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CHAR DEVELOPMENT AND SETTLEMENT PROJECT II  
চর উন্নয়ন ও বসতি স্থাপন প্রকল্প ২  
BANGLADESH

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**Reporting on Monitoring of Results of Project  
Interventions in CDSP-I Areas**

Technical Report No. 11

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## Table of Contents

	Page
<b>List of contents</b>	<b>i</b>
List of Tables	ii
List of Figures	iii
Introduction: Monitoring Efforts in CDSP-II	1
<b>1. Results of land settlement</b>	<b>3</b>
1.1 Methodology	3
1.2 Quality of CDSP-I land settlement programme	3
1.3 Distribution of households by <i>khas</i> land allotment	3
1.4 Possession of lands as given in the <i>khatian</i> : at settlement time	3
1.5 Possession of land: present status	4
1.6 Land sales status	6
<b>1.7 Land management pattern of possessed land</b>	<b>6</b>
1.8 Land use pattern	8
1.9 Cropping pattern and intensity	8
1.10 HYV Rice and Rabi Coverage	8
1.11 Concluding remarks	9
<b>2 Changes in the Environment for Agriculture and Adoption of Agricultural Technologies</b>	<b>10</b>
2.1 Introduction	10
2.2 Soil salinity	10
2.3 Nutrient status of soil	10
2.4 Adoption of improved technologies	11
2.5 Crop yield	17
2.6 Concluding remarks	18
2.7 Lesson learnt	18
<b>3 Condition and functioning of Infrastructure</b>	<b>19</b>
3.1 Physical condition and functioning of infrastructure	19
3.2 Monitoring of Maintenance plan	24
3.3 Tube well monitoring	26
3.4 Toilet monitoring	28
3.5 Effect of Infrastructure	30
3.6 Lesson learnt	30
<b>4 Functioning of Field Level Institutions: Water Management Committees and Tube well User Groups</b>	<b>32</b>
4.1 Field level institutions	32
4.2 Water Management Committees	32
4.3 Tube well User Groups	35
4.4 Concluding remarks	35

## List of Tables

Table-1: Distribution of Land Recipient Surveyed Households by Land Ownership Size Groups	3
Table-2: Land Possession situation 1/3 02, all households	4
Table-3: Land possession status of the Land Recipient Surveyed Households	4
Table-4: Land Possession Status of the Land Recipient Surveyed Households by Land Ownership Size Groups	5
Table-5: Average Land Possession	5
Table-6: Distribution of Allotted Land and Possession Over Allotted Land (percent)	5
Table-7: Distribution of Households by Land Sale Status	6
Table-8: Distribution of the Sold Land by Types of Settlers	6
Table-9: Distribution of the Land Recipient Surveyed Households by Agricultural Land Ownership Size Groups	7
Table-10: Distribution of Agricultural Land by Management Types	7
Table-11: Distribution of Non-operating Landowners by Land Ownership Size Groups	7
Table-12: Distribution of Land by Land Use Pattern	8
Table-13: Cropping Pattern and cropping intensity of the Land recipient Surveyed Farming households	8
Table-14: HYV Rice and Rabi coverage of the Land Beneficiaries in CDSP-I Area	9
Table-15: Percent plots under Rabi rabi crops in three polders of CDSP-I	12
Table-16: Changes in the adoption of rabi crops in Three Polders of CDSP-I	13
Table-17: Percent plots covered by aus crops by type of varieties in CDSP-I Areas	14
Table-18: Changes in adoption of aus rice varieties in CDSP-I Areas	15
Table-19: Percent area under HYV aman in CDSP-I Areas	16
Table-20: Changes in adoption of aman rice varieties in CDSP-I Areas	17
Table-21: Comparative Statement showing % of works taken up and accomplished by the concerned agencies and involved parties.	26
Table-22: Distribution of Tube well by Functioning status in Different Polders	27
Table-23: Distribution of Tube well by Functioning status and Tube well Types	28
Table-24: Distribution of Abandoned Tube well by Reasons for Abandoning in CDSP-I Areas	28
Table-25: Water quality and availability of water	28
Table-26: Situation of Sanitary Latrine and Its Coverage in CDSP-I Areas	29
Table-27: Reasons for Unusable and abandoning the Sanitary Latrines	30
Table-28: Water Management Committees by Polders and Sluices	32
Table-29: % of Maintenance Cost Shared by Other Users During Last Disorder	35

## List of figures:

Fig-1.1:	Soil salinity in three CDSP-I polders	11
Fig-1.2:	Grain yield of aus and aman rice in three polders of CDSP-I	18
Fig-2.1:	Sea Dykes in CDSP-I Area	20
Fig-2.2:	Interior dykes in CDSP-I Area	20
Fig-2.3:	Marginal dykes in CDSP-I Area	21
Fig-2.4:	Main Drainage Khal in CDSP-I Area	21
Fig-2.5:	Secondary Canals in CDSP-I Area	21
Fig-2.6:	Sluices in CDSP-I Area	22
Fig-2.7:	Rural Road (R-1) in CDSP-I Area	22
Fig-2.8:	Rural Road-2 in CDSP-I Area	22
Fig-2.9:	Rural Road (R-3) in CDSP-II Area	23
Fig-2.10:	% Distribution of Target Maintenance Plan by Agencies	24
Fig-2.11:	Achievement of maintenance work by different Agencies	25
Fig-2.12:	Share of Planned Maintenance Works and Actual work done by Agencies and parties	25
Fig-2.13:	Maintenance by Implementing Agencies and Involved Parties	26
Fig-2.14:	Distribution of Tube well by functioning status, CDSP-I	27
Fig-2.15:	Sanitary Latrine Coverage by CV status	30

## INTRODUCTION: MONITORING EFFORTS IN CDSP II

This is the final report on monitoring of the results of the project interventions in CDSP I areas for the period of 2002 until December 2003. This is one of the three major monitoring efforts in CDSP II. These three are<sup>a</sup>:

- a. *Progress monitoring*: monitoring of the progress of implementation of project activities as laid down in the Inception Report (and Project Proformas) and the subsequent Annual Work Plans. This kind of monitoring is the subject of the six monthly Progress Reports. These Progress Reports reflect the assessment of the progress of project staff (consultants and government staff). External monitoring of the progress is the task of the Mid Term Review Mission, scheduled for June 2002.
- b. *Result monitoring of interventions under CDSP II*: basically monitoring of the actual contribution of project interventions to the three project purposes of CDSP II. In the Progress Reports only an indication and an impression of such contributions can be given, since project interventions will still be ongoing till the end of the project period. Also the Mid Term Review Mission can give the same type and level of assessment. It is the intention to repeat at the end of CDSP II, as a first post completion exercise, the Baseline Surveys that were undertaken in six new CDSP II areas and in the three CDSP I polders. That will provide information in the changes in a number of essential variables, which would allow the formulation of an opinion on the results of project interventions in the light of the project purposes.
- c. *Result monitoring of interventions under CDSP I*: monitoring of the changes in a number of variables which are important for understanding the results of project interventions in the CDSP I period in the three CDSP I polders: Char Baggar Dona II, Char Majid and Char Bhatirtek. This is the subject of the present report.

In the Inception Report monitoring of developments in CDSP I polders were taken up as one of the activities in the component that aims at accumulation and dissemination of data and knowledge on the coastal areas. The objectives of this effort were formulated as:

- To have an informed opinion on the effectiveness of project interventions during the CDSP I period in order to learn and subsequently, if required, to adapt project organization and content of interventions in CDSP II.
- To add to the data- and knowledge base on coastal areas.

In July 2000 an Internal Resource Report was published with the details of this monitoring activity. This report states that regular monitoring will be done with regard to four major clusters of activities:

- a. Land settlement
- b. Agriculture

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<sup>a</sup> Adopted from CDSP-II; Technical Report; Reporting on monitoring of results in CDSP I areas

c. Infrastructure

d. Field level institutions

For each of these four fields, the report (ibid) indicates which variables will be followed, with what frequency and who will be responsible for the monitoring. It also gives the monitoring formats. In annex 1 of the current report the most important pages of the Internal Resource Report have been taken up. The present report follows the same structure. It contains four chapters (1 to 4) on each of the four clusters of interventions.

CDSP-II published the first Report on monitoring of results of project interventions in CDSP I Areas in March 2002 for 2001 (Technical Report No. 6) and it was the intention that similar Technical Reports would be published during the first quarter of each calendar year of the remaining project period, i.e. in 2003 and 2004. The present report is the second monitoring report for the year of 2003 but it gives the results till the period of January 2003 for Land Settlement and for other three components till December 2003.

A set of instruments was developed for gathering monitoring information, and they were changed for collecting more comprehensive monitoring information for the current report. All those formats are presented in an Internal Resource Report produced in July 2000 (Monitoring of Development in CDSP-I Areas: Char Baggar Dona-II, Char Majid and Char Bhatirtek) and it has been updated incorporating the changed formats (Internal Resource Report- update version, February 2004).

## Chapter 1 RESULTS OF LAND SETTLEMENT

### 1.1 Methodology

In CDSP-I 4,458 landless households got official *khas* land allotment, each recipient got a *khatian* (Land right documents) against their allotment. In November 2000 a census survey was undertaken among all households, focussing on the fact whether they had actually received the land that was mentioned in their *khatian*. In November 2001 a sample survey was done involving 10% (444 households) of all households that received *Khatian*. The sample was the result of a random selection. In November 2002-January 2003 another Sample Survey was carried out and it covered the same sample population. Based on the findings of that sample survey this section is prepared.

### 1.2 Quality of CDSP-I land Settlement programme

Out of a sample of 452 *Khatian-holders*, selected for the surveyed, 381 *Khatian-holders*<sup>1</sup> (henceforth households) were found for interview. The other 71 households of the sample population were not available for interview for a number of reasons such as non-availability due to migration, *Benami* (Fake-name) *khatian-holders*, living distant villages or having left the areas, etc. The report of the survey is published as an Internal Resources Report. Below the result of the most significant variables are given.

### 1.3 Distribution of Households by Khas land allotment

Table-1 gives the distribution of the all land recipient households (4458) according to land size groups based on all types of allotted land i.e. agricultural land, homestead and ponds. About 59% of the settlers got land within the range of 1.01-2.00 acres.

**Table-1: Distribution of Households by Land Ownership Size Groups**  
(percent)

Allotted Land Size Group (in acres) <sup>2</sup>	Polders			All polders N=4458
	CM N=1147	CBD-II N=815	CBT N=2496	
0.01-0.50	29.2	21.0	9.1	16.4
0.51-1.00	26.4	22.6	24.7	24.8
1.01-2.00	44.4	56.5	66.2	58.8
Total	100	100	100	100

\*Included all types of land (homestead, pond and null, i.e. agricultural land). Sources: Land unit, CDSP-II

### 1.4 Possession of land as given in the *khatian*: at settlement time

This paragraph highlights the phenomenon that households that received *khatian*, did not receive the land as described in *khatian* because it was not transferred to them by the people that illegally control the land. Table-2 gives the situation on March 1, 2002. Of the 836 households that needed to receive their land at the end of settlement operation in CDSP-I, 296 had received their land since then; for 540 households (over 12% of the total) handing over of possession still had to take place.

<sup>1</sup> In 2001 sample survey 413 households were available for interview.

<sup>2</sup> 2.47 acres=1 hectare.

However, CDSP-II recovered *khas* land from the illegal occupants and handed over land to the official titleholders i.e. settlers and some of the official titleholders recovered their land from the occupation of the *jotedars* on their own ways.

**Table-2: Land Possession situation 1/3 02, all households**

Polder	Total househ olds	H/H needed handed over land	Already handed over land	To be handed over	% of total
CM	2496	492	280	212	8.5
CBD-II	1147	261	06	255	22.2
CBT	815	83	10	73	9.0
All polders	4458	836	296	540	12.1

Source: Census Survey 2001, quoted in Report on monitoring of results of project interventions in CDSP-I Areas (Technical Report No. 6) March 2002

### 1.5 Possession of land: present status

As Table-3 shows, 13.7% for the sample households could not yet recovered their *khas* allotted land from the possession of the illegal occupants and such unoccupied land constitute 5.6% of the total allotted land (see Table-6).

**Table-3: Land Possession Status of the Land Recipient Surveyed Households**

Polders	N=*	% of Households**	
		Possession	Not all land possess
CM	117	87.3	17.1
CBD-II	82	89.0	13.4
CBT	253	92.9	12.3
Total	452	93.4	13.7

\*\*Population includes both interviewed 381 households and non-interviewed 71 households and the latter's land have been considered as under possession. It has been observed during the survey that most of the settlers of this kind had tampered the settlement process in their favour unscrupulously and both field experience and the belief of the local people corroborate it. It is very much logical that people who could have manoeuvred the settlement process for getting land title they could have been able to possess it too.

