Government of Bangladesh **World Food Programme** **Government of the Netherlands**

CHAR DEVELOPMENT AND SETTLEMENT PROJECT II

চর উন্নয়ন ও বসতি স্থাপন প্রকল্প ২

BANGLADESH

Adoption of HYV Technologies by the Extension Farmers of CDSP-I

Technical Report No. 21

M A Latif
Senior Socioeconomic Adviser

February 2004

CDP
Consultants for Development Programmes

Haskoning
Royal Dutch Consulting Engineers and Architects

Sheltech
Sheltech Consultants Pvt. Ltd.

Table of Contents :

List of Tables :

Fig:

ANNEXES :

Section 1

1. Introduction and background

1.1 Background of the study

CDSP-I (then known as CDSP) implemented a Productive Development Programme for overall agricultural development in its three project areas: Char Baggar Dona-II, Char Bhatirtek, and Char Majid. The programme covered field crop, homestead and fishery sub-sectors. The activities included on-farm demonstrations of improved technologies recommended for the areas, holding field days and demonstration sites, organizing training for farmers and other promotional activities. The agricultural programme was undertaken with an assumption that it would increase the HYV coverage of different crops, particularly that of HYV rice in Aman season in the project areas. The extension farmers (i.e. demonstration farmers and extended farmers) not only would intensify their own HYV cultivation but also would play pioneering role in diffusing the technologies. But it did not take place as expected, though not at all as some people believed. The present study has been undertaken to assess the level of adoption of HYV by the extension farmers i.e. Demonstration Farmers (Demo) and Extended Farmers (EF).

1.2 Approach of extension of CDSP-I

CDSP-I formed 25 extension groups, with a demonstration farmer (Demo farmer) and five extended farmers for each group. The Demo farmers were the pivots for the groups. They received seeds for HYV rice and other crops and inputs and some other technologies like weeding machines, threshing machines for paddy harvest and net for IPM. The extended farmers received only seeds and fertilizer. Both types of the farmers got training on different aspects on crop cultivation and crop management, seed storing process, etc.

1.3 Objective of the study

a. To assess the extension of HYV adoption by the Demo and extended farmers;

b. To assess the constraints for the adoption of HYV rice; and

c. To assess the potential for HYV cultivation in future

1.4 Scope of the study

- Socioeconomic characteristics of the demo and extended farmers;
  (draught power, family labour. labour selling status, migration status, occupation pattern, etc.)
- Retention level of different seeds by the farmers given by CDSP-I;
- Practice of different lessons learnt from training given by CDSP-I;
- Reasons for non-adoption/discontinuation of HYV rice and other crop cultivation by the demo and extended farmers;
- Existing crop production and HYV coverage by the demo and extended farmers
- Constraints in HYV rice and other crop cultivation (physical, economic and social)
- Relation between farm size and HYV adoption of the demo and extended farmers
- Relation between tenancy and HYV adoption of the demo and extended farmers

1.5 Analytical approach of the study

The study has followed several approaches to investigate the adoption rate of the HYV of rice and other crops and other improved technologies by the Demonstration and Extended farmers. The Mid Term Review Mission has stated that, "The area under HYV rice did not increase as anticipated earlier, not even in the second season when salinity remains within tolerance limits of rice. A number of demonstration farmers of CDSP-I, having observed the benefits of growing HYV rice for 2-3 years, have switched back to local varieties reason of which could not be ascertained by CDSP-II".[1]

The Mid Term Review Mission had a valid reason to make such an impressionistic view because the visibility of HYV rice in the field was very much meagre. The different in-house studies and DAE Transect Survey carried out in different seasons also found very small coverage of HYV rice cultivation. The study, therefore gave foremost importance on this aspect i.e. the non-acceptance of the adoption rate of HYV by the Demonstration farmers and the Extended Farmers and both of them have been categorised as the Extension farmers in this study together.

However, the conclusion on non-acceptance of HYV rice by the Demonstration and the Extended farmers drew merits for intensive investigation because the in-house consultant team had other view. The viewed that whatever might be the level of acceptance it was not totally lost. So, the study had enlarged its scope assuming that both the Demonstration and Extended farmers have been continuing their HYV cultivation though the level of their acceptance was not very much significant.

For investigating the above two issues the study has asked the respondents some straight questions, for the first issue the questions were about the retention of seeds of different crops given by CDSP-I. This means that the study investigated whether the recipients of different seeds, particularly those who received HYV rice continued the cultivation of crops of those seeds. If they did not continue what were the reasons behind discontinuation. As the retention of seeds does not give any distinctive conclusion as a farmer may switch over to other more suitable and productive HYV varieties based on the experiences over the years leaving the cultivation of the crops of the seeds that CDSP-I gave them. So, the second issue was on the present scenario of the HYV cultivation and what are major stumbling blocks for cultivation of those crops.

At third stage the study made attempts to find out the relationship between the tenancy and HYV adoption status. The TR-2[2] has identified sharecropping as the major stumbling block to HYV rice cultivation, particularly in Char Majid and Char Baggar Dona polders. The Nath's study followed Focussed Group Discussion (FGD) approach and did not present any empirical findings. The present study has given attention on this aspect to investigate the Nath's findings empirically.

There is no study on the farm size and the adoption rate of HYV rice cultivation, and Aus and rabi coverage for CDSP areas though this is an important factor for HYV adoption as has been revealed in different academic studies. The present study has investigated the relation between farm size and the adoption of HYV rice cultivation, and Aus and rabi overage.

Soil salinity and drainages conditions are two decisive factors behind the adoption of different crops including the HYV rice Aman which is very much dependent on the well drainage condition. The study has, therefore attempted to establish the relation between the soil salinity and the flood depth and the cultivation of HYV rice.

[1] Mid Term Review Mission, Char Development and Settlement Project-II
[2] Agricultural Production and Adoption of New Agricultural Technologies in CDSP-I Project Areas (TR-2), Narayan Chandra Nath, February 2001

Section 2

2. Methodologies and Approach

2.1 Study Area

The study was carried all three polders where CDSP-I carried out extension work for agricultural development. The areas are Char Baggar Dona-II (CBD-II), Char Bhatirtek (CBT), and Char Majid (CM) in May 2003. The field data was collected from the respondents selected from the farmers of both types i.e. demo farmer and extension farmers.

2.2 Sampling technique: Selection of sample farmers

The study planned to collect data from all the demonstration farmers and three extended farmers, out of five, from each demo group, which means that the study would have a sample of 100 farmers; 25 demo farmers and 75 extended farmers. But ultimately, the study could cover 80 samples; 18 demo farmers and 62 Extended farmers, the ratio being 1:3.4. The sample size of the demo farmers was smaller than the planned size because of non-availability of the demo farmers in the locality. Some of the demo farmers have permanently left the polders and some of them have migrated for employment. One or two had died and another one has changed his occupation leaving cultivation. The selection of the extended farmers was done based on the availability of them but without any bias.

2.3 Survey

The study followed a structured questionnaire. An experienced Field Investigator conducted the survey in May 2003. Data was collected on different aspects of which crop production is one. The study gathered data on Aman and Aus of 2002 while data on rabi crop was on 2003.

2.4 Limitation of data collection

Since the study focussed on the demonstration activities of CDSP-I carried out several year back the study has to depend on the memory of the sample farmers. But the memory lapse of the sample farmers was a hindrance for accuracy of data. Moreover, timeframe was a major constraint for such a intensive study. Moreover, non-availability of the respondents became a stumbling block for carrying out the survey within the timeframe.

Section 3

3. Characteristics of the sample extension farmers

3.1 Introduction

This section deals with some household characteristics of the randomly sample extension farmers. Findings are presented in Table-1.1 to Table-1.11. The characteristics includes types of the farmers, draught-power possession status, occupation pattern labour selling and buying status, land-ownership pattern land and land management, dependency level on the agriculture for livelihood i.e. income and employment.

3.2 Category of the sample extension farmers

Table-1 presents the distribution of sample farmers by categories. Out of 80 sample farmers, 18 farmers are demonstration farmers (23%) and 62 of them are extended farmers (77%). The sample demonstration farmers (Demo) constitute around 24% of the total respondents in CBD-II and in CBT while in CM they constitute 19% of the total respondents of this polder.

Table-1.1: Distribution of the sample Extension Farmers by extension types in three polders

Polder	Extension Farmer Categories				All Polders	
	Demo farmer		Extended farmer			
	number	percent	number	percent	number	percent
CM	4	18.2	18	81.8	22	100.0
CBD-II	9	23.7	28	76.3	38	100.0
CBT	5	25.0	16	75.0	20	100.0
All polders	18	22.5	62	77.5	80	100.0

Char Majid=CM Char Baggar Dona-II=CBD-II Char Bhatirtek=CBT

3.3 Draught-power possession status

Once in rural Bangladesh draught power was indispensable with a farm. Nowadays, it has changed with the introduction of mechanised tilling devices. However, the draught has not disappeared from the rural areas and it is still associated with good farm practices. Table-2 shows the possession status of draught power by the sample farmers. About 38% of the farmers possess draught power and it is considerably high compared with general pattern. Moreover, many of the respondents had draught power when CDSP-I worked with them. The draught power possession is high in CBD-II with about 49% but it is almost the same in CM and CBT. Among the demo farmers, the crystal corner of the extension work, 50% possess the draught power (see Table-1.3).

Table-1.2 : Sample Extension[3] Farmers and their draft power possession in three polders

Polders	Possession status of draught power				All Polders	
	Possess		Do not possess			
	number	percent	number	percent	number	percent
CM	6	27.3	16	72.7	22	100
CBD-II	18	47.4	20	52.6	38	100
CBT	6	30.0	14	70.0	20	100
All Polders	30	37.5	51	62.5	80	100

[3] Extension farmers includes both demonstration and extended farmers.

Table-1.3: Distribution of the sample Extension Farmers by draft power possession and types of Extension Farmers

Farmer Category	Possession status of draught power				All Polders	
	Possess		Do not possess			
	number	percent	number	percent	number	percent
Demo farmer	9	50.0	9	50.0	18	100.0
Extension farmer	21	33.9	41	56.1	62	100.0
All Polders	30	37.5	50	62.5	80	100.0

3.4 Occupation pattern

A little bit more than 66% of the sample extension farmers as seen in Table-4, have farming and share cropping as their main occupations. Sharecroppers are more in CM (45.5%) followed by CBD-II (24.3%). However, the difference between farming and sharecropping has been done very subjectively. If a farmer has a farm with more share cropped in land than his or her own land it has been categorised into a sharecropper household. But in some cases, when a farmer has considerable amount of own land though it is less than its share cropped in land then it has been categorised into a farming household.

Table-1.4: Distribution of the sample Extension Farmers by main occupation

Occupation types	Polders						All Polders	
	CM		CBD-II		CBT			
	No.	%	No.	%	No.	%	No.	%
Farming	3	13.6	18	47.4	11	55.0	32	40.0
Sharecropping	10	45.5	9	23.7	2	10.0	21	26.3
Day labour	2	9.1	2	5.3	2	10.0	6	7.5
Business	3	13.6	3	7.9	2	10.0	8	10.0
Rickshaw puller	1	4.5	2	5.3			3	3.8
Fishing	1	4.5			1	5.0	2	2.5
Others	2	9.1	3	7.9	1	5.0	6	7.5
Labour leader			1	2.6			1	1.3
Teaching					1	5.0	1	1.3
All Polders	22	100	38	100	20	100.0	80	100

Multiple occupations are the main features of the sample respondents. A sample respondents has more than one occupation, two occupations is the very common. Table-1.5 shows that 60, out of 80 respondent households have a secondary occupation. This might be higher as some of the respondents have not reported about their secondary occupation being not asked by the interviewers. However, farming and sharecropping are the two major secondary occupations.

3.5 Labour selling and buying status (LSBS)

The availability of imputed family labour force of a farming household plays an important role in deciding the crop practices and HYV adoption of that household. It is assumed that a farming household with surplus labour and without any other employment opportunities will intensify its crop cultivation in order to maximize profit and to use imputed family labour by adopting improved technologies such as HYV and fertilizer.

Table-6 shows the labour buying and selling status of the sample extension farmer households. Only 8% of the sample extension farmers only sell labour and another 9% neither sell labour nor buy labour. About 35% of the sample farmers sell labour as well as buy labour for agricultural activities. They do it for early completion of their own agricultural jobs such as transplantation and harvesting of paddy during the peak season. If they do these jobs with their imputed family labour it will take times to be completed, hence will cause loss in yield (for delay transplantation) and waste for delayed harvesting. They sell labour after the completion of their own jobs. Moreover, agricultural activities need collective work for higher labour productivity.

Table-1.5: Distribution of the sample Extension Farmers by secondary occupation

Occupation Patten	Polder Number.						All Polders	
	CM		CBD-II		CBT			
	#	%	#	%	#	%	#	%
Farming	10	52.6	10	31.3	6	35.3	26	38.2
Sharecropping	2	10.5	4	12.5	2	11.8	8	11.8
Day labour	2	10.5	4	12.5	2	11.8	8	11.8
Business	3	15.8	4	12.5	2	11.8	9	13.2
Labour leader			2	6.3			2	2.9
Others	2	10.5	8	25.0	5	29.4	15	22.1
All Polders	19	100	32	100	17	100	68	100

On the other hand, 49% of the sample extension farmers employ hired labour along with own family labours but they do not sell any labour. The extension farmers who buy labour as well as sell labour constitute 35%. This means that 84% (49% and 35%) of the sample extension farmers depend on hired labour for their agricultural activities. Only 9% of the extension neither sell labour nor buy labour. The nature of the agricultural activities is such that they need work in groups. Harvesting of crops of a plot should be done at time; otherwise, there remains the treat of being theft at night. Group works also expedite the speed of the work. So, people hire labour for their work and sell their own labour at their convenient time. As labour hiring need labour management cost, particularly supervision and recruitment, the farmers become judicious in hiring labour. Such a labour hiring cost also dictates the extension of agricultural activities of a farmer, and hence the adoption of HYV and other modern technologies

Table-1.6. Labour buying and selling status of the sample Extension Farmers

Labour Buying and selling categories of households (HH)	Polder Number.						All Polders	
	CM		CBD-II		CBT			
	#	%	#	%	#	%	#	%
Only selling labour	2	9.1	2	5.3	2	10.0	6	7.5
Both buying and selling labour	9	40.9	12	31.6	7	35.0	28	35.0
Only buying labour	7	31.8	21	55.3	11	55.0	39	48.8
Neither buying nor selling labour	4	18.2	3	7.9	0	0	7	8.8
Total	22	100	38	100	20	100	80	100

3.6 Landownership pattern

As is seen in Table-1.7 that more than 51% of the sample extension farmers were selected from the marginal landownership group (0.01-1.50 acres) in all polders altogether[4]. Only 6% of the sample

[4] Selection was done randomly. No other parameter such as landownership was considered. It should be noted that the study was on the extension farmers who were recruited by CDSP-I without considering any other variables.

farmers were from the large landownership group (5.00+). In CBT no farmers were selected from the large landownership groups though 9% and 8% farmers were selected from this group in CM and CBD-II respectively. It should be noted that the whole landmass of CBT were *Khas* land and that were distributed among the landless following government policy that permitted a maximum land ceiling of 2.00 acres. On the other hand, both in CM and CBD-II the big chunk of the landmass were old and ancestral land owned by the private owners. So the distribution of land was skewed in these two polders. It is to note that even in CBT 20% (4 farmers) have land more than two acres. Some of them have got more than two acres and some of them have occupied *Khas* land outside the polder after CDSP's land settlement.

It is also seen that small farmers are dominant among the sample farmers in CBT with 38% and they are very low in CM with 9%, but CBD-II has 22% of the sample farmers from this group. The lowest two farmer groups constitute about 81% in CBT 73% and in CM 68% respectively.

