Government of the People's Republic of Bangladesh

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

BANGLADESH ACTION PLAN FOR FLOOD CONTROL

COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

SIRAJGANJ CPP INTERIM REPORT

ANNEXURE 4.1: PRELIMINARY AGRICULTURAL SURVEY
ANNEXURE 4.2: LAND USE SURVEY
ANNEXURE 4.3: SURVEY ON IRRIGATION

(FINAL DRAFT)

June 1993

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

under assignment to

DIRECTORAAT GENERAAL INTERNATIONALE SAMENWERKING
Government of the Netherlands

and

KREDITANSTALT FÜR WIEDERAUFBAU
Federal Republic of Germany

Government of the People's Republic of Bangladesh

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

BANGLADESH ACTION PLAN FOR FLOOD CONTROL

COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

SIRAJGANJ CPP INTERIM REPORT

ANNEXURE 4.1: PRELIMINARY AGRICULTURAL SURVEY
ANNEXURE 4.2: LAND USE SURVEY
ANNEXURE 4.3: SURVEY ON IRRIGATION

(FINAL DRAFT)

June 1993

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

under assignment to

DIRECTORAAT GENERAAL INTERNATIONALE SAMENWERKING
Government of the Netherlands

and

KREDITANSTALT FÜR WIEDERAUFBAU
Federal Republic of Germany

Government of the People's Republic of Bangladesh

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

BANGLADESH ACTION PLAN FOR FLOOD CONTROL

COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

SIRAJGANJ INTERIM REPORT

ANNEXURE 4.1 : PRELIMINARY AGRICULTURE SURVEY

May 1992

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

under assignment to

DIRECTORAAT GENERAAL INTERNATIONALE SAMENWERKING
Government of the Netherlands

and

KREDITANSTALT FÜR WIEDERAUFBAU
Federal Republic of Germany

ANNEX 4.1: PRELIMINARY AGRICULTURE SURVEY

TABLE CONTENTS

TABLES

FIGURE

1. Introduction

The Sirajganj Pilot Project, a compartment designate of the FAP-20 Compartmentalization Pilot Project, covering an area of about 10,000 hectares (preliminary estimate) is located in Sirajganj and Kazipur Thanas of Sirajganj District between the Brahmaputra Right Embankment (BRE) in the eastern side and the Ichamati River in the Western and Northern side. The southern boundary is in line with the new Sirajganj-Bogra Road, originating form Sirajganj town upto Bhadraghat near down of the confluence of Ichamati and Baniazan Rivers.

From late sixties until 1987 the BRE protected the area from intense Jamuna floods and erosions quite satisfactorily, but after that the people lost confidence in flood protection due to frequent breaches in the BRE, and even worse situation than pre-BRE agricultural situation pushed them to resort to unplanned farming practices and other sub-systems. A more secure and stable embankment (BRE) is now posing to be the pre-condition for any development strategy and plan to be formulated for the indicated project area.

2. Agro-Environment

The area is mostly medium to medium low with gentle slope and smooth relief, although in detail, it comprises a micro-network of ridges, old channels and basins of former braided river landscape, with 1-3 meter difference between the ridge tops and adjoining beds. Lands are said to be formed of recent alluvium, and agro-ecologically classified under Karatoa-Bangali Flood Plain with some areas under mixed Karatoa-Bangali and Active Brahmaputra-Jamuna Flood Plain. The Ichamati and Baniajan Rivers are mostly siltedup. The unique physical feature of the project is the flood defence provided by the Brahmaputra Right Embankment (BRE) which was constructed in sixties; but lost confidence due to several breaches occurred from late seventies until now. The flood defence from Jamuna is not now reliable due to delapilated condition of the BRE in several places posing any time flood danger. Rainfall and local run-off accumulates in depressions starting in May and reaches its' peak in July-August flooding the depressions 1-2 meter deep. Since the area is generally low relief, with micro-topography showing considerable variation through embanked roadways, railway tracks, raised clusters of villages, flooding and drainage systems naturally developed and deviated over the past years exposed the area to monsoon inundation from moderately deep to very deep impounded waters both from river spills and rainfall run-off. This again, now a days, frequently aggravated by on-rush of flood waters entering through the breaches occurring almost every year without possibility of quick drainage.

Soils are mostly silty loam to silty clay loam with some silty clay in the depressions. During recent times sand layers are observed on topsoils alongside river catchments. Organic matter content of the soils are mostly low and having reactions of slightly acidic to neutral.

In the project area as per preliminary estimate, about 10% is highland, some 20% medium highland about,50% medium lowland and the rest 20% is lowland.

3. Landuse

About 65% of the gross area of the Sirajganj and Kazipur Thanas is presently cultivated, though this percentage will be higher if only the proposed project area is considered. This is due to the fact that vast lands belonging of these Thanas have been devoured by Jamuna River and others outside BRE are waiting to be engulfed.

The cultivated areas are mostly double cropped (61%), with some triple cropped (21%) and single cropped (18%) lands. About 78% of the net cultivated area (NCA) is devoted to rice cultivation with about 40-50% being consumed by Boro rice crop which is grown from January/ February to May with irrigation mostly by tubewells(groundwater). Total cropping intensity is 203%.

4. Irrigation

Irrigation, specially for Boro rice cultivation, has rapidly expanded from late Eighties with the privatisation of import, manufacture and marketing of Shallow Tube Wells (STW) and prolific installations of Deep Tube Wells (DTW) by BADC and other organizations. Moreover, several NGOs and BRDB agencies endeavoured to modernise the Hand Tube Wells which has also gained popularity among the small and marginal farmers.

About 50% of the net cropped area (NCA) is under irrigation in this project from which lands about 80% of the total rice produced in the area have been harvested through cultivation of HYV Boro crop, and significant quantity of wheat. In some of the unions about 60-70% of the NCA has been irrigated for Boro (mainly) and wheat cultivation. It can be assumed that more and more lands will be put to irrigated agriculture should the power supply (electricity) and diesel price is smoothened.

In the designated project area, it is estimated (from DAE data) that, about 160 DTW, 1900 STW and 8 LLP are irrigating about 50% of the NCA is dry season, together with some HTW and indegenous modes.

5. Inputs

Availability of agricultural inputs i.e. certified seeds. fertilizers, pesticides, agricultural machinery etc. appear to be fair in normal times, but the price of these materials shoots up in peak demand periods which the majority farmers (especially marginal and small) cannot afford.

There are many private dealers in the project area who import and sell fertilizers, pesticides and seeds, apart from BADC handling most of the buik seeds (certified) including paddy, wheat, mustard, jute, potato, vegetables etc. The dealers are able to procure and supply any quantity of fertilizers and pesticides from the wholesellers and importers of Khulna, Chittagong and Narayangonj. But the input use of the project area appears to be low in comparison to standards.

Agricultural machinery like Tractors, Power Tillers, Harrows, Weeders, Threshers etc. are not usually found except that DTW, STW, LLP and HTW are fairly observed. Human labourers are more or less fairly available, while animal drafts are not increasing as per rising demands.

6. Agriculture

The setting of different crops by crop seasons in a crop calendar year determines the cropping pattern and intensity of cropping of particular area. In the project area, likewise in other floodplain zones, the cropping pattern is mostly dictated by the flood regime with little reference to land and soil resources. Other factors associated directly or indirectly are: irrigation possibilities, input availabilities and the market expectations. Since the floodplain areas are uniquely set for rice cultivation due to its agro-ecological setting, and since rice is the staple food of the people of the area, it always dominates the cropping patterns. In all the 3 crop seasons rice solely dominates as a single major crop. About 78% of the NCA in this project is occupied by rice crops, cumulative of 3 seasons. This is rather low in comparison to other floodplains. The main cause of this low rice cropping in the project area is due to the occurrences and apprehension of breaches in the BRE, which have already lost the confidence of the farmers. Flood on-rush damaging Aus, T. Aman and D.W. Aman rice crops in frequent times retarded the normal cultivation of these crops in Kharif season. While the farmers are trying or rather became bound to develop new cropping patterns with mostly Jute, Sugarcane, Kaon, Groundnut, Sweet Potato etc. followed by Boro rice and wheat/ mustard engaging more intensive cultivation practices in Rabi season and making provision of irrigation. This is to compensate the low level of rice growing opportunities in Kharif season being made hazardous by breaches in the BRE. Even in pre-BRE period Aus, T.Aman and B.Aman (all Kharif rice crops) had a wide coverage in the cropping patterns. Now with the rapid expansion of irrigation facilities, Boro rice cropping in rabi season has increased manifold accounting for 45-50% of the NCA and producing about 80% of the total rice. Similarly wheat, mustard and sugarcane are now occupying larger share in the cropping patterns with 12%, 17% and 15% respectively of the NCA; while T.Aman, D.W.Aman and Aus have gone down to 20%, 7% and 7% respectively of NCA.

Rice

Rice being the principal crop of the area, likewise in other parts of the country, occupy the maximum lands in the floodplain accounting for about 78% of the NCA. In some unions the extents are 106% to 108%, though these figures are low in comparison to other floodplain areas. Details of unionwise different rice areas under HYV and local varieties are presented in Table I. It may be noted interestingly that while Boro areas (45% of the NCA) have increased significantly over the past years, the areas under D.W.Aman and Aus, unlike in other floodplain, have decreased to a minimum (7% only each). According to the land category (or land resources inventory) the T.Aman area should have also been far more, but it seems squeezed (only 20%). The main reason of such depressing scenario, as indicated earlier also, is that the area fell victim of on-rush floods from Jamuna River through the breaches in BRE and aggravated by intensive rainfall run-off accumulation with drainage congestions in the basins, whereon the floodplain has been devastatingly flooded in Kharif-I

and II season i.e. the growing period of Aus, D.W.Aman and T.Aman. This is a general picture of the rice cropping in the area after 1987 whenfrom the farmers are not growing Kharif rice crops except in high ridges. But before this, it could be learnt, the area had been intensively cropped with T.Aman and Aus in the medium high and medium low lands, and with B.Aman (D.W.Aman) in the low lands.

