	0	0	1	13	1	5
Sub total	1	10	1	25	1	13	3	14
Total	10	100	4	100	8	100	22	100

Source : Public Consultation Survey, JICA

Table VII.6.10 Non-Habitants' Response on Harmful Effects by Embankment Habitation

Items	F0 n=278*	F1 n=320	F2&3 n=145	Total n=743
Code I No.	155	247	99	501
(%)	(56)	(77)	(68)	(67)
Code II No.	76	162	84	322
(%)	(27)	(51)	(58)	(43)
Code III No.	78	118	62	258
(%)	(28)	(37)	(43)	(35)
Code IV No.	10	17	5	32
(%)	(4)	(5)	(3)	(4)
Code V No.	38	5	24	67
(%)	(14)	(2)	(17)	(9)
Code VI No.	54	13	35	102
(%)	(19)	(4)	(24)	(14)
Code VII No.	9	11	4	24
(%)	(3)	(3)	(3)	(3)
Code VIII No.	13	20	14	47
(%)	(5)	(6)	(10)	(6)

Note : n = indicates total no. of respondents

* Excluding the habitants on the embankment

Code :

- I Construction of Residence/house by cutting the slopes of the embankment
- II Cultivation of crops by cutting the slopes hastens the soil-erosion of the Embankment
- III Cattle grazing on the embankment destroy the grass and trees and thereby Weakens the embankment
- IV Use of the embankment as paddy drying and hay stacking yard damages its crest and slopes
- V Roten roots of banana trees planted by the residents create holes in the embankment
- VI Construction of approach roads to the houses of the inhabitants damages the embankment
- VII People cut the embankment to drain out the water logged in the area
- VIII Earth-cutting reduces the height of the embankment

Table VII.7.1 Response on Feeling Shortage of Irrigation Water in Rabi Season

Group	F0(288)		F1(324)		F2&3(153)		Total(765)	
	No.	%	No.	%	No.	%	No.	%
Land Less	4	10	14	27	6	29	24	21
Small	32	84	29	69	15	65	76	74
Medium	30	86	36	86	15	63	81	80
Large	23	72	36	84	13	65	72	76
Very Large	25	89	21	78	5	63	51	81
Sub-total	114	65	136	66	54	56	304	64
Fishermen	2	8	3	12	1	11	6	10
Artisan	4	15	6	24	3	23	13	20
Co-op./NGO	16	57	19	66	10	63	45	62
Local Elite	21	64	28	72	12	63	61	67
Sub-total	41	47	53	57	25	52	119	52
Total	157	55	192	59	80	52	429	56

Source : Public Consultation Survey, JICA

Table VII.7.2 Types of Irrigation Facilities Required by Group

Item	Farmers						Fisher- man	Artisan	NGO Co-op	Local Elite	Total
	Land- less	Small	Medium	Large	Very Large	Total					
(Total No. of Respondents)	(115)	(103)	(101)	(95)	(63)	(477)	(60)	(64)	(73)	(91)	(765)
STW/DTW	No. 22 (%) (19)	76 (74)	78 (77)	73 (77)	55 (87)	304 (64)	8 (13)	14 (22)	45 (62)	69 (76)	440 (58)
Surface Irrigation	No. 11 (%) (10)	44 (43)	44 (44)	45 (47)	30 (48)	174 (36)	6 (10)	9 (14)	29 (40)	43 (47)	261 (34)
Improvement Exis. facilities	No. 3 (%) (3)	13 (13)	11 (11)	13 (14)	9 (14)	49 (10)	4 (7)	5 (8)	9 (12)	14 (15)	81 (11)
Others	No. 3 (%) (3)	8 (8)	7 (7)	10 (11)	4 (6)	32 (7)	0 (0)	3 (5)	7 (10)	8 (9)	50 (7)
Total	No. 39	141	140	141	98	559	18	31	90	134	832

Source : Public Consultation Survey, JICA

Table VII.7.3 Response on Crops to be Irrigated by Group

Item	Farmers						Fisher- man	Artisan	NGO Co-op	Local Elite	Total
	Land- less	Small	Medium	Large	Very Large	Total					
(Total No. of Respondents)	(115)	(103)	(101)	(95)	(63)	(477)	(60)	(64)	(73)	(91)	(765)
Boro(HYV)	No. 19 (%) (17)	74 (72)	77 (76)	77 (81)	51 (81)	298 (62)	10 (17)	15 (23)	42 (58)	71 (78)	436 (57)
Boro(Local)	No. 0 (%) (0)	0 (0)	6 (6)	2 (2)	2 (3)	10 (2)	0 (0)	0 (0)	1 (1)	1 (1)	12 (2)
Wheat	No. 15 (%) (13)	51 (50)	62 (61)	67 (71)	52 (83)	247 (52)	4 (7)	12 (19)	36 (49)	54 (59)	353 (46)
Aus	No. 12 (%) (10)	42 (41)	41 (41)	42 (44)	27 (43)	164 (34)	8 (13)	8 (13)	25 (34)	36 (40)	241 (32)
Potato	No. 6 (%) (5)	15 (15)	23 (23)	31 (33)	24 (38)	99 (21)	0 (0)	3 (5)	13 (18)	26 (29)	141 (18)
Vegetables	No. 4 (%) (3)	9 (9)	13 (13)	15 (16)	11 (17)	52 (11)	0 (0)	2 (3)	6 (8)	10 (11)	70 (9)
Others	No. 9 (%) (8)	16 (16)	22 (22)	22 (23)	17 (27)	86 (18)	0 (0)	5 (8)	11 (15)	18 (20)	120 (16)
Total	No. 65	207	244	256	184	956	22	45	134	216	1373

Source : Public Consultation Survey, JICA

Table VII.8.1 Favourable Views on Irrigation Stulce on the Right Bank of Dharla River Instead of Construction of Dharla Barrage Pumping Plant

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	27 (42)	64	17 (52)	33	9 (21)	43	53 (115)	46
Small	21 (38)	55	31 (42)	74	18 (23)	78	70 (103)	68
Medium	29 (35)	83	26 (42)	62	16 (24)	67	71 (101)	70
Large	26 (32)	81	37 (43)	86	3 (20)	15	66 (95)	69
Very Lagre	19 (28)	68	17 (27)	63	2 (8)	25	38 (63)	60
Sub-total	122 (175)	70	128 (206)	62	48 (96)	50	298 (477)	62
Fishermen	12 (26)	46	18 (25)	72	5 (9)	56	35 (60)	58
Artisan	10 (26)	38	13 (25)	52	4 (13)	31	27 (64)	42
Coop/NGO	18 (28)	64	21 (29)	72	5 (16)	31	44 (73)	60
Local Elite	27 (33)	82	31 (39)	79	9 (19)	47	67 (91)	74
Sub-total	55 (87)	63	65 (93)	70	18 (48)	38	138 (228)	61
Total	189 (288)	66	211 (324)	65	71 (153)	46	471 (765)	62

Note : Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.8.2 Favourable Views on Irrigation by LLPs from Existing Drainage Canals to be Rehabilitated and Used as Irrigation Canals

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	0 (42)	0	7 (52)	13	3 (21)	14	10 (115)	9
Small	37 (38)	97	41 (42)	98	18 (23)	78	96 (103)	93
Medium	29 (35)	83	39 (42)	93	17 (24)	71	85 (101)	84
Large	21 (32)	66	41 (43)	95	13 (20)	65	75 (95)	79
Very Lagre	25 (28)	89	21 (27)	78	5 (8)	63	51 (63)	81
Sub-total	112 (175)	64	149 (206)	72	56 (96)	58	317 (477)	66
Fishermen	10 (26)	38	13 (25)	52	2 (9)	22	25 (60)	42
Artisan	5 (26)	19	3 (25)	12	4 (13)	31	12 (64)	19
Coop/NGO	26 (28)	93	25 (29)	86	12 (16)	75	63 (73)	86
Local Elite	31 (33)	94	33 (39)	85	15 (19)	79	79 (91)	87
Sub-total	62 (87)	71	61 (93)	66	31 (48)	65	154 (228)	68
Total	184 (288)	64	223 (324)	69	89 (153)	58	496 (765)	65

Note : Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.8.3 Favourable Views on Large Scale Irrigation to Provide Irrigation Water from the Beel both for Irrigation and Fishing

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	23 (42)	55	34 (52)	65	13 (21)	62	70 (115)	61
Small	30 (38)	79	33 (42)	79	17 (23)	74	80 (103)	78
Medium	28 (35)	80	27 (42)	64	19 (24)	79	74 (101)	73
Large	29 (32)	91	31 (43)	72	14 (20)	70	74 (95)	78
Very Lagre	18 (28)	64	13 (27)	48	5 (8)	63	36 (63)	57
Sub-total	128 (175)	73	138 (206)	67	68 (96)	71	334 (477)	70
Fishermen	23 (26)	88	17 (25)	68	7 (9)	78	47 (60)	78
Artisan	16 (26)	62	11 (25)	44	5 (13)	38	32 (64)	50
Coop/NGO	17 (28)	61	21 (29)	72	7 (16)	44	45 (73)	62
Local Elite	21 (33)	64	31 (39)	79	9 (19)	47	61 (91)	67
Sub-total	54 (87)	62	63 (93)	68	21 (48)	44	138 (228)	61
Total	205 (288)	71	218 (324)	67	96 (153)	63	519 (765)	68

Note : Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.8.4 Favourable Views on Reconstruction and Improvement of Existing Regulators

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	15 (42)	36	31 (52)	60	7 (21)	33	53 (115)	46
Small	19 (38)	50	31 (42)	74	13 (23)	57	63 (103)	61
Medium	29 (35)	83	28 (42)	67	19 (24)	79	76 (101)	75
Large	31 (32)	97	35 (43)	81	14 (20)	70	80 (95)	84
Very Lagre	27 (28)	96	11 (27)	41	3 (8)	38	41 (63)	65
Sub-total	121 (175)	69	136 (206)	66	56 (96)	58	313 (477)	66
Fishermen	7 (26)	27	3 (25)	12	2 (9)	22	12 (60)	20
Artisan	8 (26)	31	6 (25)	24	7 (13)	54	21 (64)	33
Coop/NGO	17 (28)	61	21 (29)	72	11 (16)	69	49 (73)	67
Local Elite	23 (33)	70	28 (39)	72	9 (19)	47	60 (91)	66
Sub-total	48 (87)	55	55 (93)	59	27 (48)	56	130 (228)	57
Total	176 (288)	61	194 (324)	60	85 (153)	56	455 (765)	59

Note : Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.8.5 Favourable Views on Heightening/Reshaping of Existing Embankment including Repair Works of Public Cut

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	9 (42)	21	0 (52)	0	0 (21)	0	9 (115)	8
Small	19 (38)	50	28 (42)	67	16 (23)	70	63 (103)	61
Medium	31 (35)	89	33 (42)	79	18 (24)	75	82 (101)	81
Large	13 (32)	41	17 (43)	40	11 (20)	55	41 (95)	43
Very Lagre	14 (28)	50	3 (27)	11	4 (8)	50	21 (63)	33
Sub-total	86 (175)	49	81 (206)	39	49 (96)	51	216 (477)	45
Fishermen	12 (26)	46	11 (25)	44	3 (9)	33	26 (60)	43
Artisan	7 (26)	27	12 (25)	48	3 (13)	23	22 (64)	34
Coop/NGO	11 (28)	39	18 (29)	62	8 (16)	50	37 (73)	51
Local Elite	18 (33)	55	21 (39)	54	5 (19)	26	44 (91)	48
Sub-total	36 (87)	41	51 (93)	55	16 (48)	33	103 (228)	45
Total	134 (288)	47	143 (324)	44	68 (153)	44	345 (765)	45

Note : Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.8.6 Reasons for Disagreement with Irrigation by LLPs from Existing Drainage Canals

Reason (Code)	LL	SF	MF	LF	VLF	LE	NGO	Fisher-	Artisan	Total
	No.	No.	No.	No.	No.	No.	Co-op	man	No.	No.
	115	103	101	95	63	91	73	60	64	765
Code I	No.	0	3	12	9	11	16	10	0	61
	(%)	(3)	(12)	(10)	(18)	(18)	(14)	(14)	(0)	(8)
Code II	No.	0	3	10	6	12	17	8	0	56
	(%)	(3)	(10)	(6)	(19)	(19)	(11)	(11)	(0)	(7)
Code III	No.	0	3	8	11	8	14	10	0	54
	(%)	(3)	(8)	(12)	(13)	(15)	(14)	(14)	(0)	(7)

Code :

- I Opposition of the people who are now using silted 'Khals' and 'beels' as their crop land, to re-excavate these silted 'khals' and 'beels'
- II Many lands cannot be irrigated because of topographical difference/reasons.
- III Quite a number of plots of lands cannot be irrigated because of their long distance from the 'Khals' and 'beels'

Table VII.9.1 Respondents Considering Necessity of Cooperatives for Better Management of Surface Irrigation

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	7 (42)	17	9 (52)	17	2 (21)	10	18 (115)	16
Small	21 (38)	55	27 (42)	64	12 (23)	52	60 (103)	58
Medium	17 (35)	49	23 (42)	55	11 (24)	46	51 (101)	50
Large	18 (32)	56	19 (43)	44	9 (20)	45	46 (95)	48
Very Large	13 (28)	46	16 (27)	59	3 (8)	38	32 (63)	51
Sub-total	76 (175)	43	94 (206)	46	37 (96)	39	207 (477)	43
Fishermen	7 (26)	27	7 (25)	28	3 (9)	33	17 (60)	28
Artisan	14 (26)	54	6 (25)	24	9 (13)	69	29 (64)	45
Coop/NGO	18 (28)	64	17 (29)	59	13 (16)	81	48 (73)	66
Local Elite	21 (33)	64	21 (39)	54	16 (19)	84	58 (91)	64
Sub-total	53 (87)	61	44 (93)	47	38 (48)	79	135 (228)	59
Total	136 (288)	47	145 (324)	45	78 (153)	51	359 (765)	47

Note: Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.9.2 Respondents who will not Participate in Irrigation Cooperatives

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	0 (42)	0	0 (52)	0	0 (21)	0	0 (115)	0
Small	14 (38)	37	15 (42)	36	9 (23)	39	38 (103)	37
Medium	18 (35)	51	19 (42)	45	13 (24)	54	50 (101)	50
Large	14 (32)	44	24 (43)	56	11 (20)	55	49 (95)	52
Very Large	15 (28)	54	11 (27)	41	5 (8)	63	31 (63)	49
Sub-total	61 (175)	35	69 (206)	33	38 (96)	40	168 (477)	35
Fishermen	5 (26)	19	3 (25)	12	0 (9)	0	8 (60)	13
Artisan	3 (26)	12	4 (25)	16	0 (13)	0	7 (64)	11
Coop/NGO	10 (28)	36	5 (29)	17	2 (16)	13	17 (73)	23
Local Elite	12 (33)	36	0 (39)	0	3 (19)	16	15 (91)	16
Sub-total	25 (87)	29	9 (93)	10	5 (48)	10	39 (228)	17
Total	91 (288)	32	81 (324)	25	43 (153)	28	215 (765)	28

Note: Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.9.3 Respondents who Agree with Idea of Making Some Contribution through Cooperatives for O&M of Surface Irrigation

Group	F0		F1		F2&3		Total	
	No.	%	No.	%	No.	%	No.	%
Landless	0 (42)	0	0 (52)	0	0 (21)	0	0 (115)	0
Small	19 (38)	50	23 (42)	55	17 (23)	74	59 (103)	57
Medium	16 (35)	46	27 (42)	64	21 (24)	88	64 (101)	63
Large	20 (32)	63	31 (43)	72	17 (20)	85	68 (95)	72
Very Large	11 (28)	39	9 (27)	33	6 (8)	75	26 (63)	41
Sub-total	66 (175)	38	90 (206)	44	61 (96)	64	217 (477)	45
Fishermen	5 (26)	19	3 (25)	12	0 (9)	0	8 (60)	13
Artisan	3 (26)	12	4 (25)	16	0 (13)	0	7 (64)	11
Coop/NGO	12 (28)	43	19 (29)	66	13 (16)	81	44 (73)	60
Local Elite	16 (33)	48	21 (39)	54	15 (19)	79	52 (91)	57
Sub-total	31 (87)	36	44 (93)	47	28 (48)	58	103 (228)	45
Total	102 (288)	35	137 (324)	42	89 (153)	58	328 (765)	43

Note: Figures in parenthesis indicate the total number of respondents in the respective group

Table VII.9.4 Reasons for Non-participation in Irrigation Co-operatives

Reason (Code)	Land-less	Small	Medium	Large	Very Large	Others	Total
	115	103	101	95	63	288	765
Code I No.	0	15	20	29	16	38	118
(%)		(15)	(20)	(31)	(25)	(13)	(15)
Code II No.	0	21	25	34	11	30	121
(%)		(20)	(25)	(36)	(18)	(10)	(16)
Code III No.	0	11	20	26	18	31	106
(%)		(11)	(20)	(27)	(29)	(11)	(14)
Code IV No.	0	17	15	13	14	31	90
(%)		(17)	(15)	(14)	(22)	(11)	(12)
Code V No.	0	24	8	14	12	21	79
(%)		(23)	(8)	(15)	(19)	(7)	(10)

Source: Public Consultation Survey, JICA

Code:

- I No Confidence in Co-operative
- II Irregularity in Water Distribution
- III Co-operative is dominated by Influential Persons.
- IV Nepotism and corruption of the managers
- V Lack of Proper Maintenance of Irrigation Equipment

Table VII.9.5 Reasons for not Willing to Contribute through Cooperatives for O&M of Surface Water Irrigation

Reason (Code)	Land-less	Small	Medium	Large	Very Large	Others	Total
	115	103	101	95	63	288	765
Code I No.	0	37	31	19	31	105	223
(%)		(36)	(31)	(20)	(49)	(37)	(29)
Code II No.	0	41	29	23	29	159	281
(%)		(40)	(29)	(24)	(46)	(55)	(37)
Code III No.	0	43	35	21	36	171	306
(%)		(42)	(35)	(22)	(57)	(59)	(40)

Source: Public Consultation Survey, JICA

- Code I Non-availability of proper accounts of the co-operatives
- Code II Nepotism and corruption of the managers of co-op.
- Code III Dominance of the influential people in the co-op.

Table VII.10.1 Focus Group Discussion, Lalmonirhat, Officer and Public

Thana : Lalmonirhat
Focus Group: Thana Level Officer & Public Representatives
Date: August 19, 1992

1. **Flood and Water Logging Problems:**

Flood occurs at least once a year since 1987. About 75% of the flood affected people take shelter on the embankment. The existing embankment is helpful to protect the floods from the outside the area. However, the water logging caused by heavy rainfall within the embankment has been widely observed. About 15% of the area within the embankment is affected by water logging. The main reason for water logging are (1) lack of proper drainage system, (2) construction of unplanned road, (3) culverts and bridges are smaller compared to the requirement, (4) siltation of the drainage channels, (5) many depression which have little linkage with the drainage system.

2. **Suggestions for Improvement of the Existing FCD Facilities:**

- (1) Desilting and re-excavation of the existing drainage channels,
- (2) Construction of more drainage channels,
- (3) Construction of sufficient linkage channels,
- (4) Regular repair and maintenance of the existing embankment and regulators,
- (5) Increase of the number of regulators and number of vents in the existing regulators,
- (6) Plantation of both sides of the embankment,
- (7) Construction of sufficient sluice gates on the drainage channels, and
- (8) Arrangement for organizing a committee consisting BWDB and local representatives for proper maintenance of the facilities.

3. **Suggestions on the Proposed FCD/I Project:**

Flood Control :

- (1) Repairs of the breaches and public cuts of the embankment are more essential than raising height of the embankment.
- (2) The responsibility for protection and maintenance of the embankment might be given to the chairman of respective parishad.

Drainage Improvement :

- (1) The present drainage systems should be improved by desilting and rehabilitating the present drainage channels and khals.
- (2) The silted-up channels are being used as cropland by the local people. Local administration's help is therefore essential for the re-excavation of these canals.
- (3) The number of regulators should be increased. For proper O&M of the regulators, regular committee should be formed with Union Parishad and local representatives under the supervision of BWDB.
- (4) Chilmari and Ratnai regulators should be repaired with increased vents.

Irrigation Development

- (1) The water availability of the Dharla river during the dry season is scarce. If water is available, the project will be successful.
- (2) Water reservoir should be considered within the command area for water storage.
- (3) The extraction of water from the Dhalra may cause the silting-up the river beds and dredging of the river may become essential.
- (4) Independent irrigation society may be formed with the water users. BWDB and DAE can take responsibility for forming such society with the help of union parishad.

4. **Mobilization of Local Resources for O&M of the Proposed Project**

The people who will benefit from irrigation can contribute some amount in proportion to the benefits received by them.

Table VII.10.2 Focus Group Discussion, Kurigram, Officer

Thana : Kurigram
Focus Group: Thana Level Officer
Date: August 27,1992

1. Flood and Water Logging Problems:

The existing embankment has been helpful in controlling floods of the area. Water logging problem is serious. There is no drainage system. Even there is no any drain in the Dhorma beel and Mogolpasa beel. BWDB has not considered drainage systems at the time of constructing regulators. Therefore, heavy rain causes water logging in the area. Small farmers are mostly affected by floods and water logging problems. No maintenance works has been made properly due to lack of sufficient funds. Situation is getting worse.

2. Suggestions for Improvement of the Existing FCD Facilities:

- (1) Desilting and re-excavation of the existing drainage channels and beels,
- (2) Construction of more drainage channels and linkage channels,
- (3) Proper repair of the embankment with adequate materials (not use of sandy soils),
- (4) Increase of the number of regulators and number of vents in the existing regulators,
- (5) Construction of sufficient sluice gates on the drainage channels,
- (6) Increase in fund allocation for improvement of maintenance works, and
- (7) More close communication between BWDB and local administration for O&M.

3. Suggestions on the Proposed FCD/I Project:

Flood Control :

- (1) Close coordination between BWDB and local authorities will be required for proper maintenance of the embankment.
- (2) Tree plantation on the embankment is hampering for the execution of the maintenance work.
- (3) Sandy soils should not be used for repair of the embankment.

Drainage Improvement :

- (1) The present drainage systems should be improved by desilting and rehabilitating the present drainage channels and khals.
- (2) Linkage channels should be constructed to drain out the stagnant water in the area.

Irrigation Development

- (1) The proposed surface water irrigation with use of LLPs is appreciated. However supply of spare parts for LLPs may be the problem. Credit facilities are also required for purchase of the spare parts, because about 60% of the people have no savings.
- (2) BRDB/BADC should distribute LLPs to the marginal and small farmers on a rental basis.
- (3) Large farmers may not be interested in irrigation because they can not get water charge from the tenant farmers in time. Market prices at the harvest season are generally low.
- (4) Coordination between BWDB and other related agencies will be needed to support the farmers and the landless groups.

4. Mobilization of Local Resources for O&M of the Proposed Project

No comment is given.