\*\* Figures are inclusive as some of the households received possession partly and they are included in both categories

Almost 14 percent of the total surveyed households have not got possession of all land and it was approximately 16% in 2001 Sample survey<sup>3</sup>. This means that it has improved very slightly. It has been estimated that 86.3% of the land settlement beneficiary households have received possession over all their allotted land (ref: Table-4) but during the 2001 sample survey it was 84.5%. Although the figures of the two surveys show a little improvement the actual improvement is high. A positive correlation between the possession of land and the landownership size exists as the possession goes up with the increases of the landownership size (ref: Table-4).

<sup>3</sup> See Report on monitoring of results of project interventions in CDSP 1 areas (TR-6), March 2002.

Table-5 shows the average possession status of the allotted land. The settlers do not have possession over 0.08 acres per household in three polders altogether though it varies from polder to polder. In CM it is 0.06 acres and it is highest in CBT with 0.08 acres.

Compared with the Land Monitoring Sample Survey 2001 it is seen that average non-possessed land is the same although there is some changes within individual polders. The situation has improved in CM where CDSP-II has handed over land to the settlers but deteriorated in CBD-II where a *jotedar* (land grabber) has evicted some of the settlers.

**Table-4: Land Possession Status of the Land Recipient Surveyed Households by Land Ownership Size Groups**

Allotted Land Size Group*	N=**	% Households got	
		Possession	Not possess
0.01-0.50	70	80.0	20.0
0.51-1.00	102	82.4	17.6
1.01-2.00	251	88.0	12.0
2.00+	29	100	0
Total	452	86.3	13.7

\*Land Size Groups has been classified based on total allotted khas land. Some of the non-possessors have got partial possession. However, figures here are exclusive. Some households have got more than 2.00 acres of land in more than one *khatians*.

\*\*Total sample households (both interviewed and non-interviewed).

**Table 5: Average Land Possession**

Polders	Total allotment (acres)	Land possession (acres)	
		Possess	Do not possess
CM	1.01	0.95	0.06
CBD-II	1.49	1.42	0.07
CBT	1.48	1.40	0.08
Total	1.36	1.28	0.08

As stated earlier households, who have unoccupied land, constitute 13.7% of the total sample households (Table-3&4) but their unoccupied land constitute 5.6% of the total allotted land of all sample households. In CM it is about 6.2% and in CBD-II it is 4.9% (ref. Table-6). About 89 percent of the settled land was allotted from their pre-settlement occupied land, and about 11 percent of the settled land was additional land allotted from the Reserved Land occupied by the illegal occupants. Half of the additional land allotted from Reserved Land has been recovered by the allotment-holders CDSP-II also helps them to get possession.

**Table-6: Distribution of Allotted Land and Possession Over Allotted Land (percent)**

Settlement index	Polders			Total
	CM	CBD-II	CBT	
1. Land from pre-settlement occupation	86.4	88.1	89.9	88.9
2. Additional land	13.6	11.9	10.1	11.1
3. Additional land under possession*	7.4	7.0	4.5	5.6
4. Land not under possession*	6.2	4.9	5.6	5.6
5. Total land under possession (1+3)	93.8	95.1	94.4	94.4

\*Percent with respect to total allotted land.

## 1.6 Land sale status

An important indicator of the sustainability of the result of land settlement operation in CDSP-I is the degree of retention of land. The following paragraph will deal with the extent to which landowners had contracted out their land. This paragraph is about the actual ownership. Legally speaking, khas land given to landless households through the land settlement operation cannot be sold for 99 years. In practice, the authority tolerates such illegal sale of land after the death of the owners.

Any other sale is outside the letter and practice of law. Table-7 shows that from the sample approximately 9 percent of the total sample households have sold land and a little more than 4 percent of them have sold their landholding and have left their respective polders. The land-selling people of this kind are those who had manipulated the land settlement process as stated in section 1.2. This kind of land sale is highest in CBT and lowest in CBD-II. The land sale by those who are still in the polder is also highest in CBT. In terms of land involved about 5 percent of the total allotted land (ref; Table-8) have been sold. Land sold is higher in CBT (6.2%) and lowest in CBD-II (2.1%). The land sold by the settlers who are still living in their respective polders constitutes only 1.5% of their total allotted land. It has also been observed that some of the land settlement beneficiaries have bought land with their improved economic conditions due to land settlement (such findings have not been presented in this report).

**Table-7: Distribution of Households by Land Sale Status**

Category of households	Polders			Total
	CM	CBD-II	CBT	
	N=117	N=82	N=253	N=452
Land sold and left the area	4 (3.4)	2 (2.4)	15 (5.9)	21 (4.6)
Land sold but live in the area	2 (1.7)	3 (3.7)	14 (5.5)	19 (4.2)
Total	6 (5.1)	5 (6.1)	29 (11.5)	40 (8.8)

Source: Sample Survey, Nov 2002-January 2003; Note: Figures within parenthesis are percentage

\*Total population is the sample households that include both households who are interviewed and who are not interviewed. This has been done to assess the proportion of land sold to total allotted land sold.

**Table-8: Distribution of the Sold Land by Types of Settlers**

Category of households	Polders			(percent)
	CM	CBD-II	CBT	All polders
Land sold and left the area	2.9	1.5	4.4	3.6
Land sold but live in the area	0.5	1.4	2.1	1.5
Total	3.5	2.1	6.5	5.1

Source: Sample Survey, Nov 2002-January 2003

Note: percentage is with respect to total allotted land of all sample households (452).

## 1.7 Land management pattern of possessed land

Table-9 shows that 50 respondents (13.1%) out of 381 respondents do not have received allotment of agricultural. It appears that about 36% of the surveyed households have 0.01 to 1.00 acres (below subsistence level) agricultural landholding. However, more than half of the land recipients have got land more than 1.00 acre.

**Table-9: Distribution of the Land Recipient Surveyed Households by Agricultural Land Ownership Size Groups**

Land ownership size (acres)	Polder						Total	
	CM		CBD-II		CBT			
	number	percent	number	percent	number	percent	number	percent
Landless	26	25.5	4	5.1	20	10.0	50	13.1
0.01-0.50	15	14.7	17	21.5	33	16.5	65	17.1
0.51-1.00	18	17.6	10	12.7	42	21.0	70	18.4
1.01-2.00	30	29.4	33	41.8	80	40.0	143	37.5
2.00+	13	12.7	15	19.0	25	12.5	53	13.9
Total	102	100	79	100	200	100	381	100

Source: Sample Survey, November 2002-January 2003

As per the Agricultural Khas Land Management Policy the land recipients are supposed to cultivate the allotted land under own management and cannot resort to any kinds of subletting for its management. This paragraph gives information on the question whether the settlers cultivate or share crop out or mortgaging out their allotted land. Table-10 shows that 11.3% of the total arable land is share cropped out and 12.2% is mortgaged out. This means that the landowners cultivate a little more than three-quarters of the total arable land under their own management and they either share crop out or mortgaged out the rest land.

**Table-10: Distribution of Agricultural Land by Management Types**

Polders	Management types (%)			Total
	Own cultivation	Share crop out	Mortgage out	
CM	68.0	14.9	17.1	100
CBD-II	81.7	8.3	10.0	100
CBT	77.1	11.2	11.2	100
All polders	76.2	11.3	12.2	100

Source: Sample Survey November 2002-January 2003

Table-11 shows the distribution of non-operating landowners by Landownership Size Groups. It shows that there is a negative correlation between the Landownership Size Groups and the on-operating landowners. The lower Landownership Size Groups have relatively more non-operating landowners and it decreases as the Landownership Size Group goes up. This indicates that the lower Landownership Size Groups prefer non-operation and they lease out their land because their operational holding is not optimum in size.

**Table –11: Distribution of Non-operating Landowners by Land Ownership Size Groups**

Landownership size group	Total landowners	Non-operating landowners	
	Number	Number	Percent
0.01-0.50	65	17	26.2
0.51-1.00	70	16	22.9
1.01-2.00	143	22	15.4
2.00+	53	4	7.5
Total	331	59	17.8

## 1.8 Land use pattern

Table-12 shows the percentage distribution of land under different land uses. As is usual, agricultural land use is the highest of all kinds of land uses -- pond, homestead and fallow. About 79 percent of the total lands of the land beneficiaries are used as agricultural land in the study areas. It should be noted that in the like any other coastal chars of Noakhali people in CDSP-I area also make bigger homesteads with trees for protection from the strong winds of the cyclone and storms, and ponds attached with the homesteads for fresh water supply.

**Table-12: Distribution of Land by Land Use Pattern (percent)**

Polders	Use pattern				Total
	Arable land	Water bodies	Homestead	Others	
CM	74.0	11.9	6.3	7.8	100
CBD-II	81.8	6.5	6.7	5.0	100
CBT	79.5	8.5	9.1	2.9	100
Total	78.8	8.8	8.0	4.4	100

## 1.9 Cropping pattern and intensity<sup>4</sup>

Both CBT and CBD-II have almost similar coverage of triple cropped areas with 15% for the first polder and 13% for the second polder. Table-13 shows that single cropped areas is considerably high in CM (75%) compared with other two polders. On the other hand, single cropped area is considerably low in CBT where both double cropped area and triple cropped area are high. The cropping intensity is 168%; lowest in CM with 129% and highest in CBT with 188%.

**Table-13: Cropping Pattern of the Land Recipient Surveyed Farming Households**

Cropping pattern	CM	CBD-II	CBT	Total
Single cropped area	75.2	58.8	26.8	43.9
Double cropped area	21.0	28.1	58.4	44.0
Triple cropped area	3.8	13.0	14.8	12.1
Cropping intensity	128.6	154.2	188.0	168.0

Source: Sample Survey, Nov 2002-January 2003

## 1.10 HYV Rice and Rabi Coverage<sup>5</sup>

Table-14 presents the HYV coverage of rice both in *Aus* and *Aman* seasons and *rabi* crops of the land recipients in three polders. The HYV aman coverage is slightly more than 19% for the project area altogether, and it varies from polder to polder with 9% in CBD-II, 13% in

<sup>4</sup> In this section cropping pattern and cropping intensity have been shown for the Land beneficiaries who received land through CDSP-I. Here analysis has been done based on households as socioeconomic analytical unit. It means that a household might have land within polder and outside polder of its own or under its cultivation taken as lease. In Chapter 2 cropping pattern have been shown for the whole polders covering both land settlement beneficiaries and others and confining within the polders. So these two pieces of data would not match for obvious reasons.

<sup>5</sup> *ibid*

CM and 26% in CBT. The proportionate coverage of HYV aman in CM is almost half that of the CBT. It is to be noted that the drainage system is better in CBT than other two polders which suffer from water congestion and road and embankment cuts occur in these polders almost every year to ease the water-logging problems. The HYV aus coverage is also very low in CBD-II (12%) compared with other two polders; 44% being in CBT, and 38% being in CM. The HYV coverage is higher in aus season than that of the aman season; almost double. In Aus season, it is slightly over 40 percent for the study area as a whole. Considering from the individual polder's point of view HYV Rice coverage is higher in Aus season than in Aman season holds in all polders.

**Table-14: HYV Rice and Rabi Coverage of the Land Beneficiaries in CDSP-I Area**

Crop season	Coverage in percent			
	Polders			All area
	CM	CBD-II	CBT	
Aman HYV	12.6	8.6	25.9	19.3
Aus HYV	38.2	12.0	43.9	40.3
Rabi	22.4	29.4	19.3	22.1

### 1.11 Concluding remarks

About 85% of the settlers could fulfil the criteria for getting khas land being from the locality and landless. The other 15% have manipulated the land settlement process somehow. Some of the local settlers had also manipulated the land settlement process to get their occupied *khas* land which was more than the legal ceiling i.e. 2.00 acres.

More than 93% of the settlers have got possession of their allotted land and about 7% of the settlers have not got possession of their allotted land. However, in addition to this category there are some settlers who have not got possession of their allotted land partially. These two groups constitute about 13.7% of the total land recipient settlers and most of the people who have unoccupied allotted land are from the poorer section. In terms of volume of land unoccupied land constitutes 5.6% of the total allotted *khas* land.

Land retention by the settlers is high as land sale is minimum at a tolerable limit. Only 4.2% of the households among the genuine settlers have cases of land sale though another 4.6% of the settlers had sold land and left the area. The people of the second type were not genuine landless settlers and they had rather manipulated the land settlement process as stated earlier. The land retention by the genuine landless settlers is about 98.5% as they have sold 1.5% of their allotted land.