Figure 1. Crop Calendar of Existing Crops

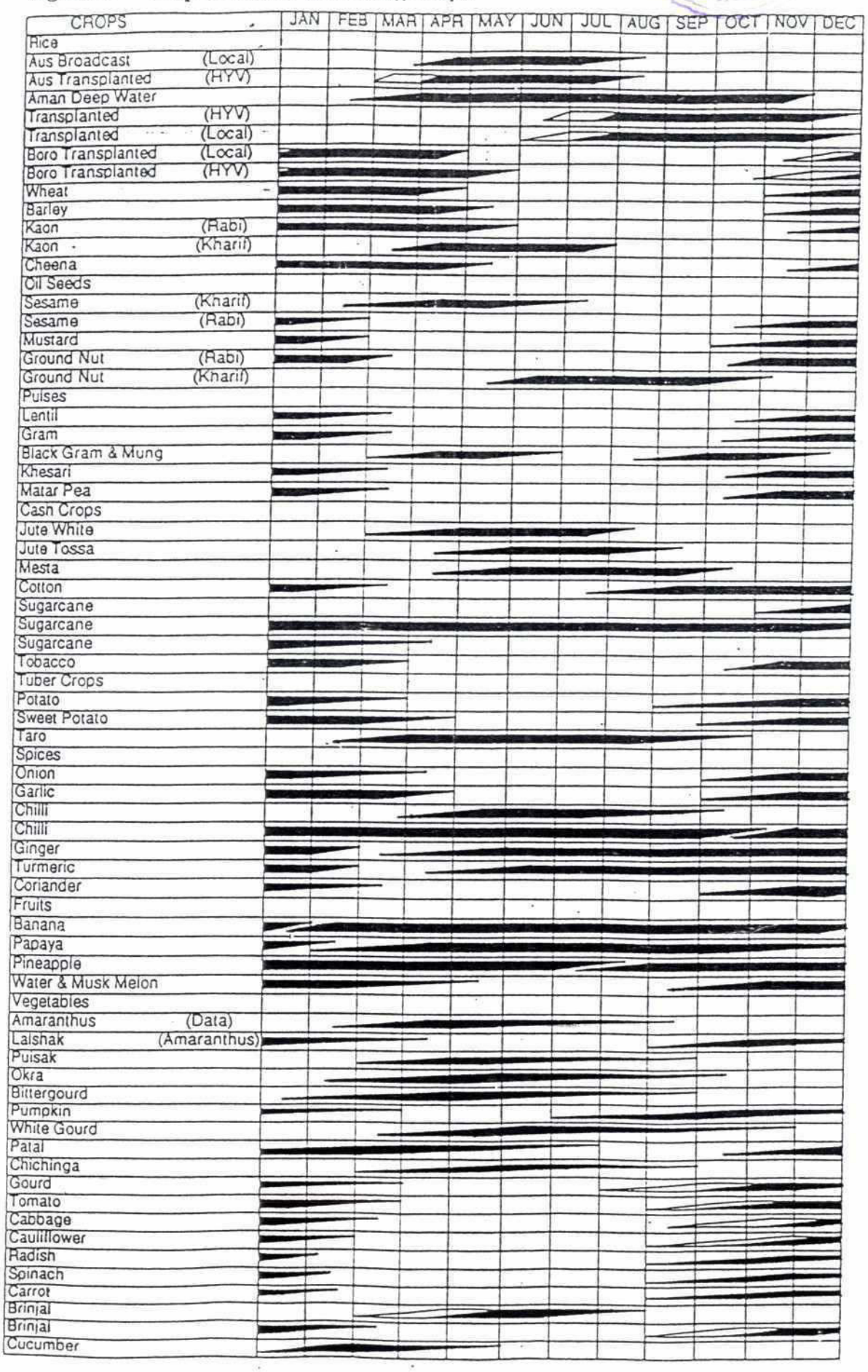


Table I

1991-92 AREA OF RICE CROPS PER UNION IN SIRAJGANJ CPP (IN HA)

Sl. No.	Union	BORO				T. AMAN				D. W. AMAN				AUS				Total Area Rice Crops	
		HYV	Local	Total	% of NCA	HYV	Local	Total	% of NCA	Tr.	Br.	Total	% of NCA	HYV	Local	Total	% of NCA	Area	% NCA
1.	Ratankandi	2030	6	2036	60	50	300	350	10	-	-	-	-	20	50	70	2	2456	72
2.	Bagbati	1468	-	1468	54	130	350	480	18	-	-	-	-	50	75	125	5	2073	77
3.	Bahuli	1376	-	1376	62	50	200	250	12	-	-	-	-	25	100	125	6	1751	80
4.	Sealkole	1209	-	1209	53	250	800	1050	45	-	-	-	-	60	125	185	8	2444	106
5.	Koksabari	555	-	555	23	200	200	400	17	-	58	58	2	15	175	190	8	1203	50
6.	Songacha	1174	-	1174	42	-	504	504	18	-	-	-	-	-	125	125	4	1803	64
7.	Mesra	41	39	80	5	15	12	27	2	-	1000	1000	62	-	275	275	17	1382	86
8.	Pourasava	289	-	289	78	-	-	-	-	-	-	-	-	-	2	2	1	291	79
9.	Kowakhola	-	40	40	3	10	-	10	1	-	550	550	42	-	200	200	15	800	62
10.	K.Haripur	1356	-	1356	68	246	500	746	37	-	100	100	5	46	140	186	9	2388	119
11.	Saidabad	830	-	830	52	235	500	735	46	-	50	50	3	8	105	113	7	1728	108
12.	Gandhail	1152	18	1170	47	49	220	269	11	-	-	-	-	14	99	113	5	1552	62
13.	Sobgacha	682	36	718	33	9	211	220	10	-	6	6	-	12	92	104	5	1048	49
14.	Kazipur	794	57	851	58	61	393	454	31	-	2	2	-	14	15	29	2	1336	92
15.	Tekani	93	109	202	18	14	364	378	33	-	263	263	23	-	387	387	34	1230	108
Total		13049	305	13354	45	1319	4554	5873	20	-	2029	2029	7	264	1965	2229	7	23485	78

Figures are of whole unions, not limited to project area.

To compensate this vacuum of rice production in Kharif season, the farmers have directed all their efforts to Boro rice cropping in dry (flood free) rabi season. As discussed in prepages, Boro rice crop alone conquered about 45% of the NCA on an average in the assumed project area, while in some unions it went upto 60-70% posing to be the single major crop. It may be anticipated that the Boro area will further expand rapidly with farmers' more access to power supply, POL price and input-credit availability.

HYV rice varieties are fast taking over the local varieties where flood control and drainage systems have developed or adjusted in Kharif season, and input-credit and irrigation provisions are available. HYV rice varieties give yields 2-3 times more than the local varieties although the cost of production is less than double. Boro has almost all HYVs (about 98%) mostly bred from IRRI varieties; but T.Aman and Aus could not quite catch up with HYVs in this project area as these varieties are mostly dwarf and non-resistant to flood. D.W.Aman has no HYV as yet. Table II elaborates the Unionwise rice productions for each seasonal rice crop varieties in the project area. It can be seen that Boro alone contributes about 82% of the rice produced in the area, while T.Aman supplies 13%, and Aus and D.W. Aman produce only 3% and 2% respectively.

Yield standards (Ton/Ha) of different rice crops/varieties may be calculated as below (from Table II):

Boro (HYV)	-	4.89 Mt./Ha
Boro (Local)	-	2.11 Mt./Ha
T.Aman (HYV)	-	3.70 Mt./Ha
T.Aman(Local)	-	1.17 Mt./Ha
D.W. Aman	-	0.95 Mt./Ha
Aus (HYV)	-	2.05 Mt./Ha
Aus (Local)	-	0.99 Mt./Ha

Other Crops

It is rather little exceptional in this project that about 125% of the total cropped area has been covered by other crops than rice, which is 78%. The reason of low rice coverage has been explained in the foregoing sections. Farmers' therefore, try their best to recoup the shortfall of rice through cultivation of other crops as much as possible.

Other crops include mostly wheat, jute, mustard, sugarcane, potatoes, pulses and vegetables. Millets (cheena and kaon), groundnut, spices (chilies, onions, ginger, garlic etc.) and some melons though usually treated as minor crops have gained larger areas to compensate low Kharif rice cropping which have been retarded due to flood situation. This year Kaon and Cheena are found widespread.

Table II

1991-92 RICE PRODUCTION PER UNION SIRAJGANJ CPP IN TON

Sl. No.	Union	BORO				T. AMAN				D.W. AMAN				AUS				Total Rice Production
		HYV	Local	Total	% of Total Rice Production	HYV	Local	Total	% of Total Rice Production	Tr.	Br.	Total	% of Total Rice Production	HYV	Local	Total	% of Total Rice Production	
1.	Ratankandi	10130	12	10142	94	185	369	554	5	-	-	-	-	40	46	86	1	10782
2.	Bagbati	6540	-	6540	86	481	430	911	12	-	-	-	-	100	70	170	2	7621
3.	Bahuli	6880	-	6880	92	185	246	431	6	-	-	-	-	50	93	143	2	7454
4.	Sealkole	5795	-	5795	73	925	984	1909	24	-	-	-	-	120	116	236	3	7940
5.	Khoksabari	2775	-	2775	70	740	246	986	25	-	50	50	-	30	163	193	5	4004
6.	Songacha	5870	-	5870	89	-	615	615	9	-	-	-	-	-	116	116	2	6601
7.	Mesra	205	-	255	18	55	15	70	5	-	860	860	59	-	256	256	18	1441
8.	Pourasava	1445	50	1445	99	-	-	-	-	-	-	-	-	-	2	2	1	1447
9.	Kowakhola	-	60	60	8	37	-	37	5	-	473	473	62	-	186	186	25	756
10.	K.Haripur	6780	-	6780	79	910	615	1525	18	-	86	86	1	92	130	222	2	8613
11.	Saidabad	4150	-	4150	78	860	150	1010	19	-	43	43	1	16	98	114	2	5317
12.	Gandhail	5300	43	5343	89	208	327	535	9	-	-	-	-	30	107	137	2	6015
13.	Sobgacha	3439	86	3525	89	40	310	350	9	-	10	10	0	30	104	134	2	4019
14.	Kazipur	4033	134	4167	85	205	502	707	14	-	4	4	0	34	18	52	1	4930
15.	Tekani	447	259	706	33	60	540	600	28	-	407	407	19	-	437	437	20	2150
Total		63789	644	64434	82%	4891	5349	10240	13%	-	1933	1933	2%	542	1942	2484	3%	79090

Figures are of whole unions, not limited to project area.

Table III gives a vivid picture of some selected other crops in each Unions giving area coverage and production volumes. It is interesting to note that Jute has fallen down much in this area with only meager 6% coverage of NCA, but this area was renowned as an important Jute trading place before Eighties. Jute is now running in a flop market as demand for Jute fibre has been diminished, and as such farmers' cannot sell their fibres even at harvest costs. Still they are putting some lands on Jute for Jute sticks, which sells at good prices, and also that farmers themselves need some jute-fibres and sticks for their domestic uses. Another reason for low jute coverage is the on-rush of deep flooding from Jamuna River through the breaches suddenly, which submerges the Jute plants and inflict damages to the crop in terms of both quantity and quality.

On the other hand Mustard, Wheat and Sugarcane have registered a quick increase with area coverage of 17%, 12% and 15% respectively. Mustard and Wheat being very short duration crop of dry season could find easy access in between two rice crops, and even as inter-crop in the Sugarcane fields. The area under Sugarcane was scanty before 1987, as could be learnt from DAE local staff sources as well as from the farmers, but after the breaches occurred in BRE starting from 1987, the Kharif rice fields of medium high and low, have began to be converted to Sugarcane plantations, which can stand certain degree of on-rush flooding.

Though rabi pulses and vegetables are not so popular in the area, meanwhile Kaon and Cheena is now dominating in both rabi and early Kharif I season before the flood waters could enter the area. It could be collected from the DAE thana staff that Kaon and Cheena has been indiscriminately and extensively cultivated this year mostly in sandy lands and charlands, but the exact area could not be quantified as yet. Similarly Sweet Potato, Groundnut, Ginger etc. also taking good places in the crop pattern of light soil areas.

Yield of the above cited crops (Ton/Ha) have been observed to be more or less similar to those of other floodplain areas. Average yields of some selected crops may be shown below as calculated from Table III.