Table VII.10.3 Focus Group Discussion, Rajarhat, Officer

Thana : Rajarhat
Focus Group: Thana Level Officer
Date: August 24, 1992

1. **Flood and Water Logging Problems:**

Floods occur almost 2 times a year. Severe attack of floods occurred in 1987, 1988 and 1989. Generally small farmers are affected more adversely. Landless generally faces famine for the damages caused by floods. About 20-25% of the area within the embankment is affected by water logging. Reasons for water logging or floods are (1) smaller regulators compared to the requirement, (2) improper function of Gharial Danga regulator, and (3) a large number of small depressions which have little linkage with the drainage system. There is a breach at Joykumar mauza at Chhinai Union. 3-vent regulator was constructed at Siramaali to avoid the replication of the breach but it has not been repaired yet.

2. **Suggestions for Improvement of the Existing FCD Facilities:**

- (1) Desilting and re-excavation of the existing drainage channels and beels,
- (2) Construction of more drainage channels and linkage channels,
- (3) Repair of the existing regulators,
- (4) Increase of the number of regulators and number of vents in the existing regulators,
- (5) Use of pumps for draining out the stagnant water,
- (6) Regular repair and maintenance of the existing embankment and regulators,
- (7) Regular monitoring of the embankment by respective Union Parishad, and
- (8) More close communication between BWDB and local administration for O&M.

3. **Suggestions on the Proposed FCD/I Project:**

Flood Control :

- (1) Proper maintenance work is more essential than raising the height of the embankment. Breaches caused by the Teesta river are serious.
- (2) Repairing work of the embankment should not be done with sandy soils.
- (3) River training work may be needed.

Drainage Improvement :

- (1) The proposed desilting works of the existing drainage channels are appreciated very much. Local administration should be involved in these desilting works.
- (2) Rehabilitation of the existing regulators will be appreciated very much. The number of regulators and the number of vents should be increased.

Irrigation Development

- (1) The proposed surface water irrigation with use of LLPs is very much appreciated. However there is a question whether not sufficient water can be extracted from the Dharla river.
- (2) Irrigation/drainage channels should be regularly desilted to maintain proper slope.
- (3) Possibility of construction of barrage in the territory of India should not be ignored.
- (4) Coordination between BWDB and other related agencies will be needed. But coordination at the national level is indispensable for the execution of proper coordination at the field level.
- (5) Demonstration farm will be needed. The efficiency of the demonstration scheme will be accelerated involving Union Parishad leadership.

4. **Mobilization of Local Resources for O&M of the Proposed Project**

Most of the people lead their lives below poverty level. Therefore, implementation and maintenance works with voluntary labour does not work. Mobilization of any local fund may also be very difficult. Only the people who will directly benefit by the irrigation may contribute some amount in proportion to the benefits to be received by them.

Table VII.10.4 Focus Group Discussion, Ulipur, Officer

Thana : Ulipur
Focus Group: Thana Level Officer
Date: August 16, 1992

1. Flood and Water Logging Problems:

The existing flood embankment is helpful. However, small floods occur 2-3 times in a year due to poor drainage conditions. Severe attack of floods occurred in 1986, 1988 and 1990. Over-topping occurred during the devastating flood of 1988. Generally small farmers are more adversely affected. During the floods, the people like to stay within their homestead area with help of boat and rafts. Others usually take shelter on the embankment. Water logging problem is more serious than floods. Due to water logging 10-15% of crops are damaged every year. Damaged crops are transplanted Aman, a part of Aus, Jute, Groundnuts and Peppers. Water logging is caused by poor drainage system and low-lying nature of land in this Thana.

2. Suggestions for Improvement of the Existing FCD Facilities:

- (1) Increase in the height of the embankment,
- (2) Plantation on the embankment,
- (3) Placement of boulder by the side of the river where necessary,
- (4) Proper repairing of the existing sluice gates and regulators,
- (5) Increase in drainage capacity of the regulators,
- (6) Desilting, repair and rehabilitation of the existing drainage channels,
- (7) Construction of more drainage channels according to the requirement of the area,
- (8) Construction of linkage channels,
- (9) Installation of pumps to drain out the stagnant water over the embankment, and
- (10) Involvement of Thana and Union Parishads in maintenance of the embankment.

3. Suggestions on the Proposed FCD/I Project:

Flood Control :

- (1) Proper maintenance work is more essential than raising the height of the embankment. There is no public cut in this Thana. Breaches are serious. Sandy soils should not be used for repairing the breaches.
- (2) For proper maintenance of the embankment, local authorities should be involved with BWDB.
- (3) Monitoring of the embankment should be entrusted to the Union Parishad. At present local administration can not play any role in the repair and maintenance of the embankment.

Drainage Improvement :

- (1) The proposed desilting works of the existing drainage channels are appreciated very much. Local administration should be involved in these desilting works.
- (2) Rehabilitation of the existing regulators will be appreciated very much. The number of regulators and the number of vents should be increased.

Irrigation Development

The proposed surface water irrigation with use of LLPs is very much appreciated, because

- (1) the surface water is iron-free while the ground water is with high iron content;
- (2) surface irrigation water will be less costly than the groundwater irrigation; and
- (3) during the peak months of dry season water level goes down and ground water supply drastically becomes low.

4. Mobilization of Local Resources for O&M of the Proposed Project

No specific comment was given.

Table VII.10.5 Focus Group Discussion, Chilmari, Officer

Thana : Chilmari
Focus Group: Thana Level Officer
Date: August 13,1992

1. **Flood and Water Logging Problems:**

The existing flood embankment is helpful. However, small floods occur 2-3 times in a year due to poor drainage conditions. Floods occurred more before construction of the embankment but flood water disappeared quickly. Now with the embankment, floods occurs less but stagnant water stays longer in the area. Generally small farmers are more adversely affected. During the floods, the people like to stay within their homestead area with help of boat and rafts. Others usually take shelter on the embankment. Water logging problem is more serious than floods. About 50% of the area are affected by the water logging problems. Water logging is caused by poor drainage system and low-lying nature of land in this Thana.

2. **Suggestions for Improvement of the Existing FCD Facilities:**

- (1) Desilting, repair and rehabilitation of the existing drainage channels,
- (2) Construction of more drainage channels according to the requirement of the area,
- (3) Construction of linkage channels,
- (4) proper repairing of the existing sluice gates and regulators,
- (5) Increase in the number of regulators,
- (6) Installation of pumps to drain out the stagnant water for the quick disposal,
- (7) Regular maintenance of the embankment,
- (8) Immediate and quick repair of the public cuts and breaches by BWDB, and
- (9) Involvement of local authorities and representatives in the process of regular monitoring with BWDB.

3. **Suggestions on the Proposed FCD/I Project:**

Flood Control :

- (1) Repairs of the breaches and public cuts of the existing embankment is more essential than raising the height of the embankment.
- (2) Height of the embankment should be raised, where necessary, to the extent that can be resist the floods water level of 1988.
- (3) Monitoring of the embankment should be entrusted to the Union Parishad. At present local administration can not play any role in the repair and maintenance of the embankment.

Drainage Improvement :

- (1) The proposed desilting works of the existing drainage channels are appreciated very much. Local administration should be involved in these desilting works.
- (2) Rehabilitation of the existing regulators will be appreciated very much. The number of regulators and the number of vents should be increased.

Irrigation Development

- (1) The proposed surface water irrigation with use of LLPs is very much appreciated, because
 - 1) the surface water is iron-free while the ground water is with high iron content;
 - 2) surface irrigation water will be less costly than the groundwater irrigation; and
 - 3) during the peak months of dry season water level goes down and ground water supply drastically becomes low.
- (2) Coordination between BWDB and other related agencies will be needed. However, coordination at the Thana level will require the same at the national level. The idea of demonstration scheme is appreciated. The scheme should include the training programme of the farmers.

4. **Mobilization of Local Resources for O&M of the Proposed Project**

The people who will benefit from irrigation can contribute some amount in proportion to the benefits received by them.

Table VII.10.6 Focus Group Discussion, Krigram, Public

Thana : Krigram
Focus Group: Public Representatives
Date: August 18, 1992

1. Opinion on the Floods and Water Logging Problems:

- (1) Flood occurs average 3 times a year and 30 times in last 10 years.
- (2) Abnormal floods occurred in 1985, 1988 and 1990, other floods were rather small.
- (3) Small farmers are affected more by floods due to the reduced crop production caused by floods. Rich farmers own some high plots where overcome the flood losses. During floods, landless are unemployed.
- (4) About 35% of land in this Thana are affected by water logging.
- (5) Existing canal siltation, internal unplanned roads, and abandon vents of regulators caused water logging.
- (6) The existing embankment is helpful for flood protection, while it is not effective in controlling internal flood caused by heavy rain.
- (7) The existing regulators function, but insufficient to drain out flood water.
- (8) Drainage channels are silted up and water can not be drained out properly.
- (9) The embankment are cut in some parts by the people affected by water logging.
- (10) The embankment reduced fish resources, while cattle diseases are reduced due to the embankment function on protection and shelter.
- (10) Time consuming and complicated process by the respective Department make the timely repair difficult.

2. Suggestions for the Improvement of Proposed Concept:

- (1) Maintenance works for the embankment, especially earth works, should be undertaken involving local people, local Union Parishad, and NGO.
- (2) Desilting, repair and rehabilitation of the drainage canals should be done.
- (3) The number of regulators and vents should be increased.
- (4) Height of embankment should be raised in some area.

3. Mobilization of Local Resources for O&M of the Proposed Project

Maintenance with voluntary labours does not work properly. Mobilization of any local fund may also be very difficult. Beneficiaries of this locality may contribute some amount to build funds that can be used for operation and maintenance of the project components.

Table VII.10.7 Focus Group Discussion, Rajarhat, Public

Thana : Rajarhat
Focus Group: Public Representatives
Date: August 17, 1992

1. Opinion on the Floods and Water Logging Problems:

- (1) Flood occurs average 2-3 times a year.
- (2) Abnormal floods occurred in 1983, 1987 and 1988, other floods were rather small.
- (3) Small farmers are affected more by floods due to the reduced crop production caused by floods. During floods, landless are unemployed.
- (4) About 50% of land in this Thana are affected by water logging.
- (5) The vents of the regulators are not sufficient, therefore water dose not come out properly. The number of sluice gates is also insufficient.
- (6) The existing embankment is helpful for flood protection.
- (7) The existing regulators do not function properly.
- (8) Drainage channels are silted up and water can not be drained out properly.

2. Suggestions for the Improvement of Proposed Concept:

- (1) Protection and maintenance of the embankment should be guided by the Union Parishads, local elites and other intellectual person of the society.
- (2) Local administration should be involved in repair, maintenance and rehabilitation of the drainage channels.
- (3) The number of regulators should be increased.
- (4) Coordination committee comprising BWDB, DAE, DOF, BRDB and LGED should be organized for proper implementation, operation and maintenance of the proposed FCD/I project.
- (5) Beneficiary groups can be organized under the guidance of BRDB.
- (6) Demonstration for the improved irrigation technology will be needed.

3. Mobilization of Local Resources for O&M of the Proposed Project

Beneficiaries of this locality may contribute some amount to build funds that can be used for operation and maintenance of the project components.

Table VII.10.8 Focus Group Discussion, Ulipur, Public

Thana : Ulipur
Focus Group: Public Representatives
Date: August 16, 1992

1. Opinion on the Floods and Water Logging Problems:

- (1) Floods occur 2-3 times a year on an average.
- (2) Abnormal floods occurred in 1983, 1987 and 1988, other floods were medium scale. Small type of floods are rare.
- (3) Small farmers are affected more by floods due to the reduced crop production caused by floods. During floods, landless are unemployed, and agricultural labour wages decrease.
- (4) About 60% of land in this Thana are affected by water logging. Rain water occurs floods in the area within the embankment.
- (5) Regulators and sluice gates are not enough to drain out the flood water.
- (6) The existing embankment is helpful for flood protection. There is a large breach on the embankment at Dari Kishorpur. The embankment has been broken in Som Narayan and Nandule areas. Some places of the embankment are made by sand, and strength of the embankment is not enough.
- (7) The existing regulators do not function properly.
- (8) Drainage channels are silted up and water can not be drained out properly.
- (9) Some part of the embankment has been weakened by the human habitation.

2. Suggestions for the Improvement of Proposed Concept:

- (1) Regular repairs and maintenance of the embankment should be assured.
- (2) Timely and immediate repairs of the public cuts should be arranged. Embankment cuts by the affected public should be prevented.
- (3) Measures should be taken up by BWDB for quick disposal of the stagnant water.
- (4) Desilting and repairs of the existing drainage channels will be very much appreciated.
- (5) Regulators and sluice gates should be increased.
- (6) Proposed surface irrigation scheme will be very much appreciated because the groundwater drastically goes down during the dry season. LLPs will be less costly than the groundwater irrigation in O&M.
- (6) Coordination between BWDB and local authorities will be needed for the implementation, operation and maintenance of the project components.
- (7) Beneficiary groups can be organized under the guidance of BRDB.
- (8) Demonstration can be taken up in this locality to identify and define the pattern of the involvement and coordination among the Thana officials of the concerned agencies.
- (9) An independent irrigation society under one LLP may be formed with the water users of the locality. The society may get loan from credit agencies with little interest.

3. Mobilization of Local Resources for O&M of the Proposed Project

Beneficiaries of this locality may contribute some amount to build funds that can be used for operation and maintenance of the project components.

Table VII.10.9 Focus Group Discussion, Chilmari, Public

Thana : Chilmari
Focus Group: Public Representatives
Date: August 16,1992

1. Opinion on the Floods and Water Logging Problems:

- (1) Floods occurred 23 time during the last 10 yaers. Abnormal floods occurred 3 times in 1986, 1987 and 1988. Other 15 floods were medium scale and the rest 5 floods were small type of floods. Excessive flood in the rivers, flush flood, heavy shower and water logging are causes of these floods in the area. Overtopping at Patrahata was observed during the devastating flood of 1988.
- (2) Flush floods damage Aus and Jute crops. Late season floods damage transplanted Aman. Small farmers are affected more by floods due to the reduced crop production caused by floods. During floods, landless are unemployed, and agricultural labour wages decrease. After floods, these disadvantages are likely to migrate to other places to seek for job oppourtunity.
- (3) Regulators and sluice gates are not enough to drain out the flood water.
- (4) The existing embankment is helpful for flood protection. There is a large breach on the embankment at Dari Kishorpur. The embankment has been broken in Som Narayan and Nandule areas. Some places of the embankment are made by sand, and strength of the embankment is not enough.
- (5) The existing regulators do not function properly.
- (6) Drainage channels are silted up and water can not be drained out properly.
- (7) The existing embankment is helpful to control flood and the people are mostly benefitted. Overall condition of the embankment is good. Some part of the embankment has been weakened by the human habitation. The embankment at Raman is now facing the danger of break-down because of river erosion.

2. Suggestions for the Improvement of Proposed Concept:

- (1) It is necessary to raise the height and expand the width of the embankment against rain cuts and breaches.
- (2) Large scale plantation on the embankment will also be needed.
- (3) The embankment should be protected from the river erosion by constructing the protective river bund. Regular repairs and maintenance of the embankment should be assured. Sandy soils should not be used for repairs of the embankment.
- (4) Timely and immediate repairs of the public cuts should be arranged. Embankment cuts by the affected public should be prevented. Involvement of Union Parishad will be helpful for better maintenance of the embankment.
- (5) Measures should be taken up by BWDB for quick disposal of the stagnant water.
- (6) Desilting and repairs of the existing drainage channels will be very much appreciated.
- (7) Regulators and sluice gates should be increased.
- (8) Proposed surface irrigation scheme will be very much appreciated because the groundwater drastically goes down during the dry season. LLPs will be less costly than the groundwater irrigation in O&M. In order to reduce the irrigation costs, electrification should be included in the development plan.
- (9) Coordination between BWDB and local authorities will be needed for the implementation, operation and maintenance of the project components.
- (10) Beneficiary groups can be organized under the guidance of BRDB.
- (11) For implementing new irrigation project and to increase production , the farmers should be motivated and trained through a demonstration farm.

3. Mobilization of Local Resources for O&M of the Proposed Project

Beneficiaries of this locality can contribute some amount to build funds that can be used for operation and maintenance of the project components as an "Irrigation charges".

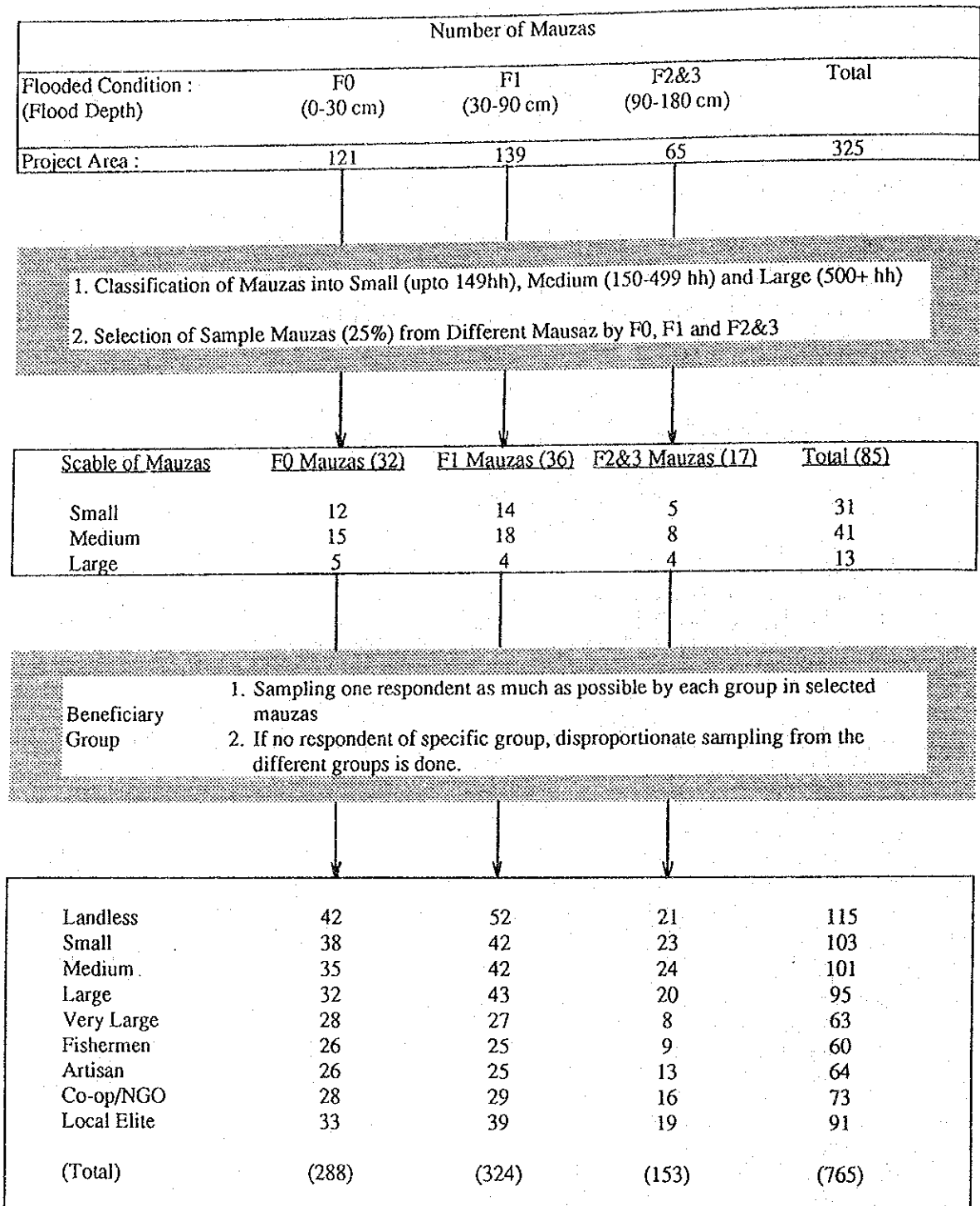
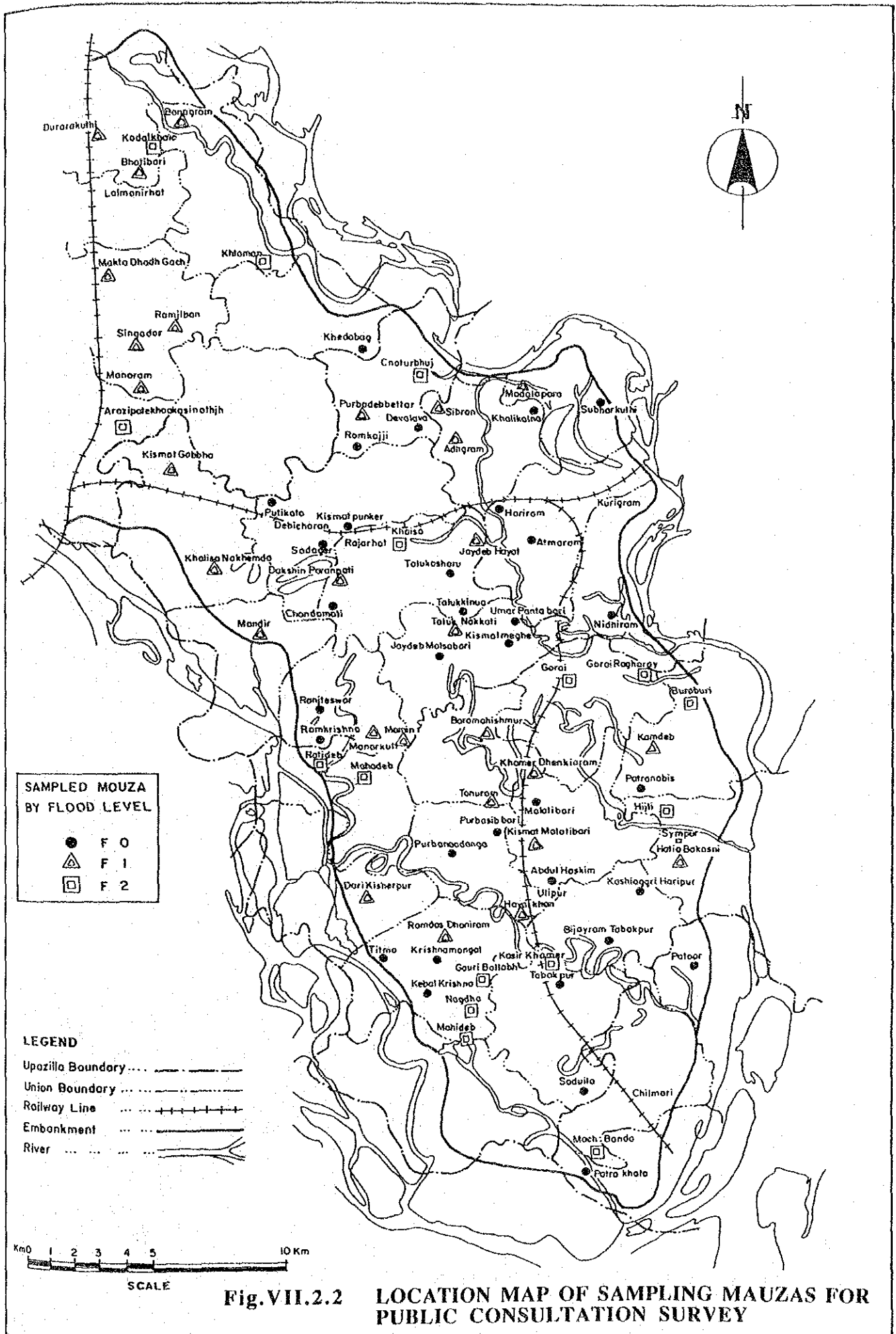


Fig. VII.2.1

**SELECTION OF REPRESENTATIVE BENEFICIARIES FOR
PUBLIC CONSULTATION SURVEY**



APPENDIX - VIII

AGRICULTURE

**FEASIBILITY STUDY ON
KURIGRAM IRRIGATION AND FLOOD CONTROL PROJECT (SOUTH UNIT)**

APPENDIX - VIII AGRICULTURE

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1. Present Condition of Agriculture

1.1 Previous Studies

Land Resources Appraisal of Bangladesh for Agricultural Development was carried out the land suitability assessment of the country on the basis of the past studies and data on land forms, soil, inundation regime, climate, and supplemental survey and studies, under the assistance of UNDP/FAO.