3.6.1 Agricultural land management

Distribution of land management by tenure pattern has been produced in Table-8. It appears from Table-8 that the sample landowners manage 80% of their own land under own cultivation and they mortgage out the rest 20%. The reasons for mortgaging out have not been investigated though it is generally said that people mortgage out both for meeting financial needs for consumption, treatment, dowry, etc. for different productive investments such as buying land, assets, etc. However, the first category of reasons is more predominant. It is to note that none of the sample farmers have share cropped out any land. This indicates that they are actual tillers of the soils.

Table-1.7: Distribution of Sample Extension Farmers by land ownership size

Land ownership group (acres)	Polders						All Polders	
	CM		CBD-II		CBT			
	number	percent	number	percent	number	percent	number	percent
0.01-1.50	13	59.1	20	52.6	8	40.0	41	51.3
1.51-2.50	2	9.1	8	21.1	8	40.0	18	22.5
2.51-5.00	5	22.7	7	18.4	4	20.0	16	20.0
5.00+	2	9.1	3	7.9	0		5	6.3
All Groups	22	100	38	100	20	100	80	100

0.01-1.50=Marginal landowner 10.51-2.50=Small landowner
2.51-5.00=Medium landowner 5.00+ Large landowner

Mortgaging out is very high in CM where about 35% of the own land has been mortgaged out but in CBT it is 19% and in CBD-II it is 12%. This indicates that the sample farmers of CM have more financial constraints.

Table-1.8: Distribution of the owned arable land of the sample Extension Farmers by land management pattern

Polders	Management pattern (%)		Total
	Own managed	Mortgaged out	
CM	64.9	35.1	100
CBD-II	88.3	11.7	100
CBT	80.7	19.3	100
All Polders	80.1	19.9	100

It is also seen in Table-1.9 that a positive o-relationship between the landownership groups and mortgage out land exists as the large farmer (5.00+) group has mortgaged out proportionately more land than that of the lower land ownership groups. This means that the large land ownership groups have more financial constraints than that the of lower land ownership groups. The medium landownership group has also mortgaged out 22% of their total own land which is also higher than their immediate lower ownership group (1.51-2.50) that have mortgaged out 8% of their own land.

3.6.2 Importance of agriculture: income and employment sources

Table-1.10 shows that around 60% of the sample farmers have more than 50% income from their agricultural activities. It is high in CBT where 75% of the sample farmers have more than 50% income from agriculture and low in CM where 45% of the farmers have more than 50% of their income from agriculture. In CBD-II they constitute about 61%. This means that more farmers in CBT are dependent on agriculture than the farmers of other two polders.

Even in terms of employment from agriculture more of the sample extension farmers in CBT are dependent than other two polders as is seen Table-11; about 65% of the extension farmers here get more than 50% of their employment from the agriculture sector as against 45% in CM and 61% in CBD-II.

Table-1.9: Distribution of owned land by management pattern and landownership size

Land Ownership Groups	Management pattern (%)		All Polders
	Owned managed land	Mortgaged out	
0.51-1.50	86.1	13.9	100
1.51-2.50	92.1	7.9	100
2.51-5.00	77.6	22.4	100
5.00+	68.4	31.6	100
All groups	80.1	19.9	100

Table-1.10: Share of income of the sample Extension Farmers from agriculture

Income ranges (%)	Share in percent						All Polders	
	CM		CBD-II		CBT			
	number	percent	number	percent	number	percent	number	percent
1-25%	5	22.7	5	13.2	1	5.0	11	13.8
26-50%	7	31.8	10	26.3	4	20.0	21	26.3
51-75%	5	22.7	11	28.9	7	35.0	23	28.8
75%+	5	22.7	12	31.6	8	40.0	25	31.3
All	22	100	38	100	20	100	80	100

Table-1.11: Share of employment of the sample Extension Farmers from agriculture

Employment ranges (%)	Polders						All Polders	
	CM		CBD-II		CBT			
	number	percent	number	percent	number	percent	number	percent
1-25%	5	22.7	4	10.5	3	15.0	12	15.0
26-50%	7	31.8	11	28.9	4	20.0	22	27.5
51-75%	3	13.6	6	15.8	2	10.0	11	13.8
76-100%	7	31.8	17	44.7	11	55.0	35	43.8
All	22	100	38	100	20	100	80	100

Section 4

4. Retention of Technology Received from CDSP-I

4.1 Introduction

CDSP-I carried out extension services for agricultural development of the polder areas. DAE was the pivot of the services. The packages of services were training on different aspects that included compost fertilizer preparation, husbandry practices, supply of seeds HYV rice cultivation, etc. The study investigated retention of those services by the sample farmers. In this section the results of the survey are presented[5].

4.2 Retention status of seeds for different crops

CDSP-I as part of its extension service distributed seeds of different varieties of rice, rabi crops such as groundnut (*Zhingabadam*) and chillies (*Hathajari*) and vegetables, particularly leafy vegetables among the sample extension farmers with an objective of technology diffusion. The study investigated the retention of some those seeds by the recipient extension farmers. The problems with the respondents were that many of them could not recollect the exact varieties of rice, sometimes even the seed itself. The consultant had collected a list of farmers with seeds variety but that did not match with the respondent's answers.

4.3 Retention status of seeds for rabi crops

Table 2.1 and Table-2.2 present the retention status of HYV chillies and groundnut and the reasons for losing those seeds. Twenty respondents (Table-2.1) have reported that they have received *Hathajari* chilli seeds from CDSP-I but only 4 (20%) of them have it and they grow it along with other traditional local varieties.

CDSP-I introduced *Zhingabadam* groundnuts and distributed seeds among the extension farmers. Before CDSP-I the local farmers used to grow Dhaka- variety traditionally. Out 35 respondents (Table-2.1) only two of them have reported that they grow *Zhingabadam* groundnuts on a tiny scale but mainly grow traditional variety.

Twenty-five of the respondents have reported that they have received *Kamalasundari* (HYV) variety of sweet potato but only 8 eight (25%) of them have *Kamalasundari* seeds with them. The retention of *dhaincha* is very much negligible (only 12%).

Table-2.1: HYV Rabi retention status by the sample Extension Farmers

	Number of Respondents		
Crops with varieties	Received seed	Retain seeds	Percentage
Hathajari chilli	20	4	20.0
Zhingabadam ground nuts	35	2	5.7
Kamalasundari sweet potato	25	8	25.0
Daincha	25	3	12.0

The reasons for losing HYV rice seeds are presented in Table-2.2. The mains reasons that are crop failure due to water-logging, pests, less market demand, not profitable, and low yield.

[5] For extension approach see section 1.2.

Table-2.2: Reasons for losing HYV rabi seed by the sample Extension Farmers

Reasons	Answers	
	Number	Percentage
Water-logging	25	38.5
Insects	7	10.8
Consumed as food	2	3.1
Mixed with local variety	4	6.2
Not profitable	2	3.1
Others	7	10.8
Less market demand	13	20.0
Low yield	1	1.5
Bad taste	4	6.2
Lodging	1	1.5
Salinity	9	13.8
Total	65	115.4

4.4 Groundnut adoption status

The farmers grow Dhaka-1 traditionally and CDSP-I introduced a new variety, Z*hingabadam*. But the study has not investigated the adoption rate of Z*hingabadam* groundnut keeping it in mind that its adoption rate is very low, if not at nil (only 2 out of 35 farmers who received seeds from CDSP-I reported about Z*hingabadam* ground cultivation; see Table-2.1 given above). Most of the respondents have stated that they have lost seeds either due to the crop failure at the initial stage of the introduction caused by either soil salinity or water-logging, or lost interest in growing it because of its less market demand at that time. Some sample farmers have mixed their seeds of Z*hingabadam* groundnuts with their traditional variety.

When CDSP-I started extension work the coverage of groundnut was considerably high compared with that of the present. For several reasons its acreage has decreased. Therefore, the study gave emphasis on the adoption of groundnut in general to identify the constraint of groundnut cultivation. Adoption rate of groundnut by the sample farmers in the study areas is 40% as seen in Table-2.3. However, it is relatively higher in CBD-II with 50% and relatively low in CBT with 25%. The adoption rate of groundnut was 55% in pre-CDSP-I period (TR-17?).

Table-2.3: Sample Extension Farmers and groundnut cultivation status

Polder	Extension Farmers who produce				Total	
	Groundnut		No groundnut			
	number	percent	number	percent	number	percent
CM	8	36.4	14	63.6	22	100
CBD-II	19	50.0	19	50.0	38	100
CBT	5	25.0	15	75.0	20	100
All Polders	32	40.0	48	60.0	80	100

Note : Production in 2003; Source: Survey on HYV Technology Adoption by Extension Farmers of CDSP-I, 2003

4.4.1 Reasons for non-adoption of groundnut

Major reasons for not cultivating of the groundnut have been the soil salinity (29%), and water–logging (29%) in CM and while water-logging is the major reason in CBD-II (58%). The findings are presented in Table-2.4.

Table-2.4: Reasons for non-adoption of groundnut by the sample Extension Farmers

Reasons*	Reasons in percent			All polder (N=48)
	CM (N=14)	CBD-II (N=19)	CBT (N=15)	
Saline land	28.6	21.1	46.7	31.3
Water logging	28.6	57.9	13.3	35.4
Lack of seed	7.1			2.1
Lack of capital	21.4	15.8	26.7	20.8
Lack of labour		5.3	13.3	6.3
Not profitable	7.1			2.1
Risky crop			20.0	6.3
Others	14.3	31.6	13.3	20.8

*Multiple answers. Adoption is calculated based on the production in 2003

There is a negative trend of the groundnut cultivation for a number of reasons of which the water-logging caused by rains during harvest period, is the major reason. The farmers had suffered several consecutive years from such problems and lost interest in growing the groundnut. In CM some of the sample extension farmers have identified the fox from the nearest mangrove forest as the major cause of non-cultivating of groundnut because they (the foxes) damage the crops at night. As the total acreage under the groundnut is meagre it is neither profitable nor comfortable to watch the crop field at night to protect them from the damages by the foxes. Some of the respondents highlighted that nowadays the post-harvest drying of groundnut has become a constraints. Previously, they dried it on the roads but nowadays there are many trees on the roadsides and that make road shady.

4.4.2 Reasons for non-adoption of *Zhingabadam* groundnut

4.4.2.1 Low market demand

When CDSP-I introduced it in the area it was not popular among the growers and it had less market demand. Since only a few sample extension farmers supplied it to market and it was very meagre amount of the total market supply. The regional traders who used to buy it from local market were not interested to buy it. If there were bulk of production the traders coming from outside markets would give more price and attention. As a result, though the production was good the net profit was less attractive than traditional one.

4.4.2.2 Damages by the foxes and children and other social factor

As the plants grew more thickly than the traditional one, the foxes got attracted and damaged it first before traditional varieties. Similarly, children out of curiosity and/or being fond of picked it up from the field for chewing. Moreover, as it was a new variety the farmers had to share their harvested groundnut with relatives, neighbours and other people for socialisation. As a result, some of them have lost the seeds.

4.5 Sweet potato

CDSP-I distributed seeds of sweet potato of *Kamalasundari* variety among the sample extension farmers. Like groundnut the study has not investigated the adoption of *Kamalasundari* assuming that its adoption rate was very low. Moreover, it is found that it was difficult to ascertain the actual variety from the answers given by the as the farmers who have confusion with the variety. With this backdrop, the study has investigated only the adoption rate of sweet potato of either variety.

Table-2.5 shows that about 68 percent of the sample extension farmers have cultivated sweet potato during the survey period. It is very highest in CBT (70%) and 64% in CM. Sweet potato is a staple food for the farmers who grow it mostly for consumption during the lean period when food deficit appears. Moreover, during this period they also meet their financial needs, particularly for Aus cultivation by selling sweet potato. Major reasons for non-cultivation of sweet potato are the saline soil (21%) and water-logging (29%). The reasons of non-adoption of sweet potato are presented in Table-2.6.

Table-2.5: Sample Extension Farmers and sweet potato cultivation status

Polders	Sweet potato cultivation status				Total	
	Cultivate		Do not cultivate			
	number	percent	Number	percent	number	percent
CM	14	63.7	8	36.4	22	100
CBD-II	26	68.4	12	32.6	38	100
CBT	14	70.0	6	30.0	20	100
All Polders	54	67.5	26	32.5	80	100

Note: Production of 2003

Table-2.6: Reasons for non-cultivation of sweet potato by the sample Extension Farmers

Reasons* for not cultivating sweet potato	Polders						All Polders	
	CM		CBD-II		CBT			
	No.	percent	No.	percent	No.	percent	No.	percent
Saline land	3	42.9	1	8.3	1	20.0	5	20.8
Water logging	0	0.0	7	58.3	0	0.0	7	29.2
Lack of seed	1	14.3	2	26.7	0	0.0	3	12.5
Lack of capital	1	14.3	0	.0	1	20.0	2	8.3
Lack of labour	0	0.0	1	8.3	1	20.0	2	8.3
Scarcity of inputs	1	14.3	0	.0	0	0.0	1	4.2
Others	1	14.3	5	41.7	2	40.0	8	33.3
All Polders	7	100	12	100	5	100	24	100

*Multiple answers.

4.6 Retention of HYV rice seeds by the extension farmers

In this section the study has investigated the retention status of HYV rice seeds by the Extension Farmers supplied by CDSP-I. The findings are presented in Table-2.7. Out of 84 farmers (cases) who received HYV rice seeds 34 farmers (cases)[6] have reported about the retention of seeds. This means that in about 41% cases have reported about retention of their seeds the rest 59% have reported about seed loss.

BR-26 was the second most popular variety as 67% of its recipients have retained it but its recipients are very small in number to make any comments on its popularity. BR-23 is a popular variety that has been kept by 57% of the surveyed recipients. On the other hand, BRRI dhan30, BRRI dhan31, and BRRI dhan33 were less popular as only 27.3%, 38.9% and 33.3% of the recipient of these seeds have retained them though CDSP-I distributed then largely. BRRI dhan30, BRRI dhan31 and BRRI dhan32 were not popular among the farmers, as they did not match with food habit of the local people. The farmers grow rice mainly for home consumption and they prefer local coarse rice but the BRRI dhan30, BRRI dhan31 and BRRI dhan32 rice are fine. It had less

[6] Some of the sample respondents have received more than one varieties.

market demand at the time of extension works in the local markets dominated by local consumers. The regional traders did not prefer to buy the fine rice, as it was tiny in amount. Now the scenario has changed. There is market demands for fine rice. The regional traders procure fine rice from the local market.

Table-2.7: Retention status of HYV rice seeds by the sample Extension Farmers

HYV varieties	Number of Recipients	Respondents with HYV rice	
		Number	Percent
BR-10	8	2	25.0
BR-11	3	0	0
BR-14	2	1	50.0
BR-20	1	0	0
BR-22	13	7	53.9
BR-23	7	4	57.1
BR-26	3	2	66.7
BR-30	23	9	39.1
BR-31	18	7	38.9
BR-32	6	2	33.3
Total	84	34	40.5

Some of the farmers reported that CDSP-I introduced HYV rice pre-maturely because at that time the soil salinity was high[7]. Moreover, lack of insect control was a major problem for two reasons. First, all over the field there were local varieties of rice, which needed no/less pesticides. But HYV rice was much more susceptible to insects. As the acreage of the HYV rice was small and other growers of the traditional varieties were reluctant to use insecticides the HYV growers could not control the pests.

"If we used pesticides to control our plot then the insects from the neighbouring plot came again. You need many people to grow HYV rice for controlling the insecticides", said most of the farmers. They added "Moreover, pesticide was not easily available in local market at that time and if it was available spray machines for spreading it was not available. CDSP-I gave one spray machine for one polder and the respective Block Supervisor (BS) of DAE kept it with him. It was not easy to get it when necessary. Sometimes it remained disordered sometimes BS was not available, etc."

The mains reasons for losing the seeds (see Table-2.8) are the crop failure due to water-logging and pest attacks, and market related issues (less demand, not profitable), bad taste, etc).