Jute	-	1.43 Tons/Ha
Wheat	-	1.90 Tons/Ha
Mustard	-	0.73 Tons/Ha
Potato	-	11.36 Tons/Ha
Pulses	-	1.85 Tons/Ha
Vegetables	-	6.42 Tons/Ha
Sugarcane	-	44.63 Tons/Ha

Table III

1991-92 AREA AND PRODUCTION OF SELECTED CROPS PER UNION IN SIRAJGANJ CPP (IN HA AND TONS)

Sl. No.	Union	JUTE			WHEAT			MUSTARD			POTATO			PULSES			VEGETABLES			SUGARCANE		
		AREA		PRODUCTION	AREA		PRODUCTION	AREA		PRODUCTION	AREA		PRODUCTION	AREA		PRODUCTION	AREA		PRODUCTION	AREA		RODUCTION
		Total	% of NCA	Total	Total	%of NCA	Total	Total	% of NCA	Total	Total	% of NCA	Total	Total	% of NCA	Total	Total	% of NCA	Total	Total	% of NCA	Total
1.	Ratankandi	75	2	87	558	16	939	500	15	300	70	2	845	118	3	89	50	2	250	500	15	22500
2.	Bagbati	70	3	84	571	21	1076	200	7	120	85	3	855	100	4	79	80	3	280	500	19	22500
3.	Bahuli	125	6	160	124	6	216	300	14	180	75	3	855	116	5	78	20	1	100	300	14	12500
4.	Sealkole	125	5	160	277	12	513	500	22	300	65	3	655	127	6	99	50	2	250	400	17	18000
5.	Khoksabari	40	2	60	150	6	275	400	17	240	55	2	635	118	6	99	50	2	280	500	21	22500
6.	Songacha	21	1	41	302	11	533	400	14	240	85	3	875	110	4	79	80	3	380	600	21	27000
7.	Mesra	85	5	142	30	2	45	150	9	90	40	2	540	132	8	97	20	1	160	400	25	17000
8.	Pourasava	25	7	44	56	15	84	50	14	30	8	2	90	26	7	20	110	30	880	129	35	5805
9.	Kowakhola	32	2	47	210	16	319	100	8	60	25	2	270	112	9	84	30	2	180	400	31	18000
10.	K.Haripur	60	3	79	222	11	353	400	20	240	35	2	340	100	5	76	80	4	350	50	3	2250
11.	Saidabad	47	3	63	213	13	395	400	25	240	45	3	530	118	7	79	50	3	200	80	5	3250
12.	Gandhail	276	11	414	188	8	501	802	32	821	63	2	804	52	2	188	76	3	700	81	3	3890
13.	Sobgacha	277	13	416	195	9	517	514	24	482	40	2	538	74	3	348	81	4	765	289	13	14100
14.	Kazipur	227	16	316	198	14	515	385	26	361	32	2	379	105	7	661	49	3	390	109	7	4500
15.	Tekani	170	15	253	344	30	619	28	2	26	10	1	119	107	9	737	80	7	650	112	10	4800
	Total:	1655	6	2366	3638	12	6900	5129	17	3730	733	2	8330	1515	5	2813	906	3	5815	4450	15	198595

Figures are of whole unions, not limited to project area.

Some Indicators (and Constraints)

Apart from the official data and information collected on records, discussion with the officials, Block Supervisors and the Farmers revealed some interesting points to be put on record which might help in guiding the future development procedures should technical parameters do not dispel them or they do not adversely influence upon the study and the planning process of the project formulation.

Since the whole of the designated project appears to be vulnerable to a single major factor - the flood defence by a stable BRE; then making exercises on issues relating to agricultural development and related sectors will be rather wishful if nobody guarantees a breach-free and reliable BRE; or otherwise, breach affects are designed to be absorbed or assimilated in a manner which will not over-crowd the development strategies.

However, the following uncensored points have been noted during field visits, farmers' interfaces and staff level discussions with relevant sectors:

1 Farmers lost their confidence on BRE since it started diplapilating with breaches occurring almost every year from 1984 until now.

2 In frequent times farmers lost their Aus, T. Aman and B. Aman crops due to intense Jamuna floods rushed inside the area through the breaches on BRE; Apart from their crops, they also lost their livestock, houses, movable properties, food stock, household belongings etc.

3 Now, farmers have almost rejected Aus, T. Aman and B. Aman, in some cases Jute also, and are diverting their farming systems to Boro (in dry season), wheat, mustard, sugarcane, kaon, cheena, potato/sweet potato, groundnut, spices etc.

4 Many chunk of lands both in the basins and in the ridges experienced sand layer deposits by the sands carried in by Jamuna floods. Those lands are being sparingly used for cultivation of sugarcane, sweet potato, kaon, cheena, groundnuts, ginger etc. instead of their previous suitability to grow rice crops, wheat, jute, pulses, oilseeds, vegetables etc. Some lands have been rendered so sandy that these have become unsuitable to any crop productions.

5 During 1987/88 floods and afterwards serious breaches occurred in different years in the BRE near (1) Simla Bazar, (2) Khokshabari, (3) Bhatpeari, (4) Matiarpur, (5) Sonali Bazar, (6) Charmara, (7) Sobgacha, (8) Banglabazar etc. Old BRE from Matiarpur (or Bhatpeari) upto Simla Bazar (Mesra) was completely wiped out into the Jamuna River and there is no sign of Simla Bazar now except some sand-dunes have developed.

6 Two groins have been constructed by the BWDB to protect the Sirajganj Town (District HQ) from erosion and engulfment by Jamuna.

7 In most of the BRE sites indiscriminate houses and settlements have sprung-up, cutting

the embankment crest and slopes into terraces, thus, weakening the embankment strength, and also inviting rat-holes; and damaging the turfing and growth of shrubs/trees in the slopes to protect from erosion and to accelerate natural process of soil compaction and conservation.

8 In some places BRE appears to be narrow, weak and un-compact, being vulnerable to any time breach and erosion.

9 In several places BRE has been retired, and new embankment constructed. But, it is observed that in some places embankment construction has been done by very sandy earths (about 80-90% sands), no compaction process been followed and the width is too narrow to match the original embankment. These are unlikely to form flood defence and save from erosion.

10 The connection point, now being constructed to reach Sobgacha or (Mesra) to original embankment from Panch Thakuri, at Charmara has been viewed by the local people to be highly vulnerable to any time breach since it is very close to Jamuna main flow which is vigorously eroding the bank and the embankment.

11 Sirajganj Town and Railway Ferry Ghat area: a new inner embankment constructed from Old Ferry Ghat point towards Belkuchi, with mostly sandy earths and without compaction and turfing, appears still vulnerable to breach and erosion. Instead people are demanding groins.

12 Internal rivers (Ichamati & Baniajan) and canals found mostly silted-up impeding quick drainage system and growth of fishery.

13 Local people are demanding re-excavation of these two rivers and other canals for quick drainage of monsoon waters; for winter storage of water for dry period supplementary irrigation; and for bathing, washing, cattle-wash, jute-retting and fishery.

14 Ground water table and aquifer discharges appeared to be satisfactory. Even in March'92 the water table is found only 5-6 meter in depth (as per report collected from PHE Deptt.).

15 General drainage is impeded and prolonged due to silted-up condition of the draining rivers and canals, and also due to indiscriminate construction of roads, local em-bankments, raised house-clusters, bridges-culverts etc. and the back-water stages of outfall rivers.

16 The most burning agricultural or farming constraints as pointed out by the farmers and the DAE staff may be noted as put below:

- Small and marginal farmers are mostly deprived of farm-credit for which they are not able to follow high-production technology.

- High price and timely unavailability of inputs, especially of fertilizers, pesticides, disel and spares for irrigation pumps, quality seeds etc.

- Comparatively low farm-gate price of crop produces in post-harvest periods.

- Difficulties in threshing and drying of Boro and Aus paddy due to rains or cloudly days.

- Scarcity of animal draft power; and non-availability of price-subsidized mechanical implements like power tillers, harrows, weeder, thresher, dryer etc.

Government of the People's Republic of Bangladesh

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

BANGLADESH ACTION PLAN FOR FLOOD CONTROL

COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

SIRAJGANJ INTERIM REPORT

ANNEXURE 4.2 : LANDUSE SURVEY

April 1993

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

under assignment to

DIRECTORAAT GENERAAL INTERNATIONALE SAMENWERKING
Government of the Netherlands

and

KREDITANSTALT FÜR WIEDERAUFBAU
Federal Republic of Germany

TABLE OF CONTENTS

TABLES

Introduction

Land use survey is one of the six components of the baseline survey. The main objectives of the survey are as follows:

- to obtain detailed picture of the way land in the project area is used for crops production
- to know about the existing cropping patterns, crop varieties and productions of hundred percent project area
- to determine areas planted to different crops
- to identify various constraints such as floods, drought, pests and diseases which limit crop production and
- to get information about the use of a major input such as irrigation water from STW, DTW and LLP with their locations.

The information will be used in both the planning and post-project evaluation of the CPP.

Methodology

Land use survey was conducted in Sirajganj CPP by a team consisting of two Agricultural Associates guided by Agronomist of the project team, Sirajganj.

Using a designed format (enclosed) the survey was conducted by visiting each discrete block of land (chawk) with the help of recent 1:20,000 aerial photograph. In this survey 100% of the cultivable area was covered. The survey gathered information on the present coverage through observation and of previous seasons, through recall method. A total of 180 survey forms were filled in during the 3-months survey period. Flood free year relates to crop production in the calender year 1992 and flood year as of average of previous five years. The project area suffered from floods since 1984. Field level data are analysed and presented below. The presentation of results rely heavily on Tables.

Results

Land types:

More than 60% lands are high or medium high lands (Table 4.2.1). Low or very low lands are not present in the project area. The information of land type is of general nature obtained in the survey through field observation and farmer's interviews. This is not based on 1:5 calculated water level.

Land utilization:

About 80% of the gross area of 12057 ha are available for cultivation (Table 4.2.2). Cropping intensity of the area is 187 with 11, 85 - 2% of the NCA is planted to single, double and triple crops, respectively. Only 2% of the NCA remain temporarily fallow.

Irrigation:

Agriculture the area is predominantely irrigation based which has expanded in recent years. There are 1013 STWs, 107 DTWs, 23 LLPs and 11 MOTs in operation in the area (Table 4.2.3). Only 32 ha is irrigated through traditional means. Total irrigated area in the project is 5267 ha. which is 55% of the NCA. HYV Boro crop is mainly irrigated. Wheat and vegetable crops are irrigated as and when necessary. Supplemental irrigation of HYV Aman crop is also often practiced.

LANDUSE SURVEY FORM

STOP NO	DATE	VILLAGE	UNION	

1. **Cropping Patterns**

	KHARIF-1	KHARIF-2	RABI	%
A. Crop Variety Growing period Yield				
B. Crop Variety Growing period Yield				
C. Crop Variety Growing period Yield				
D. Crop Variety Growing period Yield				
E. Crop Variety Growing period Yield				
F. Crop Variety Growing period Yield				

2. **Major crop damage in different years**
(code for causes: F = Flood, C = Congestion, S = Storm & hil, B = Breach, P = Pest and diseases)

YEAR	Crop 1:		Crop 2:		Crop 3:		Crop 4:	
	% damage	causes	% damage	causes	% damage	causes	% damage	causes
1992 1991 1990 1989 1988								

3. **Irrigation facilities (number and location)**

No. of DTW	No. of LLP	No. of STW

Table 4.2.1: General classification* of land types in the CPP area, Sirajganj

Sub-compartment	NCA	High land	Medium high land	Medium low land
1	750	0	518	232
2	709	0	652	57
3	893	14	502	377
4	1132	104	581	447
5	1656	208	697	751
6	1196	264	531	401
7	1071	95	562	414
8	1981	269	970	742
9	191	0	48	143
Total	9579	954	5061	3564
%	100	10	53	37

* Low and very low land are not present.

Source: Landuse Survey, CPP, January-April 1993.