The land suitability assessment was carried out through the Land Resources Appraisal of Bangladesh for Agricultural Development under the assistance of UNDP/FAO during the period of 1979 to 1988. The assessment was made in terms of agroclimatic and agroecological aspects by processing and analysing the data base arranged in the computer on land forms, soil, inundation regime, climate. 34 physiographic units and subunits were recognized in Bangladesh on the basis of the land form characteristics. 483 soil series and 1,034 soil association were identified. Inundation regime were expressed as 11 land types differentiating duration and depth of floods. Climate was characterized as moisture and thermal regimes, and 92 agroecological regions and 535 agroecological units were established. Land suitability was assessed through rating those aspect in each zone or region by ecological requirements and limitation of crops.

There are 3 Ecological Regions in the Study area, namely, Region 2:Active Teesta Floodplain, Region 3:Teesta Meander Floodplain and Region 7:Active Brahmaputra-Jamuna Floodplain, as shown in Fig. VIII.1.1. Region 2 extends over the active floodplain of the Teesta, Dharla and Dudhkumar rivers, and occupies about 8% of the Study area. Region 3 is situated in the major part of the Teesta floodplain as well as floodplains of the Atrai, Little Jamuna, Dharla and Dudhkumar rivers. This region is divided into seven Sub-regions, i.e., North-western (3a), Central (3b), North-eastern (3c), Eastern (3d), Lower Little Jamuna Floodplain (3e), Upper Little Jamuna and Middle Atrai Floodplain (3f), and Lower Atrai Floodplain (3g). However, the Study area covers only two Sub-regions of 3b Central and 3d Eastern Sub-regions, and occupies approximately 63,900 ha or 91% of the Study area. Region 7 comprises the belt of unstable alluvial land along the Brahmaputra-Jamuna river where land is constantly being formed and eroded by shifting river channel, and covers less than 1% of the Study area.

According to the land suitability assessment of Regions 2 and 7, small-scale irrigation like HTWs and STWs are effective to supplement residual soil moisture for rabi crops, however, large scale irrigation and drainage is not feasible because of channel instability. Development constraints and assessment of Region 3 is generally described as follows:

Development constraints

- (i) Drought, infertile, sandy, ridge soils, mainly in Sub-region 3a,
- (ii) Wetness of ridge soils during periods of heavy monsoon rainfall, harmful to kharif and early rabi dryland crops, except on man-made cultivation platforms,
- (iii) Ploughpan and slow drainage of basin soils after rainy season, restricting possibilities for growing dryland rabi crops,
- (iv) Risk of damage to aus and jute when drought occurs,
- (v) Occasional serious floods, especially near rivers and in basin centres,
- (vi) Shortage of surface water for retting jute,
- (vii) Low winter temperature to delay transplanting of HYV boro,
- (viii) Irregular relief and complex soil patterns to provide difficulties for distributing irrigation water,
- (ix) Thick sandy substratum causing seepage losses from irrigation canals and water logging of adjoining basin land,
- (x) Big land ownership,
- (xi) Poor internal road communications, and
- (xii) Remoteness from government, commercial services, urban markets and ports,

- (xiii) Occurrence of earthquakes which requires major structures should be made earthquake proof.

Development possibilities for small-scale irrigation

- (i) HTWs is effective for supplementary irrigation of kharif crops during drought as well as for irrigation of rabi cash crops on ridge soils,
- (ii) Command area of the existing DTWs and DTWs should be expand by linking channels, leveling land and substituting dryland (upland) crops,
- (iii) Irrigated area should be expanded by HTWs or STWs,
- (iv) Sites for lift irrigation from river channel should be identified for irrigating rabi crops,
- (v) HYV boro/aus/aman should be irrigated on impermeable land, on the other hand upland crops should be irrigated on permeable land,
- (vi) Soil and crop management should be improved, and
- (vii) Schemes foe flood protection and drainage should be promoted under Thana or Union administration.

Development possibilities for large-scale irrigation and drainage

- (i) Large part are already protected from river flooding by embankments along Teesta, Dharla and Brahmaputra rivers. Improvements are needed in maintenance, in acquiring land for building retire embankments when existing embankments are threatened by erosion, and in providing sluices/pumps to evacuate rainwater from low areas behind embankments.
- (ii) Large scale irrigation projects should take into account;ridge and basin floodplain relief, occurrence of a sandy substratum, water logging by irrigation, loss of soil bearing capacity, availability of groundwater, earthquakes.

1.2 Land Use

A series of field survey was carried out through observation of field and interviewing local farmers, extension officers and workers, governmental officials related to agriculture. In the rabi (dry) season during January to February 1992, the intensive field interview survey was conducted at 115 points, spread over the Study area. The results of the field interview survey are shown in Table VIII.1.1, and the cropping patterns at each points are shown in Table VIII.1.2. The cropping patterns have quite wide variation by points depending mainly on flood depth (land type), irrigation condition and physiographic position. Fig. VIII.1.2 shows the correlation with cropping patterns and land types by irrigation and rainfed conditions.

In the kharif (monsoon) season during August to September 1992, supplemental field survey was carried out by interview of farmers and observation of the field in order to correct the land use pattern prepared in dry season. 10 typical cropping sequences are generalized by land units, which are combination of land type and soil series described in the current soil survey described in Annex V, as shown Fig. VIII.1.3. Correlation between cropping sequence and land units are shown in Tables VIII.1.3 and VIII.1.4. Present land use map is prepared and compiled in the Drawings in the separate volume. Together with farm interview survey, interpretation of the Spot Images were made in order to estimate irrigated area, as shown in Fig. VIII.1.4.

The Study area is classified into 3 categories namely cultivated area, settlements (including roads, houses, buildings, structures, etc.) and water bodies in terms of land use. The cultivated land is further divided into gross area and net area, as shown below;

Cultivated		Settlement	Water Surface	Total
Gross	Net			
50,500	42,800	7,400	1,500	59,400
85%	72%	12%	3%	100%

The Study area (within the embankment) covers approximately 59,400 ha, of which 42,800 ha (72%) is cultivated. Irrigation facilities are available for 23% of the farm land or 9,800 ha in total as of 1991/92, as follows :

	F0	F1	F2 & F3	Total
Rainfed land	13,100 (31%)	17,200 (40%)	2,700 (6%)	33,000 (77%)
Irrigated land	3,500 (8%)	4,800 (11%)	1,500 (4%)	9,800 (23%)
Total area	16,600 (39%)	22,000 (51%)	4,200 (10%)	42,800 (100%)

1.3 Crop Seasons and Major Crops

The crop seasons comprise the "Kharif" which corresponds to summer and monsoon season (march - September) and "Rabi" which means winter and dry season (October - February). Kharif can further be sub-divided into the early Kharif (March - May) and the Kharif proper (June - September). Introduction of irrigation practices in recent years, also made a sub-division in the "Rabi"; the Rabi proper (October - December) and the late Rabi (January - February). Normally under traditional agriculture, rice and jute predominant in the Kharif season, with winter dryland crops in the Rabi season. The climatic data by 10 days at Rangpur meteorological station are shown on Fig. VIII.1.5.

Rice cultivation is predominant, occupying 76% of the cropped area, followed by jute (10%) and wheat (7%). Minor rabi crops (7%) include oil seeds, potatoes, spices, tobacco, pulses and vegetables. Farmers have various options to grow rice depending the flood conditions in the Kharif season, and availability of irrigation water in the Rabi season. Rice crop is generally categorized as follows:

Aus: Short season varieties grown in the early Kharif season; generally the HYVs (120-130 days) are used and transplanted in March/April and harvested in July/August; broadcasted Aus (local varieties) is rather limited in the area.

Aman: Long season varieties sown in June, transplanted in July/August and harvested in November/December; generally HYVs (140-160 days) are used. Local varieties are also used where flood makes deep inundation.

Boro: HYVs grown normally under irrigated in the rabi season (140-160 days).

1.4 Land Types and Cropping Patterns

The cropping patterns are largely affected by flood level and availability of irrigation water. During the Kharif (summer and wet) season, the farmers can grow HYV rice if the land is free from floods even without irrigation, and on the other hand, if flood affects the rice fields a lot, the farmers sometimes abandon rice cultivation. During the Rabi (winter and dry) season, no rain water is available and the farmers generally utilize the residual soil moisture for growing the rabi crops or grow boro rice under irrigated condition.

Manifold types of cropping patterns are actually practiced with full use of the available resources; however, the cropping patterns can be generalized according to the land types as well as the availability of irrigation water. The cropped area by land type and irrigation

condition is shown in Table VIII.1.5. The generalized cropping pattern under the present condition is illustrated on Fig.VIII.1.6, and summarised as follows:

Generalized Cropping Sequence and Land Types

Land Type (Flooding Depth)	Cropping Sequences	Cropping intensity	Area
Seasonal Flooding 0 - 30 cm	<u>Irrigated</u> HYV Boro - HYV Aman - Rabi crops /Fallow	234%	3,500
	<u>Rainfed</u> HYV.Aus/ Jute - HYV Aman - Fallow /Rabi crops	202%	13,100
	Average/Sub-total	208%	16,600
Seasonal Flooding 30 - 90 cm	<u>Irrigated</u> HYV Boro - HYV Aman - Fallow /Rabi crops	213%	4,800
	<u>Rainfed</u> HYV Aus /Jute - L.T.Aman - Fallow /Rabi crops	182%	17,200
	Average/Sub-total	189%	22,000
Seasonal Flooding > 90 cm	<u>Irrigated</u> HYV Boro - L.T.Aman /Jute - Fallow H.T. Boro - Fallow - Fallow	133%	1,500
	<u>Rainfed</u> Jute /L.B.Aus - L.T Aman /Fallow - Fallow /Rabi crops L.T. Boro - Fallow - Fallow	126%	2,700
	Average/Sub-total	129%	4,200
Total		190%	42,800

sources: mainly based on land use survey, 1992

1.5 Crop Yield and Production

The cultivated areas, crop yields and production of major crops in the Study area is estimated as follows:

Crops	Cultivated area (ha)	Unit yield (ton/ha)	Production (tons)	Crops	Cultivated area (ha)	Unit yield (ton/ha)	Production (tons)
HYV Boro	10,200	3.68	37,500	Jute	4,400	1.48	6,500
L.T.Boro	1,000	1.84	1,800	Sugarcane	1,900	27.00	51,300
HYV Aus	19,500	2.40	46,800	Wheat	3,600	2.03	7,300
B.Aus/L.T.Aus	4,300	1.25	5,400	Oil seeds	1,200	0.60	700
HYV Aman	26,300	2.77	72,900	Pulses	1,000	0.74	700
L.T.Aman	6,100	1.75	10,700	Potatoes	1,000	9.05	9,100
Rice Total	67,400	2.54	175,100	Spices	500	4.84	2,400
				Vegetables	500	6.18	3,100

sources: tentatively estimated on the basis of the preliminary socio-economic baseline survey, 1992

1.6 Livestock Situations

Cattle provides almost all the draught power for cultivation, while their wastes are principal means of replenishing soil nutrients and major source of fuel. Livestock products in the form of milk, ghee, eggs, and meat provide a useful source of protein and cash income. Moreover, livestock is an asset easily converted into cash, and often represent a significant proportion of total farm capital. There are at least 100,000 heads of cattle and nearly 300,000 of sheep and goats in the Study area. Livestock is feeding on crop residues and wasteland natural vegetation. There is a limited potential for increasing animal numbers in the area; a constraint to increasing cattle numbers is the very limited availability of fodder.

1.7 Agricultural Support Services

The Department of Agricultural Extension (DAE) has a District Office at Kurigram. It has a agricultural extension network which reaches down to the union level. In the Study area, the DAE executes the "marginal and small farm systems crop intensification project (MSFSCIP)" with aid from IFAD and Germany, and is very actively working with the RDRS (Rangpur-Dinajpur Rural Service) which is one of the very active NGOs. The MSFSCIP comprises manifold work items such as construction of growth centres and feeder roads, crop development and researches, household credit supports, strengthening of agricultural extension, and enhancement of non-crop activities. The project started in 1987 and will be completed in 1993. The target beneficiaries are defined as all of the "marginal" and "small" farmers in Kurigram District

The BWDB has a regional office at Rangpur and a district office at Kurigram, being responsible for FCD/I projects in respective areas. Large scale surface water irrigation is the responsibility of the BWDB; however, such irrigation development has not been realized in the Study area, on the contrary, small scale irrigation using mainly groundwater resources has been enhanced by various agencies. The lead agency for such minor irrigation development is BADC, with credit supply from BKB. The private sector is also much involved in the minor tubewell development for irrigation.

Six commercial banks operate in the Study area (Sanali, Janata, Agrani, Pubali, Krishi and Grameen banks). The Grameen bank, established to provide credit to the landless, individually or in group, is expanding its operation to all Thana. Other important source of credit is the BRDB cooperative funds which are channeled to the cooperatives mainly for crop loans and purchasing irrigation equipment.

BARI (Bangladesh Agricultural Research Institute) has a regional station at Rangpur, executing the wide field of farming system research. The farm input supplies (seeds, fertilizers and agro-chemicals) are largely privatized in the area. There is a district livestock officer at Kurigram, but the development of livestock services is still at an early stage.

2. AGRICULTURAL DEVELOPMENT PLAN

2.1 Proposed Cropping Pattern and Rotation

Since the Study area is currently cultivated in the maximum available area with high cropping intensity of 190%, the proposed cropping pattern is generally formulated to (1) increase the current cropping intensity, particularly in rabi season, (2) increase yield through introducing high yielding variety and (3) stable agricultural production through expansion of irrigated land utilizing both the surface water and groundwater resources. Crops are selected on the basis of the following considerations :

- (1) Physical and climatic condition as well as present cropping pattern in the Study area,
- (2) National Agricultural Development Policy given in the Fourth Five Year Plan : 1) attainment of self-sufficiency in food, particularly rice, 2) diversification of crops from rice cultivation in terms of improvement of people's nutritional level, and 3) limiting rice cultivation within the lands only available for rice and shifting lands to other crops depending on the suitability,
- (3) Supply of materials for requirement of rural living life for local people,
- (4) Contribution to the national economy and farm income,
- (5) Full use of the effects of the agricultural supporting services projects now under implementation by the various organizations in the Study area.

Rice is selected as the main crop for all the land type and location, and HYV varieties is allocated as much as possible where the maximum potential yield can be attained. HYV Aman is the main crop in the rainy season in F0 land where no severe inundation affects the rice crop, and this crop saves irrigation water supply for rice cultivation by utilizing effective rainfall. Short term variety of HYV Aus is mainly placed before HYV Aman to increase rice cropping intensity. HYV Boro is cropped in F2 & F3 land in the dry rabi season, however, low temperature below 10°C in late December to early January permits transplanting seedlings from late January. Local variety of transplanted Aman (L. T. Aman) is limited to a part of F1 land where HYV Aman can not be planted.

Although current low jute price in the market reduced production value of jute in farm income, jute has important role to supply materials for housing and house keeping in rural living life. Therefore, jute is planned to cultivate in the kharif season under rainfed condition through utilizing summer fallow land for irrigation crops. Dryland crops are concentrated in the rabi winter season with rotation of rice crops. The main rabi crops are wheat, oil seeds (mustard), pulses, potatoes, spices (onion) and vegetables. Those crops are cultivated after Aman rice and harvested before Boro or Aus rice.

Accordingly, higher cropping intensity is applied in higher land types where inundation and flood in the rainy season is not severe. On the contrary, lower cropping intensity is applied in lower land types in order to avoid damage by inundation. Although cropped area of rice in the proposed cropping pattern decreases, rice production increases. Cropped area of dry land crops expands. The proposed cropping pattern is illustrated in Fig. VIII.2.1, and the proposed cropping sequence is summarized below:

Land Type		Cropping Sequence
F0	Triple cropping	HYV Aus/Jute - HYV Aman - Rabi Crops
	Double cropping	HYV Boro - HYV Aman HYV Aus - Rabi Crops
F1	Double cropping	HYV Aus/Jute - Rabi Crops L. T. Aman - Rabi Crops
F2 & F3	Double cropping	HYV Boro - Rabi Crops

2.2 Future Land Use Patterns

The existing cultivated land in the Study area (42,800 ha) is composed of 9,800 ha of irrigated land and 33,000 ha of rainfed land. After implementation of the Project, 25,700 ha of the existing rainfed land will be irrigated by use of both surface and groundwater resources.

The remaining rainfed land (7,300 ha) will not be benefitted by the Project due to the limited water availability. The existing irrigated land of 9,800 ha will be under irrigated condition through improvement of operation and maintenance. As a result, it is proposed that 35,500 ha in total will be irrigated as the Project area as shown below (Table VIII.2.1):

	Proposed	Existing	Difference
1. Total Farm land in the Study area	42,800 ha	42,800 ha	-
2. Irrigation Area	35,500 ha	9,800 ha	21,800 ha
Existing irrigated area	9,800 ha	9,800 ha	-
Surface water by LLP	18,200 ha	0 ha	18,200 ha
STW newly constructed	7,500 ha	0 ha	7,500 ha
3. Rainfed Area	7,300 ha	33,000 ha	-21,800 ha

The present and proposed cropped area within 35,500 ha of the Project area are shown in Tables VIII.2.2 and VIII.2.3 respectively. The total cropped area will expand by about 11,000 ha and cropping intensity will increase from 192% to 224% (Table VIII.2.4), as shown below;

Item	Present Condition				Proposed	
	Irrigated (ha)	(%)	Rainfed (ha)	(%)	Total (ha)	(%)
Total Land Area	9,800	(28)	25,700	(72)	35,500	(100)
Total Cropped Area	20,400		47,900		68,300	
Cropping intensity	<u>208%</u>		<u>186%</u>		<u>192%</u>	
Rice	17,400	(178)	39,000	(152)	56,400	(159)
Jute	100	(1)	3,400	(13)	3,500	(10)
Sugarcane	-	-	1,500	(6)	1,500	(4)
Rabi crops	2,900	(30)	4,000	(16)	6,900	(19)
					32,500	(91)

2.3 Proposed Farming Practices

The proposed farming practices are formulated through modification of the existing data and information collected. Most of farming practice will be carried out by labours and draft animals, as same as the present farming practice.

For rice crops, the nursery period will be 30 days after seeding at the seed rate of 30 kg/ha. Land preparation is carried out by animal power 20 days before transplanting. Fertilizer requirement of HYV rice would be about 200 kg of urea, 100 kg of TSP and 30 kg of potash to achieve maximum potential yield. Fertilizers are applied in basal for land preparation and several top-dressings. Manure, if available, is applied as basal for land preparation. Plant protection should be made as required and minimize to use agro-chemicals. Dry land crops in the rabi season also requires proper application of fertilizer and farm management. Inputs requirement are shown in Tables VIII.2.5 and VIII.2.6.

2.4 Anticipated Yields and Production

Anticipated crop yield is estimated on the basis of the proposed farming practices. The cultivated areas, crop yields and production in the Project area under the present condition and proposed condition are estimated in Table VIII.2.7 and summarized below :

Crop	Present condition			Proposed condition			Increase (ton)
	Area (ha)	Yield (ton/ha)	Production (ton)	Area (ha)	Yield (ton/ha)	Production (ton)	
Total Production			176,000			400,400	224,400
Rice	56,400	-	149,000	38,000	-	167,500	18,500
B./L.T. Aus	3,400	1.25	4,300	-	-	-	-4,300
HYV Aus	15,200	2.40	36,500	9,600	4.30	41,300	4,800
L. T. Aman	4,900	1.75	8,600	6,000	2.80	16,800	8,200
HYV Aman	22,000	2.77	60,900	12,000	4.70	56,400	-4,500
L. T. Boro	800	1.84	1,500	-	-	-	-1,500
HYV Boro	10,100	3.68	37,200	10,400	5.10	53,000	15,800
Jute	3,500	1.48	5,200	9,000	1.57	14,100	8,900
Sugarcane	1,500	27.00	40,500	-	-	-	-40,500
Rabi crops	6,900	-	21,800	32,500	-	218,800	197,000
Wheat	2,900	2.03	5,900	8,400	3.25	27,300	21,400
Oil Seed	1,100	0.60	700	4,600	1.40	6,400	5,700
Pulses	900	0.74	700	3,000	1.20	3,600	2,900
Potatoes	1,000	9.05	9,000	9,700	13.00	126,100	117,100
Spices	500	4.84	2,400	3,400	5.70	19,400	17,000
Vegetables	500	6.18	3,100	3,400	10.60	36,000	32,900

(Note: rice yield and production are measured in paddy.)

Increased production under the project will be consumed in the project area, and marketable surplus will be traded out of the Project area. This will contribute improvement of income of farmers and nutrient condition of the local people. It is estimated that several thousand tons of rice, potatoes and vegetables will be transported to North West region and other region of the country.