4.6.1 Adoption of HYV rice varieties: present scenario

This section discusses the present HYV adoption status by varieties of HYV rice unlike the previous section where it focus was on varieties supplied by CDSP-II. Though initially the adoption rate went down with the withdrawal of support of CDSP-I supports now it has increased again. The farmers have selected new varieties instead of sticking only to the varieties supplied by CDSP-I. Most popular varieties during Aman season are BR-23[8] and BR-22; the first one being accepted 43.3% and the second by 36.7% (ref: Table-2.9) of the growers. During Aus season the most popular varieties are *Chandina* and BRRI dhan27. Half of the farmers, who had HYV Aus cultivation, grew *Chandina* irri while 23.9% of the total growers grew BRRI dhan27. BRRI dhan27 is more popular in CBT while *Chandina* irri is more popular HYV rice in CBD-II and in CM. *Mala* irri is popular as about 16% of the HYV Aus growing farmers grew it.

[7] Particularly in the newly accreted land: southwest part of CBD-II, southwest and east and south parts of CM and the whole of CBT were newly accreted land.

Table-2.8: Reasons for losing HYV rice seeds by the sample Extension Farmers

Reasons for losing HYV rice seeds	Answers	
	Number	Percentage
Water-logging	14	26.9
Draught	1	1.9
Insects	10	19.2
Consumed as food	1	1.9
Mixed with local variety	2	3.8
No interested to continue	1	1.9
Not profitable	4	7.7
Less market demand	9	17.3
Low yield	4	7.7
Bad taste	2	3.8
Salinity	3	5.8
Lack of capital	3	5.8
Seedlings damaged	3	5.8
Late rabi cultivation	1	1.9
Flowering problem	1	1.9
Plantation late of relay crop	1	1.9
Others	4	7.7
Total	52	123.1*

*Multiple answer

Table-2.9: Adoption of HYV rice by the sample Extension Farmers and rice varieties

Varieties	Adoption Rate of HYV	
	Number	percent
Aman:		
BR-8	1	1.7
BR-10	3	5.0
BR-11	6	10.0
BR-20	2	3.3
BR-22	22	36.7
BR-23	26	43.3
BR-30	10	16.7
BR-31	11	18.3
BR-32	1	1.7
BR-33	1	1.7
BR-40	1	1.7
BR-41	4	6.7
N=	60	146.8
Aus		
BR-8	3	7.9
BR-14	1	2.6
BR-26	3	7.9
BR-27	11	28.9
Doyal IRRI	2	5.3
Mala IRRI	6	15.8
Chandian IRRI	19	50.0
Sonali IRRI	1	2.6
N=	38	121.0

Note: one acceptor may have more than one variety.

4.7 Aus adoption

All polders but CBD-II have recently been empoldered and before empolderment cultivation of Aus was both risky very often being damaged by saline water intrusion and soil saline. After the embankment the situation has changed and people grow Aus nowadays. The study investigated the adoption rate of Aus of either varieties: local and/or HYV. It is seen in Table-2.10 that 73% of the sample farmers have grown Aus though it is very low in CM where soil salinity is a major problem. Moreover, in the *Kharif*-I the crop fields of this polder become grazing fields. If anyone cultivate Aus rice the cattle damages the crops. The land tenure system is also a stumbling block to Aus cultivation in CM (have been discussed in a later section).

Table-2.10: Sample Extension Farmers and Aus adoption status

Polders	Aus adoption status by Aus growers				Total	
	Adopted		Not adopted			
	number	percent	number	percent	Number	percent
CM	9	40.9	13	59.1	22	100
CBD-II	32	84.2	6	15.8	38	100
CBT	17	85.0	3	15.0	20	100
All Polders	58	72.5	22	27.5	80	100

4.8 HYV Aus adoption

There is no data available for rate of HYV Aus coverage in 1998 (TR-17 has only mentioned varieties). However, the present study collected data on the HYV Aus coverage of the sample farmers when they got inputs from CDSP-I to compare it with the present coverage. It has been found that the HYV Aus coverage of the sample farmers have increased by 1467% till 2002. The increase of the HYV coverage has been facilitated by the improvement of soil conditions that was once saline.

Adoption of HYV rice during *Kharif* -I was also remarkably high, as almost half of the respondents (48%) have adopted it though it is lower than that of the *Kharif* -II (75%; ref: Table-2.11). The adoption rate of the HYV rice during the *Kharif*-I is very high with 80% of the total respondents in CBT followed by CBD-II with 42% of its total respondents. Comparing with HYV Aman rice adoption rate, the rate of HYV Aus adoption is higher in CBT (the first being 50% and the second being 80% respectively).

Table-2.11: Sample Extension Farmers and HYV Aus adoption

Polders	HYV Aus adoption status				Total	
	Adopted		Not adopted			
	number	percent	number	percent	Number	percent
CM	6	27.3	16	72.7	22	100
CBD-II	16	42.1	22	57.9	38	100
CBT	16	80.0	4	20.0	20	100
All Polders	38	47.5	42	52.5	80	100

Note: Production of 2002 *Kharif*-I

4.8.1 Popular HYV Aus varieties over time

In TR-17 (1998) there is no mention of HYV Aus varieties of BRRI dhan27 and *Chandina*, which are now most popular among the respondents, the first being 28.9% and the latter being 59% of the sample respondents. In terms of acreage *Chandina* constitutes about 47.6 percent of the total HYV

acreages and BR-27 18%. The adoption of *Mala* has also increased from 4% in 1998 to 15.8% and about 15 percent of the total HYV Aus area under *Mala* Irri. In 1998 some farmers grew *Kuisa* Irri that has disappeared. Similarly, BR-3 and BR-16 have disappeared.

4.8.2 Reasons for Non adoption of HYV rice during Kharif-I

Major reasons for non-adoption of HYV rice during the Kharif-I season (2002) were soil salinity in CM and water-logging in CBD-II with 43% and 60% of the respondents respectively. The findings are presented in Table-2.12.

Table-2.12: Reasons for Non-adoption of HYV Aman by the sample Extension Farmers

Reasons*	Reasons in percent			All polder (N=33)
	CM (N=14)	CBD-II (N=16)	CBT (N=3)	
Saline land	42.9	6.7	25.0	24.2
Water logging	14.3	60.0	25.0	36.4
Lack of seed	.0	6.7	0.0	3.0
Lack of capital	21.4	13.3	0.0	15.2
Lack of labour	.0	20.0	25.0	12.1
Risky crop	7.1	0.0	0.0	3.0
Others	28.6	26.7	25.0	27.3
All*	114.3	133.4	100	121.2

*multiple answers.

4.8.3 HYV Aman adoption: coverage and prevalence

The adoption rate of HYV rice during Aman season for the growers cannot be compared with the adoption study done earlier (CDSP-I; Technical report; No. 17) because it has not recorded the HYV adoption rate of the growers rather it has investigated the adoption rate of HYV Aman rice by varieties[9]. But the comparison of varieties is not very much significant from our study's point of view. The present study has collected data on HYV Aman coverage of the sample extension farmers when they got supports from CDSP-I. It has been found that HYV Aman coverage of the Extension farmers has increased by 350% till 2002. Though it has some flaws because of memory lapses of the respondents about its base year's information.

Table-2.13 shows that about 75% of the sample extension farmers have reported about adoption of HYV Aman rice (one or more than one varieties) in 2002. The adoption of the HYV rice during Aman season is considerably high in CBD-II compared with other two polders, particularly with CBT where the adopters constitute about 48% of the total respondents. In CBD-II it constitutes more than 87%, which seems very unusual. A couple of years ago the drainage system was improved due to re-excavation of the Bhulua River. Moreover, during last *Kharif*–II (2002) there emerged water congestion caused by an incessant rains in the polder and people lost seedling for Aman rice. After the recession of the water a massive agricultural rehabilitation programme was undertaken by DAE that distributed seeds for HYV Aman rice variety. As a result, the adoption rate of the HYV rice jumped up in terms of number of respondents though not in terms of acreage which is 23.3 percent (shown in later section). This is a disaster led growth of HYV Aman cultivation and with the improved drainage system of this polder it is expected to sustain in future.

[9] In section individual variety was discussed. Here growers have been considered. If one grower grows a more than one variety of HYV rice he/she has been considered one unit. See also footnote 3.

Table-2.13: Sample Extension Farmers and HYV Aman adoption status

Polders	HYV Aman adoption status				Total	
	Adopted		Not adopted			
	number	percent	number	percent	number	percent
CM	17	77.3	5	22.7	22	100
CBD-II	33	86.8	5	13.2	38	100
CBT	10	50.0	10	50.	20	100
All Polders	60	75.0	20	25.0	80	100

Source: Survey on HYV Technology Adoption by Extension Farmers of CDSP-I, 2003

4.8.4 Popular Aman HYV varieties over time

In pre-CDSP stage only 11%, 20% and 7% of the respondents were using HYV t. aman varieties BR-10, BR-20 and BRRI dhan30 respectively (TR-17). In 1998, the extent of adoption of these varieties might rise to 41%, 57% and 59% (respondents) resulting an increased rate of adoption by 30, 37 and 40% respectively as compared to pre-CDSP stage (ibid). BR-23 was not a popular variety either in pre-CDSP stage or during CDSP-I period as only 7% of the respondents adopted it during CDSP-I and in pre-CDSP stage none adopted it. Now it is the most popular variety as 43.3% of the HYV rice growers grow this particular variety followed by BR-22 that is grown by 36.7% of the total HYV growers (see Table-2.9) as against 22% during pre-CDSP and 34% during CDSP periods (TR-17). The second most popular variety is the BR-22 that is 36.7% of the total Aman HYV varieties. However, BRRI dhan30, BRRI dhan31, BRRI dhan33 and BRRI dhan41 are becoming popular nowadays.

BR-23 is more popular than other HYV varieties for a number of reasons. First its plantation time is flexible compared with other HYV varieties and it gives more advantage to the growers for time budgeting of their labour. Second it is less susceptible to pest and disease. Third its plant height is higher than other HYV varieties and almost like the local varieties. Last but not least, its rice is coarse which matches the food habits of the local growers.

4.8.5 Reasons for non-adoption of HYV rice during *Kharif* II

There is a good number of reasons for non-adoption of HYV during the *Kharif* II by the respondents as presented in Table-2.14. Major reasons are the lack of capital, lack of labour, in other words, labour management, physical properties of soil i.e. soil salinity, and water logging. By polder, water logging is prominent in CBD-II (50%), soil salinity is both in CM and CBT. Lack of capital is more prominent in CM (71%). TR-17 identified a major reason responsible for non-adoption of HYV rice in 1998 as most of the respondents lost seed stock due to crop failure in 1997. In 1997 the aman crop was almost entirely damaged due to flood and subsequent drought. The present study also found this as a valid reason for non-adoption of HYV after CDSP-I withdrew its programmes.

4.9 Compost fertiliser use and preparation practice

Traditionally local farmers use cow-dung and other solid waste as fertiliser. CDSP-I provided training on the techniques of the compost fertiliser processing; a hole covered with a roof. The study investigated the training result on it. The findings are presented in Table-2.15 and Table-2.16. As seen in Table-2.15 about 70% of the respondents have reported about the use of compost fertilizer in three polders altogether. It is very high in CBT with 90% and low in CM with 57% while in CBB-II 67% of the sample farmers have reported about compost fertiliser uses. Table-2.17

presents the distribution of the respondents by the preparation process of the compost fertiliser by the respondents.

Table-2.14: Reasons of Not Producing HYV Aman Rice by the sample Extension Farmers

Reasons	Reasons (%)			All polders (N=20)
	CM (N=5)	CBD-II (N=5)	CBT (N=10)	
Saline land	14.3		11.1	10.0
Water logging		50.0	11.1	15.0
Lack of seed	14.3	25.0		10.0
Lack of capital	71.4	25.0	11.1	35.0
Lack of labour	14.3	25.0	11.1	15.0
Lack of knowledge	14.3			5.0
Not profitable			11.1	5.0
Others	14.3		55.6	30.0
All	142.9	125	111.1	125

*multiple answers.

Out of 50 respondents (who responded), 21 (42%) have reported that they store cow-dung and other solid waste in the holes with roofs over the holes, and the rest 58% of the respondents have reported that they store those things only in the hole without any roof over the holes. They have acknowledged the CDSP's teaching on the preparation of compost fertilizer and are very positive about the benefit of the compost fertiliser proceed in holes with roofs though they do not practise the full teaching on the preparation.

Table-2.15: Sample Extension Farmers and compost fertilizer use status

Polders	Use status of compost fertilizer				Total	
	Use		Do not use			
	number	Percent	number	percent	Number	percent
CM	12	57.1	9	42.9	21	100
CBD-II	24	66.7	12	33.3	36	100
CBT	17	89.5	2	10.5	19	100
All Polders	53	69.7	23	30.3	76	100

Table-2.16: Sample Extension Farmers and preparation process of compost fertilizer

Polders	Management				Total	
	Only hole		Both hole and roof			
	number	Percent	number	percent	Number	percent
CM	5	50.0	5	50.0	10	100
CBD-II	15	62.5	9	37.5	24	100
CBT	9	56.3	7	43.8	16	100
All Polders	29	58.0	21	42.0	50	100

4.10 Adoption of *Sesbania* green manure/*Dhaincha* cultivation

Though the use of green manure is an age-old practice, it has seldom been practiced in the study area. In the pre-CDSP stage, only 2 out of 56 respondents (3%) reported that they have practiced *Seshuniu* green manure before t. aman rice (CDSP-I; Technical Report; No. 13). In 1998 CDSP-I demonstrated the cultivation of green manure with *dhaincha* in the early *Kharif* seasons before transplanting of aman rice. The present study has found that 11 sample extension farmers (14%) out of 67 sample extension farmers, who responded, grow *dhaincha* though in 1998 it was about 27%. About 86% of the respondents have not adopted it (Table-2.7) for a number of reasons in 2002 Aus season.

Table-2.17: Sample Extension Farmers and *Dhaincha* cultivation status

Polders	Cultivation status of *dhaincha*				Total	
	Cultivate		Do not cultivate			
	number	Percent	number	percent	number	percent
CM	2	10.0	18	90.0	20	100
CBD-II	3	7.9	35	92.1	38	100
CBT	6	30.0	14	70.0	20	100
All Polders	11	14.1	67	85.9	78	100

The reasons for not adopting *dhaincha* are described below:

- -Lost of earlier initiative of CDSP

TR-17, CDSP-I has reported,

> 'Green manuring with *dhaincha* (*Sesbania aculeate*) has been demonstrated in the early Kharif season before transplatation of aman rice. In 1998 only 27 percent farmers grew *Sesbania* (mostly in CBD-II) but the crop failed at the emergence due to excessive rainfall. Majority farmers have not accepted the technologies due to damage of the crop at the emergence and early seedlings stages, unavailability of seeds, and possibly on economic consideration (only 20-30 kg N can be supplemented by 20 tons green biomass of *Sesbania*). A significant proportion of the respondents considers the practice hazardous due to difficulty in soil incorporation.'

Some of the respondents have added during the field survey for the present study that soil salinity was mainly responsible for losing earlier initiatives.

- Lack of seeds

  In the locality seeds for *dhaincha* is not available. On the other hand, the farmers cannot grow seeds at farm level because of small scale of production. When they keep *dhainach* on a small fraction of a bigger land plot they get lost somehow.

- Lack of draught power

  Some of the interested farmers have reported that for tilling land for growing the *dhaincha* they lack drought power. The power tiller, most dominant mode of tillage nowadays is not available at the time of land preparation for *dhaincha* cultivation.