Table 4.2.2: Land utilization in the CPP area of Sirajganj

Sub-Compartment	Gross Area (ha)	NCA	Temporarily fallow (ha)	Single cropped (ha)	Double cropped (ha)	Triple cropped (ha)	Total cropped area (ha)	Cropping intensity (%)
1	873	750	3	118	598	31	1407	188
2	797	709	1	65	639	4	1355	191
3	1061	893	3	256	628	6	1530	172
4	1371	1132	4	39	1023	66	2283	202
5	2012	1656	9	320	1320	7	2981	181
6	1455	1196	11	62	1101	22	2330	196
7	1283	1071	55	13	998	5	2024	194
8	2319	1981	70	98	1768	45	3769	194
9	886	191	21	87	83	0	253	143
Total:	**12057**	**9579**	**177**	**1058**	**8158**	**186**	**17932**	**187**

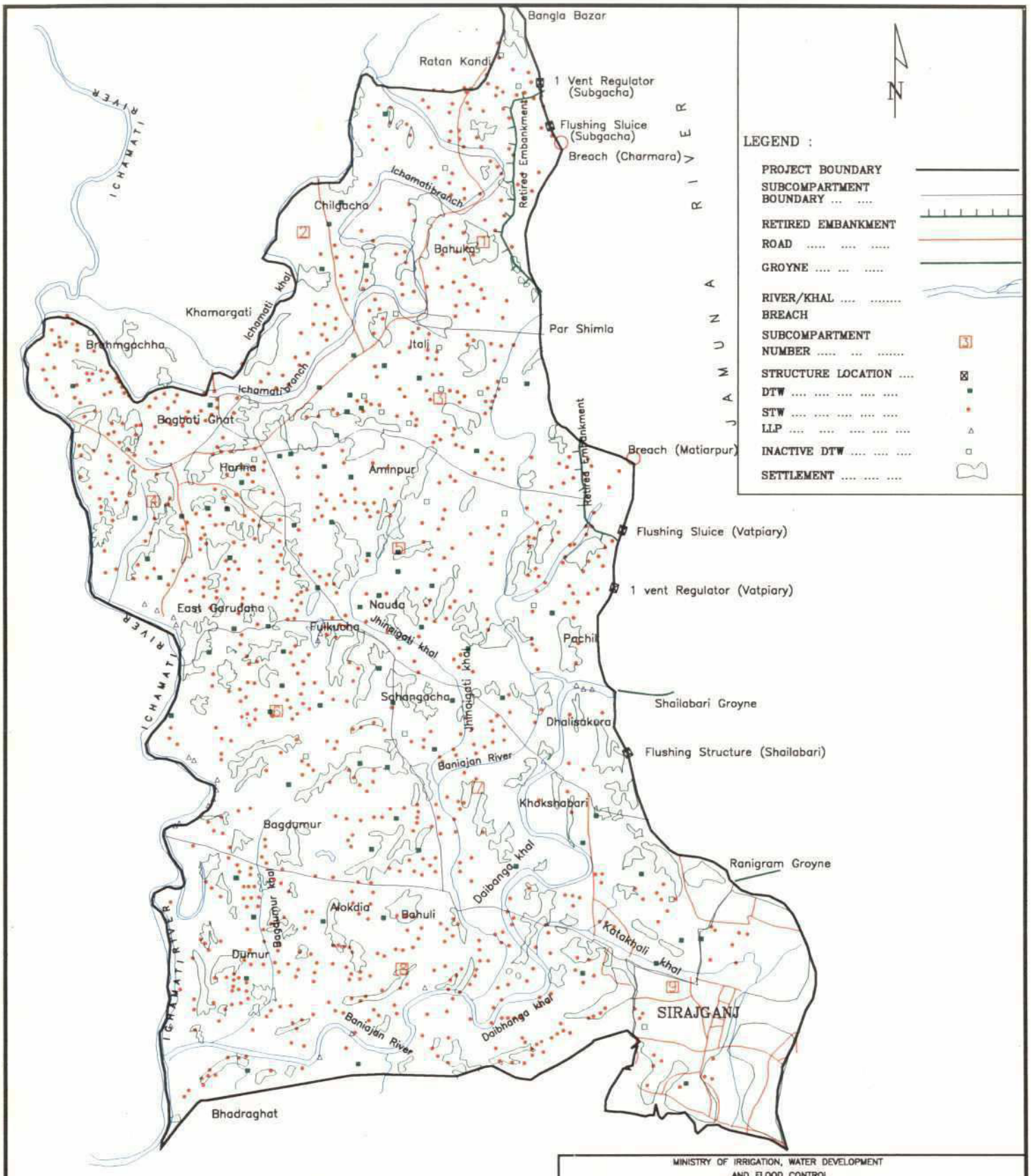
Source: Landuse Survey, CPP, January-April, 1993.

Table 4.2.3: Number of tubewells and pumps in the CPP area, Sirajganj

Sub-Compt	NCA	Numbers				Area Irrigated			% of NCA
		STW	DTW	LLP	MOT	Mecha-nical	Tradi-tional	Total	
1	750	96	6(3)*	0	2	494	0	494	66
2	709	89	9(2)	0	0	538	0	538	76
3	893	77	17(7)	0	0	452	0	452	51
4	1132	170	14(2)	3	0	748	12	760	67
5	1656	144	21(3)	3	0	803	0	803	48
6	1196	120	18(1)	12	0	686	4	690	58
7	1071	63	11(2)	0	2	424	6	430	40
8	1981	229	8	5	7	931	10	941	47
9	191	25	3(1)	0	0	159	0	159	83
Total	**9579**	**1013**	**107(21)**	**23**	**11**	**5235**	**32**	**5267**	**55**

* Number is brackets show inactive DTWs

Source: Landuse Survey, CPP, January-April 1993.



C
FAP20
P

MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD
FLOOD PLAN COORDINATION ORGANISATION

COMPARTMENTALIZATION PILOT PROJECT SIRAJGANJ (FAP 20)

DISTRIBUTION OF WELLS AND PUMPS

Consultant: Euroconsult, Lahmeyer Int.,Bets Ltd.,HCL

Figure No. 2

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

At least 27 different cropping pattern are practiced (Table 4.2.4). Most of these patterns composed of two crops with at least one rice crop. Area under a pattern with triple crop covers only about 2% of the NCA. Of different cropping patterns, 10 major patterns cover 94% of the NCA (Table 4.2.5). Boro (HYV) - T. Aman pattern occupies 46.7% of the NCA. Sugarcane is grown mixed with minimum of another crop. A relay planting of 2-3 crops mixed in a sugarcane field is not uncommon. A sub-compartmentwise crop, cropped area and cropping intensity is shown in Table 4.2.6.

Crop yield: Crop hectarage and production of different crops for the last 9 years were available from the office of the DAE, Sirajganj Sadar Thana. Yield at both flood free or flood affected years were computed as shown in Table 4.2.7. Similarly yield of different crops were obtained in this survey covering only the CPP area. Yield of Boro (HYV), wheat, potato, sugarcane, and mustard both are more within the CPP area compared to Sirajganj Sadar Thana. In a flood year, T. Aman (HYV) and T. Aman (local) severely damaged. Yield of sugarcane and jute is slightly affected. In certain locality Boro (HYV) is affected.

Crop damage: Information regarding crop damage occuring in the last five years was recorded (Table 4.2.8). 1992 was a flood free year and 1988 was the worst affected year. However, both T. Aman (HYV) and T. Aman (local) crops were affected by flood coming from on rush of breach water. Area affected was calculated on the basis of proportion of damage.

Area, yield and production: Area, yield and production of different crops grown in the area were calculated on the assumption of both flood free year and flood year (Table 4.2.9). A total of 34,728 tons of rice were produced in the CPP on 9891 ha of land in a flood free year.

In a flood year, 4628 ha. of paddy crop is affected producing only 27881 tons. A loss of rice production is estimated at 6846 tons. Production loss is the highest from HYV T. Aman crop. Besides, production loss is also incurred on both sugarcane and jute.

Table 4.2.4: Area under different cropping patterns planted in the CPP area, Sirajganj

Pattern	Sub-Compartments									
	1	2	3	4	5	6	7	8	9	Total
Single										
S. Cane	118	52	256	4	267	11	0	32	0	740
Boro (HYV)	0	13	0	21	53	47	13	40	71	258
T. Aman (HYV)	0	0	0	0	0	0	0	0	16	16
Others	0	0	0	14	0	4	0	26	0	44
Total	118	65	256	39	320	62	13	98	87	1058
Double										
S.Cane + Pulses	36	27	84	69	254	142	225	185	0	1022
S.Cane + Potato	6	4	15	79	123	163	180	209	0	779
S.Cane + Mustard	12	23	11	62	121	115	98	304	0	746
S.Cane + Spieces	8	18	38	58	42	35	23	81	0	303
S.Cane + Winter Veg.	0	0	0	1	2	3	1	31	0	38
S.Cane + Others	12	0	0	0	0	3	38	30	0	83
Boro (HYV)-T.Aman (local)	199	173	111	245	227	186	133	332	14	1620
Boro (HYV)-T.Aman (HYV)	252	291	331	440	481	401	246	366	51	2859
Boro (HYV)-Mustard	20	51	0	22	32	29	27	154	18	353
Boro (HYV)-Potato	0	0	0	0	0	0	6	0	0	6
Boro (HYV)-Winter Veg.	0	0	0	0	0	0	0	7	0	7
Wheat - Jute	53	52	38	47	38	23	18	57	0	326
B.Aus - Others	0	0	0	0	0	0	3	2	0	5
T.Aman (HYV) - Jute	0	0	0	0	0	0	0	10	0	10
T.Aman (HYV)-Winter Veg.	0	0	0	0	0	1	0	0	0	1
Total	598	639	628	1023	1320	1101	998	1768	83	8158
Triple										
Boro(HYV)-T.Aman(HYV)-Mustard	13	0	0	22	0	12	2	26	0	75
Wheat-Jute-T.Aman (local)	0	0	6	4	0	0	0	16	0	26
Wheat-Jute-T.Aman (HYV)	9	4	0	37	7	4	2	0	0	63
Jute-T.Aman (HYV)-Pulses	5	0	0	0	0	0	0	0	0	5
Jute-T.Aman (HYV)-Others	0	0	0	0	0	0	1	0	0	1
B.Aus-T.Aman (HYV)-Wheat	0	0	0	3	0	6	0	0	0	9
B.Aus-T.Aman(local)-Wheat	0	0	0	0	0	0	0	3	0	3
B.Aus-T.Aman(local)-Mustard	4	0	0	0	0	0	0	0	0	4
Total	31	4	6	66	7	22	5	45	0	186

Source: Landuse Survey, CPP, January-April 1993.

Table 4.2.5 Major cropping patterns of the CPP area, Sirajganj

Patterns	Area (ha)	% of NCA
Boro (HYV)-T.Aman (HYV)	2859	29.8
Boro(HYV)-T.Aman (Local)	1620	16.9
Sugarcane + Pulses	1022	10.7
Sugarcane + Potato	779	8.1
Sugarcane + Mustard	746	7.8
Sugarcane	740	7.7
Boro (HYV) - Mustard	353	3.7
Wheat - Jute	326	3.4
Sugarcane + Spices	303	3.2
Boro (HYV)	258	2.7
Others (17 patterns)	396	4.1
Temporarily Fallow	177	1.8
Total	**9579**	**100.0**

Source: Landuse Survey, CPP, January-April, 1993.