Most of the land settlers cultivate their allotted agricultural land under own management, and more than three-fourths land are under own cultivation. Coverage of HYV rice and rabi crops is not as per expectation though these are increasing gradually. It is higher in aus season than aman season, a coastal phenomenon.

## **Chapter 2      CHANGES IN THE ENVIRONMENT FOR AGRICULTURE AND ADOPTION OF AGRICULTURAL TECHNOLOGIES**

### **2.1 Introduction**

It is expected that with the improvement of the agro-ecosystems of the Char Baggar Dona-II, Char Bhatirtek and Char Majid due to the CDSP-I's interventions, the productivity and economic benefit of the interventions will increase. This increase in productivity is envisaged due to adoption of improved agricultural technologies. Assessment of these improvements is being done through regular monitoring on the following parameters.

1. Changes in agro-ecology
  - a) Changes in soil salinity
  - b) Changes in nutrient status of soil
2. Changes in adoption of agricultural technologies
  - a) Changes in cropping pattern
  - b) Changes in productivity level

Technical Report No. 6 (CDSP-II) reported changes in the above parameters that took place until December 2001. This report is supposed to cover the changes that took place during the period between January to December 2002. However, in order to show the trend, current data have been added to the old ones.

### **2.2 Soil salinity**

Based on the data of December 1999, three fields were selected in each polder that represented high, medium and low saline soils. Soil samples are being collected from 0-10 and 10-30cm layers of these fixed fields in alternate months as a routine basis. Soil samples collection occurred during February, April, June, August, October and December 2002. Soil salinity was measured directly in the 1:1 soil: water suspension. Soil Resource Development Institute (SRDI) has been collecting and measuring soil salinity.

Soil salinity values are being compared with those of December 1999 to ascertain changes, if any, in the salinity level. Figure-1.1 shows that levels of soil salinity reduced from those of December 1999 (depending on chars, from about 6 to 9) to a level below 4 dS/m in all the chars but CBT and has approached to the level found in fields with low soil salinity in the areas. This decreasing trend, as was envisaged during CDSP-I, continued during the reporting period except at CBD-II. At the latter site, an upward trend is observed during the later part of 2002 and thereafter showing a decreasing trend during 2003. It is interesting to note that the fields with low soil salinity are maintaining a steady level indicating that perhaps no further reduction of soil salinity can be expected.

### **2.3 Nutrient status of soil**

The earlier report (CDSP-II; Technical Report; No. 6) reported a change in the nutrient status of the soils of the project sites over a period of 1999 to 2001. Although nutrient monitoring was supposed to be repeated every after two-years, soil samples were collected by SRDI during the reporting period for nutrient analysis. The samples are being analysed in the

central Laboratory of SRDI at Dhaka and the results are expected to get sometimes later in this year.

## 2.4 Adoption of improved technologies

Improved crops and cropping practices were demonstrated to the farmers of the three CDSP-I polders. Adoption of these crops and technologies in these chars are being surveyed along the predetermined transects in each of the crop seasons as a routine work since 2001. Before this period no planned survey rather sporadic sample surveys were done. Results of these surveys as well as observations made by the consultant in some cases are compared with the earlier findings, which are reproduced here from the various documents of CDSP-I for easy comparison.

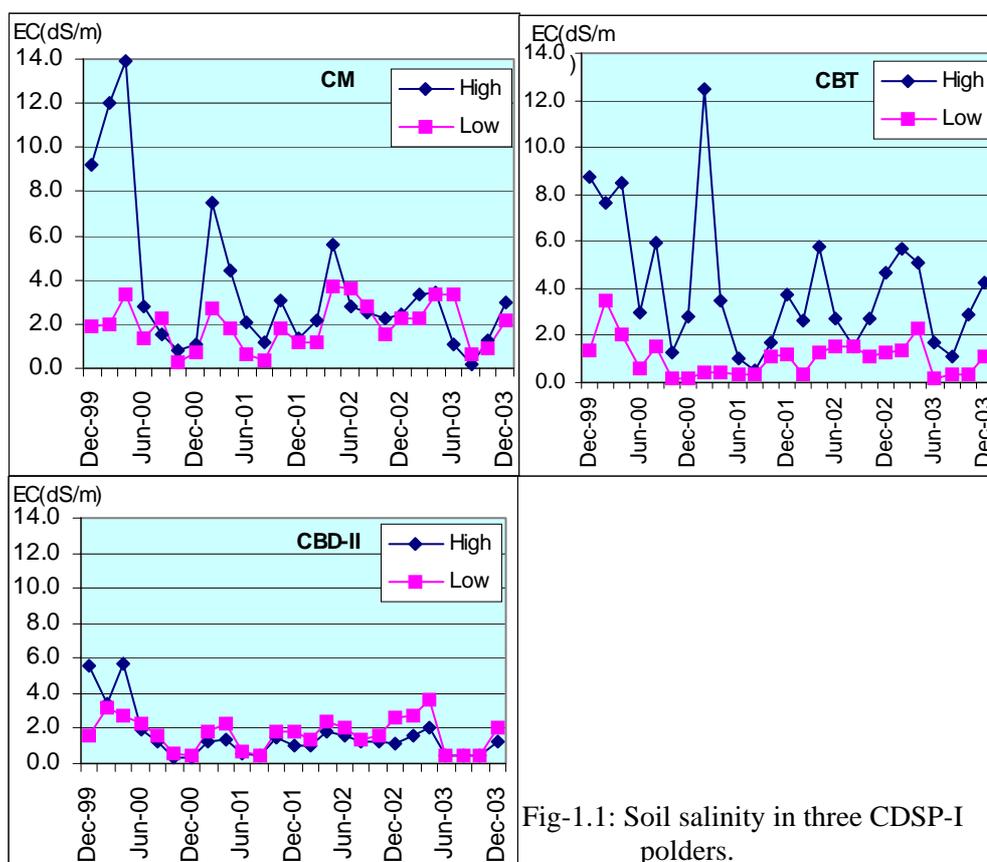


Fig-1.1: Soil salinity in three CDSP-I polders.

### 2.4.1 Rabi season

#### Cropping intensity<sup>6</sup>

At CM areas under Rabi crops remained almost stable from 2001 (Table-15). In other two polders no clear trend is observed though the coverage in the last year (2003) in CBT was very high; though it seems erroneous. At CBT Rabi crops cover more area than in the other two polders, mainly due to an improved drainage situation while in two other polders impaired drainage systems provide unfavourable moisture situation for the establishment of Rabi crops. This goes against the assumption that empolderment would improve the agro-

<sup>6</sup>see note 4 and 5

ecosystems and productivity of the chars land will increase. Although empolderment helped to reduce soil salinity to a level the most crop plants can tolerate (Fig-1.1), several socio-economic and agro-ecological factors explain this negative trend in Rabi cropping. These are:

- 1) Unavailability of tillage equipment,
- 2) Excess moisture during the time of crop establishment
- 3) Drought during post establishment period
- 4) Problem of marketing
- 5) Unavailability of seeds and other inputs
- 6) Unfavourable land tenure system
- 7) Lack of capital of the farmers, and
- 8) Lack of knowledge of the farmers.

Rabi crops have to be planted within October to December for optimum production. The polders are protected from saline flooding by the embankment. But this has reduced the speed of drainage. Because of this slow or improper drainage, land remains either flooded or too wet to work with the soil after the harvest of aman rice (during November to December). This delays the establishment of Rabi crops. On the other hand, when the crops start suffering from drought (during March to April), surface water for irrigation becomes scarce due to drying up of canals and small ponds. The second most important factor is lack of marketing and unfavourable land tenure arrangement. Apart from the socio-economic factors, these unfavourable moisture situations have made farmers less interested in this crop.

**Table-15: Percent plots under Rabi crops in three CDSP-I Areas**

Year	Project sites		
	CBD-II	CBT	CM
1995*	47.4	49.3	51.0
1996*	45.1	47.6	56.0
1999	51.0	41.8	38.8
2001	44.8	46.6	25.8
2002	36.2	32.0	26.3
2003	34.2	63.9	25.2

\* Values for these years are % farmers not plots

### **Adoption of Rabi crops**

Some changes in the adoption of Rabi crops since pre-CDSP-I period have taken place. The crops in Table-16 have been listed in order of magnitude of number of plots they cover in the particular char. These changes are in response to the changes in soil salinity, soil moisture regime, and facilities for the post harvest processing and marketing. In the early stage the dominant crop was groundnut followed by chilli and sweet potato in all polders except CBT, where *khesari* was the dominant one. In CBD-II these three crops were dominant until 2001 and later on *mungbean* replaced the groundnut. Now the coverage of the sweet potato has decreased while cowpea is gaining popularity. In CBT Rabi crops that covered about half of the area included *khesari*, chilli and sweet potato during the pre-CDSP-I period. Later on chilli became the dominant crop followed by sweet potato and *khesari*. In the recent times sweet potato is becoming less important and new crops like garlic, linseed and cowpea are coming up. In CM, groundnut and chilli were dominating until the year 1999. After that

period groundnut is replaced by *khesari* and more recently by *mungbean*. Chilli persistently occupies the second position.

**Table-16: Changes in the adoption of rabi crops in Three Polders of CDS-P-I**

Year	CM	CBT	CBD-II
Pre-CDS-P	Groundnut Chilli Sweet potato Khesari Lin seed	Khesari Chilli Sweet potato	Groundnut Chilli Sweet potato
1999	Groundnut Chilli Sweet potato Khesari	Chilli Sweet potato Khesari Lin seed	Groundnut Chilli Sweet potato Lin seed Cowpea
2001	Khesari Chilli Sweet potato Mungbean Cowpea Groundnut Lin seed	Chilli Khesari Sweet potato Lin seed Garlic	Chilli Groundnut Sweet potato Cowpea Mungbean
2002	Mungbean Chilli Khesari Cowpea Sweet potato Groundnut	Chilli Khesari Sweet potato Lin seed Garlic Cowpea	Chilli Mungbean Cowpea Sweet potato Soybean
2003	Mungbean Chilli Sweet Potato	Greengram Chilli Sweet potato Lin seed	Chilli Greengram

Note: Crops are arranged in order of magnitude.

Farmers are facing problems of post harvest processing of the crop, particularly of the groundnut, due to incessant rain during the harvest time. This occurs particularly when the crop-establishment becomes a late feature, which has become a regular phenomenon due to late drying of soil. Because of this groundnut is losing its popularity while *khesari*, being relatively more tolerant to soil salinity is grown in almost all areas because of its various uses such as fodder/fuel and pulse grain.

#### 2.4.2 Kharif-I season

##### Cropping intensity<sup>7</sup>

No summer vegetable is grown in the char areas thus the only crop grown during the *Kharif-I* is aus rice. In the mid-nineties only low yielding local varieties were grown in areas having relatively less soil salinity. In 1999 this crop covered about 2.9% of the plots in CBD-II, 0.5% in CM and 1.4% in CBT. In 2003 the aus coverage rose to 26.1% in CBD-II, 9.3% in CM and 62.9% in CBT (Table-17).

<sup>7</sup>See footnote 4 and 5

CBT and CM having relatively higher soil salinity (Figure-1) could not support a good crop stand during the early project period. With the reduction of soil salinity after protection by embankment areas under aus crop started increasing in all polders though the rate of increase in CM is low compared with two other polders, the increase being higher in CBT (62.9%) followed by CBD-II (26.1%), whereas in CM it is only 9.3% that rose from 0.5% in 1999.

Although high yielding varieties (HYVs) of aus were demonstrated in all three polders, the farmers did not adopt those varieties for reasons unclear at the time. Subsequent (during CDSP-II) investigations revealed that drought during sowing time usually delayed sowing the crop, which also delayed the planting of next aman crop. Yield of this late-planted aman rice is always lower. Therefore, to get optimum yield it is the general tendency of the farmers to sacrifice aus crop for better yield of aman. Moreover, aus crop is always risk-prone since it suffers from drought and drought-related high soil salinity in the early growth period, and high infestation of pests and diseases including weed in the later growth period.