4.11 Integrated Pest Management (IPM)

CDSP-I imparted training on integrated pest management to the demonstration and Extended farmers and gave them net for IPM. People are very much convinced about the usefulness of IPM though they do not practise it intensively though they use perching at a limited scale. The study asked about perching only and found that more than 95% of the respondents who answered to this question said that used perching (ref: Table-2.18). However, the study could not verify in the field though twigs and braches in the paddy field were observed after the survey. It should be noted that the survey was carried out in the summer when no rice was in the field.

Table-2.18: IPM Practice by the sample Extension Farmers in CDSP-I Areas

Polder	Status of IPM (perching) practice				Total	
	perching		no perching			
	number	percent	number	percent	number	percent
CM	20	95.2	1	4.8	21	100
CBD-II	30	96.8	1	3.2	31	100
CBT	15	93.8	1	6.3	16	100
All Polders	65	95.6	3	4.4	68	100

4.12 Line transplantation

Traditionally people follow line for their local varieties of Aman. CDSP-II taught them how to maintain the line by using a string fixed with two sticks at two ends. About 50% of the sample farmers who had HYV Aman cultivation have reported that they follow line transplantation for HYV Aman plantation as per the training they received from CDSP-I (ref. Table-2.19).

Table-2.19: Sample Extension Farmers and line transplantation of HYV Aman rice

Polders	Line transplantation of HYV Aman				Total	
	follow		do not follow			
	number	percent	number	percent	number	percent
CM	4	26.7	11	73.3	15	100
CBD-II	20	62.5	12	37.5	32	100
CBT	3	42.9	4	57.1	7	100
All Polders	27	50.0	27	50.0	54	100

Section 5

5. Tenancy Systems and HYV Adoption

This section has highlighted the impact of tenancy system and other socioeconomic factors on HYV adoption by the Extension Farmers.

5.1 Farmland distribution by tenure pattern

Table-3.1 shows the distribution of farmland by tenure pattern in the study polders. It appears that more 62% of the total farm land of the sample farmers of all polders together are share cropped in land and only 35% of the total farm land are own land. CM has the highest share cropped in land followed by CBD-II; 58% in the latter and 78% in the first polders. In CBT it is only 31%. CBD-II has the highest mortgaged in land with 4.4% and CM has the lowest 0.6% of the total farmland but in CBT it is 2.9%.

Table-3.1: Distribution of farm land of the sample Extension Farmers by Tenure Pattern

Polders	Land under different tenure (%)			Total
	Own land	Share in	Mortgage in	
CM	21.8	77.6	0.6	100
CBD-II	37.8	58.2	4.4	100
CBT	66.6	30.5	2.9	100
All Polders	35.0	62.2	2.8	100

5.2.1 Rabi coverage in polders

Table-3.2 shows the average rabi acres of the sample extension farmers in different polders. It appears that the average Rabi coverage per respondent household is 2.66 acres for three polders altogether, and it is the highest in CM with 3.85 acres and the lowest in CBT with 1.04 acres. For CBD-II it is 2.82 acres[10]. It should be noted that the CBT is dominated by the lower farm size (see Table-3.11). The chilli coverage is the highest in CBD-II with an average of 0.36 acres and the lowest in CBT with and average of 0.17 acres while the average acreage of groundnut is the highest in CM with 0.27 acres per respondent household followed by CBD-II where it is 0.15 acres. It is very low in CBT where the average groundnut acreage is only 0.02 acres. The soil salinity is responsible for low coverage of groundnut in CBT. The Rabi crop cultivation is done mainly for home consumption and to meet day to day financial needs not as commercially.

Table-3.2: Average Rabi of the sample Extension Farmers

Polders	Average rabi per respondent (acres)						Total rabi
	Pulses	Chillies	Sweet potato	Oilseeds	Ground nut	Others	
CM	2.98	0.22	0.12	0.19	0.27	0.08	3.85
CBD-II	1.93	0.36	0.09	0.14	0.15	0.16	2.82
CBT	0.53	0.17	0.06	0.15	0.02	0.10	1.04
All polders	1.87	0.27	0.09	0.15	0.15	0.12	2.66

The low average of rabi crop areas in CBT compared with other two polders is due to the predominance of the small farms (Table-3.11). However the nature of the rabi crops has different dimension to mention. Though the total average crop area (both pulses and non-pulses) is almost

[10] This figure is applicable for Extension farmers who are by definition good farmers.

four times higher in CM than that of the CBT, the average of the non-pulse crops is higher less than two times. Similarly, the total average of rabi crop acreage is almost three times higher in CBD-II than that of the CBT yet the non-pulse rabi crops is higher less than two times.

The major rabi crops is the pulses (*khesari*, *mugbean* and cowpea) in all three polders as it constitutes about 70.3 percent of the total rabi acreage; 77% in CM; 69% in CBD-II 51% in CBT (Table-3.3). Though the average acreage of rabi crops in CBT is the lowest as seen above, the proportionate crop acreage of rabi crops other than pulses, i.e. chillies, sweet potato, oilseeds, and other crops is considerably high in CBT with a coverage 49% of total rabi coverage. The coverage of such non-pulse crops is 23% in CM and 31% in CBD-II.

There are reasons for such differences by polders. In CBT small farms are predominant followed by CBD-II. The small farmers maximize their land cultivation through intensive cultivation. People produce these crops mostly on the canal banks, and elevated homestead mounds. Since the small farmers have less land they improve their land by elevating land through earth filling which helps desalinisation of soil and they also employ more family labours for maximum return from their small-holdings. Moreover, MCC, an international NGO has extension work in the area for vegetable cultivation. Moreover, the production of rabi crops is mainly for home consumption, and to meet the petty cash need, not for commercial purposes. The predominance of pulses in CM and CBT is due to big farm size and sharecropping system.

Table 3.3: Distribution of Rabi coverage of the sample Extension Farmers by crops

Polders	Types of rabi crops (%)						Total rabi
	Pulse	Chillies	Sweet potato	Oilseeds	Ground nut	Others	
CM	77.3	5.6	3.2	4.9	6.9	2.0	100
CBD-II	68.5	12.6	3.3	4.9	5.2	5.7	100
CBT	51.6	16.4	5.6	14.8	1.5	10.1	100
All polders	70.3	10.2	3.5	5.5	5.5	4.7	100

5.2.2 Rabi coverage by tenure types

A little bit more than 57 percent of the total net-cropped area of the all sample extension farmers comes under rabi coverage. Table-3.4 shows the coverage of rabi crops is the highest in CM with 62.4 percent and the lowest in CBT with 47 percent.

Table-3.4: Rabi Coverage of the sample Extension Farmers by tenure types

Tenure pattern	Polders			
	CM	CBD-II	CBT	All
Own land	65.7	56.6	58.2	59.0
Sharecropped in land	61.9	57.0	28.9	57.4
Mortgaged in land	7.5	43.6	0.0	35.8
Total	62.4	56.0	46.7	57.4

However, there are differences in rabi coverage by tenure pattern; higher in own land and lower in share cropped in land except in CBD-II where it is slightly higher in share cropped in land (57%) compared with own land (56%). Both CM and CBT have higher rabi coverage for own land than the sharecropped in land, but rabi coverage for own land in CBT is very high; 58% for own land and 29% for share cropped in land as against the respective figures of 66% and 62% in CM and in CBD-II both being almost 56%.

However, the differences in terms of total rabi coverage disguise the influences of tenure on rabi crop coverage. The coverage of pulses constitutes the considerably higher segment (48%) of rabi coverage for sharecropped in land. For own land pulses constitutes 29% of total own rabi crop coverage. This means that 30% of the total own rabi acreages cover chillies, sweet potato, oilseeds, groundnut and other more valued crops for rabi while a somewhat more than 9% of the sharecropped in land cover the rabi crops other than pulses (Table-3.5).

Table-3.5: Rabi Coverage of the sample Extension Farmers by crops and tenure types

Tenure pattern	Crop types in percent						Total
	Pulse	Chillies	Sweet potato	Oilseeds	Groundnut	Others	
Own land	29.0	10.8	3.5	4.9	5.2	5.6	59.0
Share cropped land	48.0	3.0	1.0	2.6	1.6	1.1	57.4
Mortgaged in land	11.5	7.1	3.8	0.0	11.5	1.9	35.8
Total	40.3	5.8	2.0	3.4	3.2	2.7	57.4

5.2.2.1 Pulses: A major rabi crops

Among pulses *mugbean* constitutes the highest portion of the pulses areas with 28.1% of the total rabi areas as against 8.7% Kheasri areas. Khesari is more risky crops than other two types of pulses i.e. *mugbean* and felon. *Felon* (cowpea) covers a small segment of the 3.5% of the total rabi crops areas (Table-3.6).

Table-3.6: Different types of pulse and tenure pattern

Tenure pattern	Pulses (%)			
	mugbean	*felon*	*khesari*	Total
Own land	13.3	4.9	10.8	29.0
Share cropped in land	37.7	2.6	7.6	48.0
Mortgaged in land	0.0	3.8	7.7	11.5
Total	28.1	3.5	8.7	40.3

5.3 Aus coverage by tenure pattern

Table-3.7 shows the Aus coverage with respect to total net-cropped area. About 27% of the total net cropped area comes Aus cultivation in three polders altogether. But it is very high for CBT where about 72% of the total net-cropped area comes under Aus cultivation, and it is the lowest in CM as in this polder only about 7% of the total net cropped areas comes under Aus. The Aus coverage is moderate in CBD-II with 31% of the total net-cropped areas. It is very low in CM with only 7%.

There is also significant difference in Aus coverage by tenure pattern as 50% of the total own land has Aus rice coverage as against 13% of the share cropped in land in all three polders. Except CBT, the pattern of difference is almost the same in other two polders; in CBD-II it is 53% for own land and 17% for the share cropped in land and in CM it is 25% for own land and 2% for share cropped in land. On the other hand, in CBT 70.2% of the own land and 72.4% of the total sharecropped in land comes under Aus. It should be noted that the proportionate share of the share cropped in land is very high for CM (77%) followed by CBD-II (58%) and comparatively very low for CBT with 34% of the total farmland.

Table-3.7: Aus coverage of the sample Extension Farmers by tenure types

Tenure types	% Total Aus			
	CM	CBD-II	CBT	All polders
Own land	25.0	52.5	70.2	50.0
Share cropped in land	1.5	16.6	72.4	12.8
Mortgage in land	0.0	42.7	100.0	46.0
Total	6.6	31.2	71.7	26.7

Fig-1 shows the relationship between the prevalence rate of sharecropping and the Aus coverage. It appears that where is more sharecropping there prevails less Aus coverage.

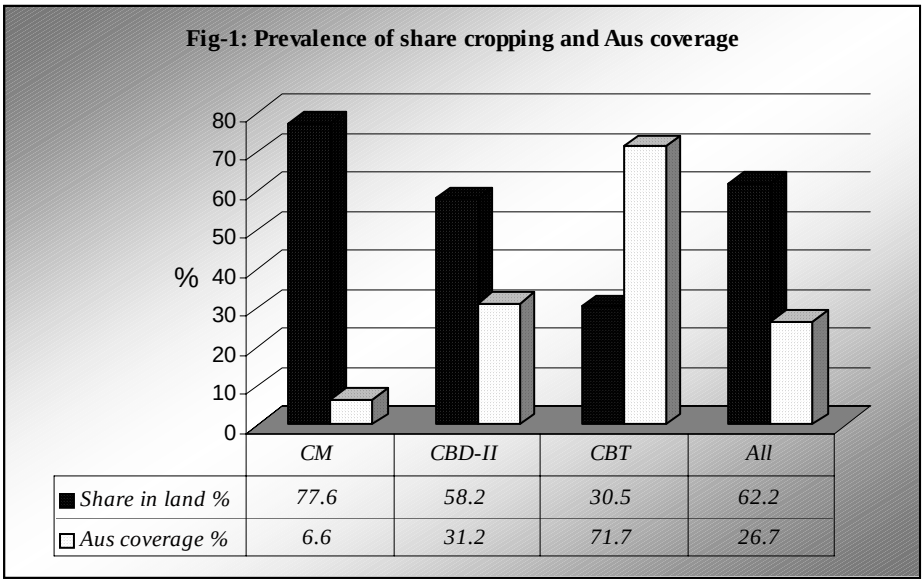


Table-3.8: LV Aus coverage of the Sample Extension Farmers by tenure types

Tenure pattern	LV Aus coverage in percent			All polders
	CM	CBD-II	CBT	
Own land	8.1	41.7	28.8	31.3
Share cropped in land	0.8	11.6	35.4	8.0
Mortgage in land	0.0	40.3	0.0	32.6
Total	2.4	24.1	30.0	16.8

*with respect to net cropped area

In CBT and CBD-II the coverage of local varieties (LV) of Aus is higher than that of CM where it is very low as in Table-3.8 presented above.

5.3.1 Reasons for low Aus coverage

Again the predominance of the small farmers in CBT is one of the major reasons for cultivating more Aus both for own and share cropped in land. Other reasons are soil conditions i.e. soil salinity, land elevation, extension services, etc. As said earlier that the rabi coverage is low in CBT compared with other two polders, farmers here compensate the rabi acreage by cultivating more Aus crops. In Char Majid cattle grazing, is also a limiting factor for Aus coverage extension.

The major reason for Aus cultivation is to meet food deficit during the lean period. The small farmers have more food deficit and they cultivate relatively more Aus. Moreover, they can use their imputed family labour in Aus cultivation while the large farmers need more hired labour to increase their Aus coverage. However, the labour selling and buying status does not corroborate it.

5.4 HYV Aus coverage

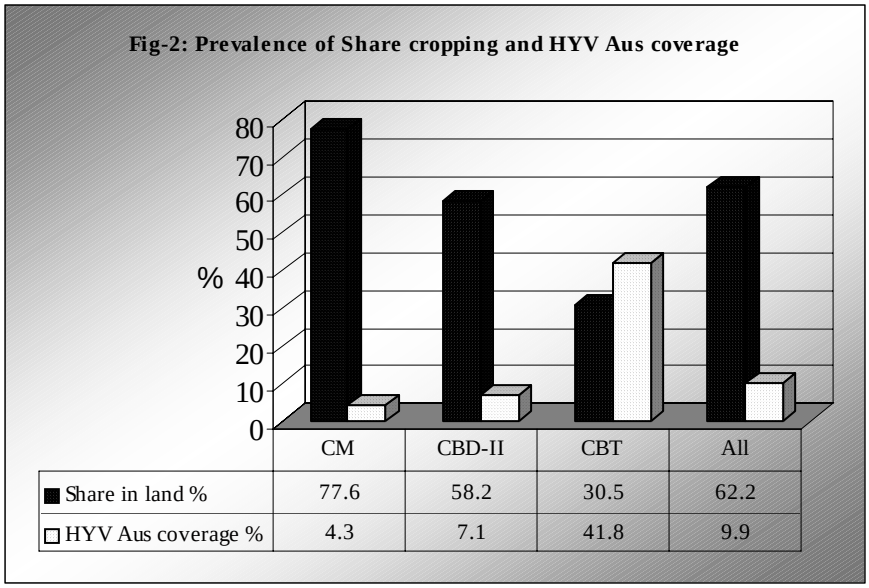
Table-3.9 shows the HYV Aus coverage by tenure pattern in three study polders. It shows that the HYV Aus coverage constitutes about 10% of the total net cropped areas, and it is 41.8% in CBT, the highest, and 4.3% in CM, the lowest, and in CBD-II it is only .9%. However, the rate of adoption in terms of acceptors is higher than this as it is seen in Table 2.13 that about 48% of the total respondents have reported about their adoption of HYV Aus.

From tenurial's point of view it appears that the HYV Aus coverage of own land constitute about 18.7% of the total own net cropped areas as against 4.8% of the total net cropped land under share cropped in land. Again, the HYV Aus coverage for both own land and share cropped in land with respect to total net cropped areas under respective tenure pattern is very high for CBT with 41.4% for own land and 37% for the share cropped in land compared with CM and CBD-II where these figures are 16.9% and 0.8% respectively in the first polder and 10.8% and 5.0% in the second polder (CBD-II). It is to be noted that the share of the share cropping in land in total farmland is higher in CM (77.6%) followed by CBD-II (58%) and lowest in CBT (31%). This means that the sharecropping has a negative impact on HYV adoption in Aus cultivation. See Fig-2 for details.