Table 4.2.6 Area(ha) under different crops planted in the CPP area, Sirajganj

Crops	Sub-Compartments									Total
	1	2	3	4	5	6	7	8	9	
Aus (direct seeded)	4	0	0	3	0	6	3	5	0	21
T. Aman (Local)	203	173	117	249	227	186	133	351	14	1653
T. Aman (HYV)	279	295	331	502	488	424	251	402	67	3039
Boro (HYV)	484	528	442	750	793	675	427	925	154	5178
Total rice	970	996	890	1504	1508	1291	814	1683	235	-
Wheat	62	56	44	91	45	33	20	76	0	427
Sugarcane	192	124	404	273	809	472	565	872	0	3711
Jute	67	56	44	88	45	27	21	83	0	431
Pulses	41	27	84	69	254	142	225	185	0	1022
Mustard	49	74	11	106	153	156	127	484	18	1178
Potato	6	4	15	79	123	163	186	209	0	785
Spices	8	18	38	58	42	35	23	81	0	303
Winter Vegetables	0	0	0	1	2	4	1	38	0	46
Others	12	0	0	14	0	7	42	58	0	133
Total cropped area	**1407**	**1355**	**1530**	**2283**	**2981**	**2330**	**2024**	**3769**	**253**	**17932**
Cropping intensity	**188**	**191**	**172**	**202**	**181**	**196**	**194**	**194**	**143**	**187**

Source: Landuse Survey, CPP, January - April, 1993.

Table 4.2.7: Yield (mt/ha) of crops grown in the CPP area, Sirajganj

Crops	Sirjganj Sadar Thana*		Present*	
	Damage free	Damaged	Damage free	Damaged
Rice				
B. Aus	1.75	0.61	1.28	0.79
T. Aman (Local)	1.55	0.32	1.35	0.40
T. Aman (HYV)	3.67	0.45	3.17	1.00
Boro (HYV)	4.10	-	4.41	4.00
Wheat	1.87	-	2.44	-
Jute	1.53	1.00	1.43	0.98
Sugarcane	42.54	-	50.20	48.40
Pulses	NA	-	1.03	-
Potato	8.72	-	9.79	-
Mustard	0.70	-	0.79	-
Spices (Chilli)	NA	-	1.31	-
Vegetables	NA	-	4.76	-

Sources

*DAE, Sirajganj Sadar Thana, April 1993, average of last 10 years.

*Present: Landuse Survey, CPP, January - April, 1993.

Table 4.2.8: Cropped area (%) affected by flood during the last 5 years (1988-1992) in the CPP area, Sirajganj

Crops affected	Year	Sub-Compartments									Mean damage (%)	Total (ha)
		1	2	3	4	5	6	7	8	9		
Aus (direct seeded)	1988	100	-	-	100	-	100	100	100	-	100	
	1989	0	-	-	0	-	0	0	0	-	0	
	1990	10	-	-	15	-	20	10	15	-	14	
	1991	50	-	-	80	-	90	80	70	-	74	
	Mean*	20	-	-	32	-	37	30	28	-		
	Estimated area (ha)	1	-	-	1	-	1	1	1	-		5
T.Aman (Local)	1988	100	100	100	100	100	100	100	100	-	100	
	1989	56	48	37	43	57	46	54	43	25	45	
	1990	73	82	86	75	62	82	56	48	75	71	
	1991	60	55	70	70	70	60	55	83	40	63	
	Mean*	63	62	64	63	63	63	55	58	47		
	Estimated area (ha)	128	107	74	157	143	117	73	204	7		1010
T. Aman (HYV)	1988	100	100	100	100	100	100	100	100	100	100	
	1989	100	100	100	79	80	90	90	85	90	90	
	1990	87	85	83	68	82	63	86	85	53	77	
	1991	90	89	75	71	86	85	85	70	60	79	
	Mean*	92	91	86	73	83	79	87	80	68		
	Estimated area (ha)	257	268	285	366	405	335	218	321	46		2501
Sugarcane	1988	100	100	100	100	100	100	100	100	-	100	
	1989	62	54	48	25	30	25	30	15	-	32	
	1990	60	54	40	20	30	20	24	20	-	30	
	1991	62	50	42	25	24	30	25	23	-	31	
	Mean*	61	53	43	23	28	25	26	19	-		
	Estimated area (ha)	117	66	174	63	227	118	147	166	-		1078
Jute	1988	-	-	-	-	-	-	-	-	-		
	1989	-	-	-	-	-	-	-	-	-		
	1990	10	20	30	18	17	50	47	45	-	26	
	1991	42	22	41	15	27	37	50	47	-	31	
	Mean*	27	21	36	17	22	43	49	46	-		
	Estimated area (ha)	18	12	16	15	10	12	10	38	-		131

*Mean excludes the year 1988 and 1992 was flood free year.

Source: Landuse Survey, CPP, January - April, 1993.

Table 4.2.9: Area, yield and production of different crops in the CPP area, Sirajganj

Crops	Flood free year			Flood Year					
	Area (ha)	Yield (t/ha)	Production (t)	Damage free		Damaged		Production (t)	Production Loss (t)
				Area (ha)	Yield (t/ha)	Area (ha)	Yield (t/ha)		
Aus (direct seeded)	21	1.28	27	16	1.28	5	0.79	24	3
T. Aman (Local)	1653	1.35	2232	643	1.35	1010	0.40	1272	960
T. Aman (HYV)	3039	3.17	9634	538	3.17	2501	1.00	4206	5427
Boro (HYV)	5178	4.41	22835	4066	4.41	1112	4.00	22379	456
Total rice	9891	-	34728	5263	-	4628	-	27881	6846
Wheat	427	2.44	1042	427	2.44	-	-	1042	-
Sugarcane	3711	50.20	186292	2633	50.20	1078	48.40	184352	1940
Jute	431	1.43	616	300	1.43	131	0.98	557	59
Pulses	1027	1.03	1058	1027	1.03	-	-	1058	-
Mustard	1178	0.79	931	1178	0.79	-	-	931	-
Potato	785	9.79	7685	785	9.79	-	-	7685	-
Spices	303	1.31	397	303	1.31	-	-	397	-
Vegetables	46	4.76	889	46	4.76	-	-	219	-
Others	133	-	-	-	-	-	-	-	-

Source: Landuse Survey, CPP, January - April, 1993.

Government of the People's Republic of Bangladesh

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

BANGLADESH ACTION PLAN FOR FLOOD CONTROL

COMPARTMENTALIZATION PILOT PROJECT (FAP 20)

SIRAJGANJ INTERIM REPORT

ANNEXURE 4.3 : SURVEY ON IRRIGATION

(in association with the Dept. of Agricultural Extension, Sirajganj)

April 1993

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

under assignment to

DIRECTORAAT GENERAAL INTERNATIONALE SAMENWERKING
Government of the Netherlands

and

KREDITANSTALT FÜR WIEDERAUFBAU
Federal Republic of Germany

TABLE OF CONTENTS

TABLES

APPENDIX

i. ABBREVIATIONS

AST	=	Agricultural Sector Team, CIDA-GOB Project, Ministry of Agriculture
BRDB	=	Bangladesh Rural Development Board
BADC	=	Bangladesh Agricultural Development Corporation
CPP	=	Compartmentalization Pilot Project
DAE	=	Department of Agricultural Extension
DTW	=	Deep Tube Well
LLP	=	Low Lift Pump
MOT	=	Mannually Operated Tubewells
NGO	=	Non-Government Organizations
STW	=	Shallow Tube Well
SIRDP	=	Sirajganj Integrated Rural Development Project
TAEO	=	Thana Agricultural Extension Officer

1 INTRODUCTION

This presents the results of a census on irrigation conducted in three thanas, involved in the CPP: Tangail Sadar, Delduar and Sirajganj Sadar. This census, formatted similarly to census of lift irrigation conducted nationwide by the Agriculture Sector Team for the Ministry of Agriculture, utilizes their information for comparison. This census, planned to be carried out annually to provide CPP project Agronomists and Planners with reliable information on the rapid changes which are taking place in the irrigation sector. With expanding role of private sector in the sale and maintenance of irrigation equipment, traditional source of information, such as BADC, no longer provides a complete picture of developments in the sector.

The objectives of the 1993 census on irrigation was to provide a variety of information on irrigation in these thanas including a complete enumeration of minor irrigation equipment.

Specific objectives were to obtain accurate estimates of:

- the number and type of minor irrigation equipment used in the Boro season;
- area under irrigation, in total;
- energy source and consumption of equipment in use;
- the incidence of equipment not in use due to mechanical breakdown and for other reasons;
- age and life expectancy of the equipment in use;
- the roles of the public and private sectors in delivering and maintaining irrigation equipment; and
- use of engines for purposes other than powering irrigation pumps.

A census questionnaire was not the appropriate vehicle for meeting all of the information needs enumerated above. A sample survey could provide much of the required information with sufficient accuracy and at a much less cost. As a result the census was restricted to collecting information on numbers of irrigation equipment in and out of operation, and the area under irrigation. This sample survey was designed to meet most of the remaining information needs.

This report is divided into two major sections. Each section describes the objectives, methodology, results, and implications. The first deals with the census itself, that is, the complete enumeration of irrigation equipment and area under irrigation conducted by the Block Supervisors of DAE. The second deals with a sample survey of operating irrigation installations conducted by the CPP field investigators.

This report presents the results dealing with areas of Sirajganj Thana. A total report with information and analysis of irrigation mode, use and trend within the CPP area will be available later on.

2 THE CENSUS

2.1 Objectives

The objectives of the census were to provide a complete enumeration of minor irrigation equipment in Sirajganj Sadar Thana, both equipment in operation and equipment out of operation for whatever reasons. Acreage under irrigation as well as number of crops were to be included.

2.2 Methodology

The questionnaire used in administering the census and the instructions accompanying it can be found in Appendix 4.3.A.

The questionnaire consisted of six questions pertaining to the number of pumps in each villages of the enumeration area (DAE block). The block supervisor recorded the number of pumps in each category based on a count carried out in his block. The block supervisor also recorded the area irrigated by each type of equipment. Two copies of the questionnaire and one copy of the instructions were distributed to each DAE block. Packages containing the appropriate material for the blocks was assembled by the CPP. The materials were distributed to Block Supervisors in the presence of TAEO, Sirajganj with brief explanation regarding procedures. Completed questionnaires were returned to the CPP through the DAE, Sirajganj Sadar.

Data entry and editing took place during the first three weeks of April.

2.3 Definitions

Within the categories of STW and LLP there are subclasses of equipment. The pump sets of shallow tube wells can be located either at the ground surface (surface set) or in a hole usually dug about 10 feet below the surface (deep set). Obtaining a count of deep set STWs is important because this mode of operation is an indication that the water table has fallen below the maximum lift capabilities of a surface mounted pump (25 to 30 feet).

LLPs are divided into four classes, those having a discharge of less than one cusec (commonly called a fractional pump) those having a discharge of one cubic feet per second (cusec), those having a discharge rate of two cusec, and those having a discharge rate of three to five cusec. The higher capacity LLPs are those obtained through normal LLP purchase/rental channels. The fractional pumps represent sets that have been assembled privately, usually from a small engine that may have been designed for other purposes, and lower capacity pumps.

2.4 Results

A summary of survey on irrigation results of Sirajganj Thana is presented in Table 4.3.1. The area irrigated is 26,531 acres. Of the total, 20,608 acres (78%) were irrigated by STWs, 5,343 acres (20%) by DTWs and the rest 580 acres (2%) by LLPs, MOTs and traditional methods.