Table VIII.1.1 Results of Field Interview Survey (1/4)
(January to February, 1992)

No.	Alt. (ft.)	Flood Level (ft.)	Irrigation		Cropping Pattern	Remarks
			DTW	STW		
1	104	2-3	-	-	L.B.Aus -L.T.Aman	
2	102	3-4	-	+	H.Boro-L.T.Aman	
	104	1-2	-	+	Wheat-Jute, Mustard-H.Boro-L.T.Aman	
3	102	3-4	-	+	Braus(late H.Boro/early Aus)-T.Aman	STW is No Good for Sandy Soil.
	104	1-2	-	+	Dhemshi-T.Aus-Aman	
4	101	3-4	-	+	H.Boro-T.Aman (50% L, 50% H)	(Some Portion : Sugarcane)
5	100	2-3	-	+	Tobacco/Potato-H.Aus-H.T.Aman	
6	96	2-3	-	+	H. Boro-T.Aman	Old River Bed
	95	3-4	-	+	H.Boro	
7	103	1	+	+	H. Boro-H.T.Aman	Small Portion(around Village) (Some Portion : Sugarcane)
	101	3-4	+	+	H. Boro-L.T.Aman	
8	104	1-2	-	+	H.Boro-T.Aman (50% L, 50% H)	
	99	4	-	+	Tobacco-(fallow) -T.Aman Wheat-Jute, Tobacco-Jute-Rhabi Crop	
9	105	1-2	+	+	Wheat/Tobacco-Jute	(Some Portion : Mustard Oct.-Jan/Feb)
					Wheat/Tobacco-L.T.Aman	
10	97-98 (101)	5-6 (6-7) 3-4)	?	?	75% H. Boro, 25% Jute-H.T.Aman (Small portion : Mustard-H.Aus-H.T.Aman)	Small portion : Cereal (Kawn)
11	99-101 (105)	2-4 1)	-	+	80% H.Boro-T.Aman (40% L, 60% H) 20% Tobacco-L.Aus-H.T.Aman	
12	100	1-2	-	-	Kaun-L.B.Aman, Wheat-Jute	
13	105	1-2	-	+	H. Boro-H.T.Aman	only small portion(<10%)
					Tobacco/Wheat/GroundNuts-Braus/Jute-L.T.Aman	
14	102	1-2	-	+	H.Boro-T.Aman (60% L, 40% H)	(Small Portion : Tobacco)
15	104	0	+	+	Tobacco-H.Braus-T.Aman (75% H, 25% L) Wheat-Jute	
16	93-97	5-6	-	+	60% H.Boro only, 40% H.Boro-L.B.Aus 60% Tobacco-L.B.Aus, 40% Wheat-Jute	60% 40%
	96-98	3-4	-	+	H.Boro-H.T.Aman Tobacco-L.B.Aus/Jute-H.T.Aman	60% 40%
17	99	4	-	+	H.Boro-T.Aman (20% L, 80% H) Tobacco/Wheat-B.Aus/Jute-L.T.Aman	25% 75% (No Irrigation)
18	104	1-2 (5mon.)	-	+	H.Boro-T.Aman (50% L, 50% H) Tobacco/Wheat-L.B.Aus/Jute-T.Aman	75% 25%
	100	3-3.5	-	+	75% L.Boro-H.T.Aman, 25% L.Boro only	
19	91-92	2-3 (3mon.)	-	-	B.Aus/Jute-T.Aman (75% L, 25% H)	No Flood Problem
20	90-91	1-1.5	-	+	H.Boro-T.Aman (25% L, 75% H)	No Flood Problem
21	99	2-4	-	+	H. Boro-H.T.Aman	
22	94	5 (1mon.)	-	+	H. Boro-L.T.Aman	10-15days 3-4times
	96	3-4 (1mon.)	-	+	H. Boro-H.T.Aman	10-15days 3-4times
23	100	4	-	-	75% B.Aus/Jute-L.T.Aman 25% L.T.Boro-L.T.Aman	(Small Portion : Wheat) 3-5days 2-3times
24	94-96	1-2 (1.5mon.)	-	-	25% H. Boro-T.Aman, 75% B.Aus-T.Aman (Some Portion : Wheat-Jute)	No Irrigation : Sandy Soil
25	92	4	+	+	H. Boro-H.T.Aman	7-10days 1-3times
26	89-91	1-3	+	-	H. Boro-H.T.Aman	75%
					Wheat-Jute/L.B.Aus-H.T.Aman	25%
27	87	5-6	+	+	25% H. Boro-L.T.Aman	8-10days 3-5times Need : Supplemental Transplant
					75% L.B.Aus-L.T.Aman	
28	93	2-3	-	+	H.Boro-T.Aman (50% L, 50% H) (No STW Portion : Jute)	5days 2-3times
29	88	4-5	+	-	H.Boro-T.Aman (50% L, 50% H)	8-10days Only 1times
	92	1	+	-	Wheat-Jute-T.Aman (Small Portion)	
30	88-89	2-3	?	?	H.Boro-T.Aman (20% L, 80% H)	20% : 10 month Moisture High
	87				H. Boro only	

Table VIII.1.1 Results of Field Interview Survey (2/4)
(January to February, 1992)

No.	Alt. (ft.)	Flood Level (ft.)	Irrigation		Cropping Pattern	Remarks
			DTW	STW		
31	88	4-5 (5mon.)	?	?	50% Wheat-Jute, 50% B. Aus	River Old Course (Deepest 6-7ft.) Only near the Village 1-2ft.(97)
32	90	5-6 (0.5-1)	?	?	H.Boro-T.Aman (50% L, 50% H) Wheat-H.Braus	(Small Portion : Tobacco) Only near the Village 0ft.
33	97 (94)	1-2 4-5)	?	?	25% Wheat-Jute/B.Aus-H.T.Aman/Mustard/Potato 75% H.Boro-T.Aman (10% L, 90% H)	
34	90	4-5(2mon.)	?	?	75% H.Boro-T.Aman (25% L, 75% H) 25% Wheat-Jute-L.T.Aman	1-2ft. 10days
35	85	3-4 (6-7)	-	+	25% H.Boro-H.T.Aman 50% Aus-H.T.Aman 25% Wheat-Jute/Aman	Deepest Area : 6-7ft. 1-2ft.Continuc Damage to H.T.Aman
36	88 (85)	2 6-7)	-	+	50% H.Boro-T.Aman (20% L, 80% H) 50% Jute-H.T.Aman	Deepest Area : 6-7ft. (15days/1month)
37	87	1-2 (1-1.5)	-	-	Jute-T.Aman (25% L, 75% H) Wheat/Potato-Jute-H.T.Aman	
38	86	3-4	-	+	H.Boro-T.Aman (20% L, 80% H) (Some Portion Jute-T.Aman)	Some Portion Damage to T.Aman Every Year Damage to T.Aman
39	87	3	+	+	H.Boro-T.Aman (25% L, 75% H) Wheat-Jute-T.Aman, Mustard/Potato-Seed Bed	
40	91 (85)	2-3 (3-4) 6-7)	+	-	60% H.Boro-T.Aman (25% L, 75% H) 40% Wheat/Potato-Jute/B.Aus-T.Aman	Late Planting T.Aman (July/Aug.-Sept.)
41	91	1-1.5 (2-2.5)	+	+	H.Boro-T.Aman (20% L, 80% H) Wheat-Jute-L.T.Aman	1 week 2-3times After Jute LTA (Period Problem)
42	91	2-3	-	-	B.Aus-T.Aman (10% L, 90% H) Wheat-L.Jute-H.T.Aman	
43	88 87	3-4 (25%) 5-6 (75%)	-	+	H.Boro-H.T.Aman H.Boro-L.T.Aman	3-4month 1-2ft. (Local planting later than HYV)
44	90 (88)	3-4 6-7)	-	+	Braus-L.T.Aman Wheat-Jute-L.T.Aman	
45	90	2-3 (3mon.)			H.Boro-T.Aman (75% L, 25% H)	Local : due to stagnant water (2ft.)
46	98	4-4.5	?	?	H.Boro-(T.Aman Seedling) H.Boro-T.Aman (2-3ft. L, 1-1.5ft. H) (Small Portion : Wheat-Jute, Tobacco-Braus)	1-1.5ft. 3month Continuc Treadle Pump
47	93	3 (3-4mon.)	?	?	Wheat/Tobacco/Potato-B.Aus-T.Aman (Higher portion : HYV, Lower portion : Local)	Need : Supplemental planting But 1/3years Damage
48	89	5-6	-	+	H.Boro-L.T.Aman (Sup. Planting but Damage, so low Production)	1.5-2ft. 3month
49	88	2-3	-	-	B.Aus-L.T.Aman (Small Portion : Wheat/Potato-B.Aus-L.T.Aman)	
50	88	0	+	+	H.Boro-T.Aman (25% L, 75% H)	
51	88 (85-86)	1-1.5 2-3)	-	+	H.Boro-T.Aman (20% L, 80% H)	
52	86	1-2 (3mon.) (Not Enough)	+	+	H.Boro-T.Aman (50% L, 50% H) (Near the River : Local, due to higher water) (Opposite the River remain water, but low)	2.5ft. 10-12days 3times
53	85-87 (82-84)	3-4 (3mon.) 6)	+	+	50% H.Boro-T.Aman (75% L, 25% H) Wheat-Jute(50% L, 50% H)	20Days
54	83	5-6 (Deepest)	+	-	H.Boro-T.Aman (50% L, 50% H) H.Boro only)	10-20days 3-4times HYV : 1/3years can harvest
55	83 (85)	2-3 (1mon.) 1-2)	-	+	H.Boro-T.Aman (75% L, 25% H)	15days 2-3times
56	81	4-6 (3mon.) 3-4.5	-	+	L.Boro only H.Boro-L.T.Aman	
57	80	5-6	-	+	L.Boro, H.Boro (No Aman)	10ft. (by location)
58	86	3 (4-4.5)	+	+	H.Boro-H.T.Aman (Planting Period : 1-1.5ft.)	Before Construction DTW : B.Aus-Wheat
59	85	3 (3mon.)	-	+	H.Boro-H.T.Aman (Sup.Plant 2times)	5-7days 5-7times

Table VIII.1.1 Results of Field Interview Survey (3/4)
(January to February, 1992)

No.	All. (ft.)	Flood Level (ft.)	Irrigation		Cropping Pattern	Remarks
			DTW	STW		
60	88	3-4	-	+	H.Boro-T.Aman (25% L, 75% H) (Late Planting)	
61	87	1-1.5	-	+	H.Boro-T.Aman (50% L, 50% H) (Small Portion : Wheat/Onion-Jute-T.Aman)	
	83	5 (Swamp)			H.Boro only	
62	85	4-4.5 (2-2.5)	-	+	H.Boro only (Late Planting T.Aman Damage) (only small portion : H.Boro-LTA)	along the River , income low area
63	83	1-2.5	-	+	H.Boro-T.Aman (70% L, 30% H) (Small Portion : Wheat-Braus/Jute-T.Aman)	10-15days 3-4times
64	84	2 (3mon.)	+	+	H.Boro-T.Aman	
65	87	1-2 (75%)	+	+	H.Boro-H.T.Aman	
	83	2-3 (25%)	+	+	H.Boro-L.T.Aman (Small Portion : Wheat-Jute-T.Aman)	
	81	5 (near Pond)	+	+	H.Boro only	
66	87	1-2 (50%)	-	+	H.Boro-H.T.Aman	10days
	85	3-3.5 (50%)	-	+	H.Boro-L.T.Aman	
	(84)				Near Water : H.Boro only)	
67	85	1-3 (3mon.)	?	?	H.Boro-T.Aman (20% L, 80% H) Wheat-H.Boro-H.T.Aman	
68	85	3-4 (3mon.)	-	+	H.Boro-T.Aman (50% L, 50% H), (Small Portion : Wheat)	
69	80-82	5-10	-	+	H.Boro only	
70	83	3-3.5	+	+	H.Boro-T.Aman (40% L, 60% H) (Sometimes Sup. Plant)	10-15days 3times
71	83	3-4	-	+	H.Boro-T.Aman (Local < 85ft. < HYV)	
72	85	2	+	+	H.Boro-L.T.Aman (HYV small portion) (85ft.>H.Boro only)	
73	83	4-5	+	+	H.Boro-T.Aman (60% L, 40% H) (82ft.>H.Boro only)	
74	83	2-4 (3mon.)	+	+	83ft.<H.Boro-T.Aman (50% L, 50% H) 83ft.>H.Boro-T.Aman (80% L, 20% H)	
	81	5-6	+	+	H.Boro only	
75	83	2-3	-	-	H.Boro-T.Aman (30% L, 70% H)	
	80	4-5	-	-	H.Boro-T.Aman (75% L, 25% H) (deepest portion H.Boro only)	
76	81	2-3 (3-4mon.)	-	+	H.Boro-L.T.Aman, Jute-L.T.Aman (>83ft.)	
	78-80	4-6 (3-4mon.)	-	+	H.Boro-L.T.Aman (Late Planting)	
77	77-78	5-6	-	+	Wheat-L.T.Aman, Jute/Aus-L.T.Aman	1/3 years can harvest
78	78-81	3-5	?	?	H.Boro-L.T.Aman (2-3times Planting)	10-15days 3times
79	82	3-4	+	-	H.Boro-T.Aman (80% L, 20% H) (82ft.>H.Boro only)	Before Embankment 7-8ft.
80	82	5-6	+	-	H.Boro only	Flood Condition No Good
81	82-83	3-3.5	-	+	H.Boro-T.Aman (75% L, 25% H) (Late Planting) Aus/Jute	Constant Flood (Mid.Sep. 2ft.)
82	83	3-4	-	+	H.Boro-L.T.Aman (small : HYV)	(Late Planting and Low Production)
83	79	3-4	+	+	H.Boro-H.T.Aman (79-80ft.) H.Boro-L.T.Aman (77ft.) (Late Planting)	Up to Sep./Oct. 2.5-3ft.
84	79-80	3	-	+	H.Boro-T.Aman (25% L, 75% H)	3ft. 4-5days , 1ft. for 3month
85	77	3-4 (4mon.)	-	+	50% L.Boro only 20% B.Aus - T.Aman L, 25% 30% Jute H. 75%	
	85		-	-	30% H.Boro H. 15% 35% B.Aus - T.Aman L. 15% 35% Jute (Fallow 70%)	
86	82-83	4-5	-	+	H.Boro-L.T.Aman , Wheat only	North (4-5ft.)
					H.Boro-T.Aman	South (4ft.)
87	80	2-3 (3-4)	-	+	(High) Jute/B.Aus-H.T.Aman	
					(Low) H.Boro-L.T.Aman	
	77		-	+	H.Boro only	

Table VIII.1.1 Results of Field Interview Survey (4/4)
(January to February, 1992)

No.	Alt. (ft.)	Flood Level (ft.)	Irrigation		Cropping Pattern	Remarks
			DTW	STW		
88	83 81-82	5-6	? ?	? ?	Wheat-H.T.Aman, Wheat-Jute/Aus Aus/Jute-H.T.Aman	
89	78 77	4-5	- -	- +	Aus/Jute-L.T.Aman (High Water during Planting) 25% H.Boro -T.Aman 70% Local 75% Aus/Jute 30% HYV	
90	77-78	5-6	? ?	? ?	30% Aus / 70% Jute-L.T.Aman (Late Planting)	
91	81-82	3-4	- -	- +	30% Aus / 70% Jute-L.T.Aman H.Boro-T.Aman (50% L, 50% H)	
92	76	5-10	+ -	- -	H.Boro (Only near the Village : L.T.Aman) L.Boro (Only near the Village : L.T.Aman)	
93	78	3-4	+ +	+ +	H.Boro-L.T.Aman	After 7days 2ft. 3-4times
94	76-78	3-4	+ +	+ +	75% H.Boro -T.Aman 75% Local (low) 25% Wheat-Jute- 25% HYV (high)	
95	76-77	4-6	- -	+ +	H.Boro-50% T.Aman / 50% Fallow Wheat (Sandy Soil)	
96	74-75	3-5	- -	+ +	H.Boro-50% L.T.Aman / 50% Fallow	
97	76	3	+ +	+ +	H.Boro-T.Aman (25% L, 75% H)	
98	82	4-5	- -	- -	B.Aus-Fallow (low) Wheat-Jute-Fallow (high)	
99	83	3.5 (3.5mon.)	+ +	+ +	80% H.Boro-L.T.Aman 20% Wheat-H.T.Aman	
100	77 79	2-3 (1mon.) 2-3	+ -	+ -	20% H.Boro 40% Jute -T.Aman 75% Local 40% B. Aus 25% HYV 50% Aus /50% Jute-L.T.Aman (HYV<5%)	2-3times Rainwater
101	80 75	3-4 5-6	+ +	- -	L.B.Aus & L.B.Aman (Deep Water Rice) H.Boro only	Mix Seed and Separate harvest
102	79	2-4	- -	+ +	70% H.Boro-L.T.Aman 30% Wheat-Jute-L.T.Aman	10days 2-3times
103	74-76 74	3-4 5-6	- -	- +	Wheat-Jute-L.T.Aman H.Boro only	5-7days 3-4times
104	75 74	3 6	+ +	+ +	H.Boro-70% L.T.Aman (70%), 30% Fallow H.Boro only	>75ft. Fallow 10-15days 2-3times
105	77-78 76	3-4 5-6	- -	- -	60% H.Boro, 40% Wheat-L.T.Aman H.Boro only	Treadle Pump
106	75-79	3 (60%) 3-4 (40%)	- -	- +	Wheat/Fallow-Jute-L.T.Aman/Fallow H.Boro- L.T.Aman	River Course 7ft.
107	76 77-78	5-9 4-6	- -	+ -	80% H.Boro, 20% Wheat-T.Aman (60% L, 40% H) Wheat-Jute, H.Boro only	5-10Days 5-7times 4month
108	78	2-3 5	+ +	+ +	H.Boro-T.Aman (75% L, 25% H) H.Boro- L.T.Aman	
109	79 (80)	4-5 3-4)	+ +	+ +	H.Boro- L.T.Aman Wheat-Jute- L.T.Aman	Late Planting (late Sept.)
110	80	3.5-4.5	+ +	+ +	H.Boro- L.T.Aman (Small Portion : Wheat-Jute)	
111	78 80	5-6 2-3 (6mon.)	- +	- +	Wheat-Jute H.Boro- L.T.Aman (Small Portion : Wheat)	Sometimes Damage to Jute
112	80 83-84	4-5 (3-4mon.) 2-2.5	- -	- -	30% Wheat-Jute- L.T.Aman 70% Jute- L.T.Aman 40% Wheat-Jute- L.T.Aman 60% Jute	Reason why not plant all area : It is too hard to plow all field
113	80-82	2-4	- -	- -	30% Wheat-Jute- L.T.Aman 70% Jute- L.T.Aman	Sandy Soil
114	78-81	5-6	- -	+ +	H.Boro- L.T.Aman (Late Planting)	15days 3 -4times Even on the Road 2ft.
115	82 79	3-5 6-9	? ?	? ?	25% Wheat-Jute- L.T.Aman 75% Jute- L.T.Aman 30% H.Boro only 70% Jute- L.T.Aman	

Table VIII.1.2_C.P.bySurvey

Table VIII.1.2 Cropping Pattern by Observation Point (1/5)

(January to February, 1992)

Thana	Union	Point No.	Location		Altitude (ft.)	Flood level	Irrigation		Cropping Pattern	Aman Variety		
			Latitude	Longitude			DTW	STW				
Lalmonirhat												
	Barabari	7	25°52.59'N	89°30.32'E	103	F0	o	o	B	H		
					99	F2	o	o	B	L		
	Gukunda	16	25°48.27'N	89°27.07'E	93 - 97	F2	-	o	B C-2 C-3 D	-		
					96 - 98	F2	-	o	A B	H		
		21	25°49.34'N	89°27.70'E	97	F2	-	o	B	H		
		46	25°48.24'N	89°27.49'E	98	F2	-	-	B C-3	M		
	Kulaghat	5	25°55.68'N	89°30.15'E	100	F1	-	o	A	H		
					96	F1	-	o	B	M		
					95	F2	-	o	C-3	-		
	Lalmonirhat	1	25°55.11'N	89°27.72'E	104	F1	-	-	B	L		
					102	F2	-	o	B	L		
					104	F1	-	o	A C-3	L		
	Mogalhat	3	25°55.95'N	89°27.70'E	102	F2	-	o	B	M		
					104	F1	-	o	A	M		
		4			25°55.50'N	89°27.31'E	101	F2	-	o	B	M
		9			25°59.09'N	89°27.47'E	105	F1	o	o	C-2 D	L
		10			25°57.97'N	89°27.57'E	97 - 98	F3	-	o	C-2 C-3	H
						101	F2	-	-	-	A	H
		11			25°58.18'N	89°28.08'E	99 - 101	F2	-	o	A B	HL
		12			25°57.98'N	89°28.51'E	100	F1	-	-	C-2 D	L
		13			25°57.30'N	89°27.01'E	105	F1	-	o	B	H
					Mohendranagar	8	25°52.18'N	89°28.57'E	104	F1	-	o
99	F2		-	-					C-2 D	M		
14	25°53.66'N		89°27.19'E	102		F1			-	o	B	LH
15	25°53.64'N		89°28.36'E	104		F0			o	o	A D	HL
18	25°51.58'N		89°28.59'E	104		F1			-	o	A B	M
		100	F2	-	o	B C-3	H					
	Panchagram	17	25°50.51'N	89°28.62'E	99	F2	-	o	A B	LH		
					91 - 92	F1	-	-	B	LH		
		20			25°48.97'N	89°29.99'E	90 - 91	F1	-	o	B	HL
		23			25°51.57'N	89°30.51'E	100	F2	-	-	B	L
		24			25°49.46'N	89°30.63'E	94 - 96	F1	-	-	B	M
		25			25°49.90'N	89°30.99'E	92	F2	o	o	B	H
Rajarhat												
	Bidayanand	40	25°46.63'N	89°32.28'E	91	F2	o	-	A B	HL		
					91	F1	o	o	B C-1	HL		
					48	25°45.55'N	89°31.09'E	89	F2	-	o	B
		39	25°46.76'N	89°34.13'E	87	F1	o	o	B C-1	HL		
	Chhenai	28	25°51.05'N	89°32.02'E	93	F1	-	o	B	M		
					90	F2	-	o	B C-2	M		
					33	25°52.15'N	89°32.75'E	97	F1	-	o	A B
	Ghorialdanga	22	25°48.10'N	89°29.50'E	94	F2	-	o	B	L		
					96	F2	-	o	B	H		
		45			25°47.70'N	89°30.24'E	90	F1	-	-	B	LH
		47			25°46.47'N	89°29.90'E	93	F1	-	-	A	M

Legend of cropping pattern is shown in Table VIII.1.2 (5/5)

Table VIII.1.2_C.P.bySurvey

Table VIII.1.2 Cropping Pattern by Observation Point (2/5)

(January to February, 1992)