**Table-17: Percent plots covered by aus crop by type of variety in CDSP-I Areas**

Polder	Year	Total aus	HYV	Local
CBD-II	1995*	42.4	0.0	42.4
	1996*	40.0	0.0	40.0
	1999	3.2	0.3	2.9
	2001	15.1	8.3	6.8
	2002	16.6	10.1	6.5
	2003	26.1	10.6	15.5
CBT	1995*	7.7	0.0	7.7
	1996*	6.6	0.0	6.6
	1999	1.4	0.2	1.2
	2001	47.3	17.4	29.9
	2002	42.3	16.8	25.5
	2003	62.9	35.8	27.1
CM	1995*		4.2	
	1996*		4.7	
	1999	0.5	0.0	0.5
	2001	6.7	3.1	3.6
	2002	11.5	4.6	6.9
	2003	9.3	4.4	4.9

\* Values for these two years are percent of farmers not plots

### Changes in adoption of variety

Before CDSP-I, the predominant variety of aus crop was the newly introduced HYV, IR8 followed by *Hashikolmi* locally known as *Shatia* (Table-18). Farmers soon lost interest in this long duration HYV and tried to replace this with early maturing new HYV rice such as BR26, BR21 and *Purbachi*.

All of these newly introduced high yielding varieties have intermediate plant height. In the seedling stage this crop frequently gets submerged due to sudden heavy rain, which damages the crop. To combat this, CDSP-II introduced BRR1 Dhan27, relatively a tall aus rice variety during 2001 in the adjoining areas. Farmers of three CDSP-I polders picked up this variety, which is gaining popularity since the year 2002. However, local variety of aus rice still dominates in all the polders.

**Table-18: Changes in adoption of aus rice varieties in CDSP-I Areas**

Period	CBD-II	CBT	CM
Pre-CDSP	IR8 Hashikalmi Kerandol Purbachi	IR8 Hashikalmi BR3 BR26 Mala	IR8 Hashikalmi BR3 BR26 Mala
1999	Hashikalmi Kerandol Boilam BR3 BR26	Hashikalmi Kerandol BR21 Purbachi	Hashikalmi Boilam China
2001	Local BR21 BR3 BR14 Purbachi	Local Other HYV BR1 BRRI Dhan27 BR24 BR14	Local BR1 BR3 BR14
2002	Local BR3 BRRI Dhan27 BR14 BR21	Local BR3 BRRI Dhan27 BR1 BR14	Local BR1 BR14 BR3
2003	Local Other HYV BRRI Dhan27	Local BRRI Dhan27 BR1	Local BR1 BRRI Dhan27

Note: Most dominant variety tops the list

### 2.4.3 Kharif-II season

#### Cropping intensity

Adoption of HYV of aman rice in the CDSP-I polders is not very satisfactory. The coverage varies from only about 1 to 13% until 1999 (Table-19). This indicates that the farmers of the CDSP-I polders have not adopted HYVs of aman rice demonstrated earlier. However, coverage of about 20 to 22% in CBT and CM during 1999 might either be the result of inappropriate method of survey or due to a biased observation of the surveyors. With the improvement of soil salinity and drainage conditions of the areas in 2001 and launching a massive extension programme by the project as well as DAE in the adjoining (new project areas) areas, farmers of CDSP-I polders are also motivated to adopt HYVs of rice. As a result the coverage of HYVs of aman is increasing after 2000 except in all polders but at a lower pace in CM. At CM matters related to the tenancy and poor drainage conditions are found to play a major role in adoption of HYVs.

Transplanted aman rice is the predominant crop of Bangladesh and the coastal char areas are no exception. During the Kharif-II season soil becomes non-saline due to dilution with the monsoon rain but most fields would remain flooded up to a depth of 30 to 45 cm. This type of flooding at the time of transplantation does not allow planting of varieties having shorter seedlings. The options available for solving this problem are (1) use of varieties having taller seedlings, (2) improving the drainage system of the area, and (3) maintaining plot levee height up to a maximum of 20-25cm. Since there is no variety having seedlings taller than 30cm available at present, the two other options should merit consideration. Farmers are

reluctant to decrease the levee height of their plots so that the risk of drought, if sets in during the period of crop growth, can be avoided. Therefore, the only option left is to improve the drainage condition of the area to provide favourable ecosystem for the HYV of aman rice. Two years back CDSP-II collected some seeds of four advanced breeding lines from BRR I whose seedling height varies from 50 to 60 cm. Out of these, twos were selected and they are under test production now. Meanwhile farmers exposed to these lines showed more interest. After completing the test phase, if it results positive, CDSP-II would request BRR I for release as a variety so that a massive extension programme can be undertaken.

**Table-19: Percent plots under HYV aman in CDSP-I Areas**

Year	Polder		
	CBD-II	CBT	CM
1995	5.6	1.3	6.3
1996	15.7	2.2	0.3
1999	6.7	20.2	22.7
2000	1.4	11.6	6.9
2001	17.9	18.7	9.5
2002	22.7	27.8	6.4
2003	17.9	19.8	12.1

### Changes in adoption of varieties

The predominant rice varieties in the region including three CDSP-I polders are *Kajalsail* and *Rajasail*. Introduction of new HYVs through demonstration could hardly motivate the farmers until 1999. There are reports of some special studies available and observations made on the non-adoption of HYVs, which identified water congestion in and around the areas, among others, as the main limiting factor (Technical Report; No 6; and unpublished workshop notes). With the improvement in the drainage system and launching modified extension methodology by DAE during CDSP-II, coverage of HYVs, particularly of BR23, is increasing more. BR11, an old HYV of aman rice, is still finding its place in CBD-II (Table-20). Recently among the local varieties, *Kajalsail* is the most dominant and areas of other local varieties are replaced by BR23.

Time of rainfall actually dictates the farmer's choice of a variety. If rainfall starts early, farmers select HYV otherwise they look for local varieties. BR23 and BR22 are highly sensitive to photoperiod and are gradually replacing *Kajalsail* and *Rajasail*. Farmers complained about the grain sterility of BRR I Dhan31 during 2001. On analysing the situation time adjustment of planting was made to avoid this problem. Extension message has been prepared and farmers are briefed during the Kharif-II season of 2003. However, this did not improve the situation much as the farmers prefer recently demonstrated varieties, particularly BRR I Dhan39 and BRR I Dhan41 because of their yield potential and maturity duration similar to *Rajasail*.

**Table-20: Changes in adoption of aman rice varieties in CDSP-I Areas**

Period	CBD-II	CBT	CM
Pre-CDSP	Kajalsail Rajasail Gigaj	Kajalsail Rajasail Kartikgota	Kajalsail
1999	Kajalsail Rajasail Gigaj BR23 BR22	Kajalsail Rajasail Latisail	Kajalsail Rajasail BR23 BR22
2000	Kajalsail Rajasail Betichikon BR23 BR22 BRRi Dhan31 BRRi dhan32	Kajalsail Latisail BR23 BRRi Dhan30	Kajalsail Rajasail Betichikon BR22 BR23
2001	Kajalsail Rajasail Betichikon Gigaj BR23 BR22 BR11 BRRi Dhan31	Kajalsail BR23 BR22 BRRi Dhan30 BRRi Dhan31 Rajasail	Kajalsail Rajasail BR22 BR23 Betichikon
2002	Kajalsail Gigaj Betichikon BR22 BR23 Rajasail BR11 BRRi Dhan31	Kajalsail BR23 Gigaj BR11 Betichikon Rajasail	Kajalsail BR23 Rajasail BR22 Gigaj
2003	Kajalsail Betichikon Gigaj BR23	Kajalsail BR23 Gigaj Betichikon	Kajalsail BR23 BR22 Rajasail

Note: Varieties are arranged in order of magnitude of the area they cover.

## 2.5 Crop yield

Crop-cuts were done to assess changes in yield of aman rice in the three polders of CDSP-I. Crop-cuts in other seasons were not done regularly due to the problems discussed in Technical Report 6. However, a few (depending on polders, 8 to 10 fields) crop-cuts were done in each season. Results shown in Fig-1.2 indicate that HYV produced about one tonne more grain than the local varieties. However, both HYV and Local rice gave grain yield little lower in CM than in the other two polders, perhaps due to difference in the level of management employed among these polders.

During the aman season grain yield of both HYV and local rice varieties were lower until 1997 after which it increased and reached a level that is still maintained. This indicates that the yield has reached its plateau. Variations of grain yield among the polders are not very high in both the seasons.

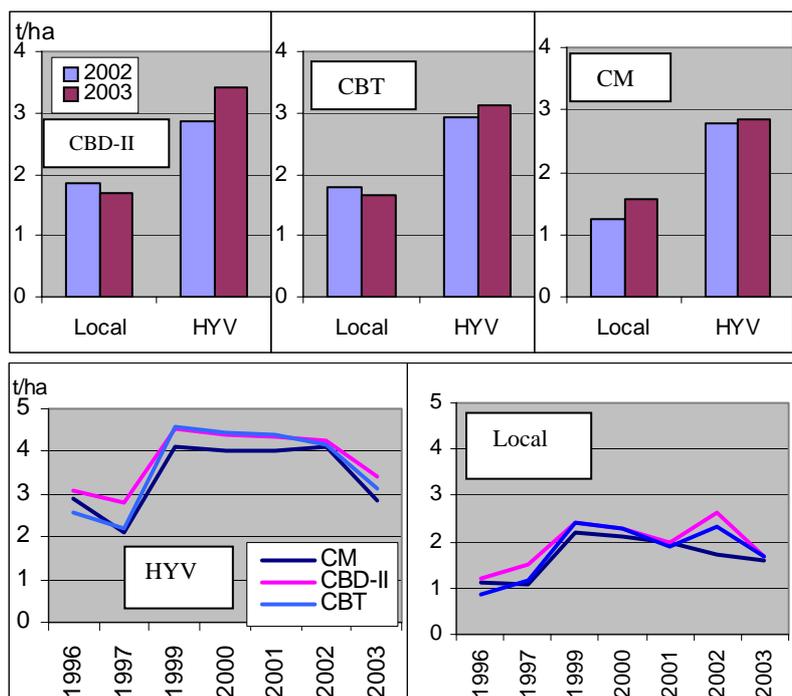


Fig-1.2: Grain yield of aus (top row) and aman (bottom row) rice in three polders of CDSP-I

## 2.6 Concluding remarks

Desalinisation has taken place in all polders. More valued and profitable crops (groundnut, chilli, mug bean, soybean) have replaced the low valued crops though in recent times the groundnut cultivation has decreased in CM. The coverage of HYV rice in both Kharif seasons has been increasing gradually though it is not substantial. Mean yield of HYV and local varieties of Aman started increasing after 1997 and reached a level that is still maintained.

## 2.7 Lesson learnt

Desalinisation takes place slowly after empolderment. The assumption that empolderment would improve the agro-ecosystems and productivity of the chars land will increase is not plausible. Although empolderment help reduce soil salinity to a level the most crop plants can tolerate several socio-economic and agro-ecological factors are also determining forces.

The extension service should continue at the same level of the project period. The post project drainage problem should be addressed adequately. The drainage system of a polder also depends on the regional drainage system and the improvement of the drainage system a polder cannot bring desired change in cropping pattern of the polder. The unequal distribution of land, absentee landlords and sharecropping are the major obstacles to HYV adoption. The unfriendly credit delivery system for the chars people, people's food habit and market inaccessibility for new crops are also the obstacles in changing the cropping pattern.

## Chapter 3    CONDITION AND FUNCTIONING OF INFRASTRUCTURE

### 3.1    Physical condition and functioning of infrastructure

The frequency of monitoring the physical condition and the functioning of the infrastructure is twice a year (January-June and July-December). The monitoring was carried out by the members of the consultant staff, as much as possible in cooperation with BWDB and LGED staff.

#### 3.1.1    BWDB infrastructures

The main infrastructure of BWDB include the following:

- Embankments
- Drainage khals
- Sluices

In CDSP-I polders, there is 54.20 km of embankment of various types (Sea dyke E-1, interior dyke E-2 and marginal dyke E-3)<sup>8</sup>. In general, the physical conditions of the *sea dykes* in CBT polder are good but that of the *sea dyke* of CM polder was not good during the monitoring period (From January 2000 to December 2003 (Fig-2.1). Initially the physical conditions of the *interior dykes* of CBD-II were good but were in a deplorable state in year 2001 after which their physical conditions improved (2002) and still are in good condition. Initially the physical conditions of the *interior dyke* of CM was not good but it improved in 2000 when some maintenance work was done but its physical condition was gradually deteriorating in the following years (Fig-2.2) despite a little maintenance work done on it. Initially the *interior dykes* of CBD-II were not good at all, but later some maintenance work was done in year 2001 to improve the condition. Now the quality is good. In general, the physical conditions of the *marginal dykes* of CBD-II and CM are good (Fig-2.3). Only a little maintenance was needed and done here. But the physical conditions of the *marginal dykes* of CBT were bad during the monitoring period. Details of the physical conditions of these embankments are shown in the following graphs.