Table 4.3.1: Summary of census on irrigation results, Sirajganj Thana, 1993

Type of Equipment	Units operating	Acres irrigated	Command Area (acres)	Non-operating
Shallow Tubewells*	1952	20,608	10.56	10
Low Lift Pumps*	5	90	18.00	0
Deep Tubewells	119	5,343	44.90	56
Manually operated tubewells	1	1	-	-
Sub-Total:		26042		
Traditional methods	-	489		
Total irrigation		26,531		

Source: CPP-DAE Census on Irrigation, 1993.

* There were no deep set STWs and LLPs were only of 1 cusec type.

The number of STWs operating have increased in a 2 year period from 1991 to 1993 (Table 4.3.2). There is no report of deep setting of STWs in the Thana. The number of LLPs is decreasing probably because of non-availability of surface water. The number of DTWs in operation has also decreased in a 2 year period from 1991 to 1993. A very large number (32%) of DTWs are out of operation.

Table 4.3.2: Growth of minor irrigation in Sirajganj Sadar Thana

Studies/Reports	Numbers in operation			Area irrigated (acres)
	STW	LLP	DTW	
1976 SIRDP Report	0	15	22	573
1991 AST Result	1349	8	147	27776
1993 CPP-DAE Result	1952	5	119	26042

Overall, diesel fuel still powers 75% of the STWs and 30% of DTWs (Table 4.3.3). DTWs are powered by electricity. Blockwise results of census on irrigation of Sirajganj Sadar Thana is presented in Table 4.3.4.

Table 4.3.3: Energy sources of irrigation equipment in operation in Sirajganj Thana

Energy source	STWs	LLPs	DTWs
Electricity	494	2	84
Diesel	1458	3	35
Total	1952	5	119

Source: DAE-CPP Census on Irrigation, 1993.

2.5 Implications

a) The number of STWs increasing with no substantial increase in command area
b) STWs are mostly diesel powered. Electrification of rural areas is needed
c) Large number of DTWs are idle, probably will never be operational again

3 THE SAMPLE SURVEY

3.1 Objectives

The objective of the sample survey was to provide additional data which can be applied directly to census results to provide a wider range of information about irrigation than it is practical to collect in a census.

3.2 Methodology

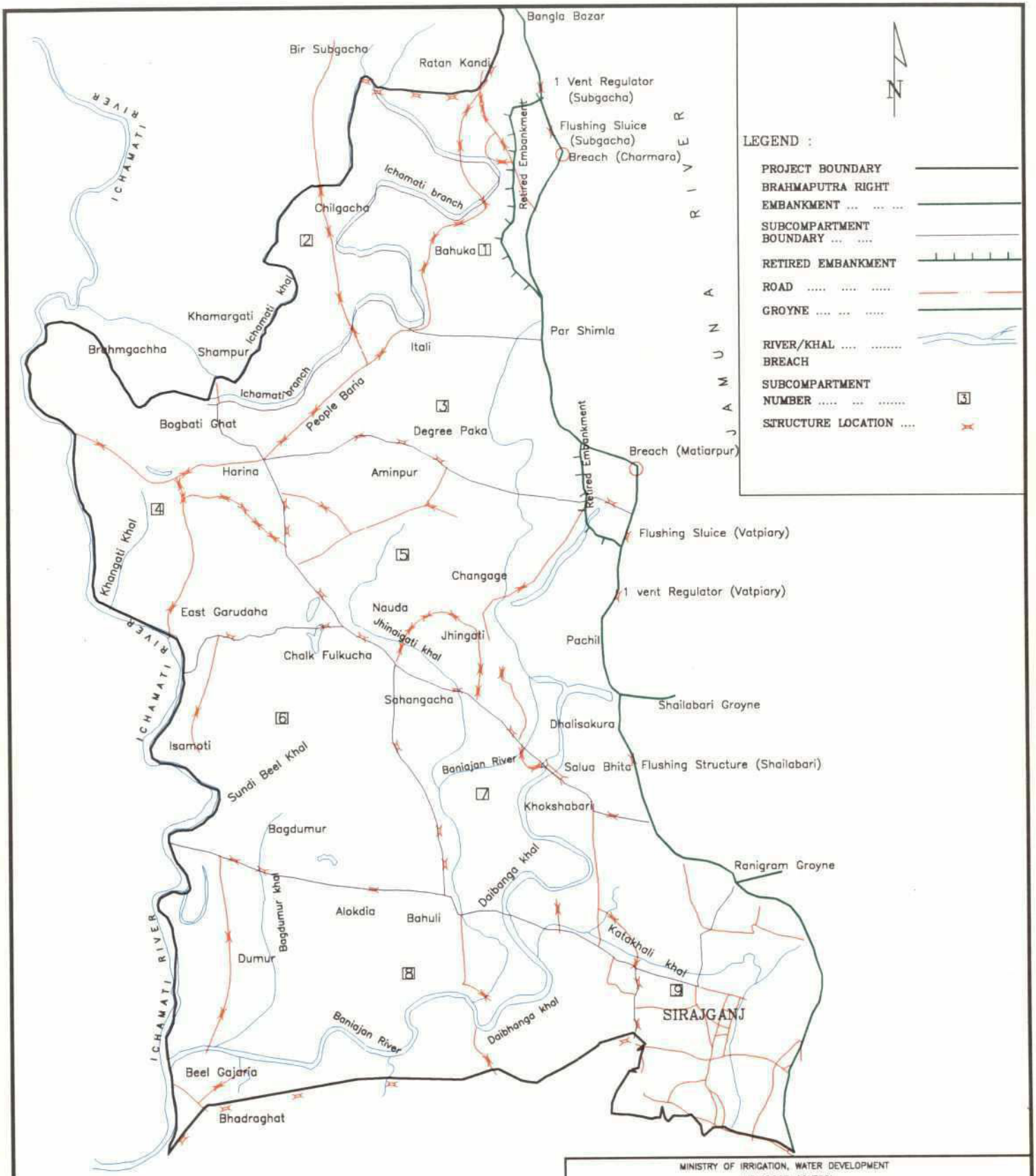
The sample survey involved interviews at 75 wells and pumps in Sirajganj Thana but restricted only within the CPP area (Map enclosed). The pumps selected were located randomly over the sub-compartments of the CPP. The questionnaire was developed with certain modification but based on a similar one adopted in the 1991 Survey of Lift Irrigation by the AST. A copy of the questionnaire can be found in Appendix 4.3.B. The emphasis in the questionnaire and in conducting the interviews was on collecting information about the wells and pumps and its operation.

The field work was carried out by a single investigator. Interviewer was free to choose any pump within the specified area.

The landuse survey of the Sirajganj CPP area indicated that there are 107 DTWs, 1013 STWs, 23 LLPs and 11 MOTs (Annex 4.2, Table 4.2.3). It was initially planned to cover 10% of each type of pumps and wells. However, number of irrigation wells and pumps actually surveyed in detail is presented in Table 4.3.5.

Table 4.3.5: No. of irrigation wells and pumps located within the CPP area, Sirajganj surveyed in detail during March to April 1993

Sub-Compartment No.	STW	DTW	LLP	MOT
1	7	2	-	-
2	3	1	-	-
3	3	2	-	-
4	3	1	-	-
5	8	1	-	-
6	8	1	4	-
7	4	3	-	1
8	14	1	1	1
9	6	-	-	-
Total:	56	12	5	2



C
FAP20
P

MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD
FLOOD PLAN COORDINATION ORGANISATION

COMPARTMENTALIZATION PILOT PROJECT SIRAJGANJ (FAP 20)

BASE MAP

Consultant: Euroconsult, Lahmeyer Int.,Bets Ltd.,HCL

Figure No. 1

3.3 Results

3.3.1 Source of water (for LLPs)

The source of water for all the LLPs surveyed was the rivers Ichamati and Doibhanga. The availability of water along the length of the river is also at certain sections of the river during the dry season.

3.3.2 Energy source

DTWs are very often powered by electricity. Diesel fuel still powers more of STWs and LLPs surveyed (Table 4.3.6). With the electrification of villages, it is expected that more STWs will be powered by electricity. However, such shift will also depend on the regularity of power supply. Gasoline is not used as energy source.

Table 4.3.6: Energy source to power irrigation equipment

Energy source	STW	LLP	DTW
Electricity	24	1	10
Diesel	32	4	2
Gasoline	0	0	0
Others	0	0	0
Total	56	5	12

Source: Survey on Irrigation, CPP, March 1993.

3.3.3 Rural electrification

Sustainability, promotion and expansion of irrigation will depend on rural electrification in the long run. Rural Electrification Board does not operate in the Sirajganj CPP area. However, Power Development Board supplies electricity in 101 villages (out of 140-150 villages) of the CPP area (Appendix 4.3.C). Even with such wide coverage, electrification of irrigation equipment have not expanded. This is mainly because of uncertain and often irregular supply of electricity.

3.3.4 Ownership of equipment

Individual ownership of irrigation equipment predominates. Whereas DTWs are group owned, STWs and LLP are mostly individually owned (Table 4.3.7). STWs are often managed by 2-3 land operators grouped together non-formally.

Table 4.3.7: Ownership of equipment

Ownership	STW	LLP	DTW	MOT
Individual	49	5	0	2
Group				
Non-organizational	5	0	4	0
BADC	0	0	7	0
BRDB	0	0	0	0
Grameen Bank	0	0	1	0
NGO	2	0	0	0
Total	56	5	12	2

Source: Survey on Irrigation, CPP, March 1993.

3.3.5 Nature of rental agreements

Although most of the irrigation equipment is individually owned, yet owners provide or sell water to nearby fields. Cash rental is more prevalent, pronounced in case of DTWs (Table 4.3.8). Sharing of 25% crop production is also often paid as irrigation charge, more frequently in cases of STWs.

Table 4.3.8: Nature of rental agreements

Agreements	STW	LLP	DTW
Cash	32	4	11
25% of crop production	24	1	1
Total	56	5	12

Source: Survey on Irrigation, CPP, March 1993.

3.3.6 New versus second-hand purchases

There is an active market for used equipment. Generally the equipments were purchased new. More or less 1/4 the of the equipments were purchased second-hand (Table 4.3.9). It is expected that use of second-hand equipments will be more frequent.

Table 4.3.9: New and used equipment purchases

Nature of purchase	STW	LLP	DTW
New	43	4	8
Used	13	1	4
Total	56	5	12

Source: Survey on Irrigation, CPP, March 1993.

3.3.7 Sources of funds

All of LLPs and most of STWs were purchased from owner's cash (Table 4.3.10). Often owner loan a portion of these cash from friends and money lenders. Institutional fund financed purchase of all of DTWs and a few of STWs.

Table 4.3.10: Sources of funds used to finance equipment purchases

Sources	STW	LLP	DTW
Owner's cash	52	5	0
BADC rental purchase	0	0	12
Bank loan	4	0	0
Total	56	5	12

Source: Survey on Irrigation, CPP, March 1993.

No one used dealer, NGO and BRDB loan. However in case of DTWs, BADC has started on a selling programme on installments.

3.3.8 Use of equipment

Only STWs are used for purposes other than irrigation. Even then, engines used for irrigation tend to be used only for irrigation (Table 4.3.11). Use in milling has been indicated as other use.

Table 4.3.11: Year around use of STWs

Uses	Numbers(STW)
Exclusively for irrigation	43
Exclusively for irrigation in season but other purposes in other season	13
Irrigation & other purposes any season	0
Total	56

Source: Survey on Irrigation, CPP, March 1993.