Thana	Union	Point No.	Location		Altitude (ft.)	Flood level	Irrigation		Cropping Pattern	Aman Variety
			Latitude	Longitude			DTW	STW		
Rajarhat										
	Najimkhan	42	25°45.07'N	89°32.30'E	91	F1	-	-	B C-1	HL
		43	25°44.73'N	89°31.61'E	88	F2	-	0	B	H
					87	F2	-	0	B	L
		49	25°43.36'N	89°32.21'E	88	F1	-	-	B	L
		50	25°44.39'N	89°34.08'E	88	F0	0	0	B	HL
	Rajarhat	26	25°43.43'N	89°31.40'E	89 - 91	F1	0	-	A B	H
		27	25°48.84'N	89°32.89'E	87	F2	0	0	B	L
		30	25°49.77'N	89°34.66'E	88 - 89	F1	-	0	B	HL
					87	F1	-	0	C-3	
	Umarmajid	44	25°47.05'N	89°31.60'E	90	F2	-	0	B C-1	L
		51	25°46.00'N	89°34.42'E	88	F0	-	0	B	HL
		52	25°45.75'N	89°35.51'E	86	F0	0	0	B	M
		53	25°45.33'N	89°36.92'E	85 - 87	F2	0	0	D	LH
				82 - 84	F2	0	0	B	M	
Kurigram										
	Belgachi	36	25°47.76'N	89°36.94'E	85 - 88	F1	-	0	B C-2	HL
		37	25°46.48'N	89°36.78'E	87	F0	-	-	C-1 C-2	HL
		38	25°46.97'N	89°36.20'E	86	F2	-	0	B	HL
		68	25°46.74'N	89°37.65'E	85	F2	-	0	B	M
	Holokhana	34	25°50.71'N	89°37.27'E	90	F2	-	0	B C-1	HL
		35	25°49.57'N	89°38.20'E	86 - 88	F2	-	0	B D	H
	Kanthalbari	29	25°49.06'N	89°35.09'E	88	F2	0	-	B	M
		31	25°50.86'N	89°34.54'E	88	F2	-	-	C-3 D	-
	Maghalbasha	69	25°46.55'N	89°38.32'E	80 - 82	F3	-	0	C-3	-
		70	25°45.56'N	89°39.51'E	83	F2	0	0	B	HL
		71	25°45.32'N	89°39.38'E	83	F2	-	0	B	M
Ulipur										
	Buraburi	75	25°43.80'N	89°39.86'E	83	F1	-	-	B	HL
					80	F2	-	-	B	LH
		76	25°43.81'N	89°40.68'E	81	F1	-	0	B C-2	L
					78 - 80	F2	-	0	B	L
		115	25°42.15'N	89°39.80'E	82	F2	-	-	C-1 C-2	L
				79	F3	-	-	C-3 C-2	L	
	Bazra	90	25°35.75'N	89°36.35'E	77 - 78	F2	-	-	B C-2	L
		94	25°35.53'N	89°37.80'E	76 - 78	F2	0	0	B C-1	LH
	Daldolia	59	25°41.71'N	89°33.14'E	87	F2	-	0	B	H
		60	25°42.05'N	89°33.51'E	86	F2	-	0	B	HL
		61	25°41.87'N	89°34.24'E	87	F1	-	0	B	M
					83	F2	-	-	C-3	-
	Dhamsreeni	108	25°39.38'N	89°39.95'E	78	F1	0	0	B	LH
						F2	0	0	B	L
		110	25°39.89'N	89°38.86'E	80	F2	0	0	B	L
		111	25°38.97'N	89°38.74'E	78	F2	-	-	D	-
					80	F1	0	0	B	L

Legend of cropping pattern is shown in Table VIII.1.2 (5/5)

Table VIII.1.2 Cropping Pattern by Observation Point (3/5)

(January to February, 1992)

Thana	Union	Point No.	Location		Altitude (ft.)	Flood level	Irrigation		Cropping Pattern	Aman Variety	
			Latitude	Longitude			DTW	STW			
Ulipur	Dharnibati	67	25°41.60'N	89°37.65'E	85	F1	-	0	A B	HL	
		78	25°41.78'N	89°38.38'E	78 - 81	F2	-	0	B	L	
		79	25°42.54'N	89°38.93'E	82	F2	0	-	B	LH	
		112	25°41.25'N	89°39.82'E	80	F2	-	-	C-1 C-2	L	
		113	25°41.03'N	89°39.01'E	83 - 84	F1	-	-	C-1 D	L	
					80 - 82	F1	-	-	C-1 C-2	L	
	Durgapur	54	25°44.41'N	89°37.43'E	83	F2	0	-	B C-3	M	
		55	25°43.71'N	89°37.09'E	83	F1	-	0	B	LH	
		72	25°45.07'N	89°38.71'E	85	F1	0	0	B C-3	L	
		73	25°44.39'N	89°37.89'E	83	F2	0	0	B C-3	LH	
		74	25°43.91'N	89°38.74'E	83	F2	0	0	B	M	
						81	F2	0	0	C-3	-
		80	25°43.21'N	89°38.69'E	82	F2	0	-	C-3	-	
	Gunaigach	57	25°40.16'N	89°34.99'E	80	F2	-	0	C-3	-	
		83	25°37.36'N	89°35.35'E	79	F2	0	0	B	M	
		84	25°38.08'N	89°35.85'E	79 - 80	F1	-	0	B	HL	
		85	25°39.07'N	89°36.09'E	77	F2	-	0	B C-2 C-3	HL	
					85	F1	-	-	B C-3	M	
		86	25°39.41'N	89°35.39'E	82 - 83	F2	-	0	B D	L	
					82 - 83	F2	-	0	B	M	
		87	25°38.80'N	89°35.98'E	80	F1	-	0	B	H	
					80	F1	-	0	B	L	
					77	F2	-	0	C-3	-	
	98	25°38.51'N	89°37.22'E	82	F2	-	-	C-3 D	-		
	Haita	77	25°41.49'N	89°41.76'E	77 - 78	F2	-	0	B C-2	L	
		109	25°40.55'N	89°39.96'E	79	F2	0	0	B	L	
					80	F2	0	0	C-1	L	
		114	25°42.02'N	89°40.54'E	78 - 81	F2	-	0	B	L	
Pandul	64	25°41.94'N	89°36.53'E	84	F1	0	0	B	M		
	65	25°42.32'N	89°36.04'E	87	F0	0	0	B	H		
				83	F1	0	0	B	L		
				81	F2	0	0	C-3	-		
	66	25°42.60'N	89°34.39'E	87	F0	-	0	B	H		
			85	F2	-	0	B	L			
Tabakpur	88	25°38.45'N	89°36.75'E	83	F2	-	-	C-2 D	H		
				81 - 82	F2	-	-	B	H		
	89	25°36.89'N	89°36.69'E	78	F2	-	-	B	L		
				77	F2	-	0	B	LH		
	91	25°37.54'N	89°37.46'E	81 - 82	F2	-	-	B C-2	L		
					F2	-	0	B	M		
	92	25°36.83'N	89°38.58'E	76	F3	0	-	C-3	-		
	93	25°36.38'N	89°37.88'E	78	F2	0	0	B	L		
	99	25°37.86'N	89°37.78'E	83	F2	0	0	B C-2	LH		
	100	25°37.57'N	89°38.73'E	77	F1	0	0	B C-2	LH		
				79	F1	-	-	B C-2	L		
	101	25°37.21'N	89°39.24'E	80	F2	0	-	B	L		
			75	F2	0	-	C-3	-			
106	25°38.02'N	89°39.63'E	75 - 79	F1	-	-	C-1 C-2 D	L			
				F2	-	0	B	L			

Legend of cropping pattern is shown in Table VIII.1.2 (5/5)

Table VIII.1.2_C.P.bySurvey

Table VIII.1.2 Cropping Pattern by Observation Point (4/5)
(January to February, 1992)

Thana	Union	Point No.	Location		Altitude (ft.)	Flood level	Irrigation		Cropping Pattern	Aman Variety
			Latitude	Longitude			DTW	STW		
Ulipur										
Thetrai		58	25°40.22'N	89°33.42'E	86	F1	0	0	B	H
		81	25°39.71'N	89°33.73'E	82 - 83	F2	-	0	B	LH
					82 - 83	F2	-	-	C-3 D	-
		82	25°38.60'N	89°33.87'E	83	F1	-	0	B	L
Ulipur		56	25°40.21'N	89°35.95'E	81	F2	-	0	C-3	-
						F2	-	0	B	L
		62	25°41.00'N	89°34.74'E	85	F2	-	0	C-3	-
		63	25°40.95'N	89°36.06'E	83	F1	-	0	B	LH
Chilmari										
Ramna		96	25°34.41'N	89°39.16'E	74 - 75	F2	-	0	B C-3	L
		97	25°33.98'N	89°40.52'E	76	F1	0	0	B	HL
Ranigang		107	25°38.40'N	89°40.30'E	76	F3	-	0	C-2 C-3	LH
					77 - 78	F2	-	-	C-3 D	-
Thanahat		95	25°35.10'N	89°38.72'E	76 - 77	F2	-	0	B C-3	M
		102	25°36.19'N	89°39.73'E	79	F2	-	0	A B	L
		103	25°36.05'N	89°40.73'E	74 - 76	F2	-	-	A	L
					74	F2	-	0	C-3	-
		104	25°34.93'N	89°40.69'E	75	F1	0	0	B C-3	L
					74	F2	0	0	C-3	-
		105	25°36.74'N	89°39.67'E	77 - 78	F2	-	-	C-2 C-3	L
					76	F2	-	-	C-3	-

Legend of cropping pattern is shown in Table VIII.1.2 (5/5)

Table VIII.1.2 Cropping Pattern by Observation Point (5/5)
(Legend of Cropping Pattern)

1. Flood Level

Symbol in Table	Land Type	Flood Condition	Inundation Condition
F0	High Land	Normal above flooding	
F0	Medium High Land	Seasonal Flooding	0 - 30cm
F1	Medium Low Land	Seasonal Flooding	30 - 90cm
F2	Low Land	Seasonal Flooding	90 - 180cm
F3	Very Low Land	Seasonal Flooding	180cm<

2. Cropping Pattern

No. of Rice Crops	No. of Crops	Symbol in Table	Cropping Pattern				
2 times	3 Crops	A	Groundnuts	-	H.Boro	-	T.Aman
			Mustard	-	H.Boro	-	T.Aman
			Tobacco	-	H.Boro	-	T.Aman
			Wheat	-	H.Boro	-	T.Aman
			Dhemshi	-	Aus / Jute	-	T.Aman
			Mustard	-	Aus / Jute	-	T.Aman
			Potato	-	Aus / Jute	-	T.Aman
			Tobacco	-	Aus / Jute	-	T.Aman
			Wheat	-	Aus / Jute	-	T.Aman
2 times	2 Crops	B	H.Boro	-	T.Aman		
			H.Boro	-	Aus		
			Aus / Jute	-	T.Aman		
1 time	3 Crops	C-1	Onion	-	Jute	-	T.Aman
			Potato	-	Jute	-	T.Aman
			Wheat	-	Jute	-	T.Aman
1 time	2 Crops	C-2	Jute	-	T.Aman		
			Potato	-	T.Aman		
			Tobacco	-	T.Aman		
			Wheat	-	T.Aman		
			Kaun	-	B.Aman		
			Tobacco	-	Aus		
Wheat	-	Aus					
1 time	1 Crops	C-3		H.Boro			
				L.Bor			
				Aus			
No rice	2 Crops	D	Tobacco	-	Jute		
			Wheat	-	Jute		
No rice	1 Crops			Kaun			
				Jute			
				Wheat			

3. T. Aman Variety

Symbol in Table	Variety Ratio of HYV and Local
H	All varieties are High Yield Varieties (HYV)
HL	High Yield Varieties (HYV):60 - 80%, Local Varieties:20 - 40%
M	High Yield Varieties (HYV):50%, Local Varieties:50%
LH	High Yield Varieties (HYV):20 - 40%, Local Varieties:60 - 80%
L	All varieties are Local Varieties

Table VIII.1.3 Generalized Present Cropping Pattern by Land Unit

Legend	Cropping Season		Land Unit by Land Type				Remark
	Kharif-I	Kharif-II	Rabi (Winter)	F0	F1	F2, F3	
1 A	Aus/Jute	HYV Aman	Rabi	2a, 8a, 9a	1b, 12b	-	with some sugarcane
A	HYV Aus	HYV Aman	Rabi	-	-	-	10% fallow for Rabi
A	Jute	HYV Aman	Rabi	-	-	-	10% fallow for Rabi
A	Sugarcane	Sugarcane	Sugarcane	-	-	-	
2 B	Aus/Jute	HYV Aman	HYV Boro	5a	1b, 3b, 4b, 5b, 6b	4c, 10c	HYV Aus, L. T. Aus
B	Aus	HYV Aman	HYV Boro	-	-	-	
B	Jute	HYV Aman	HYV Boro	-	-	-	
3 C	Aus/Jute	HYV Aman	Rabi	2a, 3a, 5a, 8a, 9a	1b, 2b, 4b, 6b, 7b, 8b, 12b	4c, 7c	10% fallow for Rabi
C	HYV Aus	HYV Aman	Rabi	-	-	-	10% fallow for Rabi
C	Jute	HYV Aman	Rabi	-	-	-	
4 D	Aus/Jute	HYV Aman	-	-	2b, 4b	-	with some sugarcane
D	HYV Aus	HYV Aman	-	-	-	-	
D	Jute	HYV Aman	-	-	-	-	
D	Sugarcane	Sugarcane	Sugarcane	-	-	-	
D	L. T. Aus	HYV Aman	-	-	-	-	
5 E	Aus/Jute	HYV Aman	-	2a, 5a, 8a	12b	12	HYV Aus
E	Aus	HYV Aman	-	-	-	-	
E	Jute	HYV Aman	-	-	-	-	B. Aus
E	Aus	L. T. Aman	-	-	-	-	B. Aus
E	Aus	HYV Aman	-	-	-	-	
6 F	Aus/Jute	-	Rabi	8a	4b, 12b	-	B. Aus, 10% fallow for Rabi
F	Aus	-	Rabi	-	-	-	10% fallow for Rabi
F	Jute	-	Rabi	-	-	-	
7 G	-	HYV Aman	HYV Boro	-	5b, 11b	-	
8 H	-	L. T. Aman	HYV Boro	-	11b	1c, 6c, 7c, 10c, 11c, 12c	L. T. Aman:chance crop
9 I	-	-	HYV Boro	-	-	4c, 6c	
10 J	-	-	HYV Boro/Rabi	-	-	1c, 4c	Predominantly wheat for Rabi

VIII.1.4 Cropping Pattern by Land Unit (1/4)

(1) High Land (F0)

Land Unit	Cropping Pattern	Remarks including crops, irrigation condition, location, and soil series
2a A	Aus/Jute - HYV Aman - Rabi	Some sugacane:30%, HYV Aus:40%, Jute:30%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Bonarpara Series.
2a C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Bonarpara Series.
2a E	Aus/Jute - HYV Aman	HYV Aus:60%, B. Aus:20%, Jute:20%, HYV Aman:90%, L. T. Aman:10%, B. Aus without irrigation, HYV Aus under irrigation, Northern part around Lalmonirhat and Kurigram, Bonarpara Series.
3a C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly wheat, some onion and pulse), less land under irrigation, middle/southern part around Rajarhat, Ulipur and Chilimari, Chilimari Series.
5a B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:60%, Jute:40%, Most land under irrigation, Middle and southern part around Kurigram, Rajarhat, Ulipur and Chilimari, Gangachara Series.
5a C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly wheat, some onion and pulse), Less land under irrigation, Middle and southern part around Kurigram, Rajarhat, Ulipur and Chilimari, Gangachara Series.
5a E	Aus/Jute - HYV Aman	HYV Aus:70%, Jute:30%, Less land under irrigation, Middle and southern part around Kurigram, Rajarhat, Ulipur and Chilimari, Gangachara Series.
8a A	Aus/Jute - HYV Aman - Rabi	Some sugacane:30%, HYV Aus:40%, Jute:30%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Palasbari Series.
8a C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi.
8a E	Aus/Jute - HYV Aman	HYV Aus:70%, Jute:30%, less land under irrigation, northern part around Lalmonirhat and Kurigram, Palasbari Series.
8a F	Aus/Jute - Rabi	L. T. Aus, 10% fallow for Rabi (mainly mustard, chilli and tobacco in north and mainly wheat in south), Less land under irrigation, North, middle and south part, Palasbari Series.
9a A	Aus/Jute - HYV Aman - Rabi	Some sugacane:30%, HYV Aus:40%, Jute:30%, 10% fallow for Rabi (mustard, tobacco, chilli, potato and less wheat), less land under irrigation, northern part near Lalmonirhat and Kurigram, Pirgacha Series.
9a C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (wheat, some onion and pulse), less land under irrigation, middle/southern part around Rajarhat, Ulipur and Chilimari, Pirgacha Series.

Table VIII.1.4 Cropping Pattern by Land Unit (2/4)

(2) Medium High Land (F1)

Land Unit	Cropping Pattern	Remarks including crops, irrigation condition, location, and soil series
1b A	Aus/Jute - HYV Aman - Rabi	Some sugacane:30%, HYV Aus:40%, Jute:30%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Amgaon Series.
1b B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Northern part around Lalmonirhat and Kurigram, Amgaon Series.
1b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (wheat, some onion and pulse), less land under irrigation, middle/southern part around Rajarhat, Ulipur and Chilimari, Amgaon Series.
2b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (wheat, some onion and pulse), less land under irrigation, middle/southern part around Rajarhat, Ulipur and Chilimari, Bonarpara Series.
2b D	Aus/Jute - HYV Aman - Rabi	Some sugacane:30%, HYV Aus:40%, L. T. Aus:10%, Jute:20%, Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Bonarpara Series.
3b B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Chilimari Series.
4b B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Farabari Series.
4b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (wheat, some onion and pulse), less land under irrigation, middle/southern part around Rajarhat, Ulipur and Chilimari, Farabari Series.
4b D	Aus/Jute - HYV Aman	Some sugacane:30%, HYV Aus:40%, L. T. Aus:10%, Jute:20%, Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Farabari Series.
4b F	Aus/Jute - Rabi	B. Aus, 10% fallow for Rabi (mainly mustard, chilli and tobacco in north and mainly wheat in south), Less land under irrigation, North, middle and south part, Farabari Series.
5b B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Gangachara Series.
5b G	HYV Aman - HYV Boro	Most land under irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Gangachara Series.

Table VIII.1.4 Cropping Pattern by Land Unit (3/4)

(2) Medium High Land (F1)

Land Unit	Cropping Pattern	Remarks including crops, irrigation condition, location, and soil series
6b B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Northern part around Lalmonirhat and Kurigram, Kaunia Series.
4b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (wheat, some onion and pulse), less land under irrigation, middle/southern part around Rajarhat, Ulipur and Chilimari, Kaunia Series.
7b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Bonarpara Series.
8b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Bonarpara Series.
11b G	HYV Aman - HYV Boro	Most land under irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Ulipur Series.
11b H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Whole part along the Dharla and Brahmaputra rivers, Ulipur Series.
12b A	Aus/Jute - HYV Aman - Rabi	Some sugacane:30%, HYV Aus:40%, Jute:30%, 10% fallow for Rabi (mainly mustard, tobacco, chilli), Less land under irrigation, Northern part around Lalmonirhat, Sandy and silty alluvium.
12b C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Sandy and silty alluvium.
12b E	Aus/Jute - HYV Aman	HYV Aus:70%, Jute:30%, less land under irrigation, northern part around Lalmonirhat and Kurigram, Sandy and silty alluvium.
12b F	Aus/Jute - Rabi	B. Aus, 10% fallow for Rabi (mainly mustard, chilli and tobacco in north and mainly wheat in south), Less land under irrigation, North, middle and south part, Sandy and silty alluvium.

Table VIII.1.4 Cropping Pattern by Land Unit (4/4)

(3) Medium Low Land (F2 and F3)

Land Type		Cropping Pattern	Remarks including crops, irrigation condition, location, and soil series
1c	H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Amgaon Series.
1c	J	HYV Boro/Rabi	Predominantly wheat for Rabi, Northern and middle part around Lalmonirhat, Rajarhat and Kurigram Amgaon Series.
4c	B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Northern part around Lalmonirhat and Kurigram, Farabari Series.
4c	C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Farabari Series.
4c	I	HYV Boro	Utilizing residual moisture and irrigation, Whole part, Farabari Series.
4c	J	HYV Boro/Rabi	Predominantly wheat for Rabi, Northern and middle part around Lalmonirhat, Rajarhat and Kurigram Farabari Series.
6c	H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Kaunia Series.
6c	I	HYV Boro	Utilizing residual moisture and irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Kaunia Series.
7c	C	Aus/Jute - HYV Aman - Rabi	HYV Aus:60%, Jute:40%, 10% fallow for Rabi (mainly mustard, tobacco, chilli, potato and less wheat), Less land under irrigation, Northern part around Lalmonirhat and Kurigram, Laskara Series.
7c	H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Middle part around Rajarhat and Kurigram, Laskara Series.
10c	B	Aus/Jute - HYV Aman - HYV Boro	HYV Aus:50%, L. T. Aus:10%, Jute:40%, Most land under irrigation, Northern part around Lalmonirhat and Kurigram, Uttargaon Series.
10c	H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Middle and southern part around Kurigram Rajarhat, Ulipur and Chilimari, Uttargaon Series.
11c	H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Middle and southern part around Rajarhat, Ulipur and Chilimari, Ulipur Series.
12c	E	Aus/Jute - HYV Aman	HYV Aus:70%, Jute:30%, less land under irrigation, northern part around Lalmonirhat and Kurigram, Sandy and silty alluvium.
12c	H	L. T. Aman - HYV Boro	L. T. Aman damaged heavily, Utilizing residual moisture and irrigation, Whole part along the Dharla and Brahmaputra rivers, Sandy and silty alluvium.