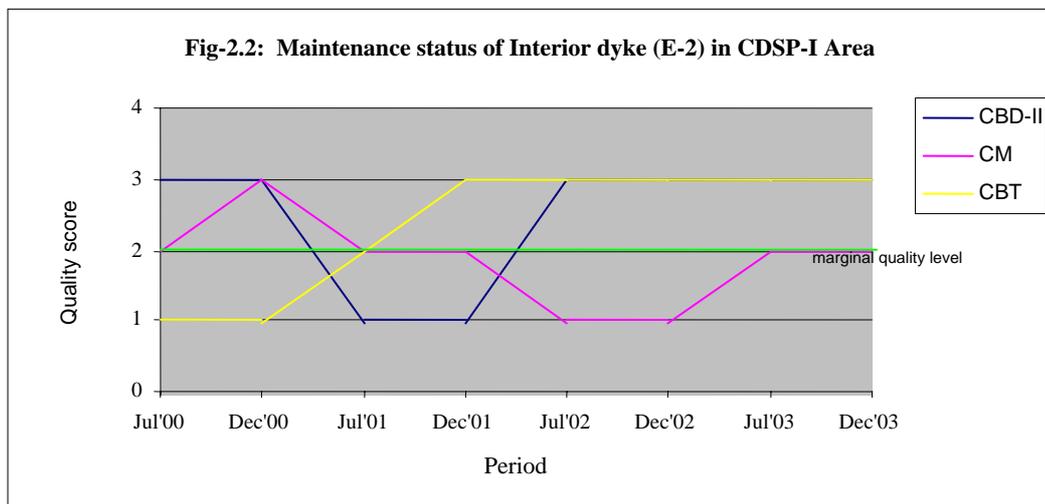
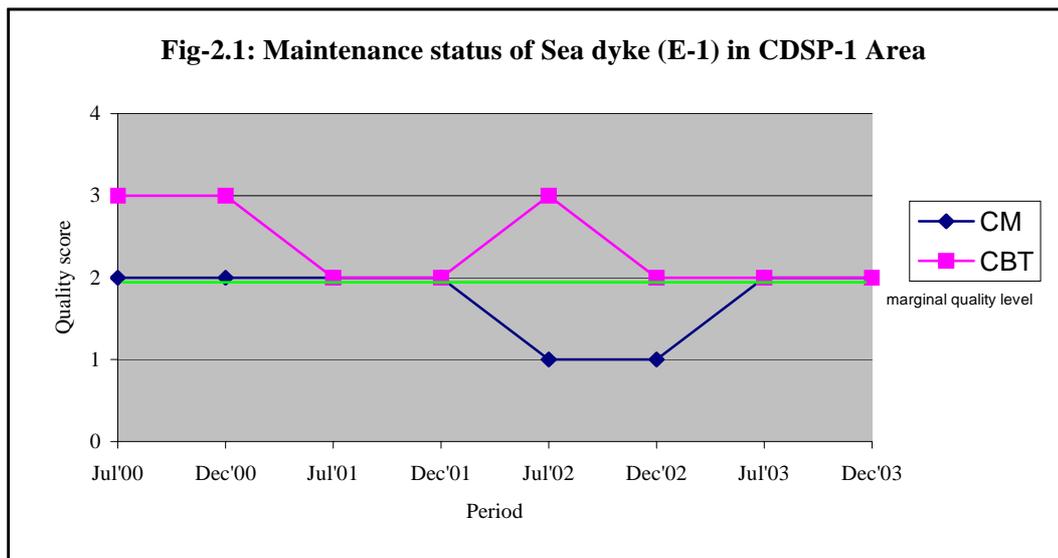
The condition of the infrastructure has been ranked into four categories – good, average (yes) (average vulnerable) and bad. Each condition carries a score, 0 to 3 which refers to bad to good as shown below with details of scoring criteria.

Physical condition of infrastructure	Quality score	Remarks
Good	3	The infrastructure are in its designed section and it can serve its intended function.
Average (Yes)	2	The infrastructure deteriorated to a certain degree still it serve its intended function.
Average (Vulnerable)	1	The infrastructure deteriorated to such an extent that it cannot serves its intended function.
Bad	0	Totally damaged

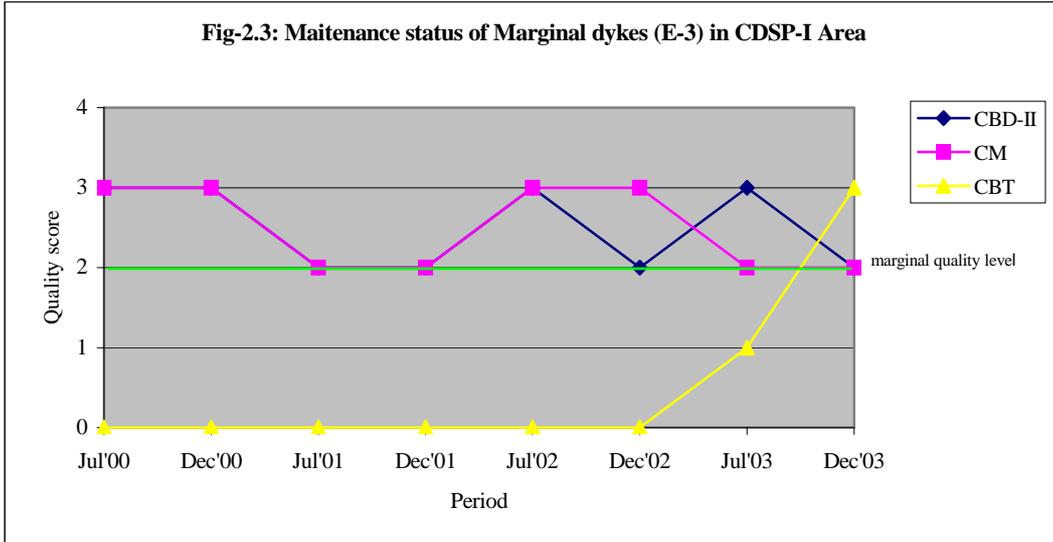
<sup>8</sup> Sea dyke E-1: 14 feet crest width with slope 3:1 in country side (C/S) and 7:1 in sea side, interior dyke E-2: 14 feet crest width slope 2:1 in c/s and 3:1 in river side (R/S) and marginal dyke E-3: 8 feet crest width with slope 2:1 in both C/S and R/S.

In general the physical conditions of the main and secondary drainage *khals* were good and were acceptable as shown in the Fig-2.4 and Fig-2.6.

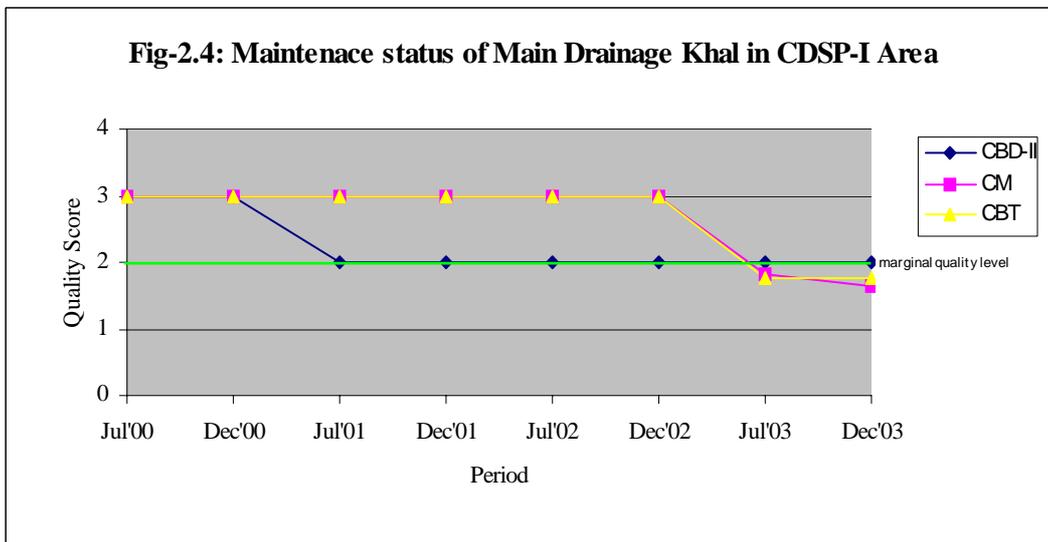
There are five sluices in CDSP-I area. It was observed that the rubber seal damage caused leakages in the gates. In the year 2001 and 2002, BWDB took some steps to address this problem but there still exists a serious leakage problem for Nabagram sluice which was observed in December 2001. However, the structure is in good (shown in graphs) condition now after proper maintenance work done in 2002 though there still exists leakage problems in CBD-II and CM (Bashkhali) sluices (shown in Fig-2.6).



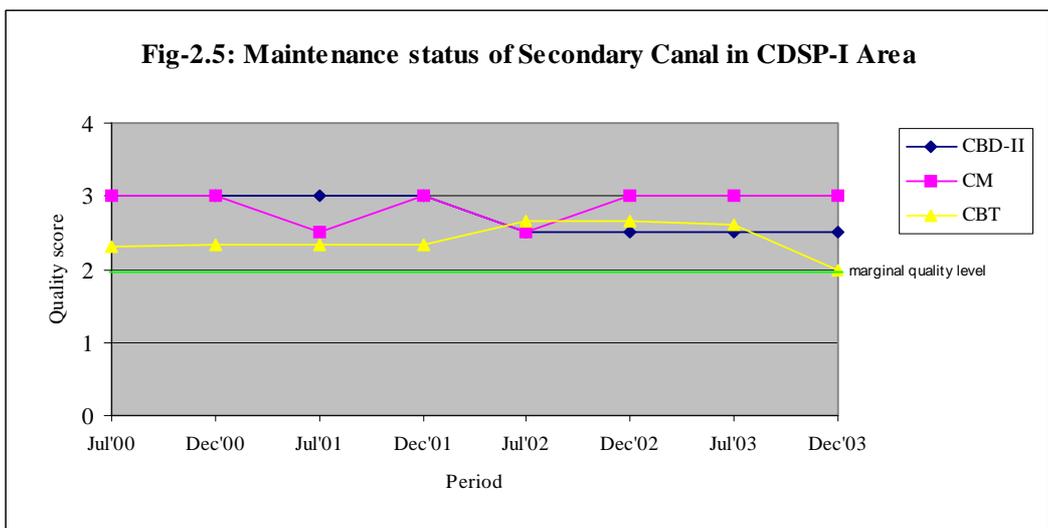
**Fig-2.3: Maintenance status of Marginal dykes (E-3) in CDSP-I Area**



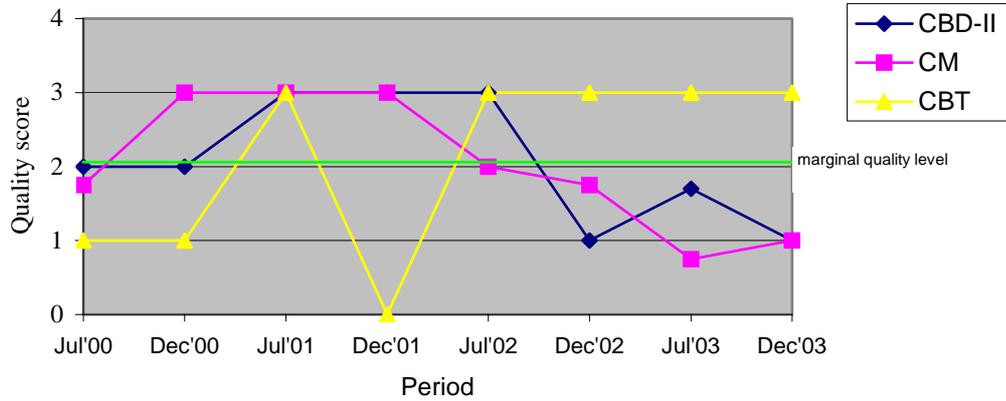
**Fig-2.4: Maintenance status of Main Drainage Khal in CDSP-I Area**