3.3.9 Year of installation of irrigation mode

Irrigation in Sirajganj started with installation of DTWs and also, to an extent, with LLPs. Year of installations shown in the table is of surveyed equipments and not actually representative of developmental process. However, sinking of DTWs decreased with increased popularity of STWs (Table 4.3.12). LLPs in the area, although used in early years of irrigation, is re-appearing again.

Table 4.3.12: Year of installation of the irrigation equipment

Year Groups	STW	LLP	DTW
Before 1969	0	0	1 (1962)
1969-1972	0	0	0
1973-1976	0	0	1
1977-1980	0	0	0
1981-1984	1	0	10
1985-1988	4	0	0
1989-1993	51	5	0
Total	56	5	12

Source: Survey on Irrigation, CPP, March 1993.

3.3.10 Age of equipment

DTWs tends to be older with mean age of 13.5 years (Table 4.3.13). STWs and LLPs are of recent ages. The oldest STW is only of 12 years of age.

Table 4.3.13: Age of equipment

Equipment	Numbers surveyed	Age	
		Mean	Range
STW	56	4.0	0-12
LLP	5	3.2	1-5
DTW	12	13.5	11-31

Source: Survey on Irrigation, CPP, March 1993.

3.3.11 Life expectancy of equipment

Life expectancy refers to the age of the equipment plus the number of years until replacement will be necessary. Answer depended mostly on guesses and on clear conception of the question. However, there are some clear indication of expectations (Table 4.3.14).

Table 4.3.14: Life expectancy of irrigation equipments

Equipment	Numbers surveyed	Expected age	
		Mean	Range
STW	56	12.7	5-27
LLP	5	9.2	4-16
DTW	12	62.6	51-112

Source: Survey on Irrigation, CPP, March 1993.

3.3.12 Command area

Information on command area is an important and crucial one. Command area varies with the type of engine, energy source and land availability. The command area derived from the census are higher than obtained from this survey (Table 4.3.15). Probably both the estimate can be used taking as maximum and minimum limit of the command area.

Table 4.3.15: Command area

Equipment	Energy source	Average command area (ha)		Potential command area (ha)
		Census	Survey	
STW	Electricity	-	4.28	
	Diesel	-	2.74	
	Mean	4.27	3.51	6.50
DTW	Electricity	-	11.86	
	Diesel	-	7.89	
	Mean	18.17	9.88	22.80
LLP		7.28	2.83	6.70
MOT		0.25	0.20	0.40

Source: Survey on Irrigation, CPP, March 1993.

The potential area is area free from nearby irrigation equipment but with limitations to natural barrier such as village road, canals etc. The difference between potential command area and actual command area indicating competition for crop area by nearby mechines. The average command area for all type of irrigation mode is decreasing over the years.

3.3.13 Operation of irrigation equipment

Irrigation equipments are operated about 9-11 hours daily with average seasonal days of 64-77 (Table 4.3.16).

Table 4.3.16: Irrigation operation in the Boro season

Type of Equipment	Daily hours	Season days
STW	10	77
LLP	9	64
DTW	11	77

Source: Survey on Irrigation, CPP, March 1993.

3.3.14 Operation costs of irrigation equipment

Operation costs of different irrigation equipment will be useful in crop budgets. The most striking observation is the substantial difference in per hectare cost of irrigation between

electric and diesel operated equipment (Table 4.3.17). Depending on the category of equipment, electricity costs per hectare irrigated area is one half to one third of diesel fuel costs.

Table 4.3.17: Operational cost of irrigation equipment

Equipment	Year	Electricity cost (Tk.) per		Diesel cost (Tk.) per	
		Equipment	Hectare	Equipment	Hectare
STW	1992	6178	-	-	-
	1993	9356	2186	10500	3832
DTW	1992	16386	-	-	-
	1993	33600	2833	28641	3630

Source: Survey on Irrigation, CPP, March 1993.

3.3.15 Crops irrigated

Boro HYV of rice represents most of the area under irrigation (Table 4.3.18). Wheat, potato and vegetable crops are irrigated not regular basis but as of supplemented type. In Sirajganj, a large belt of the area is planted to sugarcane besides HYV Boro fields. These sugarcane fields, during stress period, are often irrigated.

Table 4.3.18: Crops under irrigation

Crop	Irrigated area (ha) with				Total area (ha) irrigated	% of total area
	STW	LLP	DTW	MOT		
Boro HYV	187	14	132	1	334	98.2
Wheat	2	0	*	0	2	0.6
Potato	*	0	1	0	1	0.3
Vegetables	*	0	*	0	0	0.0
Sugarcane	2	0	1	0	3	0.9
Total	191	14	134	1	340	100.0

* Less than 0.5 ha.

Source: Survey on Irrigation, CPP, March 1993.

3.4 Findings and Implications

- STWs are spreading at a faster rate, however, of course, without substantial increase in area under irrigation.
- STWs & LLPs are powered with diesel more frequently.
- Individual ownership of STWs and LLPs predominate.
- DTWs were installed before 1984 and STWs installation started during '80s.

- Command area for individual DTW is much lower than expected or potential because of uncontrolled installation of STWs. Hence operation of DTW is becoming un-economical as can be seen that per hectare cost of irrigation with DTW is more than STW.
- Electricity costs per hectare irrigated area is about 1/3 to 1/2 of diesel fuel costs. Electricity is available in 101 villages (out of 140-150 villages) within the CPP project area through Power Development Board. Use of this facility is not maximum due to uncertain and irregular supply of electricity.
- Use of diesel, though costly in operation, provides the security of power supply.
- STW with electricity as power source can reduce the cost of cultivation of HYV Boro - a crop of the most economic importance in the CPP area, Sirajganj.

Appendix 4.3.A: The census questionnaire and instructions

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

বাংলাদেশ পানি উন্নয়ন বোর্ড

কম্পার্টমেন্টালাইজেশন পাইলট প্রকল্প, CPP

সেচ জরীপ প্রশ্নাবলী

মার্চ ১৯৯৩ ইং

প্রশ্নাবলী পূরণের নির্দেশাবলী : দয়া করে আপনার ব্লকের প্রত্যেকটি গ্রামের জন্য দুই কপি করে জরীপ প্রপত্র পূরন করুন। পূরণকৃত দুই কপি প্রপত্র আপনার থানা কৃষি কর্মকর্তার নিকট জমা দিন। ১ থেকে ৬ নং প্রশ্নের জবাব নির্দিষ্ট ঘরগুলির মধ্যে লিখুন। যে ঘরে কোনই যন্ত্র ব্যবহারে নাই সে ঘরে শূন্য (০) লিখিতে হইবে। জবাব বাংলায় লিখুন।

জেলা : ____________________

থানা : ____________________

ব্লকের নাম : ____________________

গ্রামের নাম : ____________________

ব্লক সুপারের স্বাক্ষর ____________________

ব্লক সুপারের নাম : ____________________

জরীপের তারিখ : ____________________

	চালু অবস্থায়						অচালু অবস্থায়			
	সংখ্যা	চালিতশক্তি			সেচকৃত					
		বিদ্যুত	ডিজেল	অন্যান্য	জমি (একরে)	ফসল	অকেজোর সংখ্যা	কারণ সমূহ	সাময়িক বন্ধের সংখ্যা	কারণ সমূহ
১। অগভীর নলকূপ।										
(ক) উপজিলায় স্থাপিত										
(খ) ব্যক্তিগত স্থাপিত										
২। লো লিফট পাম্প।										
(ক) ১ কিউসেকের কম শক্তিযুক্ত (হস্তচালিত)										
(খ) ১ কিউসেক শক্তিযুক্ত										
(গ) ২ কিউসেক শক্তিযুক্ত										
(ঘ) ৩-৫ কিউসেক শক্তিযুক্ত										
৩। গভীর নলকূপ।										
৪। গভীর নলকূপের স্থান সমূহ। (পাড়া/বাড়ী বা মহল্লার নাম)										
৫। [illegible] গ্রাম চালিত নলকূপ।										
৬। ঐতিহ্যগত এবং অন্যান্য পদ্ধতি										

*(ক) [illegible] (খ) [illegible] অভাব (গ) বিদ্যুৎ সংযোগের অভাব (ঘ) ডিজেল সরবরাহ বন্ধ (ঙ) এলাকায় পানির অভাব (চ) [illegible] (ছ) [illegible] (জ) [illegible] (ঝ) [illegible] (ঞ) অন্য, যেমন ____ ।

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বাংলাদেশ পানি উন্নয়ন বোর্ড
কম্পার্টমেন্টালাইজেশন পাইলট প্রকল্প, সিপিপি
সেচ জরীপের তথ্যাবলী

স্মারক নং- ১৬-০৩-১৯৯৩ ইং

বিষয়: সেচ জরীপ-মার্চ, ১৯৯৩ ইং

৭ই মার্চ ১৯৯৩ইং তারিখে সেচ জরীপ সম্পাদন করার নিমিত্তে থানা কৃষি কর্মকর্তা এবং ব্লক সুপারভাইজারগনের জন্য তথ্যাবলী নিম্নে বর্নিত হইল:

১। থানা কৃষি কর্মকর্তা তাদের অধিনস্থ প্রতিটি ব্লকের জন্য একটি তথ্যাবলী এবং ব্লকের অধীন প্রতিটি গ্রামের জন্য দুইটি প্রশ্নপত্র সংগ্রহ করিবেন।

২। ২৩ শে ফেব্রুয়ারী মঙ্গলবার ৯৩ইং তারিখে সেচ জরীপ প্রশ্নাবলী ব্লক সুপারভাইজারদের মধ্যে বিতরন করিবেন। একই দিন কম্পার্টমেন্টালাইজেশন পাইলট প্রজেক্টের কৃষি বিশেষজ্ঞ প্রশ্নাবলী পূরণের নিয়ম বুঝাইয়া দিবেন।

৩। ৭ই মার্চ ১৯৯৩ ইং রবিবার তারিখের মধ্যে ব্লক সুপারভাইজারগণ প্রশ্নাবলী পূরণের জন্য প্রয়োজনীয় তথ্য সংগ্রহ করিবেন। অনুপস্থিত ব্লক সুপারভাইজারের ক্ষেত্রে থানা কৃষি কর্মকর্তার নিজস্ব উদ্যোগে উক্ত প্রশ্নাবলী পূরণের ব্যবস্থা করিবেন।

৪। ৯ই মার্চ ১৯৯৩ ইং মঙ্গলবার তারিখের মধ্যে প্রত্যেক ব্লক সুপারভাইজারগনের পূরণকৃত প্রশ্নপত্র থানা কৃষি কর্মকর্তার নিকট জমা দেওয়ার ব্যবস্থা করিবেন।

৫। পূরনকৃত প্রশ্নপত্রের এক কপি থানা কৃষি কর্মকর্তা নিজ অফিসে রাখিবেন। অন্য আর এক কপি প্রশ্নাবলীর পূরণকৃত সেট ১৩ ই মার্চ শনিবার কম্পার্টমেন্টালাইজেশন পাইলট প্রজেক্টের কৃষি বিশেষজ্ঞ সংগ্রহ করিবেন।

জরীপ সম্পর্কে কয়েকটি শব্দের ব্যাখ্যা:

১। চালু অবস্থায়:
- সংখ্যা: প্রতি গ্রামে একই প্রকৃতির চালু পাম্পের সংখ্যা
- একর: প্রতি গ্রামে একই প্রকৃতির চালু পাম্পের অধিনস্থ সেচকৃত জমির পরিমাণ
(লেখার নিয়ম: যেমন ৫ একর ২৫ শতাংশ = ৫.২৫)।