**Table VIII.1.5 Present Cropped Area by Land Types
in the Study Area (1/3)
(total of irrigated and rainfed condition)**

Land Type Flood Level Item	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	<u>16,600</u>	(39)	<u>22,000</u>	(51)	<u>4,200</u>	(10)	<u>42,800</u>	(100)
Total Cropped Area	<u>34,600</u>		<u>41,500</u>		<u>5,400</u>		<u>81,500</u>	
Cropping intensity	208%		189%		129%		190%	
Rice	<u>28,300</u>	(170)	<u>34,500</u>	(157)	<u>4,600</u>	(110)	<u>67,400</u>	(157)
B./L.T. Aus	500	(3)	3,700	(17)	100	(2)	4,300	(10)
HYV Aus	9,700	(58)	9,800	(45)	0	(0)	19,500	(46)
L. T. Aman	0	(0)	4,500	(20)	1,600	(38)	6,100	(14)
HYV Aman	14,600	(88)	11,700	(53)	0	(0)	26,300	(61)
L. T. Boro	0	(0)	0	(0)	1,000	(24)	1,000	(2)
HYV Boro	3,500	(21)	4,800	(22)	1,900	(45)	10,200	(24)
Jute	<u>1,300</u>	(8)	<u>2,800</u>	(13)	<u>300</u>	(7)	<u>4,400</u>	(10)
Sugarcane	<u>800</u>	(5)	<u>1,100</u>	(5)	<u>0</u>	(0)	<u>1,900</u>	(4)
Rabi	<u>4,200</u>	(25)	<u>3,100</u>	(14)	<u>500</u>	(12)	<u>7,800</u>	(18)
Wheat	2,100	(13)	1,200	(5)	300	(7)	3,600	(8)
Oil Seed	700	(4)	400	(2)	100	(2)	1,200	(3)
Pulses	500	(3)	400	(2)	100	(2)	1,000	(2)
Potatoes	500	(3)	500	(2)	0	(0)	1,000	(2)
Spices	200	(1)	300	(1)	0	(0)	500	(1)
Vegetables	200	(1)	300	(1)	0	(0)	500	(1)

**Table VIII.1.5 Present Cropped Area by Land Types
in the Study Area (2/3)
(under irrigated condition)**

Land Type Flood Level	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
Item	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	<u>3,500</u>	(8)	<u>4,800</u>	(11)	<u>1,500</u>	(4)	<u>9,800</u>	(23)
Total Cropped Area	<u>8,200</u>		<u>10,200</u>		<u>2,000</u>		<u>20,400</u>	
Cropping intensity	234%		213%		133%		208%	
Rice	<u>6,800</u>	(194)	<u>8,700</u>	(181)	<u>1,900</u>	(127)	<u>17,400</u>	(178)
B./L.T. Aus	-	-	-	-	-	-	0	(0)
HYV Aus	-	-	-	-	-	-	0	(0)
L. T. Aman	-	-	300	(6)	400	(27)	700	(7)
HYV Aman	3,300	(94)	3,600	(75)	-	-	6,900	(70)
L. T. Boro	-	-	-	-	-	-	0	(0)
HYV Boro	3,500	(100)	4,800	(100)	1,500	(100)	9,800	(100)
Jute	-	-	-	-	<u>100</u>	(7)	<u>100</u>	(1)
Sugarcane	-	-	-	-	-	-	<u>0</u>	(0)
Rabi	<u>1,400</u>	(40)	<u>1,500</u>	(31)	-	-	<u>2,900</u>	(30)
Wheat	400	(11)	400	(8)	-	-	800	(8)
Oil Seed	300	(9)	200	(4)	-	-	500	(5)
Pulses	200	(6)	200	(4)	-	-	400	(4)
Potatoes	300	(9)	300	(6)	-	-	600	(6)
Spices	100	(3)	200	(4)	-	-	300	(3)
Vegetables	100	(3)	200	(4)	-	-	300	(3)

**Table VIII.1.5 Present Cropped Area by Land Types
in the Study Area (3/3)
(under rainfed condition)**

Land Type Flood Level Item	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	<u>13,100</u>	(31)	<u>17,200</u>	(40)	<u>2,700</u>	(6)	<u>33,000</u>	(77)
Total Cropped Area	<u>26,400</u>		<u>31,300</u>		<u>3,400</u>		<u>61,100</u>	
Cropping intensity	202%		182%		126%		185%	
Rice	<u>21,500</u>	(164)	<u>25,800</u>	(150)	<u>2,700</u>	(100)	<u>50,000</u>	(152)
B./L.T. Aus	500	(4)	3,700	(22)	100	(4)	4,300	(13)
HYV Aus	9,700	(74)	9,800	(57)	-	-	19,500	(59)
L. T. Aman	-	-	4,200	(24)	1,200	(44)	5,400	(16)
HYV Aman	11,300	(86)	8,100	(47)	-	-	19,400	(59)
L. T. Boro	-	-	-	-	1,000	(37)	1,000	(3)
HYV Boro	-	-	-	-	400	(15)	400	(1)
Jute	<u>1,300</u>	(10)	<u>2,800</u>	(16)	<u>200</u>	(7)	<u>4,300</u>	(13)
Sugarcane	<u>800</u>	(6)	<u>1,100</u>	(6)	-	-	<u>1,900</u>	(6)
Rabi	<u>2,800</u>	(21)	<u>1,600</u>	(9)	<u>500</u>	(19)	<u>4,900</u>	(15)
Wheat	1,700	(13)	800	(5)	300	(11)	2,800	(8)
Oil Seed	400	(3)	200	(1)	100	(4)	700	(2)
Pulses	300	(2)	200	(1)	100	(4)	600	(2)
Potatoes	200	(2)	200	(1)	-	-	400	(1)
Spices	100	(1)	100	(1)	-	-	200	(1)
Vegetables	100	(1)	100	(1)	-	-	200	(1)

Table VIII.2.1 Proposed Land Use in Study Area and Project Area

Condition of Land	Land Type and Flood Level						Total Area	
	F0		F1		F2 & F3			
	0 - 30 cm		30 - 90 cm		> 90 cm		(ha)	(%)
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Proposed Land Use of the Study Area of 42,800 ha								
1. Present Condition of Cultivated Area								
1.1 Rainfed Area	<u>13,100</u>	(79)	<u>17,200</u>	(78)	<u>2,700</u>	(64)	<u>33,000</u>	(77)
	(40%)		(52%)		(8%)		(100%)	
1.2 Irrigated Area	<u>3,500</u>	(21)	<u>4,800</u>	(22)	<u>1,500</u>	(36)	<u>9,800</u>	(23)
	(36%)		(49%)		(15%)		(100%)	
1.3 Total Area	<u>16,600</u>	(100)	<u>22,000</u>	(100)	<u>4,200</u>	(100)	<u>42,800</u>	(100)
	(39%)		(51%)		(10%)		(100%)	
2. Proposed Condition of Cultivated Land								
2.1 Rainfed Area	<u>2,900</u>	(17)	<u>3,900</u>	(18)	<u>500</u>	(12)	<u>7,300</u>	(17)
	(40%)		(53%)		(7%)		(100%)	
2.2 Irrigated Area	<u>13,700</u>	(83)	<u>18,100</u>	(82)	<u>3,700</u>	(88)	<u>35,500</u>	(83)
	(39%)		(51%)		(10%)		(100%)	
- Groundwater	6,400		8,400		2,500		17,300	
Existing Well	3,500		4,800		1,500		9,800	
New STW	2,900		3,600		1,000		7,500	
- Surface Water by LLP	7,300		9,700		1,200		18,200	
2.3 Total Area	<u>16,600</u>	(100)	<u>22,000</u>	(100)	<u>4,200</u>	(100)	<u>42,800</u>	(100)
	(39%)		(51%)		(10%)		(100%)	
Proposed Land Use of the Project of 35,500 ha								
1. Present Condition of Cultivated Area								
1.1 Rainfed Area	<u>10,200</u>	(74)	<u>13,300</u>	(73)	<u>2,200</u>	(59)	<u>25,700</u>	(72)
	(40%)		(52%)		(9%)		(100%)	
1.2 Irrigated Area	<u>3,500</u>	(26)	<u>4,800</u>	(27)	<u>1,500</u>	(41)	<u>9,800</u>	(28)
	(36%)		(49%)		(15%)		(100%)	
1.3 Total Area	<u>13,700</u>	(100)	<u>18,100</u>	(100)	<u>3,700</u>	(100)	<u>35,500</u>	(100)
	(39%)		(51%)		(10%)		(100%)	
2. Proposed Condition of Cultivated Land								
2.1 Rainfed Area	<u>0</u>	(0)	<u>0</u>	(0)	<u>0</u>	(0)	<u>0</u>	(0)
	(0%)		(0%)		(0%)		(0%)	
2.2 Irrigated Area	<u>13,700</u>	(100)	<u>18,100</u>	(100)	<u>3,700</u>	(100)	<u>35,500</u>	(100)
	(39%)		(51%)		(10%)		(100%)	
- Groundwater	6,400		8,400		2,500		17,300	
Existing Well	3,500		4,800		1,500		9,800	
New STW	2,900		3,600		1,000		7,500	
- Surface Water by LLP	7,300		9,700		1,200		18,200	
2.3 Total Area	<u>13,700</u>	(100)	<u>18,100</u>	(100)	<u>3,700</u>	(100)	<u>35,500</u>	(100)
	(39%)		(51%)		(10%)		(100%)	

Table VIII.2.2 Present Cropped Area by Land Types in Proposed Irrigated Area (1/3)

(1) Total of (2) and (3)

Land Type Flood Level	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	<u>13,700</u>	(39)	<u>18,100</u>	(51)	<u>3,700</u>	(10)	<u>35,500</u>	(100)
Total Cropped Area	<u>28,800</u>		<u>34,700</u>		<u>4,800</u>		<u>68,300</u>	
Cropping intensity	210%		192%		130%		192%	
Rice	<u>23,600</u>	(172)	<u>28,700</u>	(159)	<u>4,100</u>	(111)	<u>56,400</u>	(159)
B./L.T. Aus	400	(3)	2,900	(16)	100	(3)	3,400	(10)
HYV Aus	7,600	(55)	7,600	(42)	0	(0)	15,200	(43)
L. T. Aman	0	(0)	3,500	(19)	1,400	(38)	4,900	(14)
HYV Aman	12,100	(88)	9,900	(55)	0	(0)	22,000	(62)
L. T. Boro	0	(0)	0	(0)	800	(22)	800	(2)
HYV Boro	3,500	(26)	4,800	(27)	1,800	(49)	10,100	(28)
Jute	<u>1,000</u>	(7)	<u>2,200</u>	(12)	<u>300</u>	(8)	<u>3,500</u>	(10)
Sugarcane	<u>600</u>	(4)	<u>900</u>	(5)	<u>0</u>	(0)	<u>1,500</u>	(4)
Rabi	<u>3,600</u>	(26)	<u>2,900</u>	(16)	<u>400</u>	(11)	<u>6,900</u>	(19)
Wheat	1,700	(12)	1,000	(6)	200	(5)	2,900	(8)
Oil Seed	600	(4)	400	(2)	100	(3)	1,100	(3)
Pulses	400	(3)	400	(2)	100	(3)	900	(3)
Potatoes	500	(4)	500	(3)	0	(0)	1,000	(3)
Spices	200	(1)	300	(2)	0	(0)	500	(1)
Vegetables	200	(1)	300	(2)	0	(0)	500	(1)

Table VIII.2.2 Present Cropped Area by Land Types in Proposed Irrigated Area (2/3)

(2) Irrigated Land								
Land Type Flood Level	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	<u>3,500</u>	(10)	<u>4,800</u>	(14)	<u>1,500</u>	(4)	<u>9,800</u>	(28)

Total Cropped Area	<u>8,200</u>		<u>10,200</u>		<u>2,000</u>		<u>20,400</u>	
Cropping intensity	234%		213%		133%		208%	

Rice	<u>6,800</u>	-	<u>8,700</u>	-	<u>1,900</u>	-	<u>17,400</u>	-

B./L.T. Aus	-	-	-	-	-	-	0	-
HYV Aus	-	-	-	-	-	-	0	-
L. T. Aman	-	-	300	-	400	-	700	-
HYV Aman	3,300	-	3,600	-	-	-	6,900	-
L. T. Boro	-	-	-	-	-	-	0	-
HYV Boro	3,500	(100)	4,800	(100)	1,500	(100)	9,800	(100)

Jute	-	-	-	-	<u>100</u>	(7)	<u>100</u>	(1)

Sugarcane	-	-	-	-	-	-	<u>0</u>	-

Rabi	<u>1,400</u>	(40)	<u>1,500</u>	(31)	-	-	<u>2,900</u>	(30)

Wheat	400	(11)	400	(8)	-	-	800	(8)
Oil Seed	300	(9)	200	(4)	-	-	500	(5)
Pulses	200	(6)	200	(4)	-	-	400	(4)
Potatoes	300	(9)	300	(6)	-	-	600	(6)
Spices	100	(3)	200	(4)	-	-	300	(3)
Vegetables	100	(3)	200	(4)	-	-	300	(3)

Table VIII.2.2 Present Cropped Area by Land Types in Proposed Irrigated Area (3/3)

(3) Rainfed Land								
Land Type Flood Level Item	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	<u>10,200</u>	(40)	<u>13,300</u>	(52)	<u>2,200</u>	(9)	<u>25,700</u>	(100)
	78%		77%		81%			
Total Cropped Area	<u>20,600</u>		<u>24,500</u>		<u>2,800</u>		<u>47,900</u>	
Cropping intensity	202%		184%		127%		186%	
Rice	<u>16,800</u>	(165)	<u>20,000</u>	(150)	<u>2,200</u>	(100)	<u>39,000</u>	(152)
B./L.T. Aus	400	(4)	2,900	(22)	100	(5)	3,400	(13)
HYV Aus	7,600	(75)	7,600	(57)	-	-	15,200	(59)
L. T. Aman	-	-	3,200	(24)	1,000	(45)	4,200	(16)
HYV Aman	8,800	(86)	6,300	(47)	-	-	15,100	(59)
L. T. Boro	-	-	-	-	800	(36)	800	(3)
HYV Boro	-	-	-	-	300	(14)	300	(1)
Jute	<u>1,000</u>	(10)	<u>2,200</u>	(17)	<u>200</u>	(9)	<u>3,400</u>	(13)
Sugarcane	<u>600</u>	(6)	<u>900</u>	(7)	-	-	<u>1,500</u>	(6)
Rabi	<u>2,200</u>	(22)	<u>1,400</u>	(11)	<u>400</u>	(18)	<u>4,000</u>	(16)
Wheat	1,300	(13)	600	(5)	200	(9)	2,100	(8)
Oil Seed	300	(3)	200	(2)	100	(5)	600	(2)
Pulses	200	(2)	200	(2)	100	(5)	500	(2)
Potatoes	200	(2)	200	(2)	-	-	400	(2)
Spices	100	(1)	100	(1)	-	-	200	(1)
Vegetables	100	(1)	100	(1)	-	-	200	(1)

**Table VIII.2.3 Proposed Cropped Area
by Land Type in Proposed Irrigated Area**

Land Type Flood Level	F0 0 - 30 cm		F1 30 - 90 cm		F2 & F3 > 90 cm		Total Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Itema								
Total Land Area	13,700	(39)	18,100	(51)	3,700	(10)	35,500	(100)

Total Cropped Area	37,300		36,100		6,100		79,500	
Cropping Intensity	272%		199%		165%		224%	

Rice	23,200	(169)	12,000	(66)	2,800	(76)	38,000	(107)

HYV Aus	4,200	(31)	-	-	-	-	4,200	(12)
L. T. Aman	-	-	6,000	(33)	-	-	6,000	(17)
HYV Aman	12,000	(88)	-	-	-	-	12,000	(34)
HYV Boro	2,100	(15)	-	-	2,800	(76)	4,900	(14)
Boro/Aus	4,900	(36)	6,000	(33)	-	-	10,900	(31)

Jute	2,500	(18)	6,000	(33)	500	(14)	9,000	(25)

Rabi	11,600	(85)	18,100	(100)	2,800	(76)	32,500	(92)

Mustard	7,900	(58)	-	-	500	(14)	8,400	(24)
Spice (Onion)	1,200	(9)	3,000	(17)	400	(11)	4,600	(13)
Vegetables	-	-	3,000	(17)	-	-	3,000	(8)
Pulses	2,500	(18)	6,100	(34)	1,100	(30)	9,700	(27)
Wheat	-	-	3,000	(17)	400	(11)	3,400	(10)
Potato	-	-	3,000	(17)	400	(11)	3,400	(10)

**Table VIII.2.4 Cropped Area under Present and Proposed Condition
in the Project Area**

Item	Present Condition						Proposed	
	Irrigated Area		Rainfed Area		Total Area		Irrigated Area	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Land Area	9,800	(28)	25,700	(72)	35,500	(100)	35,500	(100)
Total Cropped Area	20,400		47,900		68,300		79,500	
Cropping intensity	208%		186%		192%		224%	
Rice	17,400	(178)	39,000	(152)	56,400	(159)	38,000	(107)
B./L.T. Aus	-	-	3,400	(13)	3,400	(10)	-	-
HYV Aus	-	-	15,200	(59)	15,200	(43)	4,200	(12)
L. T. Aman	700	(7)	4,200	(16)	4,900	(14)	6,000	(17)
HYV Aman	6,900	(70)	15,100	(59)	22,000	(62)	12,000	(34)
L. T. Boro	-	-	800	(3)	800	(2)	-	-
HYV Boro	9,800	(100)	300	(1)	10,100	(28)	4,900	(14)
Late Boro/Early Aus	-	-	-	-	-	-	10,900	(31)
Jute	100	(1)	3,400	(13)	3,500	(10)	9,000	(25)
Sugarcane	-	-	1,500	(6)	1,500	(4)	-	-
Rabi	2,900	(30)	4,000	(16)	6,900	(19)	32,500	(92)
Wheat	800	(8)	2,100	(8)	2,900	(8)	8,400	(24)
Oil Seed	500	(5)	600	(2)	1,100	(3)	4,600	(13)
Pulses	400	(4)	500	(2)	900	(3)	3,000	(8)
Potatoes	600	(6)	400	(2)	1,000	(3)	9,700	(27)
Spices	300	(3)	200	(1)	500	(1)	3,400	(10)
Vegetables	300	(3)	200	(1)	500	(1)	3,400	(10)

Table VIII.2.5 Input Requirement under Present Condition (without Project)

(Irrigated)		(unit/ha)					
Description	Unit	HYV Aus	L. T. Aman	HYV Aman	HYV Boro	HYV Wheat	Potato
Labour	day/ha	202	147	204	219	116	197
Draft animal	day/ha	50	43	49	53	43	48
Seed	kg/ha	30	30	30	30	140	1,200
Urea	kg/ha	190	28	142	141	157	50
TSP	kg/ha	80	18	82	73	118	37
MP	kg/ha	18	0	20	12	15	29
Pesticide	kg/ha	0.50	0.25	0.5	0.5	0.25	0.5

(Irrigated)		(unit/ha)				
Description	Unit	Sugarcane	Oil Seeds	Spices	Vegetable	Tabacco
Labour	day/ha	299	90	159	307	305
Draft animal	day/ha	68	37	39	52	60
Seed	kg/ha	5,000	10	600	6	0
Urea	kg/ha	162	58	33	83	58
TSP	kg/ha	130	135	38	53	43
MP	kg/ha	80	35	32	30	45
Pesticide	kg/ha	0.75	0.50	0.00	0.25	0.50

(Rainfed)		(unit/ha)					
Description	Unit	B. Aus	HYV Aus	B. Aman	L. T. Aman	HYV Aman	L. Boro
Labour	day/ha	140	170	105	136	169	162
Draft animal	day/ha	44	46	42	43	45	41
Seed	kg/ha	100	25	100	30	30	30
Urea	kg/ha	25	108	0	28	107	32
TSP	kg/ha	0	63	0	18	58	12
MP	kg/ha	0	4	0	0	8	0
Pesticide	kg/ha	0	0.50	0	0.25	0.50	0.12

(Rainfed)		(unit/ha)					
Description	Unit	HYV Boro	HYV Wheat	Potato	Jute	Sugarcane	Pulse
Labour	day/ha	206	86	179	218	263	46
Draft animal	day/ha	51	39	48	48	66	30
Seed	kg/ha	30	130	1000	9	5,000	30
Urea	kg/ha	80	104	40	41	128	0
TSP	kg/ha	34	34	24	12	96	0
MP	kg/ha	6	5	21	10	58	0
Pesticide	kg/ha	0.50	0.25	0.5	0.50	0.50	0.00

(Rainfed)		(unit/ha)			
Description	Unit	Oil Seeds	Spices	Vegetable	Tabacco
Labour	day/ha	67	143	270	241
Draft animal	day/ha	35	39	51	59
Seed	kg/ha	10	600	6	0
Urea	kg/ha	25	30	64	42
TSP	kg/ha	62	25	28	27
MP	kg/ha	15	21	18	30
Pesticide	kg/ha	0.10	0.00	0.25	0.50

Table VIII.2.6 Input Requirement under Future Condition (with Project)

(Irrigated)

Description	Unit	HYV Aus	L. T. Aman	HYV Aman	HYV Boro	HYV Wheat	Potato
Labour	day/ha	210	153	214	234	135	209
Draft animal	day/ha	51	44	50	55	44	49
Seed	kg/ha	30	30	30	30	140	1500
Urea	kg/ha	231	65	189	202	189	84
TSP	kg/ha	110	38	117	117	144	60
MP	kg/ha	30	0	36	35	35	55
Pesticide	kg/ha	0.75	0.30	0.75	0.75	0.40	0.75

(Irrigated)

Description	Unit	Sugarcane	Oil Seeds	Spices	Vegetable	Tabacco
Labour	day/ha	310	97	175	345	347
Draft animal	day/ha	69	37	40	53	60
Seed	kg/ha	5,000	10	600	6	0
Urea	kg/ha	191	73	69	166	83
TSP	kg/ha	155	165	80	102	63
MP	kg/ha	99	48	71	68	64
Pesticide	kg/ha	0.75	0.50	0.00	0.25	0.50

(Rainfed)

Description	Unit	B. Aus	HYV Aus	B. Aman	L. T. Aman	HYV Aman	L. Boro
Labour	day/ha	147	174	106	140	173	167
Draft animal	day/ha	44	47	42	43	46	42
Seed	kg/ha	100	30	100	30	30	30
Urea	kg/ha	29	137	0	57	133	62
TSP	kg/ha	0	82	0	33	75	27
MP	kg/ha	0	11	0	0	14	0
Pesticide	kg/ha	0	0.75	0	0.30	0.75	0.25

(Rainfed)

Description	Unit	HYV Boro	HYV Wheat	Potato	Jute	Sugarcane	Pulse
Labour	day/ha	216	90	185	226	271	48
Draft animal	day/ha	52	42	48	48	66	30
Seed	kg/ha	30	140	1200	9	5,000	30
Urea	kg/ha	130	140	66	57	157	0
TSP	kg/ha	64	45	38	17	117	0
MP	kg/ha	18	12	41	14	74	0
Pesticide	kg/ha	0.75	0.40	0.75	0.75	0.75	0.00

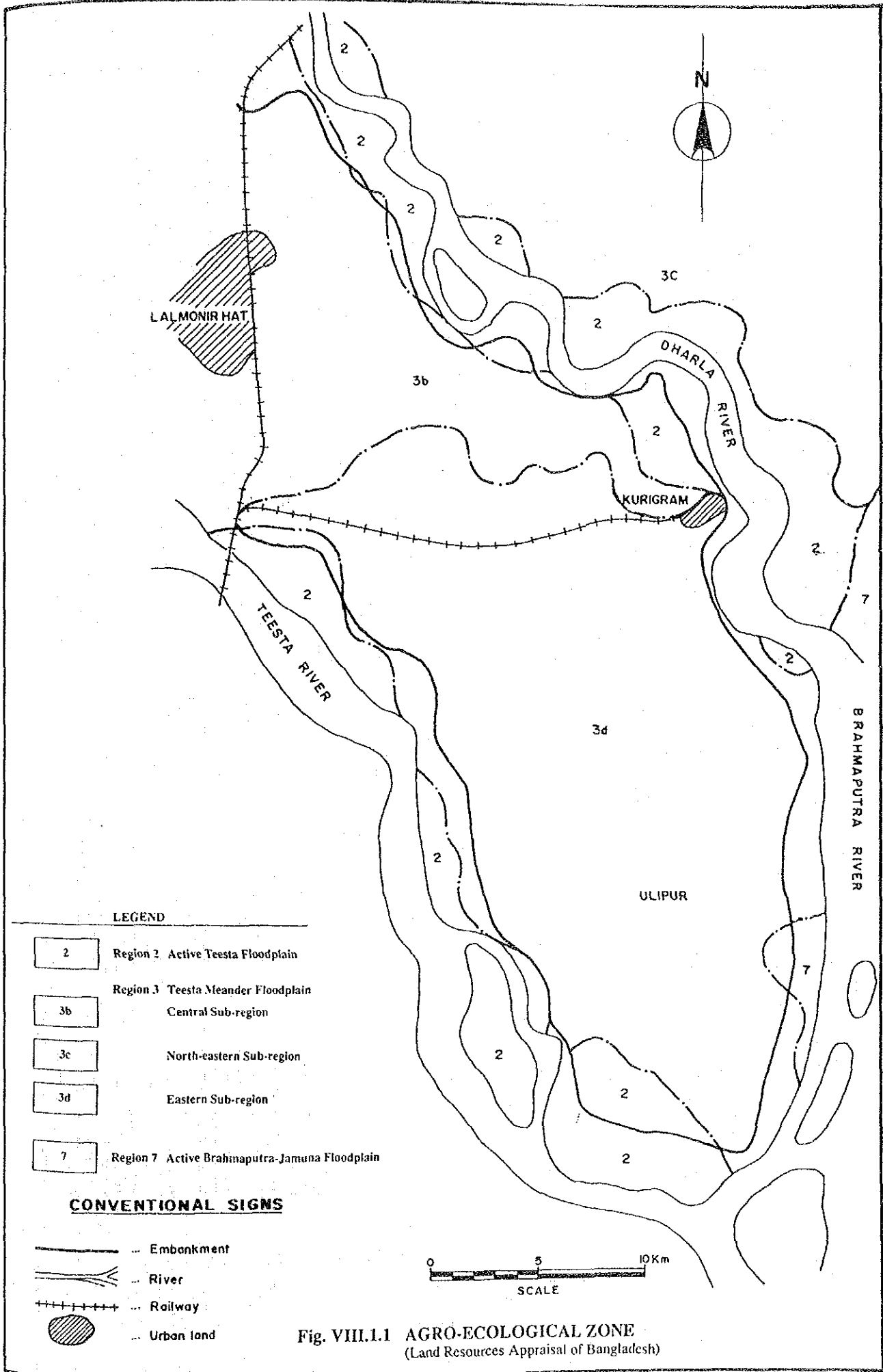
(Rainfed)

Description	Unit	Oil Seeds	Spices	Vegetable	Tabacco
Labour	day/ha	70	154	287	266
Draft animal	day/ha	35	39	52	60
Seed	kg/ha	10	600	6	0
Urea	kg/ha	35	74	121	72
TSP	kg/ha	82	61	55	43
MP	kg/ha	24	56	38	47
Pesticide	kg/ha	0.50	0.00	0.25	0.50

Table VIII.2.7 Crop Production under Present and Proposed Condition

Crop	Present Condition			Proposed Condition			Production Increase (ton)
	Area (ha)	Yield (ton/ha)	Production (ton)	Area (ha)	Yield (ton/ha)	Production (ton)	
Total Production			176,000			400,400	224,400
Rice	56,400	-	149,000	38,000	-	167,500	18,500
B./L.T. Aus	3,400	1.25	4,300	-	-	-	-4,300
HYV Aus	15,200	2.40	36,500	9,600	4.30	41,300	4,800
L. T. Aman	4,900	1.75	8,600	6,000	2.80	16,800	8,200
HYV Aman	22,000	2.77	60,900	12,000	4.70	56,400	-4,500
L. T. Boro	800	1.84	1,500	-	-	-	-1,500
HYV Boro	10,100	3.68	37,200	10,400	5.10	53,000	15,800
Jute	3,500	1.48	5,200	9,000	1.57	14,100	8,900
Sugarcane	1,500	27.00	40,500	-	-	-	-
Rabi	6,900	-	21,800	32,500	-	218,800	197,000
Wheat	2,900	2.03	5,900	8,400	3.25	27,300	21,400
Oil Seed	1,100	0.60	700	4,600	1.40	6,400	5,700
Pulses	900	0.74	700	3,000	1.20	3,600	2,900
Potatoes	1,000	9.05	9,000	9,700	13.00	126,100	117,100
Spices	500	4.84	2,400	3,400	5.70	19,400	17,000
Vegetables	500	6.18	3,100	3,400	10.60	36,000	32,900

Rice yield and production are measured in paddy .