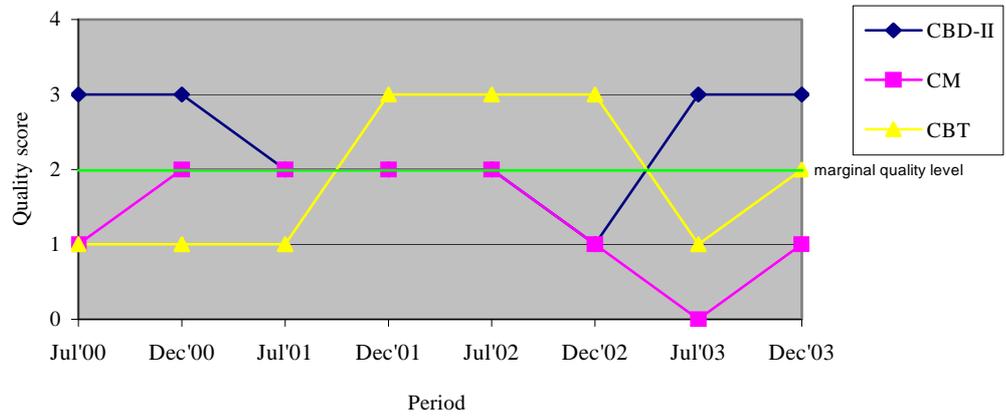
**Fig-2.5: Maintenance status of Secondary Canal in CDSP-I Area**



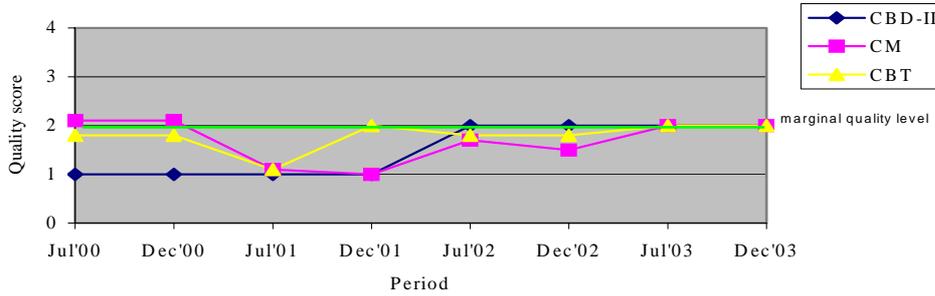
**Fig-2.6: Maintenance staus of Sluices in CDSP-I Area**

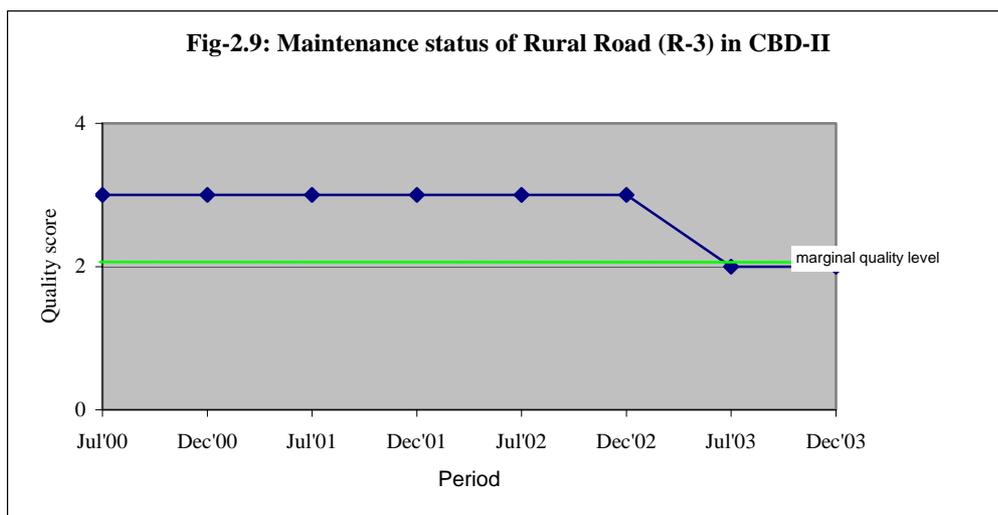


**Fig-2.7: Maintenance status Rural Road (R-1) in Three Polders of CDSP-I**



**Fig-2.8: Maintenance status of Rural Road-2 in CDSP-I Area**





### 3.1.2 LGED infrastructure

The main infrastructure of LGED include the following:

- Roads<sup>9</sup> (Type R-1: with 16 feet crest width, Type R-2: with 12 feet crest width and Type R-3: with 8 feet crest width).
- Box culverts, pipe culverts, bridges.
- Cyclone shelters.
- Cluster village yards (including houses and ponds).
- Deep tube wells and pit latrines (in CDSP II this responsibility has been shifted to DPHE).

In general, the physical condition of the rural roads in CM is not satisfactory. But the rural roads in CBD-II are acceptable as some maintenance work was done during the monitoring period. The rural roads in CBT were in reasonably good condition from December 2001 to December 2002 but the quality deteriorated in the following years.

Observations reveal that LGED is not interested in O&M of rural roads that involve smaller budget; rather they are interested in doing the works of bigger budget like carpeting of paved roads and repairing and maintenance of cyclone shelters.

In 2002, some maintenance work like sand sealing on paved was done. Still there are some damaged roads, approach roads to bridge/culverts, etc. The physical conditions of the *pipe culverts, bridges, cyclone shelters* and *cluster village yards/ponds* were good and as such they are not shown in the graphs.

<sup>9</sup> Type R-1: with 16 feet crest width, Type R-2: with 12 feet crest width and Type R-3: with 8 feet crest width.

## 3.2 Monitoring of Maintenance Plan

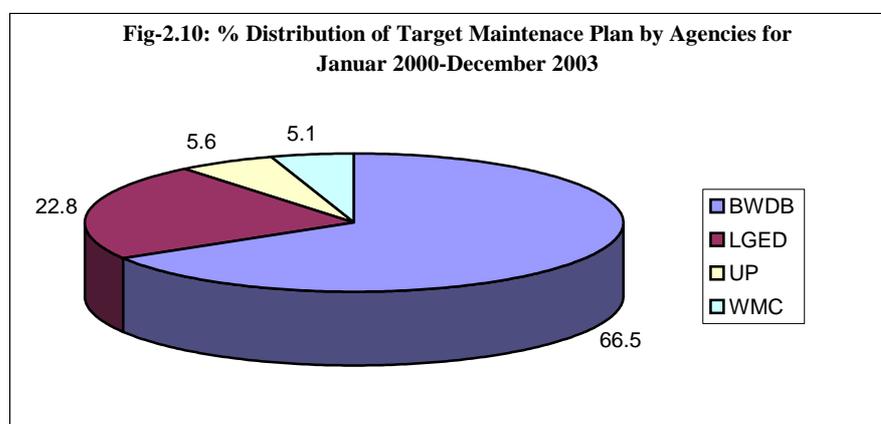
### 3.2.1 Monitoring the maintenance of infrastructure

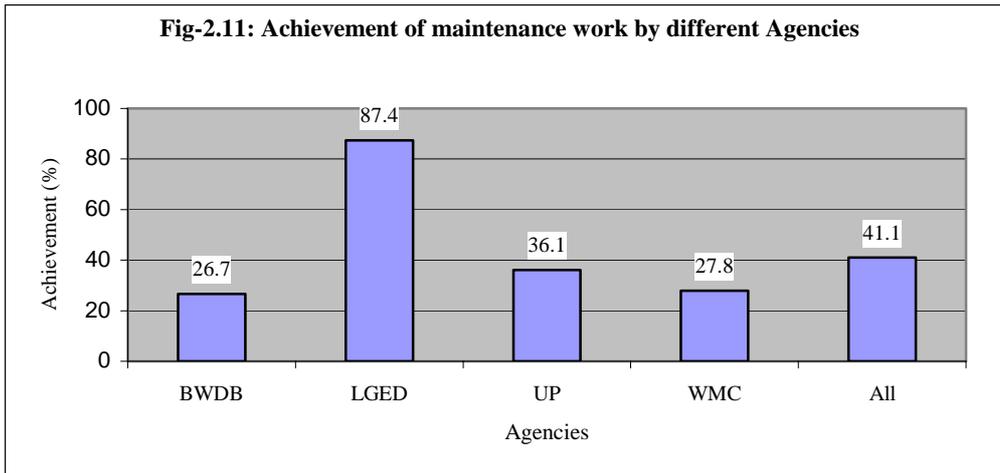
In general maintenance of infrastructure after the completion of a project is ignored leading to a gradual deterioration in the physical condition of the structures. One of the main reasons that are mentioned is the fact that the allocation from the national budget for maintenance by implementing agencies (BWDB and LGED) is insufficient. To promote proper allocations and to stimulate participation from the major stakeholders, a **Maintenance Plan (TR 23)** was developed for CDSP-I polders in 1999 for the period of five years (January 2000 to December 2004). The Plan is a result of a series of round table sessions with the BWDB, LGED, Union Parishad and WMC. The Plan gives an outline of sharing of maintenance costs among the agencies (BWDB and LGED), local government institution (Union Parishad) and the users (WMC). Consultants closely monitored the implementation of the Maintenance Plan.

Below the results are given for the last four-year period from January 2000 to December 2003 in graphical form. Fig-2.10 shows the comparative distribution of targeted maintenance works of different implementing agencies and involved parties. It appears that BWDB is the major partner with 67% of the total targeted maintenance work for the period of January 2000 to December 2003. LGED is the second major partner to accomplish 22.4% whereas Union Parishad and WMC have the shares of 5.5% and 5% respectively.

Up to December 2003 only about 41% of the total targeted maintenance works have been completed (Fig-2.11) by all implementing agencies and involved parties. However, the relative performance is better for LGED which has completed its 87% of the targeted maintenance works compared with that of BWDB that has done only 27% of its target. Union Parishad and WMC have respectively completed 36% and 28% of their targeted maintenance works.

Fig-2.12 presents a comparison between the shares of obligation (left side of the graph) as laid down in the Maintenance Plan for each implementing agency and other parties and their shares of implemented maintenance works done (right side of the graph) during last four years (monitoring period). Table-22 gives a picture on financial investment of different implementing agencies and involved parties.

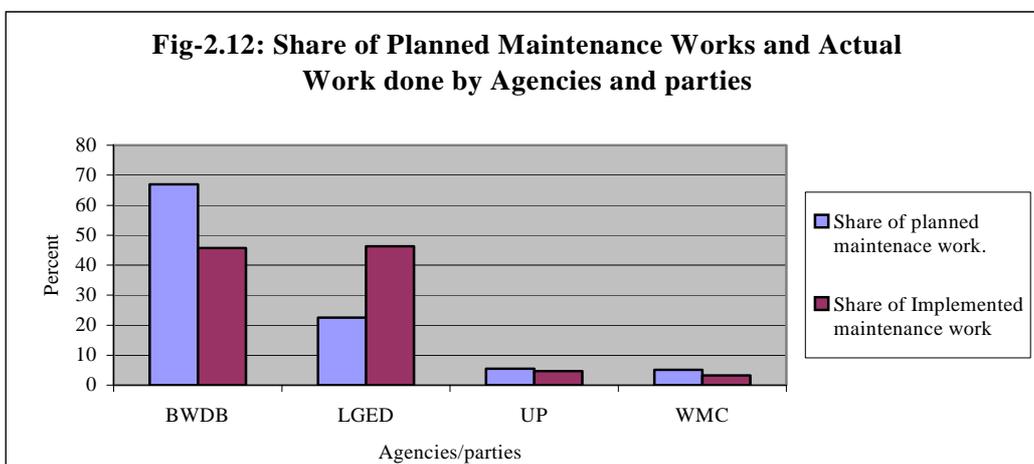




The implementing agency BWDB contributed in cash, LGED contributed in cash and wheat, Union Parishad contributed in cash and wheat, while users contributed in cash, but more so with voluntary labours.

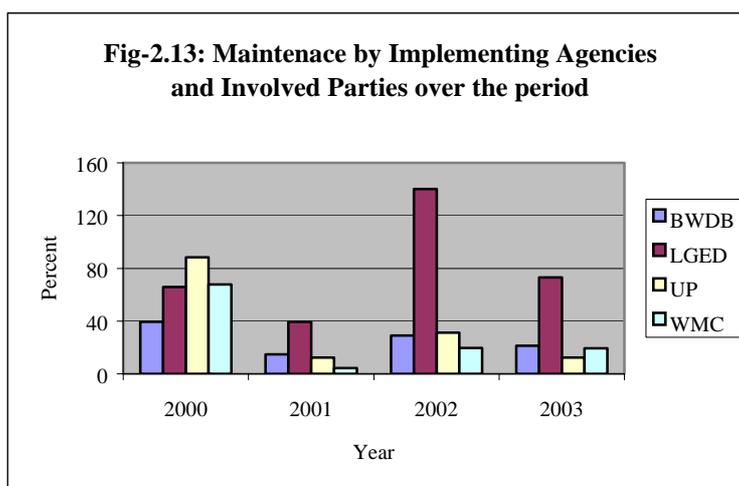
LGED has relatively more shares in the total achievement than its share in total plan maintenance works. On the other hand, BWDB has more shares in total plan but less in actual work done so far. Fig-2.13 shows the annual achievement of maintenance works of different implementing agencies and involved parties by years. LGED has done major maintenance works in the year 2002 when it exceeded its target by 40%. The following year (2003) it has done 73% of its targeted work and it achieved 60% of its target in 2000. This came down to 40% in 2001. However, till 2004, LGED has achieved 87% of its total target throughout the monitoring period (see Fig-2.11). On the other hand, BWDB could not reach even half of its target in any maintenance year. It accomplished 40% of its total targeted work only in 2000 and afterwards, it by and large went down. Union Parishad could achieve 88% of its target in 2000 and afterwards, it went down drastically with 12% in 2004. Similarly, WMC has highest target fulfillment in 2000 when it was 68% and afterwards, it could not reach 20% in any year.