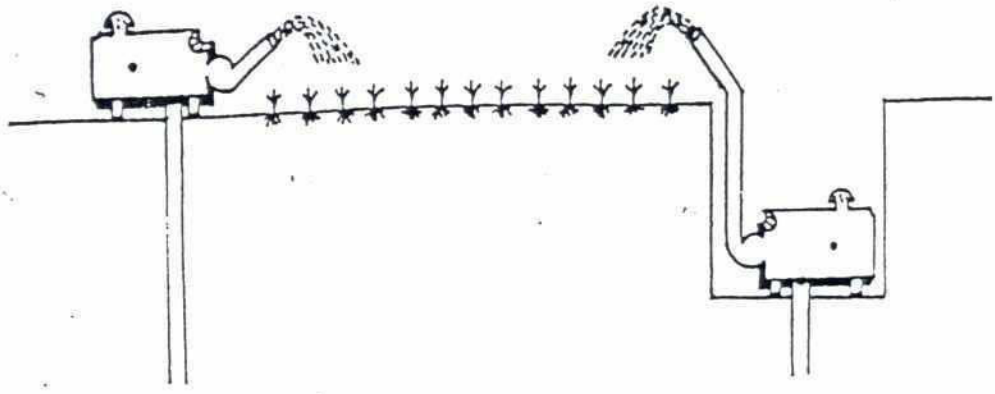
২। অচালু অবস্থায়:
- অকেজো সংখ্যা: একই প্রকৃতির পাম্পের সংখ্যা চালু অবস্থায় নাই কারন এইগুলি যান্ত্রিক বিভ্রাটের দরুন পরিচালনের অযোগ্য।
- সাময়িক বন্ধের সংখ্যা: একই প্রকৃতির পাম্পের সংখ্যা যাহা যান্ত্রিক বিভ্রাট/গোলযোগ ছাড়া অন্য যে কোন কারনে চালু অবস্থায় নাই।
- সম্ভাব্য কারনসমূহ প্রশ্নাবলীতে বর্নিত হইল।
(লেখার নিয়ম: যেমন ক ৫টি, খ ২টি, গ ১টি)

উপরিভাগে স্থাপিত: যে পাম্প ভূমির উপরিভাগে স্থাপন করা আছে।

তলদেশে স্থাপিত: যে পাম্প গর্তের তলদেশে স্থাপন করা আছে।

উপরিভাগে স্থাপিত :

তলদেশে স্থাপিত :



৪। কায়িক শ্রমে চালিত নলকূপ :

ট্রেডেল পাম্প, রোয়ার পাম্প এবং অন্যান্য হস্তচালিত পাম্প দ্বারা পানি তুলিয়া ফসলের জন্য সেচের ব্যবস্থা করা হয়। খাবার পানির হস্তচালিত পাম্প এই জরীপে আসিবেনা।

৫। চিরাচরিত এবং অন্যান্য পদ্ধতি :

যেমন, সেউনি অথবা অন্য যে কোন পদ্ধতি দ্বারা পানি তুলিয়া ফসলের সেচ কাজে ব্যবহার করা হয় যাহা এক থেকে পাঁচ নং প্রশ্নের অন্তর্ভুক্ত নয় এরূপ।

এই জরীপ অত্যন্ত জরুরী বিষয়। সঠিক তথ্য ও সময়মত প্রেরণের জন্য অনুরোধ করা হইল। এই জরিপের রিপোর্ট আপনাদের অবগতির জন্য প্রেরণ করা হইবে।

উপ পরিচালক
কৃষি সম্প্রসারণ বিভাগ
এবং সদস্য বর্ধিত প্রজেক্ট টিম
কম্পার্টমেন্টালাইজেশন পাইলট প্রজেক্ট

নির্বাহী প্রকৌশলী
কম্পার্টমেন্টালাইজেশন পাইলট প্রজেক্ট
সিরাজগঞ্জ

জ্ঞাতার্থে ও প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য :

১। ব্লক সুপারভাইজার, কৃষি সম্প্রসারণ (সকল ব্লক)।

২। থানা কৃষি কর্মকর্তা, কৃষি সম্প্রসারণ (সকল থানা)।

Appendix 4.3.B: The sample survey questionnaire

Bangladesh Water Development Board
Compartmentalization Pilot Project (FAP-20)
Survey on Irrigation, March-April 1993

Name of interviewee: ____________________
Date of interview: ____________________
Village: ____________________
Sub-Compartment No: ____________________
Union: ____________________
Thana: ____________________
District: ____________________

1) Which of the following best describes the irrigation activity?

Shallow Tube Well	1	
Deep Tube Well	2	[SKIP TO QUESTION 3]
Manually Operated Tubewell	3	[SKIP TO QUESTION 16]
Low Lift Pump		
less than 1 cusec (fractional)	4	
1 cusec	5	[CONTINUE]
2 cusec	6	

2) What is the source of irrigation water?

River	1
Canal	2
Pond/Tank	3
Baor/Beel	4
Other ____________ (Specify)	( )

3) a) At what level did you find underground water (of 2/3 previous years)

in year .... ft
in year .... ft
in year .... ft

b) At what depth are strainers the set?

.... ft
.... ft

c) Water supply condition at the set pipe level during April

Sufficient water available	1
Water supply reduced	2
Water supply reduced substantially	3
No available water	4

4) What source of energy does the engine use?

Electricity	1
Diesel	2
Gasoline	3
Other ____________ (Specify)	( )

5) Which of the following best describes the ownership of the engine?

a) Individual 1
Group 2 male/female/mix and farmer/landless

b) Group specification:

BRDB	3
Government Agency	4
Grameen Bank	5
NGO	6
Non-organizational	7
Other_____ (Specify)	( )

6) Which of the following best describes the status of the person being interviewed?

Hires the equipment (Mobile Pump)	1
Rents the equipment(seasonal rental)	2
Owns the equipment	3
Manages the equipment	4
Operates the equipment	5
Other_____ (Specify)	( )

7) What are the details of the rental/hire agreement?

a) Basic agreement (include time period where applicable).
_____ ( )

b) Any additional costs (specify)? [PROBE] Any others?

_____ ( ) _____ Taka
_____ ( ) _____ Taka
_____ ( ) _____ Taka

c) Does the renter/hirer supply:

	YES	NO
Fuel or Electricity?	1	2
Lubricants and other routine maintenance?	1	2

[SKIP TO QUESTION 9]

8) a) Was the equipment purchased new by the present owner(s)?

New	1
Second Hand (Used)	2
Year purchased	.....
From whom	.....

b) How was the purchase of this equipment financed?

Owner's cash	1
Borrowing from relatives	2
Money Lender	3
Bank Loan	4
BRDB Loan	5
Cooperative Loan	6
NGO Loan	7
Dealer Loan	8
Other_____ (Specify)	( )

9) Which of the following best describes the use of the equipment?

Irrigation AND other purposes, any season	1	[CONTINUE]
Exclusively for irrigation in season, other purposes in other seasons	2	[CONTINUE]
Exclusively for irrigation	3	[SKIP TO Q 11)

10) What purposes, other than irrigation, do you use the equipment for? [PROBE] Any others?

Milling	1
Generator (electricity)	2
Power tiller	3
Saw mill	4
Water transport	5
Road transport	6
Other_____ (Specify)	( )

11) a) How old is the equipment? _____Years

b) How many more years do you think this equipment will operate before it must be replaced? _____ Years

12) What was the period of irrigation in 1992 and 1993?

1992 : Start 1/2/3/4 week of ..... (month)
End 1/2/3/4 week of ..... (month)

1993 : Start 1/2/3/4 week of ..... (month)
End 1/2/3/4 week of ..... (month)

13) a) What are the average daily hours of operation of this equipment? _____ Hours

b) How many days do you operate in a season _____

14) [IF ENERGY SOURCE IS ELECTRICITY AT QUESTION 4 THEN ASK:]

a) How much were the electricity cost to operate this equipment in the last season? _____ Taka

b) Unit in Kilo-watt-hour .....

c) How much to expect in the current season _____Taka

15) [IF ENERGY SOURCE IS DIESEL/GASOLINE AT QUESTION 4 THEN ASK:]

a) How much fuel will this equipment use in the current season?

_____	Gallons	G
	Litres	L
	Other_____ (Specify)	( )

b) How much will the fuel cost to operate this equipment in the current season? _____ Taka

16) a) How many acres is this facility irrigating during the current season? ____._____ Acres

b) How many acres possible to irrigate from this facility .....acres.

c) Reasons for difference _____

17) a) What crops are under irrigation at this location? [PROBE] Any others? [RECORD BELOW]

b) [FOR EACH CROP MENTIONED ASK:] How many acres of [CROP] are under irrigation? [RECORD BELOW]

[ADD AND CHECK TOTAL AGAINST ** Acres ** AT QUESTION 16]

	Q 17 a)	Q 17 b)
Boro	1	_____._____
Wheat	2	_____._____
Potatoes	3	_____._____
Vegetables	4	_____._____
Oilseeds	5	_____._____
Pulses	6	_____._____
Other_____ (Specify)	( )	_____._____
_____	( )	_____._____
_____	( )	_____._____

[_____._____ TOTAL]

18) a) Is there a need for supplemental irrigation for Aman crops in areas you are irrigating now. Yes/No

b) If yes, do you provide supplemental irrigation to Aman crops. Yes/No

i) Yes, on ..... acres with STW/DTW/LLP/MOTW

ii) No, because -----

Irrigation equipment not available	1
Electricity not connected	2
Others	( )

[TERMINATE] Thank you for taking the time to answer my questions!

Appendix 4.3.C: List of 101 villages with electricity within the CPP area, Sirajganj

Janpur	Peoplebaria	Kodda
New Bhangabari	Haripur	Barakandi
Beparipara	Chak Mirrerkhor	Kashiahata
Rahmatgonj	Daobari	Kadai
Telkupi	Veoumara	Chatiantali
Phulbari	Gazaria	Saidabad
Diadhangara	Saratail	Randhanbari
Shahdhangara	Chilgacha	Boro Saratia
Nalchapara	Kuralia	Porabari
Kushahat	Bir Subgacha	Chala
Doatbari	Ratankandi	Ramgati
Kobdashpara	Diar Baiddanath	Sadanandapur
Ranigram	Khudra Sialkhol	Mohammadpur
Gungati	Shibnathpur	Kaliakandapara
Khokshabari	Bildhali	Mirpur
Sholabari	Jagatghati	Machimpur
Tukri Changacha	Koilghati	Kallany
Gupirpara	Sialkhol	Bauitara
Shahangacha	Ragunathpur	Ariamohan
Pouchibari	Syampur	Dukhiabari
Jinaigati	Chandidashgati	Majhail
Sangacha	Bhadraghat	Bharangha
Phulkocha	Saraichandi	Nandinamath
Noada Phulkocha	Dumur	Krishnapur
Khorachora	Kadamphal	Paikpara
Joynagar	Kandapara	Chakuli
Bajgati	Kalia Choudhury	Malshapara
Char Nandina	Haripur	Dhanbandi
Garudaha	Chuniahat	Hossainpur
Bagbati	Dhanbaria	Kaliabari
Baidda Dholdhop	Char Raipur	Amlapara
Dholdhop	Konagati	Ekdala
Harina	Porabari	Hasna
		Hasna Bahirgola

Source: Power Development Board, Sirajganj