LEGEND

- 2 Region 2 Active Teesta Floodplain
- 3b Region 3 Teesta Meander Floodplain Central Sub-region
- 3c North-eastern Sub-region
- 3d Eastern Sub-region
- 7 Region 7 Active Brahmaputra-Jamuna Floodplain

CONVENTIONAL SIGNS

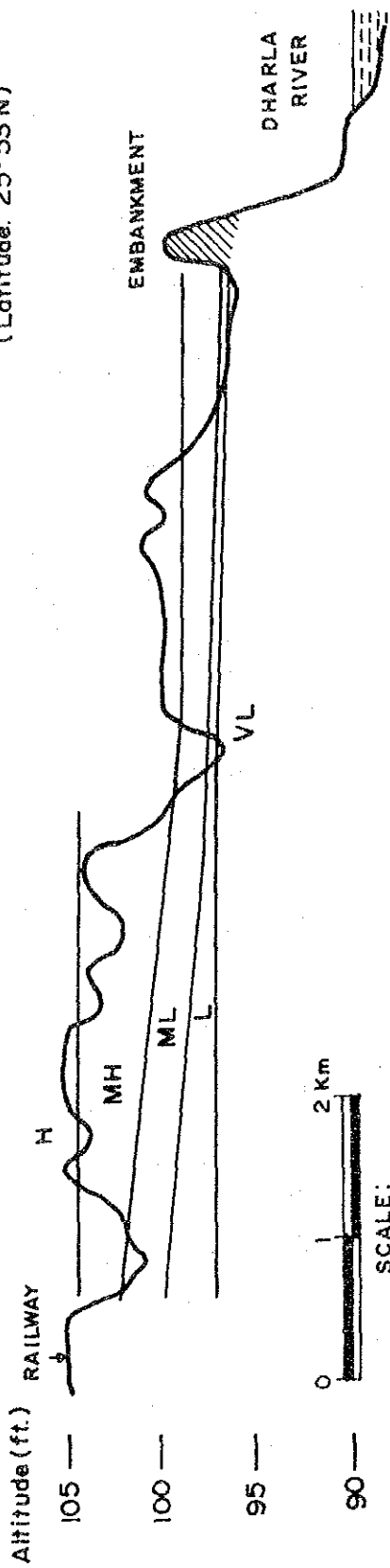
- Embankment
- River
- Railway
- Urban land



Fig. VIII.1.1 AGRO-ECOLOGICAL ZONE
(Land Resources Appraisal of Bangladesh)

Fig. VIII.1.2 Land Type and Cropping Pattern (1/4)

Line : A
(Latitude. 25° 53'N)

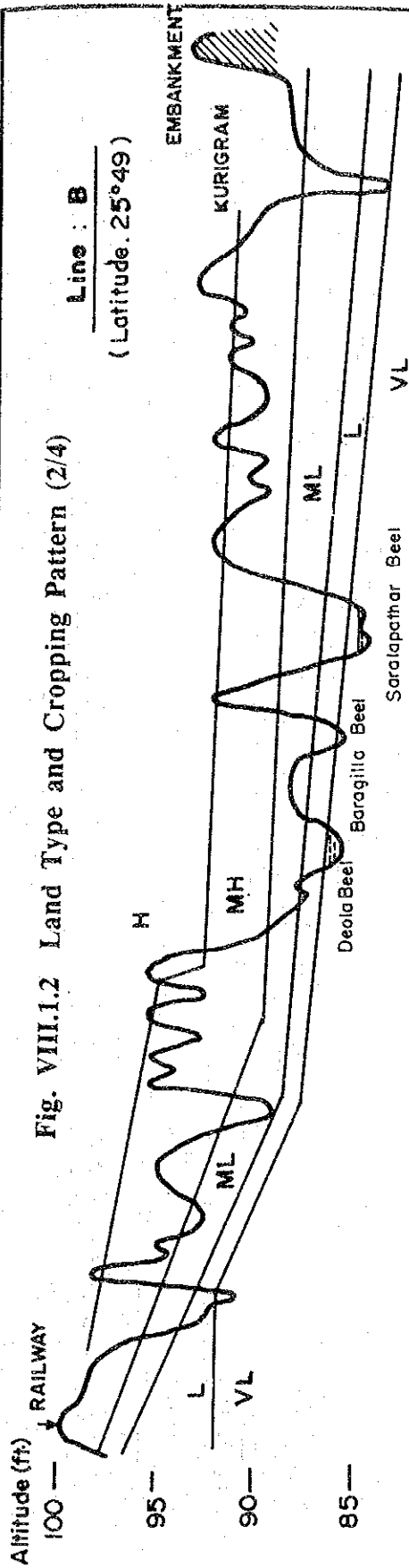


Cropping Pattern

Land Type	Irrigated Area	Rainfed Area
H High Land (Normal above flooding)	MPO:F0 H.Boro* - H.T. Aman - Rabi Crops* / fallow	Aus/Jute - H.T. Aman - fallow / Rabi Crops**
MH Medium High Land (Seasonal flooding 0-30cm)	MPO:F0 H.Boro* - H.T. Aman - fallow / Rabi Crops**	Aus/Jute - H.T. Aman - fallow / Rabi Crops**
ML Medium Low Land (Seasonal flooding 30-90cm)	MPO:F1 H.Boro - H.T. Aman	Aus/Jute/fallow - H.T. Aman - fallow / Rabi Crops**
L Low Land (Seasonal flooding 90-180cm)	MPO:F2 H.Boro - H/L.T. Aman	Jute/Aus - L.T. Aman/fallow - fallow / Rabi Crops***
VL Very Low Land (Seasonal flooding 180cm<)	MPO:F3 H/L.Boro	L. Boro

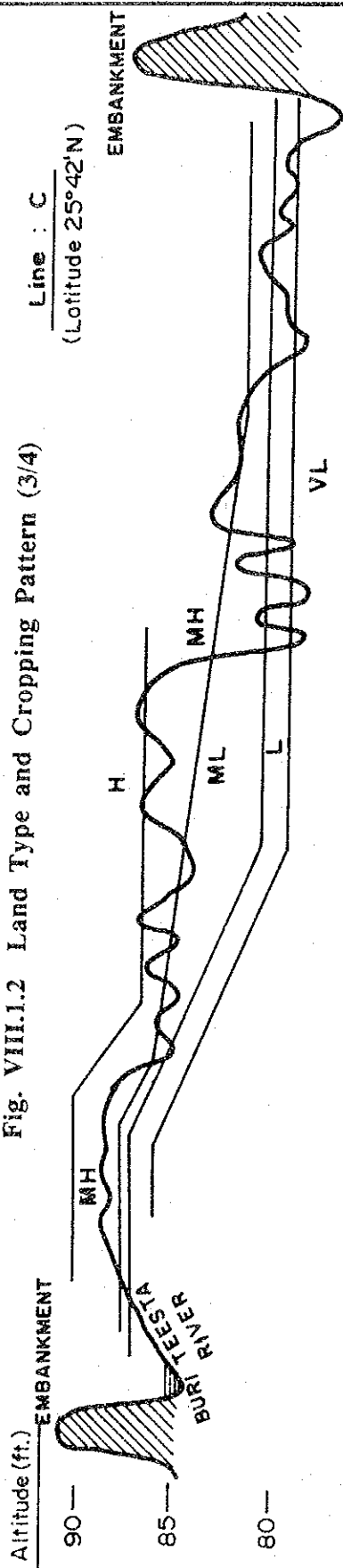
* : Late Planting ** : Tobacco, Mustard, Dhanshi, Kaun. *** : Wheat, Tobacco.

Fig. VIII.1.2 Land Type and Cropping Pattern (2/4)



Land Type	Irrigated Area	Cropping Pattern	Rained Area	Remarks
H High Land (Normal above flooding)	MPO:FO	H. Boro* - H.T. Aman - Rabi Crops** / fallow	Aus / Jute - H.T. Aman - fallow / Rabi Crops**	
MH Medium High Land (Seasonal flooding 0 - 30cm)	MPO:FO	H. Boro - H.T. Aman	Aus / Jute / fallow - H.T. Aman - fallow / Rabi Crops **	
ML Medium Low Land (Seasonal flooding 30 - 90cm)	MPO:F1	H. Boro - L.T. Aman	Aus / Jute / fallow - L.T. Aman - fallow / Rabi Crops **	
L Low Land (Seasonal flooding 90 - 180cm)	MPO:F2	H. Boro - Aus / fallow - fallow / L.T. Aman ***	Jute / Aus - L.T. Aman *** / fallow - fallow / Rabi Crops	
VL Very Low Land (Seasonal flooding 180 cm-)	MPO:F3	H/L. Boro	L. Boro	***: Occasionally damaged by floods resulting in supplement planting

Fig. VIII.1.2 Land Type and Cropping Pattern (3/4)

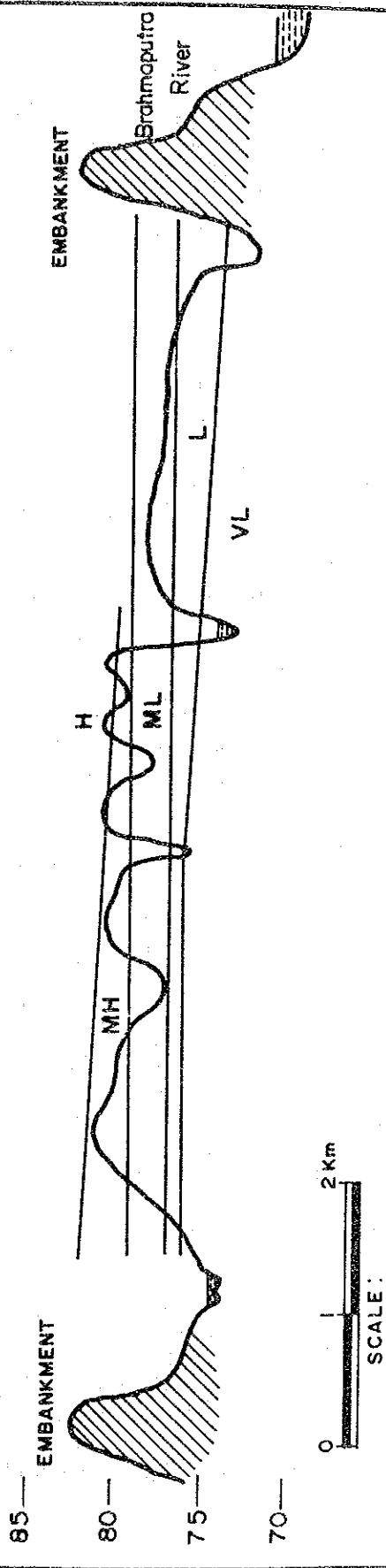


Land Type	Irrigated Area	Rainfed Area	Cropping Pattern
H High Land (Normal above flooding)	MPO:FO	H.Boro* - H.T.Aman - Rabi Crops** / fallow	Aus / Jute - H.T.Aman - fallow / Rabi Crops**
MH Medium High Land (Seasonal flooding 0-30cm)	MPO:FO	H.Boro - H/L.T.Aman	Aus / Jute - L.T.Aman - fallow / Rabi Crops**
ML Medium Low Land (Seasonal flooding 30-90cm)	MPO:F1	H.Boro - L.T.Aman	Aus / Jute / fallow - L.T.Aman - fallow / Rabi Crops**
L Low Land (Seasonal flooding 90-180cm)	MPO:F2	H.Boro - L.T.Aman***	Jute / Aus - L.T.Aman*** / fallow - fallow / Rabi Crops**
VL Very Low Land (Seasonal flooding 180cm+)	MPO:F3	H/L.Boro	L.Boro / Jute

Remarks
 * : Late Planting ** : Wheat, Potato, Onion *** : Occasionally damaged by floods resulting in delayed transplanting

Fig. VIII.1.2 Land Type and Cropping Pattern (4/4)

Line: D
(Latitude 25°36'N)



Land Type	Cropping Pattern	
	Irrigated Area	Rainfed Area
H High Land (Normal above flooding)	MPO:FO H.Boro - H.T. Aman	Aus/Jute - L.T. Aman - fallow / Rabi Crops *
MH Medium High Land (Seasonal flooding 0 - 30cm)	MPO:FO H.Boro - L.T. Aman	Aus/Jute - L.T. Aman - fallow / Rabi Crops #
ML Medium Low Land (Seasonal flooding 30-90cm)	MPO:F1 H.Boro - L.T. Aman	Aus/Jute/fallow - L.T. Aman - fallow / Rabi Crops *
L Low Land (Seasonal flooding 90-180cm)	MPO:F2 H.Boro - L.T. Aman *	Jute/Aus - L.T. Aman** / L.B. Aman*** / fallow
VL Very Low Land (Seasonal flooding 180cm)	MPO:F3 H/L.Boro	L.Boro

Remarks

* : Wheat ** : Occasionally damaged by floods
 *** : Aus & Aman Mix Seeding resulting in delayed transplanting

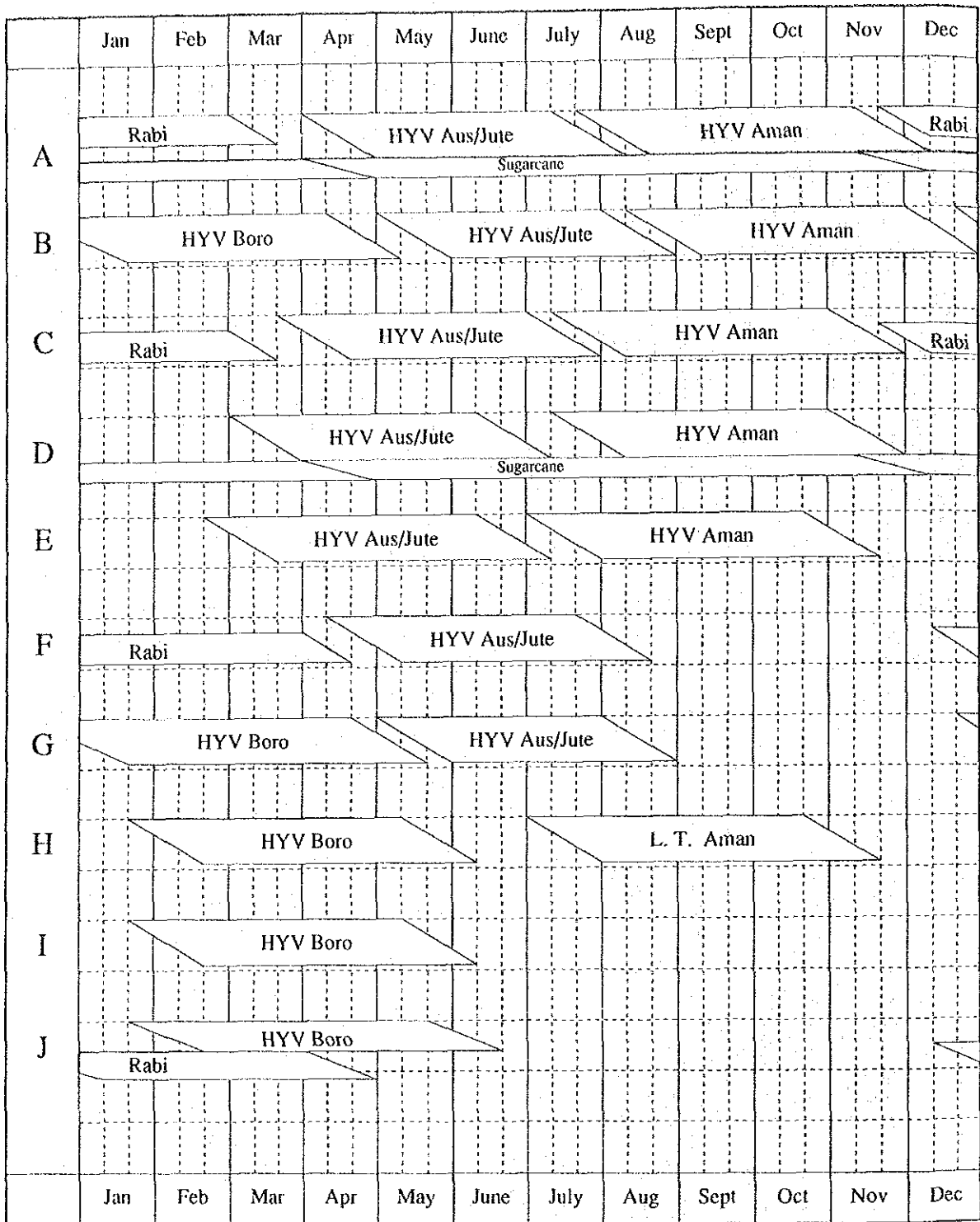


Fig. VIII.1.3 Generalized Present Cropping Sequence

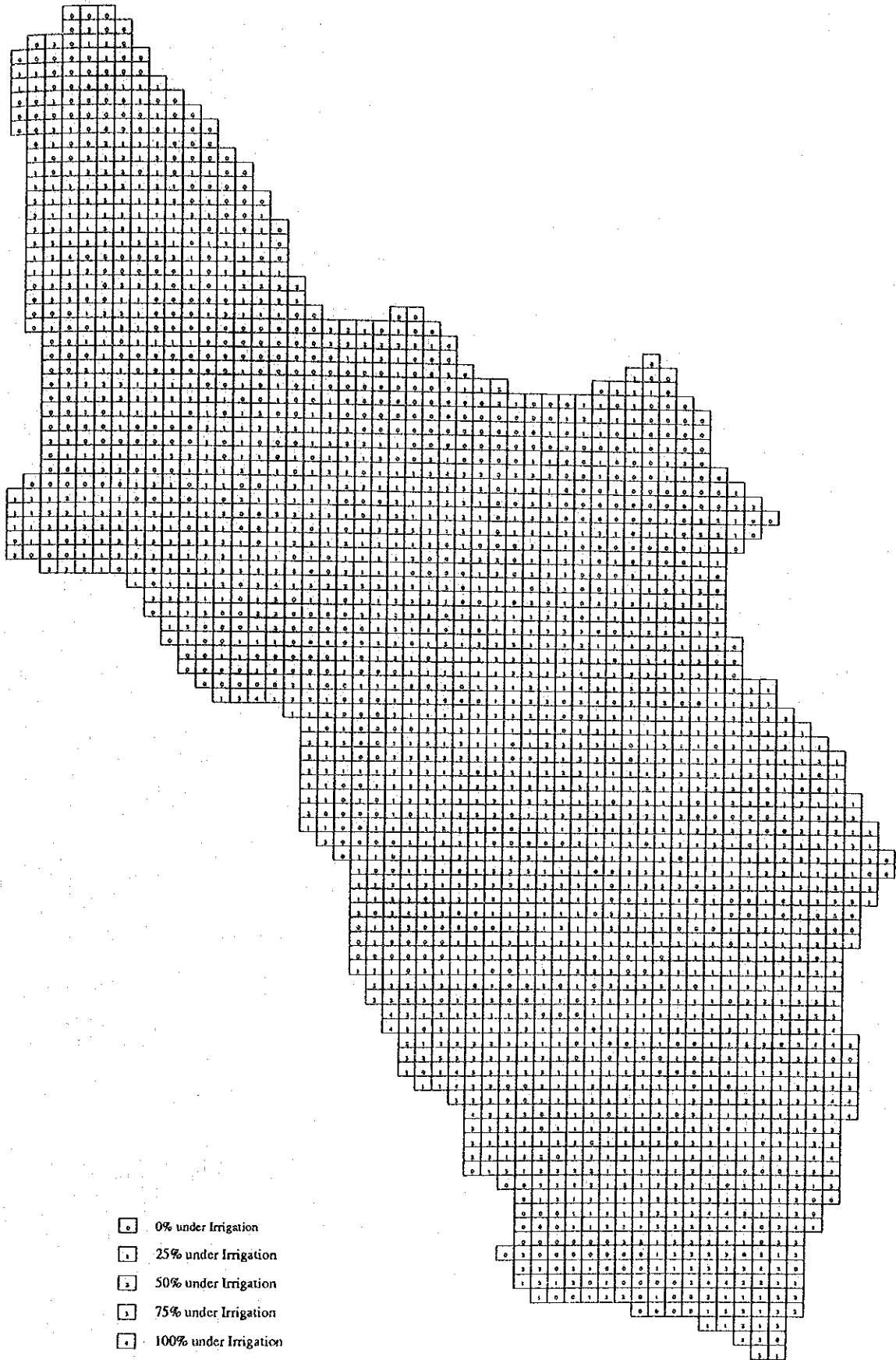


Fig. VIII.1.4 Irrigation Condition in the Study Area
(Condition in Dec. 1990)