Table-3.9: HYV Aus coverage of the sample Extension Farmers by tenure pattern

Tenure types	HYV Aus coverage (%)			
	CM	CBD-II	CBT	All polders
Own land	16.9	10.8	41.4	18.7
Share cropped in land	0.8	5.0	37.0	4.8
Mortgage in land	0.0	2.4	100.0	13.4
Total	4.3	7.1	41.8	9.9

*with respect to net cropped area



Comparison between Table 3.8 and Table-3.9 shows that the coverage of HYV Aus is greater than that of the LV Aus in CM and CBT but not in CBD-II where the local variety is higher than that of the HYV coverage.

5.5. HYV Aman coverage by tenure types

A little more than 20% of the total aman areas come under HYV Aman in three polders altogether and like HYV Aus coverage, HYV Aman coverage is highest in CBT compared with other two polders (Table-3.10). In CBT it is about 30% followed by CBD-II with 23%. In CM it is less than half of the CBT as it has only 13.3% of HYV coverage. A comparison with Table 2.9 or Table-2.10 shows that the adoption rate of HYV in terms of number of the adopters is higher (75%) but in terms of land it is low; only 20%.

Like any other crops there are significant differences in HYV coverage by tenure pattern in all three individual polders, hence all three polders together. Around 37% of the total own net cropped areas come under HYV Aman cultivation during *Kharif*-II as against 10.3% of the total net cropped areas under share cropped in.

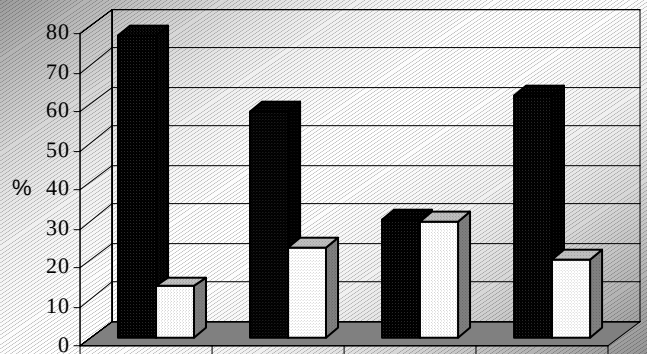
Table-3.10: HYV Aman Coverage of the sample Extension Farmers by tenure pattern

Tenure Pattern	% HYV Aman with respect to net-cropped areas			
	CM	CBD-II	CBT	All polders
Own land	31.2	39.0	38.6	37.1
Share cropped in land	8.3	12.0	12.3	10.3
Mortgage in land	25.0	40.3	0.0	37.7
Total	13.3	23.3	29.9	20.3

From individual polder's point's of view it is seen that unlike HYV Aus coverage even in CBT the difference of HYV Aman coverage between the own land and share cropped in land is very significantly high as it is 38.6% for own net-cropped areas and 12.3% for share cropped areas (Table-3.10), while during *Kharif*-I it is 41.4% and 37% respectively (see Table-3.9). It is also interesting to note that the coverage of the HYV Aman of the mortgaged in net-cropped land is higher than that of the share cropped in land, as it is 25% in CM and 40.3% in CBD-II but in CBT there is no HYV Aman on mortgaged in land.

Again it is to be noted that with about 78% of the total farm land under the share cropping pattern (Table-3.1) CM has the lowest HYV coverage of Aman with 13.3% (Table-3.10) and CBD-II with 58% share cropped in land has a coverage of 23.7% of the HYV Aman, the second highest among three polders, and CBT with about 34% of the total farm land under share cropped in land has the HYV coverage of about 28%, the highest among all three polders. Like Aus the dominance of the sharecropping system plays a negative impact on HYV adoption during the Aman season too (see Fig-3).

Fig-3: Prevalence of Share cropping and HYV Aman Coverage



	CM	CBD-II	CBT	All
Share in land %	77.6	58.2	30.5	62.2
Aman coverage %	13.3	23.3	29.9	20.3

Section 6

6. Farm size and HYV Coverage

In this section the relationship between HYV adoption and farm size has been discussed. Attempts are made to investigate the relationship between the farm size and the coverage of HYV Aman, total Aus and HYV Aus, and rabi crops and the cropping pattern and cropping intensity.

6.1 Farm size distribution

In three polders altogether 21% of the total sample extension farmers (ref. Table-4.1) are marginal farmers (0.01-1.50 acres), about 24% are small farmers (1.51-2.50 acres) and 29% area medium farmers (2.51-5.00 acres)[11]. The rest 26% of the sample farmers are large farmers. The large farmers dominate in CM and CBD-II, while in CBT such large farmers are not being selected there. The prevalence of the big farmers is relatively more in CM where they constitute about 41% of the sample farmers of the polder. In CBD-II 32.4% of the sample farmers are large farmers. In CBT the marginal and the small farmers dominate the polder with about 72% of the total sample farmers.

Table-4.1: Distribution of the sample Extension Farmers by Farm Size

Farm Size	Polders						All Polders	
	CM		CBD-II		CBT			
	number	percent	number	percent	number	percent	number	percent
0.0-1.50	5	22.7	6	15.8	6	30.0	17	21.3
1.51-2.50	1	4.5	9	23.7	9	45.0	19	23.8
2.51-5.00	7	31.8	11	28.9	5	25.0	23	28.8
5.00+	9	40.9	12	31.6		0	21	26.3
All groups	22	100	38	100	20	100	80	100.0

0.01-1.50=marginal farmers 1.51-2.50=small farmers
2.51-5.00=medium farmers 5.00+=large farmers

Table-4.2 shows that there is a positive correlation between the share cropped in land and the farm size as the proportionate share of the share cropped in land goes up as the farm size goes up. The marginal farmers have only 17.3% of their total farmland under share cropping system but the large farmers has about 73% of its farmland under share cropping arrangement.

Table-4.2: Distribution of the sample Extension Farmers by Farm Size

Farm Size	Land under different tenure (%)			Total land
	Own land	Share cropped in	Mortgaged in	
0.01-1.50	82.7	17.3	0.0	100
1.51-2.50	69.1	28.9	2.0	100
2.51-5.00	39.3	56.2	4.6	100
5.00+	24.6	72.9	2.5	100
Total	35.0	62.2	2.8	100

[11] In sample selection no weigh was given to farm size. Sample was selected randomly from the Extension farmers of CDSP-I randomly. Moreover, many sample farmers have land outside their respective polders. Therefore, the findings do not represent the whole population of any polders.

6.2 Farm size and rabi coverage

Table-4.3 shows the average land under the rabi crops of the sample extension farmers by farm size in CDSP-I areas. It appears that the average rabi land is highest for the large farm size as expected. The average rabi crop area is lowest for the lowest farm size group. It means that there is a positive correlation between the average rabi crops areas and Farm Sizes. However, it is the pulse that makes the difference among the Farm Sizes and the gap among the farm size is relatively smaller for other valued crops such as chillies, sweet potato, groundnut, and other crops.

Table-4.3: Average Rabi crops of the sample Extension Farmers by Farm Size

Farm size (in acres)	# of farms	Crops (acres)						All crops
		pulse	chillies	S. potato	oilseeds	groundnut	others	
0.01-1.50	17	0.25	0.12	0.05	0.07	0.02	0.04	0.54
1.51-2.50	19	0.27	0.18	0.08	0.10	0.03	0.14	0.79
2.51-5.00	23	1.08	0.23	0.04	0.30	0.10	0.07	1.83
5.00+	21	5.50	0.52	0.20	0.11	0.40	0.24	6.97
Total	80	1.87	0.27	0.09	0.16	0.15	0.12	2.66

6.3 Farm size and Aus adoption

The Aus coverage of the sample extension farmers is 26.7% in CDSP-I area. It is highest for the small farm size group (1.51-2.50 acres) with about 55% of its total farmland (Table-4.4). This group has considerably higher amount of land under Aus in their share cropped in land (37.7%) compared with other groups varying from 8.2% for the large farm size group and 23.5% for the medium farm size group. The marginal group (0.01-0.50 acres) has about 39% Aus coverage of its total farmlands and it is the second highest coverage among all groups. The large farm size groups has the lowest us coverage (19%).

Table-4.4: Aus Coverage of the sample Extension Farmers by Farm Size

Farm size (in acres)	Land under different tenure (%)			All land
	Own	Share in	Mortgage in	
0.01-1.50	44.3	13.2	0.0	38.9
1.51-2.50	62.4	37.7	26.3	54.6
2.51-5.00	45.4	23.5	78.9	34.6
5.00+	48.0	8.2	27.2	18.5
Total	50.0	12.8	46.0	26.7

6.4 Farm size and HYV Aus adoption: Farms

In terms of number of farms there is no particular co-relationship (see Table 4.5) between the adoption rate of the HYV rice during *Kharif*-I and the farm size as the small farmers (1.51-2.50 acres) have the highest adoption rate with more than 68% and both the groups, just below it and above it, have less adoption rate; 29% for the first group and 44% for the second group. On the other hand, the large farm size group has more than 52% of adoption rate of HYV rice during *Kharif*-I and it is higher than the rate of any other farm size groups except the small farm size group as mentioned. It is to be noted that the adoption rate for the marginal farmers (0.01-1.50 acres) is the lowest.

Table-4.5: Sample Farmers and HYV Aus adoption and Farm Size

Farm size	HYV Aus adoption status				Total	
	Adopted		Non-adopted			
	number	percent	number	percent	Number	percent
0.01-1.50	5	29.4	12	70.6	17	100
1.51-2.50	13	68.4	6	31.6	19	100
2.51-5.00	10	43.5	13	56.5	23	100
5.00+	10	47.5	11	52.4	21	100
All Farms	38	47.5	42	52.5	80	100

6.5 Farm size and HYV Aus adoption: Land

From the transacted land's point's of view it is seen that about 10% of the total net cropped areas come under HYV Aus cultivation during the *Kharif*-I season as against 19% of total owned land. It appears in Table-4.6 that the lower three farm size groups have almost similar acreage of HYV Aus ranging from 20% to 22% but the highest farm size group has only 3.5% HYV Aus coverage of their total own net cropped area. But there are differences of HYV Aus coverage by tenancy patterns and farm sizes without having any particular co-relationship. The marginal farm size group cultivates HYV Aus on 26.6% of their total own net- cropped area, but no HYV Aus on their share cropped in land. The small farm (1.51-2.50 acres) group has about 25% of their total own net-cropped area under HYV Aus cultivation as against 11% of HYV Aus of their total net share cropped in areas. The medium farm size group (2.50-5.00 acres) has 29% Aus HYV coverage of their total own net-cropped areas as against 16% of HYV Aus coverage of their total net share cropped in land. On the other hand, the large farm size group (5.00+ acres) have only about 9% of their own total net cropped area as against 1.6% of the share net-cropped areas.

Table-4.6: HYV Aus Coverage of the sample Extension Farmers by Farm Size

Farm size (acres)	HYV Aus on land under different tenure (%)			All land
	Own land	Share cropped in	Mortgaged in	
0.01-1.50	26.6	0.0	0.0	22.0
1.51-2.50	24.8	10.7	26.3	20.0
2.51-5.00	28.5	15.6	31.6	21.0
5.00+	9.8	1.6	0.0	3.5
All Groups	18.7	4.8	13.4	9.9

6.6 Farm size and HYV Aman adoption: Farms

Table-4.7 shows the adoption rate of HYV Aman rice by Farm size groups. It appears that there is a positive correlation between the farm size and adoption of HYV rice adoption.

6.7 Farm size and HYV Aman adoption: Land

Except small farm size group (1.51-2.50 acres) there is a negative co-relationship between farm size and HYV adoption during the Kharif-II season as seen in Table-4.8. The marginal farm size group has about 24% of HYV Aman coverage and the medium farm size group has 23% of HYV Aman coverage. It goes further with the large farm size group (5.00+ acres) with 18%. The exceptional group, small farm size group, has coverage of about 29%.

Table-4.7: Sample Extension Farmers and HYV Aman adoption status by Farm Size

Farm size groups (acres)[12]	HYV Aman cultivation status				Total	
	Adopted		Not adopted			
	number	percent	number	percent	Number	percent
0.01-1.50	9	52.9	8	47.1	17	100
1.51-2.50	16	84.2	3	15.8	19	100
2.51-5.00	14	60.9	9	39.1	23	100
5.00+	21	100.0			21	100
All Farms	60	75.0	22	25.0	80	100

Source: Survey on HYV Technology Adoption by Extension Farmers of CDSP-I, 2003

From tenure's point of view the large farm size group has the highest HYV Aman coverage (42%) of their total own net-cropped areas followed by the small farm size group with 41%. The marginal farm size group has the lowest HYV Aman coverage on their own land compared with other farm size groups as they have only 26% of their total own net cropped area with HYV Aman coverage. Again for share cropped in land, the lowest two farm size groups do not have any HYV coverage on their share cropped in land. The medium farm size group (2.51-5.00 acres) have about 16% HYV Aman coverage on their net share cropped in land but falls down to about 10% with the large farm size groups.

Table-4.8: HYV Aman coverage of the sample Extension Farmers by Farm Size

Farm size (acres)	HYV Aman on land under different tenure (%)			All land
	Own land	Share cropped in	Mortgaged in	
0.01-1.50	26.3	0.0	0.0	23.9
1.51-2.50	40.9	0.0	0.0	28.5
2.51-5.00	29.1	15.5	69.0	22.8
5.00+	42.1	9.6	27.2	17.9
All Groups	37.1	10.3	37.7	20.3

6.8 Proportion of farmland and proportion of land under different crops

Both Table-4.9 and Fig-4 show that though the total land under marginal farm group constitutes 4.2% of the total farmland in the study areas yet they have 9.4% of total HYV Aus coverage that is more than double of its share of the total farmland. Similarly, the HYV Aus coverage of the small and the medium farm groups are more than double than that of their respective shares of the total farmland. On the other hand, the share of the HYV Aus coverage of the large farm group is less than one-third of the total coverage though they have three-fifths of share of the total farmland.

But things are different for HYV Aman coverage as the share of the HYV Aman coverage of the large farm is more than half of the total HYV Aman coverage which is close to its total share of farmland. For other groups, it is also close to their respective shares of the total farmland (see Annex-1). The major factor behind the cultivation of Aus is the home consumption and to meet the food deficit the large farmers need less Aus vis-à-vis HYV Aus cultivation.

[12] 2.47 acres is equivalent to 1 hectare.

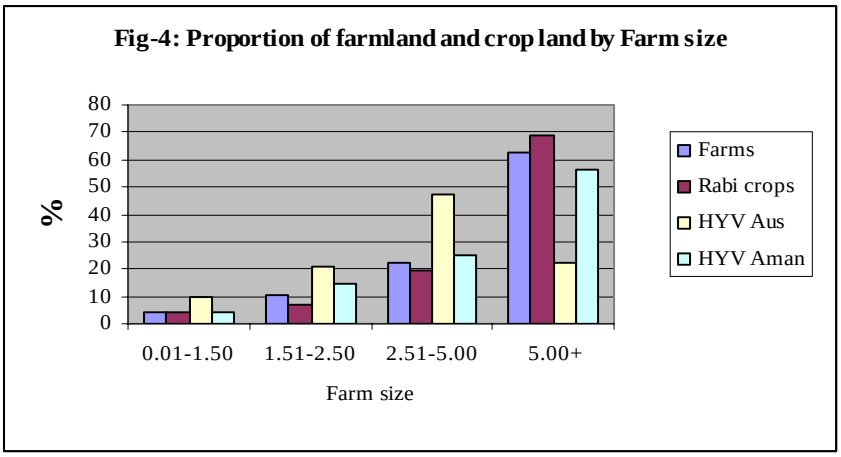


Table-4.9: Proportion of farmland and crop land of the sample Extension Farmers by Farm Size

Farm Size (acres)	Proportion of land (%) under			
	Farms	Rabi crops	HYV Aus	HYV Aman
0.01-1.50	4.2	4.3	9.4	4.1
1.51-2.50	10.5	7.1	21.1	14.4
2.51-5.00	22.4	19.8	47.3	24.9
5.00+	62.9	68.8	22.2	56.6
All groups	100	100	100	100

6.9 Agricultural land utilisation and cropping pattern

6.9.1 Agricultural land utilisation pattern

Triple crops area is the highest in CBT with 34.4% and the lowest in CM with 6%. Double crops area is the highest in CM with about 56.6% but CBD-II and CBT have almost similar areas under double crops; 39.4% and 42.2% respectively (see Table-4.10).