The results of less progress for BWDB, UP and WMC lead to the conclusion that the round table meetings have to be started again and that a system of periodic revisions of the Plan is required or other alternative ways should also be looked into in accordance to GPWM.



**Table-21: Comparative Statement showing % of works taken up and accomplished by the concerned agencies and involved parties**

Polder/ Sluice catchment areas	Value of work to do as per Maintenance Plan (TR 23) in January 2000 to December 2003				Value of work done from January 2000 to December 2003								Remarks
					BWDB		LGED		UP		WMC		
	BWDB	LGED	UP	WMC	Amount (Tk)	%	Amount (Tk)	%	Amount (Tk)	%	Amount (Tk)	%	
CBD II	3,380,000	1,528,000	352,000	528,000	879,538	26.02	1,887,207	123.51	115,063	32.69	139,313	26.39	Cost of wheat assumed to be Tk. 7,500/= per MT. Rate per voluntary labour Tk. 80/= only.
CM	5,288,000	1,664,000	228,000	128,000	2,154,400	40.74	1,188,549	71.43	132,350	58.05	76,705	59.93	
CBT (Nabgram)	1,312,000	448,000	184,000	152,000	314,000	23.93	678231	151.39	135,000	73.37	29,860	19.64	
CBT (Kalmi)	716,000	208,000	40,000	112,000	-	-	-	-	-	-	23,700	21.16	
CBT (Gangchil)	1,855,000	448,000	256,000	48,000	-	-	-	-	-	-	-	-	
Total	12,551,000	4,296,000	1,060,000	968,000	3,347,938	26.67	3,753,987	87.38	382,413	36.08	269,578	27.85	



### 3.3 Tube well monitoring

In CDSP-I, LGED carried out the tube well and sanitation programmes and installed 231 tube wells to add to previously installed 177 tube wells, of which 64% (113) were running, in the project area for an approximate population of 41,000. With the installation of new tube wells through CDSP-I the number of users per running tube well reduced to 119 from 363 and consequently, the tube well density became higher in the project areas compared with the national average which had 216 peoples per tube well. Average distance of a running tube well was reduced from 330 meters to 185 meters (national average 150 meters)<sup>10</sup>.

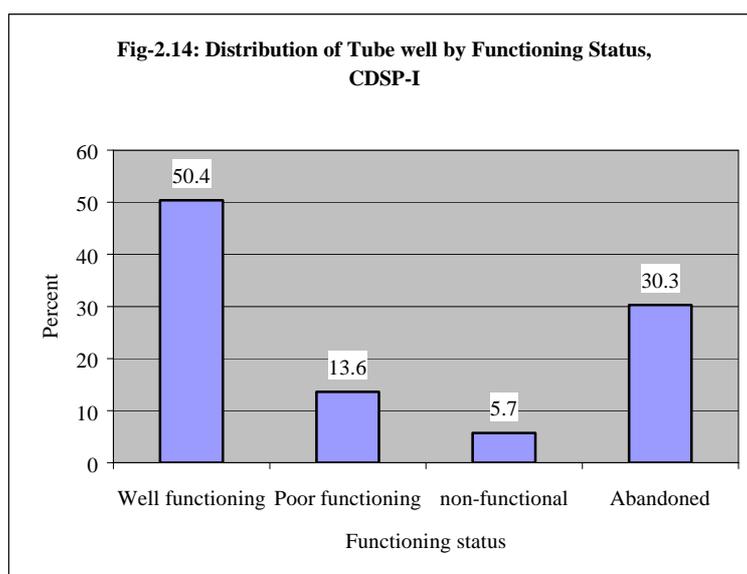
<sup>10</sup>CDSP-I; Technical Report; No. 29; Out of the Periphery, Guidelines for Development of Coastal Chars in South-east Bangladesh, September 1999.

### 3.3.1 Functioning status of tube wells

In all three polders 36% of the tube well installed by CDSP are not functioning; 30.3% being abandoned and 5.7% are temporarily non-functional till January 2004 (Fig-2.14). CBT has the more abandoned tube wells with 53% (Table-22) of the total installed tube wells (87 nos.). In CM 12%, and in CBD-II 21% tube wells are abandoned. On the other hand, well functioning tube wells are highest in CM where 70.3% (74 nos.) tube well are well functioning, whereas in CBD-II well functioning tube wells are 49% (67 nos.)<sup>11</sup>. CBT has only 34.5% such well functioning tube well.

Comparison among the tube wells installed in CV, Non-CV and public places i.e. Cyclone Shelter-cum-schools, shows that the public places have proportionately more abandoned tube wells with 55% compared with the Clustered Villages where it is 37% (Table-23). Similarly, it is lower in scattered villages i.e. Non-CV (Non-Clustered Villages) with 24%.

The abandoned ones are irreparably damaged for different reasons of which choking up is the major cause (54%) followed by structural damages i.e. the breakdown of different parts of the tube well body (Table-24). Choking up is the major cause in CBT where 75% of the abandoned tube wells are abandoned owing to such problem (36 out of 48 tube wells).



**Table-22: Distribution of Tube well by Functioning status in Different Polders**

Functioning status of Tube well	CM		CBD-II		CBT		All polders	
	No.	%	No.	%.	No.	%	No.	%
Functioning well	52	70.3	33	49.3	30	34.5	115	50.4
Poor functioning	8	10.8	13	19.4	10	11.5	31	13.6
Temporary non-functional	5	6.8	7	10.4	1	1.1	13	5.7
Abandoned	9	12.2	14	20.9	46	52.9	69	30.3
Total	74	100	67	100	87	100	228	100

<sup>11</sup> CDSP-I installed 70 tube wells in CBD-II but the survey covers 67 tube wells.

**Table-23: Distribution of Tube well by Functioning status and Tube well User Types**

Functioning status of Tube well	CV		Non-CV		Public places		All users	
	No.	%	No.	%.	No.	%	No.	%
Functioning well	26	40.0	83	58.0	6	30.0	115	50.4
Poor functioning	12	18.5	18	12.6	1	5.0	31	13.6
Temporary non-functional	3	4.6	8	5.6	2	10.0	13	5.7
Abandoned	24	36.9	34	23.8	11	55.0	69	30.3
Total	65	100	143	100	20	100	228	100

**Table-24: Distribution of Abandoned Tube well by Reasons for Abandoning**

Reasons for abandoning of the tube well	CM		CBD-II		CBT		All polders	
	No.	%	No.	%.	No.	%	No.	%
Choked up			1	8.3	36	75.0	37	53.6
Head broken			3	25.0			3	4.3
Body broken	2	22.2					2	2.9
Pipe/pump broken	5	55.6	6	50.0			11	15.9
Socket damages				16.7	11	22.9	11	15.9
Others	2	22.2	2		1	2.1	5	7.2
Total	9	100	12	100	48	100	69	100

Table-25 shows the water quality and water availability in the tube wells in dry season. A sample of 48 running tube wells were investigated and it has been found that 90% of the tube wells give saline free water, 85% tube wells give iron free water, 94% tube wells give foul smell free water. It appears that water quality is better in CM with all tube wells having saline free, iron free and bad smell free water. It also appears that the water quality of tube wells in CBT is worse in comparison with other two polders.

A little more than 79% of the total tube wells gives sufficient water even during the dry season when water scarcity become acute due to surface water shortage in the project area. This means that the water level of most of the tube wells does not go down in the dry season.

**Table-25: Water quality and availability of water**

Polders	N=	Saline free	Iron free	No gas smell	sufficient water
CM	20	100.0	100.0	100.0	70.0
CBD-II	16	87.5	87.5	93.8	93.8
CBT	12	75.0	58.3	83.3	75.0
All polders	48	89.6	85.4	93.8	79.2

### 3.4 Toilet monitoring

The coverage of sanitation (toilet) was only 3% in May 1995<sup>12</sup>. CDSP-I distributed 4,000 sets of toilets. Out of them 3950 toilet sets (99%) were installed in the project area<sup>13</sup>. A sample

<sup>12</sup> CDSP-I; Technical Report; No. 29; Out of the Periphery, Guidelines for Development of Coastal Chars in South-eastern Bangladesh, September 1999.

<sup>13</sup> CDSP-I; Technical Report; No. 6.

survey<sup>14</sup> was done in January 2004 for monitoring the sanitation programme. Its results are presented in Table-26. It appears that 79% members of the Tubewell Users Groups received toilets sets from CDSP-I.

**Table-26: Situation of Sanitary Latrine and Its Coverage in CDSP-I Areas**

Serial number	Indicators	CV		Non-CV		All	
		No.	%	No.	%	No.	%
1	Total households	98	100	214	100	312	100
2	Received sanitary latrine	96	98.0	149	69.6	245	78.5
2.1	Received no sanitary latrine	2	2.0	65	30.4	67	21.5
3.	Installed sanitary latrine	96	100.0	145	97.3	241	98.4
3.1	Installed latrine with siphon	65	67.7	96	66.2	161	66.8
3.2	Usable sanitary latrine	60	62.5	87	60.0	147	61.0
3.2.1	Usable with siphon	47	78.3	65	74.7	112	76.2
3.2.2	Usable without siphon	13	21.7	22	25.3	35	23.8
3.3	Unusable yet use	35	36.5	44	30.3	79	32.8
3.4	Abandoned	1	1.0	14	9.7	15	6.2
4.	Newly procurement (1)	1	50.0	16	24.6	17	25.4
5.	Total coverage (2)	96	97.7	131	68.7	243	77.9
6.	Water sealed latrine coverage (3)	61	62.2	103	48.1	164	52.6

(1) Percentage with respect to non-recipients (serial no 2.1)

(2) With respect to serial no 3.2+3.3+4/serial no 1.

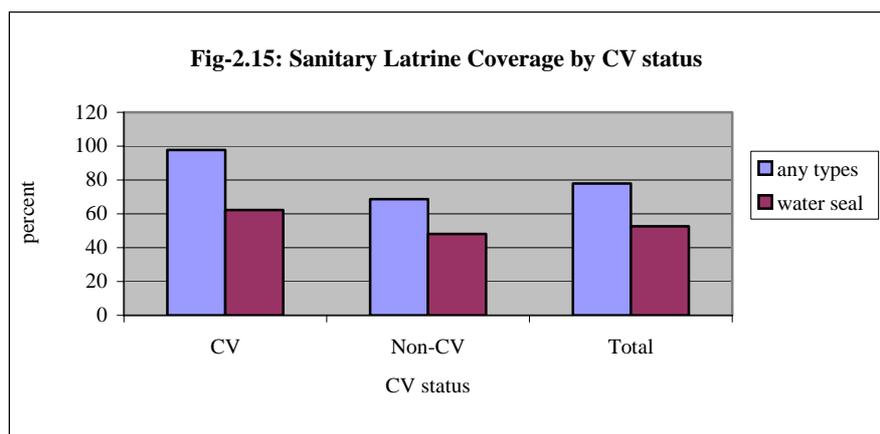
(3) Serial no 3.2+4. Percentage is with respect to total households (serial no 1).

Almost 100% households of the Clustered Villages (CV) and 70% households of the Tubewell Users Groups of the Non-CV got toilet-sets. More than 98% of these toilet sets were installed; 100% in CVs and 97% in Non-CVs.

From the environment's point of view the Public Health Department prescribes for the installation of water-sealed latrines, which means a toilet set must have its siphon (gooseneck) with other parts i.e. ring and slab. About 67% of the total toilet sets (ref: Table-26) were installed with siphons and the other 33% were installed without siphons, mainly because siphons were not given or were damaged during carrying. At present 61% of the installed toilet sets are still usable. Of them 76.2% have siphons and 23.8% do not have any siphons.