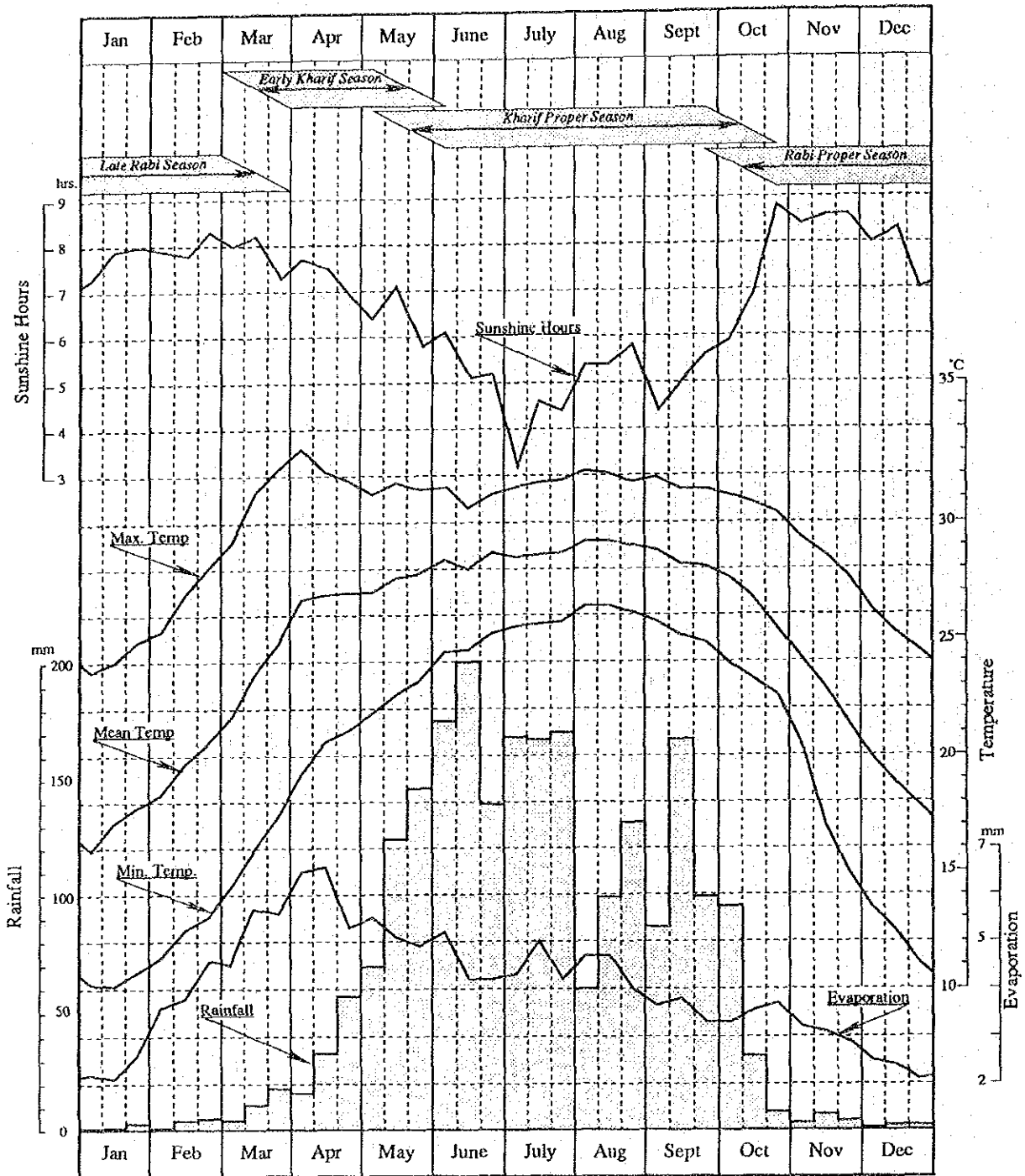


Fig. VIII.1.5 METEOROLOGICAL DATA (1961 - 1990 at Rangpur)

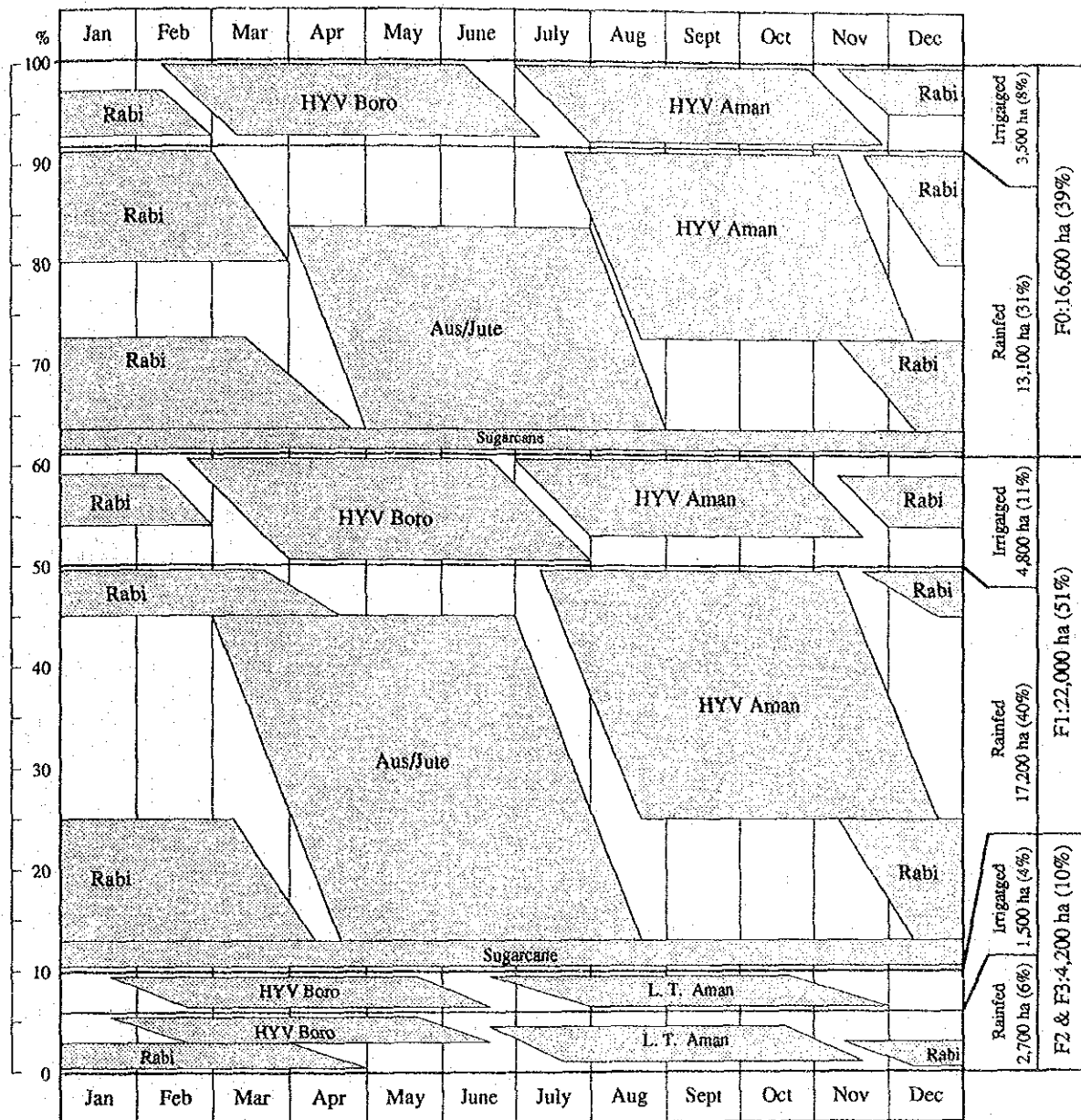


Fig. VIII.1.6 PRESENT CROPPING PATTERN
(STUDY AREA: 42,800 ha)

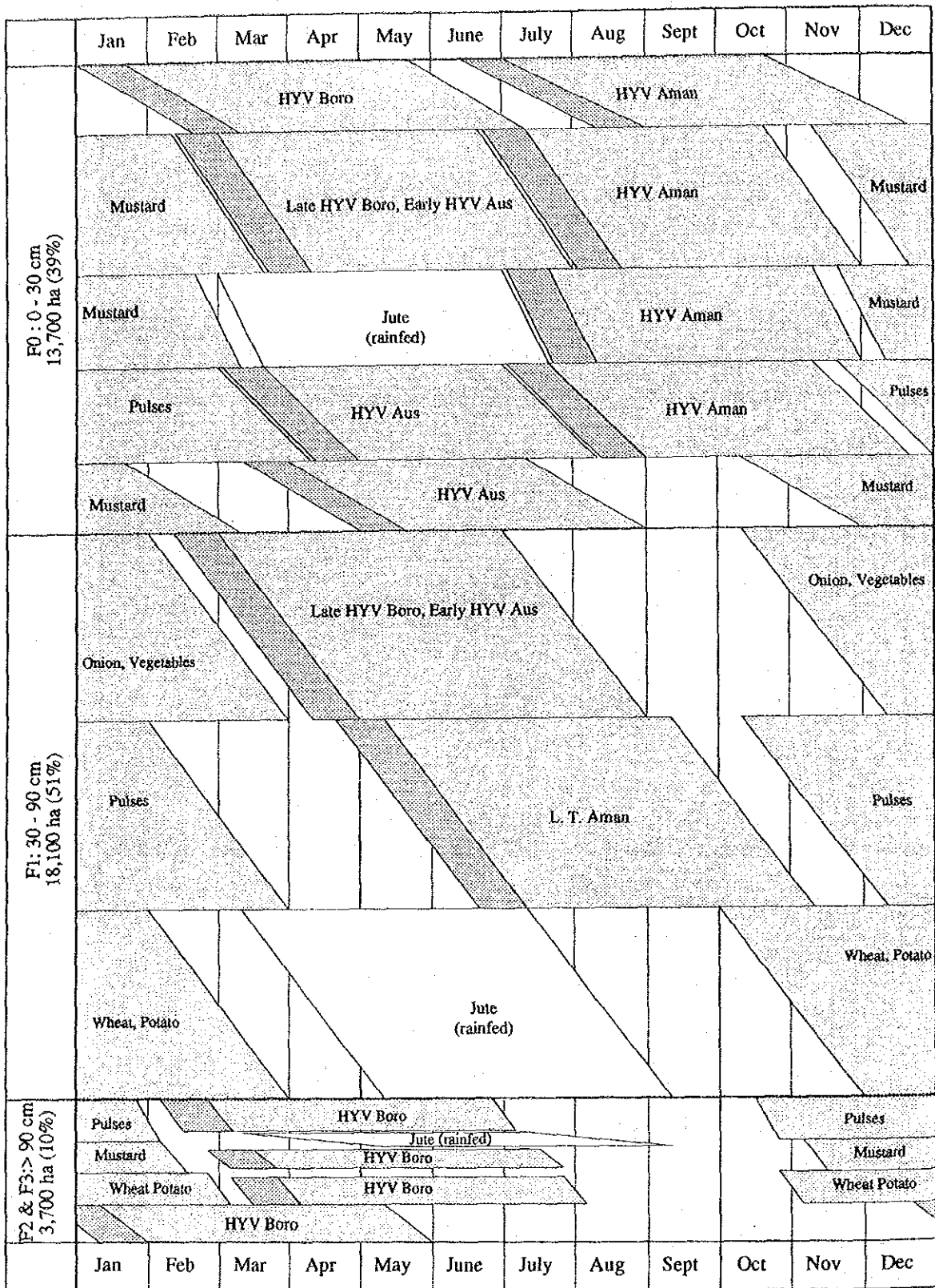


Fig. VIII.2.1 PROPOSED CROPPING PATTERN
(FOR IRRIGABLE AREA ONLY: 35,500 ha)

APPENDIX - IX

**INLAND
FISHERY**

**FEASIBILITY STUDY ON
KURIGRAM IRRIGATION AND FLOOD CONTROL PROJECT (SOUTH UNIT)**

APPENDIX - IX INLAND FISHERY

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APPENDIX-IX INLAND FISHERIES

1. Introduction

1.1 Background of the Study

Fisheries and aquaculture are second only to agriculture in terms of food production and the country's economy. These contribute about 80% of the animal protein intake to the daily diet, nearly 6% to the Gross National Product (GNP) and about 15% of the export earnings of the country. More than 10 million people of the country live from fisheries and directly related activities, and even a large number of people are engaged in subsistence fisheries. Fisheries thus play a vital role in supplying food, supplementing protein requirement, earning foreign exchange and providing employment opportunities in Bangladesh. But implementation of agricultural development projects such as FCD and FCDI ones have been detrimental to our fisheries resources. The Kurigram Flood Control and Irrigation Project (KFCIP)-South Unit (Kurigram South) undertaken by Japan International Cooperation Agency (JICA) to safeguard the lives and properties of people in the project area as well as to increase its agricultural production by formulating flood control, irrigation and drainage development plan would, no doubt, adversely affect the natural fish populations, particularly the inland aquatic environment which contributes about 74% of the country's total fish production (FRSS, 1986). Inland fisheries study has, therefore, been considered to be one of the important components in the present feasibility study.

1.2 Project Description

The Kurigram South Project is located in the Kurigram and the Lalmonirhat Districts of the North-West Region of Bangladesh adjacent to the northern boundary with India. Four Thanas namely, Kurigram Sadar, Rajarhat, Ulipur and Chilmari of the Kurigram District and only one Thana namely, the Lalmonirhat Sadar of the Lalmonirhat District comprise the Project Area (PA). Area of each constituent Thana, its percentage of the total Thana area and of the total project area have been shown in Table IX.1.1.

The project area is bounded by the international border with India in the North, the railway line leading to Lalmonirhat in the West, the Teesta river in the South-west, the Dharla river to the North East and the Brahmaputra river to the East (Fig.IX.1.1). The total gross area surrounded by these boundaries covers approximately 70,000 ha and the area protected by the existing embankment is 59,400 ha, of which, the total cultivated farm land is estimated at 42,800 ha (about 61% of the gross area). The major source of income is crop production accounting for 79% of total income, other sources of income being business/service (18%), livestock (2%) and fisheries (1%), as reported by JICA (1992). The area is very poor with an average per capita and per household income of Tk. 3,200 (US\$ 85.00) and Tk. 18,600 (US\$ 490.00) respectively per annum, which is considerably lower than the national average.

Construction of the flood control and drainage aspects in the Kurigram South Unit started from July 1973 based on the original plan of 1969/71. The flood embankment of about 108 km was completed in 1983/84 and a total of 11 as against 5 drainage sluices originally planned in 1969/71 were also constructed.

About 40% of the area was flooded almost every year before the project, resulting in extensive damage to Aus and Aman crops, disruption of communication and damage to infrastructure. Large tracts of agricultural lands were lost every year due to bank erosion caused by the three aforesaid major rivers. In the dry season, there is a lack of surface water which constrained agriculture until the introduction of tube wells. One river, the Ratnai still flows into the project area unrestricted. The drainage system is silted up and appears never to have been excavated or improved. The irrigation component planned earlier was also never implemented.

1.3 Objectives of the Study

The primary objectives of the study was to effect improvements in the water regime to facilitate increased crop production by providing irrigation, flood control and drainage in the project area. Of the many different tasks of the present fisheries study, some of the important ones were:

- i) Field reconnaissance along the existing embankments;
- ii) Collection of both field and archive information as to the present and recent nature of fisheries in the project area;
- iii) Field surveys and investigations on inland fisheries to assess the current fisheries status, development constraints and future potentials;
- iv) Review of the existing F/S reports and on-gong Flood Action Plan (FAP) studies;
- v) Assessment of the existing Flood Control and Drainage (FCD) facilities and of their potential impacts on the existing aquaculture and capture fisheries resources;
- vi) A broader understanding of the institutional supports available for fisheries development and management; and
- vii) Formulation of the definitive development plan based on a broader appreciation of overall development needs and constraints.

2. Methodology

2.1 Preliminary Data Collection

Efforts were made to collect all relevant background materials (maps, previous reports etc.), available literature and information required for the project activities. Study of the previous literature/reports and bibliography indicated the different sources of preliminary data collection on the fisheries resources of the project area. Data were collected from quite a few sources mainly BBS, BRAC, BRDB, BWDB, CARE, FPCO, FRSS, Grameen Bank, LGED, SPARRSO, WARPO (Former MPO) and World Bank. Some information/data on the project area were also recorded from the JICA Inception Report (1991) and Interim Report (1992). All the data were cross-checked and then consolidated.

Reconnaissance field visits were undertaken to establish the accessibility and arrangements at the study sites, gain familiarity with local conditions and develop rapport with the field personnel of the Department of Fisheries (DOF). Field reconnaissance along the existing embankments was planned also for an overview of the technical assessment, institutional and social assessment, embankment maintenance conditions etc.

2.2 Questionnaire Survey

Keeping in view the points of information required in implementing the project, a suitable questionnaire was designed for collecting data on the different aspects of inland fisheries sector, covering both the subsectors culture fisheries and capture fisheries. The questions falling into the following broad categories were included in the questionnaire:

I. Culture Fisheries

- Location identification and qualification
- Ownership status and present state of cultural operations
- Existing cultural practices, fish species stocked and production
- Sources of fish seeds, existing hatchery/nursery-production and status
- Current and potential productive levels, Input costs and Net Production Value (NPV)
- Causes of reduction in fish production including post harvest losses/administrative /financial causes etc.
- Perceived development constraints
- DOF and NGO's aquaculture development/extension plans

II. Capture Fisheries

- Location identification and qualification
- Present management system (leasing, licensing) and catch statistics
- Catch composition of fish stocks, marketing channels and mechanisms
- Inventory of fishermen and their socio-economic status
- Perceived development constraints
- Development and management plans, and
- Opportunities for further development

The questions were targeted towards the outlying District Fisheries Officers (DFO) and the Thana Fisheries Officers (TFO) working in the project area. The fisheries Expert of the JICA Team, on undertaking field trips to the project site (between 19 and 30 January 1992), contacted personally the DFOs, to whom, copies of the questionnaire were already mailed earlier, to answer any queries they might have. Relevant data literature/publications and almost all the questionnaires were procured by him before his return to the Head Quarters in Dhaka. The remaining interview sheets were received by him soon after his return to Dhaka.

III. Inventory of Fishermen

For fishing community survey, another set of questionnaire was designed at the very outset of the phase-II study period. This questionnaire covered the following aspects:-

- Particulars of fishermen (total number, average family size, number of earning members, weekly/monthly and yearly average income etc;)
- Household's involvement in fishing (Full time/Part time/Subsistence)
- Household member's income and employment including participation in fishing, fish marketing, fish processing, fish trap making, net weaving, poultry/livestock raising, small trade/service etc.
- Fishing periods, duration and fishing locations (Flood land, main rivers, other rivers and beels)
- Annual catch statistics (catch, weight and value)
- Particulars of crafts and gears used
- Effects of FCD/FCDI Activities
- Constraints/Problems faced and suggestions

The questionnaire was passed on to the Development Planners & Consultants (DPC) that was entrusted with the job of data collection analyses and interpretation of the survey results. The same questionnaire was administered to the cross sections of all three types of fishermen.

2.3 Field Survey and Investigations

Field surveys were scheduled after the development of a clear and precise definition of what information were both essential and accessible to discovery by survey methods. They were scheduled in order to confirm the validity of the data collected from different secondary sources and from the questionnaire survey. They were planned also to enrich the data base.

The field surveys and investigations were undertaken between 19 and 31 January 1992 during the phase-I period and between 22 and 30 August 1992 during the phase-II. Based on preliminary field experience and a deeper understanding of the tasks of the study, some more questions were incorporated in the original questionnaires.

During the short survey and investigation periods, both primary and secondary sources were utilized for answers on many important questions of the questionnaires as well as on those missing from them. The primary sources included the fish culturists, the lessees of the ponds/tanks/Jalmahals, fish traders, fishermen and the fish consumers. The owners of the ponds/tanks and the lessees of the open water Jalmahals who were available at the sites were interviewed. As many as 34 ponds/tanks (Rajarhat 13, Chilmari 6, Ulipur 5, Kurigram 4 and Lalmonirhat 6) were visited by our Fisheries Expert. The beels/Jalmahals he visited numbered 17 (Rajarhat 6, Chilmari 7, Ulipur 3 and Kurigram 1). Quite a few fishermen selected at random were also interviewed during Phase-II field trip undertaken by the Fisheries Expert. All these interviews were made by him for cross checking the data collected by Questionnaire survey.

The fishermen were interviewed both at home and at the fishing sites. The fish traders and the fish consumers were interviewed at fish markets. The Farm Managers of the two Fish Seed Multiplication Farms (FSMF), one managed by the Department of Fisheries (DOF) at Kurigram and the other by the Grameen Bank at Lalmonirhat were also interviewed. The data collected from all possible sources were properly recorded. The secondary sources that provided the data/information included the Thana Fishery Officers, District Fisheries Officers, Thana Nirbari officers, Officials of the BRAC, BRDB, BWDB, CARE, Grameen Bank, LGED, RDRS (RESP) and so on.

2.3.1 FCD/I Impact Assessment Approach

The process of FCD/I development, although inevitable, will change the aquatic environments of inland water bodies to the detriment of the traditionally dominant inland capture fisheries. Typical pre- and post-FCD conditions can be envisioned from the Figure F-2. The major constraints hindering the maintenance and development of inland capture fisheries of Bangladesh have been reviewed in detail in recent years by MPO (1987), Islam (1988), Ali (1991). The greatest problem identified has been that caused by the extensive development of various flood protection programmes, often linked with improved drainage and irrigation schemes. An FCD/I impact assessment on fisheries in the present study on the Kurigram South, has therefore been considered essential.

In making an assessment of the potential impact on inland fisheries of the present project, the methodology outlined by MPO (now WARPO) in 1985 (MPO 1987 b) was followed. The method is fairly approximate; but in the absence of more detailed information on fish productivity and biomass in different water depths on the flood plain, it offers the best available method to date.

The assessment of the project impact requires :-

- 1) a clear understanding of the (WO) situation of the fisheries resources (biological and production models, mapping of fisheries typology), and
- 2) a fisheries production and socio-economic bench mark.