Table-4.10: Land utilisation pattern of the sample Extension Farmers

Land utilisation pattern	Land utilisation (%)			All polders
	CM	CBD-II	CBT	
Single crop	37.3	37.3	23.4	35.7
Double crops	56.6	39.4	42.2	46.0
Triple crops	6.0	23.3	34.4	18.2
All crops	100	100	100	100.0

6.9.2 Agricultural land utilisation and farm size

Table-4.11 shows the agricultural land utilisation pattern by farm size. The small farmer group has more triple cropland with 24% of its total farmland followed by the medium farm size that has 21% triple cropland of its total farmland. The large farm size groups has the lowest triple crop land with 16% of its total farm land and the marginal farm size group has about 17% triple cropland of its total farmland.

Though the marginal and the large farm size groups have less triple cropped land compared with small and medium farm size groups they have more land of double cropland. Table-4.9 also shows

that about 49% of the total farmland of the large farm size group is double cropland and it is 47% for the marginal farm size group. For small and medium farm size groups the corresponding figures are 43% and 39%.

Table-4.11: Land utilisation pattern of the sample Extension Farmers by Farm Size

Farm size (in acres)	Land utilisation pattern (%)			All Polders
	Single	Double	Triple	
0.01-1.50	36.6	46.7	16.8	100
1.51-2.50	33.0	42.9	24.1	100
2.51-5.00	39.3	39.4	21.3	100
5.00+	34.9	48.9	16.2	100
All	35.7	46.0	18.2	100

6.9.3 Cropping pattern

Table-4.12 shows the cropping pattern in terms of crop sequence in the polders of CDSP-I. It is appeared that double crops with Aman and Aus combination is very high in CBT (33.3%) compared with other two polders, 1.3% in CM and 7.5% in CBD-II. Similarly, triple crops with the combination of aman followed by aus follwed by rabi is about 6 times high in CBT than CM and more than double than CBD-II which has about 4 times high than CM. On the other hand, the combination of rabi and aman is very high in CM compared with CBT. It is about 8 times high in CM than CBT. This combination is also high for CBD-II though not as much as it is in CM. It also appears that rice cultivation dominates the cropping pattern of CBT while rabi is more dominant in CM followed by CBD-II.

It was shown in Table-3.4 that CBT has the lowest rabi coverage (47%) and CM has the highest rabi crop coverage (62%). The farmers in CBT, therefore, produce more Aus to compensate rabi coverage. CBT has less land suitable for rabi cultivation mostly for soil salinity. Compared with other two polders CBT has more newly alluvial land, its whole area surfaced from the seas about 30 years back. On the other hand, both CM and CBD-II have more old land than their new landmass.

Table-4.12: Cropping pattern of the sample Extension Farmers

Cropping pattern	Figure in percent			All polders
	Polders			
	CM	CBD-II	CBT	
Rabi only	1.1	0.6	7.0	1.5
Rabi+aus	0.0	0.3	1.6	0.3
Rabi+aus+aman	6.0	23.3	34.4	18.2
Rabi+Aman	55.3	31.7	7.3	37.6
Aus only	0.0	0.2	3.6	0.5
Aus+aman	1.3	7.5	33.3	8.1
Aman only	36.2	36.5	12.7	33.7
All crops	100	100	100	100

6.10.1 Cropping intensity : general

Among three polders, CBT has the highest cropping intensity with 205% (Table-4.13). It should be noted that small farmers are more dominant in CBT and the lowest cropping intensity is in CM (168%) where sharecropping is highest compared with other two polders.

Table-4.13: Cropping Intensity of the sample Extension Farmers

Polders	Crop areas under (%)			Cropping Intensity
	Aman	Aus	Rabi	
CM	99	7	62	168
CBD-II	99	31	56	186
CBT	87	72	47	205
All polders	97	27	57	182

Note: Figures have been made round

6.10.2 Cropping intensity and Farm Size

Cropping intensity is 182% for all farm size groups altogether and it is highest for the small farm size group (1.51-2.50 acres) with 188% (ref: Table-4.14) followed by the medium farm size group (2.51-5.00 acres) with 182%. The lowest cropping intensity is for the marginal farm size groups (0.01-1.50 acres), which has 179% cropping intensity.

Table-4.14: Cropping Intensity of the sample Extension Farmers by Farm Size

Farm size	Crop areas under (%)			Cropping Intensity
	Aman	Aus	Rabi	
0.01-1.50	81	39	59	179
1.51-2.50	95	55	39	188
2.51-5.00	96	35	51	182
5.00+	99	18	63	181
All groups	97	27	57	182

Note: Figures have been made rounded.

Section 7

7. Rainfall, Soil Salinity and Land Elevation

7.1 Rainfall : crop acreage and crop selection

Most of the rainfall in the polder areas occurs during monsoon (June September) with a peak in July (Ref: TR-5, Vol. I. pp 5, CDSP-II). The pattern of rainfall distribution largely determines the cropping seasons. Though the probability of optimum rainfall for Rabi crops (31-50 mm) is not as much problematic as the excessive soil moisture, which makes the establishment of rabi crops often difficult. On the other hand, low probability (0.1-0.14) of optimum rainfall delays sowing of the Aus and other *Kharif*-I crops and high rainfall (>50 mm) starts within a few days, which often damages standing *Kharif*-I crops though it is generally good for the *Kharif*-II crops (ibid).

7.1.1 Rainfall and drainage

Dr. Sheikh A. Sattar observes for CDSP-II areas that during the monsoon the canals in and around some of the project sites usually remain filled up with rain water that cannot recede because of raised water level in the nearby larger water bodies together with very low or negative seepage and percolation rate due to elevated ground. This prolongs the duration of water stagnation that makes introduction of high yielding varieties of Aman rice difficult (ibid). This also holds good for CDSP-I areas, except CBT where the drainage system is better than other two polders (CM and CBD-II).

7.1.2 Land elevation and HYV rice cultivation

Land elevation is an important factor for crop choice both for within the season and over the season. It has been stated by the farmers that medium and high land is more suitable for high yielding varieties in *Kharif*-II season. The stems of the HYV rice, being relatively shorter, get inundated when water level goes up due to incessant rainfall. On the other hand, the stems of the local varieties being relatively taller can survive relatively more water depth.

The study sought people perception about their land elevation. As it was a subjective judgement the study had limitation to have a clear picture about the land elevation. However, it appears that well drained low land can have high yielding varieties while poor drained high land cannot have high yielding varieties. The land near the canals has well drainage and people grow high yielding rice there during the *Kharif*-II. Too high land is also unsuitable for high yielding rice during the *Kharif*-II for two reasons. First, it cannot retain water and it has capillary effect if there is long spell of drought during the post-monsoon.

It appears from Table-5.1 that only 20% of the total land of the sample farmers is high land and another 15% of it is low. People believe that low land have less prospects for HYV rice cultivation. The share of low elevated land is high in CM (18%) and in CBT there is no such low land. On the other hand, CBT has the highest high land as about 54% of its total land is high land. It should be noted that the HYV coverage is also higher in CBT.

Table-5.2 shows that the proportion of HYV Aman rice cultivation is higher for high land (33%) followed by medium land of which 18% comes under HYV Aman rice cultivation. From individual polder's point of view CBD-II has very meagre high land, hence less potentials for HYV Aman rice cultivation. In fact CBD-II has less high land because of water congestion caused by the encroachment of the Baggar Dona River by the fish projects and other blockage over it, the main drainage channel of the CBD-II and its upstream areas.

Table-5.1: Distribution of land of the sample Extension Farmers by land types

Land types	Land (%)			All polders
	Polders			
	CM	CBD-II	CBT	
High	28.4	7.5	54.1	19.9
Medium	53.6	76.3	45.9	64.8
Low	18.1	16.2	0.0	15.3
Total	100	100	100	100

Note: Calculation has been made based on land for which information on land elevation was available. Information on some of the plots were not available.

High land=0-8 inch medium land=9-24 inches low land=more than 24 inch.

Table-5.2 : Proportion of land under HYV Aman rice by land types

Land types	Proportion (%)			All polders
	Polders			
	CM	CBD-II	CBT	
High land	17.7	66.5	39.3	33.2
Medium Land	11.3	21.8	18.9	18.4
Low land	12.4	10.8	N/A	11.5
Total	13.3	23.4	29.9	20.3

Table-5.3 shows the relationship between land types and different crop coverage. It appears that proportionately high land comes under Aus, HYV Aus and non-pulse crops (chillies, groundnut, sweet potato, etc.) more and the low land comes less.

Table-5.3: Proportion of different land by types and crops of the sample Extension Farmers

Land types	Crop types (%)			
	Aus		Rabi	
	Total	HYV	Pulse	Non-pulse
High land	41.9	18.5	29.9	27.7
Medium land	27.0	8.8	44.8	16.4
Low land	10.5	5.4	41.7	9.0
Total	27.4	10.2	41.4	17.5

7.2 Soil salinity

The salinity level goes below 4 dS/m in the whole coastal region of Noakhali during monsoon and so Aman rice is grown successfully (Mutsaers et al, 2000). However, Aman rice may suffer from soil salinity in case of prolonged drought during tillering and/or establishment phase of growth. In order to avoid crop damage due to rise of soil salinity during grain filling stage, a relatively shorter duration cultivation of Aman rice should be sample (CDSP-II; Technical Report; No. 5).

The grain yields of some BRdhan21 and *Hashikolma* in Aus, and BRRI Dhan31 and *Kajalshail* in Aman season decrease linearly with the increase of soil salinity. It also observes that that the rates of decline in yield of HYVs are higher than those of the local varieties because of the latter's adaptation in the region through the long term process of natural acclimatisation. Often the Aman rice crop suffers from drought during either tillering or ripening stage reducing yield to great extent; modern varieties suffer more than local varieties (ibid).

The yield of the groundnut has a very week relationship with soil salinity indicating its adaptation to a wide range of soil salinity levels. The area remains too wet condition during the transition period of Kharif-II and Rabi season. This happens particularly after heavy rainfall in the late monsoon season, making it difficult to plant Rabi crops in most areas or delaying sowing of seeds (ibid).

Organic matter (OM) content of soils of the Noakhali chars is low ranging from about 0.86 to 2.44% in the top and 0.93 to 2.02% in the subsoil. Coastal soils formed upon deposition of silt and clay undergoes gradual development through the addition of organic matter (ibid) but such addition is very meagre for various reasons. This means that the yield of the high yielding varieties is relatively low compared with other parts of Bangladesh, especially with non-coastal char areas, so the relative return per unit is lower for high yielding varieties. All these make the char people relatively less responsive to high yielding varieties compared with their counterpart compradors from non-coastal chars. But, the traditional varieties do not have such comparative disadvantages because of its adaptation in the region through the long-term process of natural acclimatisation.

Table-5.4: Distribution of Land of the Sample Extension Farmers by soil salinity

	Land in percent			
	Polders			
Salinity Level	CM	CBD-II	CBT	All polders
Saline free	42.6	52.0	42.9	47.6
Mild saline	49.6	37.5	40.7	42.3
Strong saline	7.8	10.5	16.4	10.1
Total	100	100	100	100

Note: Calculation has been made based on land for which information on salinity was available.

Table-5.4 as above shows that more than half of the total land has salinity problems varying from strong to mild levels though level is the perception of the respondents not tested in laboratory. This means that people do not dare to take risk of cultivating HYV Aman rice fearing capillary rise of saline at tillering stage.

7.3 Land suitability for HYV Aman : Farmers' perception

The study has asked the sample extension farmers about the suitability of their land for HYV Aman and HYV Aus cultivation and if suitable land whether they cultivate HYV rice and if not why and non-suitable, the reasons of non-suitability. Table 5.5 presents the findings on suitability of land for HYV Aman rice. It appears from the table that about 73% of the total net-cropped areas are suitable for HYV Aman cultivation. CBT has more suitable land for HYV Aman cultivation with 87.8% and CM has the lowest with 67.2% of its total net-cropped areas. CBD-II has 73.5% suitable land. Table- 5.6 shows the reason for non-suitability of land for HYV Aman cultivation. Water-logging is the major problem in CBD-II while poor drainage and soil salinity are two major problems in CM and soil salinity is the major reason in CBT. CBD-II has severe water congestion as said earlier in CM there are some pockets with water logging.

Table-5.5: Distribution of net-cropped land of the sample Extension Farmers by suitability for HYV Aman

Polders	Land Suitability status (%)		Total land
	Suitable	Not suitable	
CM	67.2	32.5	100
CBD-II	73.5	26.2	100
CBT	87.8	12.0	100
All polders	72.7	27.0	100

Table-5.6: Distribution of non-suitable land of the sample Extension Farmers by reasons

Reasons for non-suitability	Land in percent			All polders
	Polders			
	CM	CBD-II	CBT	
Water-logging	0.3	64.6	21.3	33.7
Poor drainage	44.9	7.9	0.0	23.7
Soil saline	54.7	21.1	75.0	39.2
Others	0.1	6.5	3.3	3.5
Total	100	100	100	100

7.4 Cultivation of HYV Aman on suitable land

Though suitable land for HYV Aman cultivation is considerably high in all polders yet less than one-third of the suitable land comes under the cultivation. In CM it is only one-sixth of total land and both in CBD-II and CBT it is about one-third. The major reasons as the sample extension farmers have said are the share cropping system with no production cost sharing, high production cost, lack of capital and shortage of labour and other relay crops, lack of inputs, especially seeds for HYV rice, lack of knowledge on HYV crop management practice, limited number of available HYV, lack of knowledge on suitability of variety for a particular type of soil and flood depth, etc. Moreover, many of the respondents have expressed their reluctance to adopting new kinds of varieties without care and observation. The production environment is not yet conducive because massive HYV Aman cultivation has not yet been started.