There are another 33% of the toilet sets, which are not useable from water seal's point of view, as they have lost either one or more than one components of their basic structures such as slab, commode, ring, siphon, etc, yet they are used as latrines (unusable yet in use). Besides, some people who did not receive toilet sets from CDSP-I have installed new sanitary latrines later. They constitute 25.4% of those people who did not receive any toilet sets through CDSP-I. The people who have procured sanitary latrines later from other sources have installed their latrines with siphons. If the toilets of the first category (unusable yet in use) are considered as sanitary latrines the present latrine coverage stands at 78% (see also Fig-2.15). The coverage of the water-sealed latrines stands at 53% (usable old sanitary latrines installed through CDSP-I and newly procured later from other sources).

<sup>14</sup> Details findings are presented in an Internal Resource Report.



About 20% of the toilets (Table-27) are abandoned or unusable yet in use because of filling in the tanks by human excreta. Breakdown of the commode is the major cause for unusable yet in use and abandoning as 65% of the total abandoned and unusable toilets have broken commodes. It appears that 78% of the latrines do not have siphons. However, these toilets also include those latrines that have lost commodes.

People were found unaware of the necessity for general cleanliness of the toilets. No regular and proper flushing is done for make toilets clean. People are happy with sanitary latrine, as the scavenging poultry birds cannot spread the human excreta that are now deposited in the pits. People are also aware of the beneficial effects of the sanitary latrine on environment and health.

**Table-27: Reasons for Unusable and abandoning the Sanitary Latrines**

Reasons for unusable/abandoning latrine	CV status				All	
	CV status		Non-CV status			
	Number	Percent	Number	Percent	Number	Percent
Filled with waste	3	8.6	15	26.3	18	19.6
Slab broken	2	5.7	11	19.3	13	14.1
Commode broken	23	65.7	37	64.9	60	65.0
Superstructure damaged	2	5.7	1	1.8	3	3.3
Siphon broken	34	97.1	38	66.7	72	78.3
Ring broken	7	20.0	11	19.3	18	19.6
Total	35	100	57	100	92	100

### 3.5 Effect of Infrastructure

#### Embankment and drainage canal

Embankment provides protection to 5149 hectares of agricultural land from saline intrusion and potential dangers of loss of lives and properties of a population 42,235 of 6995 households who are living inside the polders. The drainage network has reduced the drainage problems of different polders though for CBD-II such problem still remains due to hinterland drainage congestion. In post-embankment situation people feel more secured for pond fish cultivation. Desalinisation of soil has been taking place gradually being protected by the embankment.

## **Road networks**

The perceived benefit of the road communication have been articulated by the local people as follows:

- Many more rickshaws are available who ply in all seasons of the year
- Travel time to the nearest bus stop or bazaar has been much reduced
- Costs of transport have become lower
- The number of shops has significantly increased (which also led to higher subcontracting rates), the number of bazaars grew only a little
- More goods are available
- The price of land has increased

## **Tube wells and Sanitation**

The coverage of both potable water and sanitation has increased. Not only safe drinking water is available and but also water scarcity has reduced in the polder areas. People have become aware of the benefits of sanitary latrines though they do not have adequate knowledge on the proper maintenance of the latrines and are not aware of the usefulness of proper maintenance of toilet sets.

### **3.6 Lesson learnt**

The implementing agencies lack adequate resources for operation and maintenance (O & M) for inadequate budget allocation from the national government. Both at national and field level the priority for O & M are minimum. For a successful sanitation programme emphasis should be given on the software activities to make people aware about the usefulness of the sanitary latrines and its maintenance. Hygienic education should be integrated with water and sanitation programme.

## Chapter 4 FUNCTIONING OF WATER MANAGEMENT COMMITTEES AND TUBE WELL USER GROUPS

### 4.1 Field level institutions in CDSP-I

At field level, CDSP-I established Polder Committees (PC) and Sub Polder Committees (SPC), and formed Water Management Committees (WMC) and Tubewell User Groups (TUG). The Polder and Sub Polder Committees were created for ensuring the people's participation in planning of the internal infrastructure in the areas concerned. They were dissolved in 1999 after the completion of the polder at the end of the CDSP-I period. After dissolving the PC and SPC WMCs were formed for operation and maintenance of the polders and sluices. The Tubewell User Groups were created aiming at creating the institutional environment for better operation and maintenance of tube wells. These two Committees are meant to be permanent.

### 4.2. Water Management Committees

#### 4.2.1 Committees

The formation of WMCs was done in 1998. The respective WMC of CBD-I<sup>15</sup> and CBD-II was formed in April and in May 1998 and WMCs of Nabagram and Kalmi in CBT were established in June and an ad-hoc WMC committee for Gangchil was formed in August 1998. After completion of the first tenure, all the WMCs were reconstituted at the end of 2001. WMC of Gangchil worked on ad-hoc basis during the sluice construction and it was reconstituted in January 2000. During last one year, the present monitoring reporting period, no new water management committees was formed or reconstituted.

A Water Management Committee is formed for one water system, which is the command area of a sluice. The command area of a sluice has several water management areas, smallest unit. The size of a WMC therefore, depends on the numbers of water management areas (socio-hydrologic units). Reconstituted WMCs were formed with two representatives, one male and one female, from each water management area. In addition to them, two landless representatives, one male and one female, represent the landless category in each committee. In case of CM and CBD-II representatives from the outside areas of the Polder, as affected areas, were also included. Table-28 shows the details of reconstituted WMCs.

**Table-28: Water Management Committees by Polders and Sluices**

Name of WMC	WMC members		Remarks
	Male	Female	
CBD-I	9	8	New WMC formed on 06/12/01
CBD-II	10	10	- Do -
CM	10	10	New WMC formed on 04/12/01
CBT (Nabagram)	4	4	New WMC formed on 05/12/01
CBT (Kalmi)	4	4	- Do -
CBT (Gangchil)	9	9	WMC formed on 30/07/01

Sources: CDSP-II; Technical Report; No. 6.

<sup>15</sup> CBD-I is a polder developed under Land Reclamation Project (LRP) that preceded CDSP-I.

**a) Committees' performance: meeting**

WMCs hold bi-monthly meetings. Moreover, they convene for need based special meetings. Extension Overseer from BWDB and CDSP team members also attend those meetings. From inception to last monitoring date, WMC of Char Baggar Dona-I met 26 times, WMC of Char Baggar Dona-II met 28 times, WMC of Char Majid 28 times, WMC of Nabagram 26 times and WMC of Kalmi met 24 times. The average attendance rate in these meetings varied from 73% to 80%. During previous monitoring period the attendance rate was 60 to 70% (CDSP-II; Technical Report; No. 6).

During the period of January to December 2003 WMC held on an average seven meetings, which is more than the target by 17%, and the average attendance was about 80%. Details of these meetings are shown in TR-14. The minutes of the meetings were recorded properly and served to all concerned agencies including the concerned UP Chairmen.

**b) Training for WMC members**

WMC members attend training courses conducted by CDSP-II for enhancing the management capacity of the WMCs. WMC training course emphasizes both on technical and institutional aspects. The first aspect focuses on the operation and maintenance of the sluices, removal of obstacles from the canals, maintaining of water levels in different seasons needed for different crops and activities, measurement of water levels, etc. The institutional aspect mainly deals with the committee's responsibilities, functions and management including financial matter. It also highlights the issues of liaison and coordination with concerned agencies and Local Government Institutions (LGI), and the concept of gender and agricultural issues.

As part of the strengthening and capacity building of the WMCs, different training/orientation courses were organised from CDSP-II. More than 95% of the targeted participants attended the courses. The courses are sequentially mentioned as follows:

- One-day orientation in the formation day.
- Three days basic training on O & M and task and responsibilities.
- One day practical training on O & M.
- One-day refreshers.
- Accounts management and record keeping
- One day orientation on agricultural issues
- Five days basic gender training.
- Exposure visit to others potential FCD/FCDI project

**c) Exposure visit by WMC members**

Like the old WMC members, who visited the Khulna-Jessore Drainage Rehabilitation Project (KJDRP), the members of the executive bodies of the present WMCs visited the Meghna-Dhonagoda Irrigation Project (MDIP) and Comilla Didar Sammittee. These visits helped the visiting members to gain knowledge on the institutional development process, water management, financial management and other aspects behind attaining sustainability of the WMCs

#### **4.2.2 WMC contribution in O & M**

##### **a) Maintenance Plan**

The WMCs once prepared a long-term maintenance plan (TR-23) but that plan was not executed properly due to fund shortage of BWDB. Thereafter, all the WMCs have been exercising to prepare annual maintenance plan and review it with BWDB and LGED before finalisation, and after finalisation they submit it to the BWDB and LGED. WMCs have prioritised the schemes of the annual plans that made by the WMCs in a participatory manner.

##### **b) Voluntary labour**

WMCs provided voluntary labour for re-excavating canal beds and for removing the cross *bundhs* (dams) from the drainage canals. During the monitoring period it has been found all the WMCs contributed money for greasing the sluice gates, observed water level in the monsoon, and removed debris and other obstacles from the canals by voluntary participation.

##### **c) System operation and management**

WMCs were successful in sluice gate operation and removal of cross dams from the canals. The gate operators generally followed the informal instruction of the President of the respective WMCs in operating the gates. The WMC are getting more involved in water management activities including sluice operation and it was learnt from the field experiences that during the last two years (2002 and 2003) all the gates were operated by WMC decision. However, in some cases, especially in CBD-II, the fishermen influenced the operators for opening the gates at their conveniences at the cost of the other stakeholders' interests.

##### **d) Local resource mobilisation**

WMCs are raising funds for running their organisational expenditures and small O & M. They collect monthly voluntary subscription money from all WMC members. In CM, the WMC collected token money from the fishermen who caught fish inside the sluice area in the monsoon. All the WMCs have been exploring other local resources for fund raising. These attempts will help them attain financial sustainability.

#### **4.2.2 Sustainability and WMC**

CDSP consultants had taken efforts to strengthen the WMCs with the aim to make them sustainable and make them capable of exercising their functions properly. For this purpose, orientation and training to the members of WMCs on the guidelines and on system operation and maintenance was carried out.

#### **4.2.3 WMC and Implementing Agencies (IAs)**

Support to the WMCs from CDSP-II has gradually been shifting to the staff of BWDB, both O & M and water management wings. BWDB has already posted three extension overseers (XO) and one assistant extension officer (AEO) for the working areas of both CDSP-I and CDSP-II. They are working jointly with the team of CDSP-II. Moreover, attempt has also been taken to involve the concerned Union Parishads more in the water management

activities. CDSP-II has planned to continue its support in the full time of project period to make the WMCs sustainable

### 4.3 Tubewell User Groups

CDSP-I designed an integrated water supply, sanitation and health education program with a package of tube wells and sanitary latrine and motivational activities for changing attitudes towards a hygienic environment. Women of the families who were the potential users of a tube well were first organised into Tube well Users Groups. These Groups collected contribution money that was mandatory for installation a tube well.

Two members of each users group were trained as caretaker and provided with maintenance kit for efficient operation and maintenance of the tube wells. Training was provided to all users groups in operation and maintenance of tube wells and pit latrine through weekly sessions conducted by Community Health Workers.

In a recent concluded survey it has appeared that the objective of creating Tube well Users Groups have not adequately achieved as the maintenance works in most cases are done by the Care-taker-families and contribution from other user families is meagre and very irregular though situation is a bit better in CV. It has also been observed that the Care-taker-families take the maintenance responsibility voluntarily without waiting for the contribution money from other co-users. As an institution the Tube well User Groups once (during CDSP-I period) met together but now it is almost nil.

#### 4.3.1 Maintenance and User Groups

Average maintenance cost per tube well was Taka 233 for their latest maintenance. Table-29 shows that average maintenance cost borne by other users i.e. Non-Care-taker-families was Taka 96. In CV 93% of the tube wells got contribution from other users for maintenance but in Non-CV only 25% of the tube wells got such contribution. In CV Non-Care-taker-families bore 69.3% of the total maintenance cost as against 15% of the Non-CV tube wells.

**Table-29: % of Maintenance Cost Shared by Other Users During Last Disorder**

Indicators	Unit	CV	Non-CV	All users
Average cost per Tube well	Tk.	306	195	233
Average cost born by other users	Tk.	212	28	96
% of other users borne maintenance cost	No.	93.0	25.0	50.0
% of maintenance born by other users	TK	69.3	15.0	41.2

Sources: Sample Tube well Survey, January, 2004, CDSP-II

### 4.4 Concluding remarks

Water management committees have become a viable local level institution for water management. They ensure the people's participation in water management by maintaining proper water level inside the polders through judicious operation of sluices. They contribute to making Operation and Maintenance Plan. They mobilise local resources for small types of maintenance and resolve conflict over the uses of water by different stakeholders.