Table-5.7: Distribution of suitable land for Aman HYV of the sample Extension Farmers by cultivation status

Polders	Cultivation status (%)		Total land
	Cultivated	Not cultivated	
CM	17.0	83.0	100
CBD-II	33.8	65.9	100
CBT	32.7	68.5	100
All polders	27.9	72.0	100

7.5 Suitable land and tenure

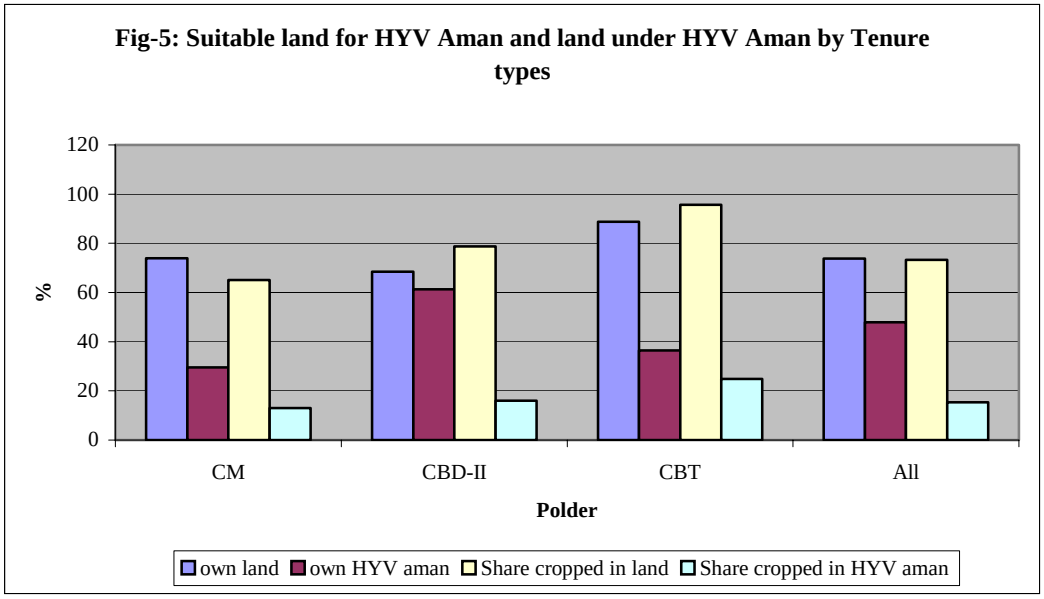
As has been said in the preceding section that there is a negative impact of sharecropping system on HYV Aman cultivation. The people's perception also collaborates such findings. Table-5.8 shows the effect of the share cropping system on the cultivation of HYV Aman rice on suitable land. In all polders altogether total suitable land for HYV Aman cultivation for own land and for sharecropped

in land are almost equal but the cultivation of HYV Aman on suitable sharecropped in land is less than one-third of the own suitable land under HYV aman. Fig-5 also shows it graphically. For individual polder the suitable share cropped in for aman HYV is higher in CBD-II and CBT but proportionate share of HYV aman for this type f land relatively low compared with own land.

Table-5.8: Distribution of suitable land of the sample Extension Farmers for HYV Aman and land under cultivation

Polders	Land suitability and cultivation status (%)			
	Suitability status		Cultivation status	
	Tenure types		Tenure types	
	Own	Sharecropped in	Own	Sharecropped in
CM	73.9	65.1	29.6	13.0
CBD-II	68.5	78.7	61.3	16.0
CBT	88.8	95.6	36.4	24.9
All polders	73.8	73.3	47.9	15.3

Note: Mortgage land has not been included



Section 8

8. General Comments on Crop Choices and Crop Decision

This section present some of the general comments gathered from the fields through interview with different categories of people including the respondents. Some of them may not be technically valid yet the local people believe those and those beliefs are the stumbling block towards the adoption of the HYV rice, particularly HYV Aman rice.

8.1 Rabi crops

Rabi crops are both labour and capital intensives as well as risky crops. In a subsistence mode of production the growers consider mainly consumption, then family expenses to meet cash need more than profit maximisation i.e. commercialisation. It also provides employment opportunity for the imputed family labour. People tend to diversify the cultivation of Rabi crops with a view of not only consumption but also to avoid risk of mono crop cultivation. It provides opportunity for making time budget of the family members, to reduce the dependency on the hired labour, opportunity for good labour management and supervision of the hired labour, if hire any. As different crops ripe at different times the harvesting and post-harvesting works are done one after another more easily, otherwise it would have been a problem.

Excessive soil moisture and soil salinity are two limiting factors for the Rabi cultivation especially in CM and CBT. Water congestion especially in CBD-II makes the cultivation of Rabi crops delayed and hence makes yield low.

A limiting factor for Rabi cultivation is the lack of labour, particularly woman labour for harvesting and post-harvesting activities and over-lapping of other agricultural activities with Rabi harvesting. For example, during the groundnut harvesting the transplantation of Aus goes on. People hire labour for Aus cultivation and women cook foods for the labour. These two activities together make household works difficult for the women. Lack of space in the courtyards for drying and other post-harvest works also fix the limits of the cultivation of Rabi crops of a family. The farmers grow more pulses on share cropped d in land while they produce more valued crops, such as chillies, groundnut, etc on own land.

8.1.1 Groundnut

Groundnut is a cash crop that people grow for cash that they use for the following cultivation, i.e. for labour wage, tilling cost and fertiliser. Since the cultivation of groundnut is both capital and labour intensives compared with some their crops (*mugbean*, pulses, etc.) its acreage is limited by these two factors. Though the net return from ground is higher than some other Rabi crops yet its acreage is gradually decrease because, as said earlier (section 7.4.1), of excessive rains during the harvesting period and lack of space for drying. Foxes and other factors have been mentioned earlier. In CM people are growing *mugbean* with the decreasing tendency of groundnut cultivation.

8.1.2 Sweet potato

It is a staple food and people grow it mainly for consumption during the food deficit period in the month of April when the locality suffers from food crisis. However, it also helps them for meeting cash need during this period. Besides, lack of capital and labour, soil condition also limits its acreage. This means that suitable sandy soils are not available in plenty for cultivating sweet potato.

8.1.3 *Khesari* cultivation

Khesari is a risky crop on too low land because if there is any rainfall in *Magh* (January-February) there creates water congestion the *khesari* gets damaged. On the other hand, high land is not good for *khesari* because, as people say, it has a saline tendency and capillary effect damages the crops. During Aman season people grow *Rajashail,* more saline tolerant, on the high land. However, nowadays, people grow soybean, more soil tolerant crop, on such land.

8.1.4 *Mugbean* cultivation

Mugbeans need tilling twice but many of the growers do not have draft power. They have to buy draft power at a cost of Taka 1100 for one *kani* (1.20 acrs). The price of seeds per kg is Taka 30. Many farmers keep their own seeds for *mugbeans* but later they consume it being compelled by food deficit.

Khaeasri is more profitable than *mugbeans* as the latter need more labour for harvesting, at least two harvests while *khesari* need one harvest. In the locality women and children do *the mugbean* harvesting and the supply of both is limited.

8.1.5 Newly emergent Rabi crops: soybean and wheat

In recent time, soybean has become a popular crop. People are also doing trail on whet cultivation being influenced by the extension agency. Some of the sample extension farmers in CBD-II have bad experience with wheat cultivation while others have good profit with soybean cultivation.

8.2 Aus cultivation

8.2.1 Aus a subsidiary production

Like any other parts of Bangladesh Aus is a subsidiary production in the study areas and it is very much application for the sample farmers, the respondents of the study, because they are mostly the small farmers. The major factor behind the production of Aus is to meet the food deficit as the Aman production, the major staple of the area, cannot meet the food demand of a family for the whole year. The Aus production also provides some cash money to meet the petty expenses and to pay wage bill for the labour used for Aman cultivation and for other Aman inputs.

8.2.2 Aus and soil salinity an drought

Aus is a risky crop. Soil salinity has made the Aus cultivation more risky in the study areas. In the study areas rainfalls short of crop water requirement in *Kharif*-I season till the second decade of May. As a result, dibbling seeds of Aus rice underneath is a common practice in the areas. It is done to avail the residual soil moisture for the germination of seeds. But water stress suffered by the crop during the early growth stage brings down their yield level. Like elsewhere in Bangladesh, lowering of solar radiation through cloud cover during reproductive stage of the crop also contribute to low yield level of Aus rice (TR-21, CDSP-I). The soil salinity due to capillary effect makes Aus more vulnerable to long spell of non-rain situation (draught).

8.2.3 Limiting factor for Aus cultivation

Other limiting factors for more Aus coverage are the carrying hazard for harvested rice from the fields ((harvesting is done in the monsoon and harvested crops is being carried mostly on the shoulder from the fields) and its related cost, pos-harvest hazard for threshing, drying and

winnowing due to lack of court-yards, incessant rain, etc. Moreover, female labour shortage for post-harvest works also limits the more Aus cultivation. Harvesting of Aus and transplantation of Aman almost overlap and at that time not only labour management becomes difficult but also it (labour) becomes scarce.

It has been observed that almost all the farmers (100%) have food deficit and they borrow money from the money-lenders/*Aratdars*[13] selling their Aman rice in advance to meet financial needs both for consumption and production cost of aman and Aus cultivation. Advance sale is a distressed sale because a borrower pays 6 maunds[14] of paddy for every one thousand Taka which means the price of every maund of paddy stands at Taka 166 far below the market price that remains at least Taka 250 (approximately). Under this circumstance, more aus cultivation means more cost, which again means more borrowing by selling more aman paddy in advance. Moreover, such borrowing is not always available.

In Char Majid two other factors limit the Aus cultivation. These are the cattle grazing and absentee landowners who cultivate their land under their own management. This type of absentee landowners prefers the cultivation of Aman rather than any other crops; Rabi or Aus. Since a large track of land remains barren during the dry season people graze cattle in the fields and the grazing cows destroy the standing crops.

8.3 Crop choices

Crop choices are determined by different factors of which risk minimisation is an important one. The agricultural production depends largely on weather, especially on the rainfall. It has been experienced by the farmers that one particular crop suits one particular rainfall. So the farmers diversify their crops so that one type of crop will grow better if another grow worse. The farmers make crop production in such a way that they can meet their food deficit as well can earn profit. In doing that they allocate a portion of land for short duration of rice for early harvesting rice. It also helps them do well labour management. Moreover, food requirement in the lean period i.e. in late November also influences the crop choices.

8.3.1 *Gigoj* rice versus HYV rice

The *Gogoj* is a traditional variety and its yield is lower than that of the HYV rice. But the price of *Gigoj* is higher (by 50 Taka per maund) than the HYV rice. It is good for puffed rice. However, the return from HYV rice is higher than that of the *Gigoj*. Still people grow *Gigoj* for two reasons: risk minimisation through crop diversification (uncertain weather), and consumption as puffed rice. Last but not least, due to higher price smaller amount of rice gives higher value than HYV and it saves the storing spaces.

8.4 HYV cultivation: homestead

People prefer HYV rice cultivation, particularly HYV Aman on the land near their homesteads to the land in the field on a ground, as they claim, quality of land near homestead is more fertile being fertilised by the household waste and other organic manure residual drained from the homesteads, and being well overseen. Moreover, near homestead *Kajalshail*, the traditional varieties get lodge being shadowed by the homestead tree coverage. It has also been observed that land near homestead is better being elevated from the field and having better drainage facilities. Generally people make their house on the high land preferably on the canal banks, which in most cases is

[13] Wholesale traders/big rice traders
[14] 1maund=37.5 kilogram

high. It should be noted that they also grow more valued Rabi crops near homesteads. Like Rabi crops they grow

8.5 Canal bank: HYV and Rabi crop cultivation

It has been observed that land near or on the bank of the canal is more suitable both for Rabi crops and HYV Aman cultivation because of well drainage linked with the nearby canal.

8.6 Limiting factor for HYV rice cultivation

8.6.1 Implication of share cropping on HYV rice expansion

Most of the landowners live outside the area, namely Maijdee (for CBD-II) and Sandwip (for CM) and they prefer traditional varieties for which they do not need to share production cost at all. Moreover, the yield level of traditional varieties is well known varying within a certain limit. The landowners can get the minimum share in any worst situation. The sharecroppers cannot misappropriate their share grossly.

On the other hand, the absentee landowners have to share the production cost of the HYV rice. As the absentee landowners cannot supervise and monitor the inputs use, such as the quantity and quality of fertilizers and pesticides and the yield they are reluctant to share the production cost. The sharecroppers are not interested to grow HYV without cost sharing by the landowners. For two reasons the sharecroppers do not grow HYV rice without cost sharing. First the marginal return without cost sharing is not attractive. Secondly, with more fertiliser and manure use (HYV rice needs) the land quality would be improved and for the improved land there would be more competition among the sharecroppers.

It has been observed that there is a trustworthy relationship between the sharecroppers and landowners established over generations. It has been observed a sharecropper has been cultivating share cropped inland for a long period, even over generation. So, neither party is interested to disturb this relationship by introducing new production relationship being shaped by new kinds of inputs though this old relationship is changing with the emergent fierce competition for land for sharecropping leading HYV cultivation by the sharecroppers without cost sharing, as many sharecroppers grow HYV Aman without cost sharing.

8.6.2 Soil salinity and land tenure

It has been reported by many sharecroppers that soil salinity is relatively higher for sharecropped in land compared with their own land. The apparent reason is that the sharecroppers give less attention to improve their shared cropped in land compared with their own land for which they give more attention applying more fertiliser (TSP) and cow-dung. As a result, desalinisation process of the share cropped in land takes place slowly than own land. It should again be noted that most of the sharecroppers have been sharecropping the same piece of land for a long period. The sharecroppers are also reluctant to improve land quality being afraid of losing land in future.

8.6.3 Flood and HYV seedling damage

The area has maximum rainfall in the month of July, and the areas, especially CBD-II, experience water congestion which causes damages to Aus crops and seedbeds. The seedlings of the high yielding varieties being relatively shorter get damaged more than the local varieties i.e. *Kajalshail*.

The knowledgeable persons have said that the more damaging effect of the flood is on the seedlings than on the already transplanted rice in the field. In post flood-situation, people cannot grow seedlings of high yielding varieties and they even do not take the risk of buying seedlings from the market places fearing the poor quality of the seedlings. They can buy seedlings of local varieties, which they know well and can ensure the quality. It has been seen that the respondents, particularly in the northern part of CBD-II hire high land for seedbeds.

8.6.4 Soil salinity within a plot and limitation of HYV cultivation

People have said that even a single plot may have sporadically located different soil level, and the cultivation of high yielding varieties on that plot is not possible. As said earlier about capillary effect[15] (section 7.2) Such sporadically located saline soil hinders the HYV Aman cultivation over the whole plot.

8.6.5 Unevenness of land plot

Some of the respondents have said that they have unevenly elevated land plots and they face difficulty to store water, necessary for high yielding varieties in those plots. They do not make any compartments based on the land elevation because it incurs more labour cost and it would increase also production costs.

8.6.6 Land development for HYV Aman Cultivation

Land development is a gradual process. It takes times for desalinisation. People newly accreted alluvial land bring under Aus cultivation before going for HYV Aman rice cultivation or Rabi. Through Aus cultivation they accelerate the desalinisation process of soil before HYV Aman cultivation. This is more applicable for CBT and for newly accreted land in CM south, southeast and southwest parts of the polder) and CBD-II (southwest part of the polder)

8.6.7 Shortage of draft animal

Lack of draft animal limits the cultivation of Rabi and HYV rice cultivation. Transplanting plan is hampered because of non-availability of draft power. They have said, ‘You cannot have a power tiller whenever you needs. So, seedlings become overgrown and it is not desired for HYV though it is a problem for local variety yet it is not as much as for HYV.

8.6.8 Lack of HYV seeds

Shortage of qualitative HYV seeds in the locality is an impediment to the expansion of the HYV rice cultivation. People avoid seeds from the market because there is no guarantee of its quality. Even the variety cannot be ensured from the market. However, nowadays, the availability of qualitative HYV seeds has increased as the production of HYV has increased. People are collecting seeds either from their HYV growing neighbours or fellow villagers or relatives.

8.6.9 Absentee landlords and HYV rice

Many absentee landlords, mainly in CM and CBD-II, cultivate their land by themselves and they concentrate only on Aman cultivation and prefer local traditional varieties. They have been found living in the area temporarily for few days for cultivating the land and come back again for harvesting.

[15] CDSP-II, Technical Report; No.6.

8.6.10 Homestead and HYV coverage and rabi cultivation

It has been observed that CBT has more HYV coverage both in Aus and Aman seasons. It has also been observed that population density is higher in CBT compared with other two polders. Even in other two areas, HYV rice cultivation and valued rabi crops concentrated in those pockets where population density is high i.e. concentration of homestead more. In fact, people make habits on the high land and it is mere a coincidence of nexus between homestead and more rabi crops.

8.7 Labour shortage: an impediment for HYV cultivation

It seems surprising that the areas, particularly CBD-II and CM have labour shortage for agricultural activities especially during both Aman sowing harvesting. About 70% of the local landless wage labourers migrate either to the brickfields (Chatkhil and Feni) or to the fishing ship/trawlers (Chittagong). The rest 30% of the total local labourers work in the locality and they work mainly on their own farms and then for other farms. The migrant labour known as *probashi,* from other areas such as South Hatiya, Boyer char and Shahbajpur of Bhola district come both in sowing and harvesting periods of Aman. They meet about 90% of the local labour demands. The farmers hire labour mostly from the local market places through haggling. They get free lodging and three free meals every day and a cash wage bill of Taka 80-100 daily. The distribution of migrant labour by areas of origin is given below:

Sources of labour for the locality (CBD-I)

Source location	District	Distance	Coverage	Remarks
Shahabajpur	Bhola		45%	Crossing the Meghna river
South Hatiya	Noakhali	30 Km.	40%	Crossing the Meghna river
Boyer char	Noakhali	20 Km.	5%	
Local			10%	

8.7.1 Labour Productivity and its effect on HYV rice expansion

A labour can harvest 8-10 decimal of land a day. It also includes the carrying times. This means that a day labourer harvest 60 kg paddy a day the value of which Taka 375 Taka (Tk. 250 per 40 kg.). As wage bill a farmer has to pay him around Taka 100 for each 60 Kg of rice and he gets Taka 275 (approximately). With such high wage rate a farmer cannot dare to invest more money in an agricultural activities because of lack of cash for labour hiring and of labour management that includes hiring, lodging, meals, etc.

8.8 CDSP-I and Extension Service

8.8.1 Too many packages

CDSP-I launched early extension programme for HYV rice and too many inputs in a package. At that time the soil salinity was high, and still soil salinity limits HYV cultivation in some pockets of CM and CBT. CDSP-I provided too many packages without considering the sensitivity of the farmers. Moreover, demonstration people had great enthusiasm for receiving other inputs such as pond excavation for fish cultivation, tube well at own homesteads. CDSP-I excavated ponds for demonstration farmers, and sunk tube wells in the project area. These two promoted their dreams of having more helps from CDSP-I and consequently they lost the spirit of extension to a substantial extension.

8.8.2 Lack of primary capital

When CDSP-I launched the extension programme, the designated extension farmers were not as much solvents financially as to expand the HYV cultivation or other extension packages. They were in dire need of primary capital for any new ventures. At that they were mere struggling for survival in a new coastal environment (new land settlement, newly empolderment, etc.), and were lacking of capital for the extension of their agricultural activities. So, they could not leap forward with the programme after the withdrawn of CDSP-I. Moreover, the farmers in CBD-II got jolted with new phenomenon of water logging after the withdrawn of the services by CDSP-I. However, farmers in CBT were making steady progressing in a favourable situation.

8.8.3 Lack of seeds for HYV rice

Even when CDSP-I was in the field many farmers lost their HYV rice seeds either because of lack of knowledge how to preserve it or consumption to meet their food deficits or due to crop failure. Though they were motivated for the high yielding varieties yet they could not continue it owing to lack of seeds. At that time in the local market there was no seeds traders nor could they collect it from the alternative sources i.e. BADC in Maijdee. Even other interested growers could not adopt HYV rice because they could not collect HYV seeds from the local mark. Later, many growers in CBT collected HYV rice seeds from their relatives living in other areas.

8.8.4 Lack of pesticides

When CDSP-I were carrying out its agricultural extension works in CDSP-I areas the private market for pesticides was very much limited and people could not control pests easily due to lack of pesticides. Since then a few people grew HYV rice on a limited scale the HYV rice were very much vulnerable to pests' attacks. The pest used to like the well grown HYV stems and leaves than traditional rice plants. So, the extension service could not get push forward with HYV rice.

8.8.5 Lack of need identification: traditional approach of extension

CDSP-I followed the traditional extension service methods of DAE. They sample some demonstration farmers and five extension farmers for each demonstration farmer. The extension services were limited with those people. Other people attended the demonstration farms on the Field Day. A dependency on the part of the farmers on CDSP-I developed rather than developing self-propelled leadership.

8.8.6 A successful endeavour: extension service of CDSP-I

Though the immediate success of the extension service of CDSP-I was not a leap forward it cut the edge of the ice and now people have shed off their shy in adopting the HYV rice and the adoption has become pervasive among almost all farmers though the coverage is still to go far. However, the lagging behind of the coverage is not only due to the weakness of the extension services rather due to other physical constraints such as soil condition, land types and functioning of the drainage system, and different hardware such availability of seeds and financial packages.

Section 9

9. Conclusion and recommendation

9.1 Socioeconomic characteristics of the sample extension farmers

Most of the sample farmers have farming as their main occupation and a good number of them have farming as secondary occupation. About 38% of the sample extension farmers have draught power of their own. About 49% of the sample extension farmers hired labour and do not sell labour. On the other hand, 3% of the sample extension farmer buy labour as well sell labour. Around 60% of the sample extension farmers earn 51 to 100% income from agricultural sector and about 58% get more than 50% employment from agriculture.

9.2 Landownership and land management

More than 51% of the sample extension farmers belong to the lowest landownership size (0.01-1.50 acres) group. Only 6% of the sample farmers belong to large landownership size group (5.00+ acres). The sample extension farmers cultivate most of their land (80%) under their own management though it lowest in CM where 35% of the agricultural land is being mortgaged out. Land mortgaged out is predominant for two top land groups.

9.3 Retention of rabi crops

Neither *hathajari* chillies nor *Kamalasundari* sweet potato has become popular. About 40% of the sample farmers cultivated groundnut and it is very high in CBD-II (50%) and low in CBT (25%). There is a negative trend of the groundnut cultivation for a number of reasons of which poor drainage is the major one. Moreover, early-rain during harvest period damaged groundnuts for sever consecutive years and it has a negative effect on groundnut cultivation.

9.4 Retention of HYV rice

The retention status of HYV rice seeds received from CDSP-I by the extension farmers is not very much encouraging as the seeds supplied by CDSP-I were not suitable for the areas. The most popular varieties were BRRI dhan22, and BRRI dhan23 not BRRI dhan30, BRRI dhan31 and BRRI dhan32 though CDSP-I distributed seeds of the latter varieties. These varieties were not compatible with local food taste.

9.5 Adoption of HYV Aman rice

Though retention of seeds for HYV rice supplied by CDSP-I was not very much encouraging yet the adoption of HYV Aman rice was very high in 2002 Kharif-II season when 75% of the sample extension farmers grew HYV Aman rice. They have adopted different types of varieties other than the varieties supplied by CDSP-I. However, in terms of acreage the adoption rate is not as high as it is for respondents (see later).

9.6 Adoption Aus and HYV Aus

Aus a risky crop due to unpredictable weather, either excessive rains or long spell draught, is produced by the growers mainly for supplementing their food deficit. The soil salinity in new landmass of the polders is another factor that hinders the acreage the production of Aus cultivation. However, the adoption of Aus is very high with 73% of the sample extension farmers producing it.

Again adoption of HYV Aus is considerably high with 48% of the sample extension farmers producing it. BRRI dhan27 and *Chandina* are most popular HYV Aus rice. *Mala* an old variety of HYV is also popular.

9.7 Other improved technologies

There is somewhat improvement in compost fertiliser preparation after the intervention of CDSP-I. Its use has also increased. However, the cultivation of *dhaincha* has not become popular.

9.8 Farmland by tenure

The sample extension farmers own only 35% of the total land under their farms. The other 65% of the farmlands are mainly sharecropped in (62%). The land under sharecropped in is distinctively high in CM (78%) and low in CBT (31%).

9.9 Rabi coverage and tenure system

The average area under rabi crops is 2.662 in three polders altogether and it is 3.85 acres in CM and 1.04 acres in CBT while it is 2.82 acres in CBD-II. The major single rabi crop is the pulse being 70.3% in three polders varying from 51.6% in CBT to 77.3% in CM. The proportion of land under rabi crops is higher for own land than share cropped in land for more valued crops like chillies, sweet potato, groundnut, oilseeds, etc. It is reverse for pulses.

9.10 Aus coverage and tenure

Due to soil salinity the coverage of Aus is in polders areas is limited and with the protection of the area its acreage is increasing. About 27% of the total net-cropped areas of the sample farmers come under Aus cultivation and it varies from polder to polder as it is very high in CBT (72%) and low in CM (7%). The Aus coverage of the sample farmers is 31% in CBD-II. The proportion of land under Aus is higher for own land compared with that of the share cropped in land as it is 50% for the first case and 13% for the second case. The same pattern is applicable even for HYV Aus adoption as it is 19% for the own land and 5% for share cropped in land.

9.11 Aman coverage and tenure

.

HYV aman coverage is modest with 20% of the total land of the sample farmers. It is highest in CBT with about 30% and lowest with 13%. The proportion of land under HYV Aman is higher for own land compared (37%) with that of the share cropped in land (20%).

9.12 Farm size and tenure

The higher is the farm size the higher is the share of the share cropped in land of the farm as the latter goes up with the increase of the farm size.

9.13 Farm size and rabi crop

The area under rabi crops is higher for the big farms and there exists a positive correlation between the farm size and the area under rabi crops. However, pulse is the more dominant crop for big farmers.

9.14 Farm size and Aus adoption

The lowest two smaller farm size groups have more Aus coverage compared with the upper farm size groups. The biggest farm size group has the lowest Aus coverage.

9.15 Farm size and HYV Aus

Only 10% of the total net-cropped areas of the sample farmers come under HYV Aus cultivation. The lowest three farm size groups have almost similar (around 20%) coverage of HYV Aus in terms of their total net-cropped areas. The upper farm size group has very insignificant coverage of HYV Aus as it brings only 3.5% of its net-cropped areas under HYV Aus.

The proportion of HYV Aus of own land is higher for all farm size groups compared with that of the share cropped in land as it is about 19% for own land as against 5% of share cropped in land altogether.

9.16 Farm size and HYV Aman adoption

The small farm size (1.51-2.50 acres) group has the highest coverage of HYV Aman adoption with 29% and the big farm size group has the lowest with 18% coverage. The other two farm size groups have more HYV coverage compared with the biggest farm size group but less coverage with the small farm size group. The upper two farm size groups have share cropped in HYV Aman land while lower two farm size groups do not have any share cropped in HYV Aman land. This means that the lower group avoid the risk of HYV Aman Cultivation on share cropped in land.

9.17 Agricultural land utilisation pattern

Only 18% of the total net-cropped areas of the sample extension farmers are tripled crops, 46% of the land are double cropped and the other 36% areas are single cropped areas. CBT, where small farmers are predominant among the sample extension farmers, has more both triple and doubled cropped areas.

The small (1.51-2.50 acres) and the medium (2.51-5.00 acres) farm size groups have more tripled crops areas compared with the lowest and biggest two farm size groups.

9.18 Cropping pattern and intensity

Cropping intensity of all sample farmers is 182% and it is 205% for the sample farmers of CBT and 168% for the sample farmers of CM. Cropping intensity is highest for the small farm size group (1.51-2.50 acres) and lowest for the marginal farm size groups (0.01-1.50 acres).

9.19 Drainage and land elevation and soil salinity

Drainage and land elevation are interlinked. Generally lowly elevated land has more drainage congestion and it is less suitable for HYV rice cultivation. A big chunk of land of the sample farmers is lowly elevated land. The high and medium high land, depending on polder, is suitable for HYV rice cultivation because of poor drainage. In CBD-II where drainage congestion is a major problem, high land is more suitable for HYV Aman cultivation but it has only 8% high land. High

The poor drainage and soil salinity are two major physical constraints for expanding the HYV rice cultivation during Both Kharif-I and Kharif-II seasons.

9.20 Suitable land and HYV cultivation: People's perception

A great chunk of land suitable for HYV Aman remains under traditional local Aman varieties because of share cropping system, high production cost, lack of capital and shortage of labour, lack of inputs, etc.

9.21 Rabi crops

Since rabi crops is both labour and capital intensive and risky crops its coverage is limited. Moreover, lack of women labour for post-harvesting activities is another important factor for its limited coverage.

Now-a-days groundnut, a cash crop, is gradually increasing compared particularly in CM because of fox. Sweet potato is a staple food and people grow it mainly consumption.

The farmers grow more pulse on share cropped in land while they produce more valued crops, such as chillies, ground, etc on own land. Soybean is an emerging crop in the areas.

9.22 Aus cultivation

Aus is a subsidiary crops for supplementary to food deficit. Soil salinity limits the coverage of Aus cultivation. Post harvest hazard that includes carrying from the crop filed, threshing and drying, also limits the Aus cultivation. Lack of capital that pushes the farmers to the money-lenders also limits the Aus cultivation.

9.23 HYV rice and cultivation: homestead

The farmers generally grow and HYV rice near their homesteads where land is relatively better and traditional *Kajalshail* get lodge being shadowed by the homestead tress. People also grow more valued rabi crops near homesteads.

9.24 Share cropping and HYV coverage

Sharecropping and absentee landownership have negative impact on HYV rice cultivation. Soil salinity is higher for share cropped in land because these land get less attention for improvement.

Annex-1: Average of Farm Size and Average Land (acres) under different Crops of the Sample Farmers

Items	CM	CBD-II	CBT	Total
Average farm size	6.18	5.09	2.08	4.64
Average total rabi land	3.85	2.82	1.04	2.66
Average pulses*	3.0	1.9	0.5	1.9
Average total Aus	0.41	1.59	1.49	1.24
Average LV Aus	0.15	1.23	0.62	0.78
Average HYV Aus	0.26	0.36	0.87	0.46
Average total Aman	6.10	5.03	1.80	4.52
Average LV Aman	5.29	3.85	1.26	3.60
Average HYV Aman	0.81	1.17	0.54	0.92

Note: *Mugbean+felon* (cowpea) *+khesari*

Source: Survey on Adoption of HYV Technology by the Extension Farmers of CDSP-I

Annex-2 : Report on the Coverage of the High Yielding Varieties in Kharif-II of 2000

This is a brief report on HYV crop coverage in old polders of CDSP. The information was collected through the walk-through interview and group discussion in different market and gathering places. The survey also investigated the reasons behind the low coverage of HYV in the polder areas.

1. HYV coverage

Char Majid Polder:

A very negligible fraction of total polder areas have HYV Aman coverage. In the north-eastern corner of the polder there is a HYV Aman coverage and it is estimated that it consists of only 10 percent of the total land of the this part of the polder. To the south of this area, the southeast corner of the polder and around Karim Sareng Bazaar, a smaller coverage of HYV Aman has been found. It has been estimated that about 20 percent farmers near Karim Sareng bazaar have grown HYV Aman on their 20 percent landholding. Apart from those two areas, there is no other HYV Aman coverage except a few demonstration plots of DAE and some plots of CDSP- demo farmers in the area. Considering the polder as a whole the total HYV coverage will not exceed 2 percent.

CBD-II

In Panaulla there is some HYV cultivation, mainly on the plots near the homesteads of the farmers. In Uttar Bagga, and Madhya Baggga Mauzas there is a few HYV plots, but it is very negligible to calculate in percentage term. Some of the Demo farmers of the CDSP-I have cultivated most of these plots. However, there is a small pocket around Pariskerer Bazaar, the oldest land mass of the polder and relatively elevated where there is some HYV cultivation. It has been reported that almost 75 percent farming households in this pocket have HYV Aman cultivation, again mostly on the plots near their homesteads. Here the area is densely populated. Here land under HYV consists of about 25 percent of the total area of this pocket. It has also been reported that HYV cultivation in Kharif-II season is increasing gradually in this pocket. However, if this HYV coverage is considered within the perspective of the total polder area it will consist of 1-2 percent of total land.

CBT

In CBT acreage of HYV is high with about 15 percent of total area. However, in some parts of Nabagram and Baishakhi Mauzas it is about 25 percent. The HYV coverage has doubled this year. There is a great potential for HYV Aman cultivation in the coming years. It should be noted that water management with relatively better drainage system and high land elevation is good in this polder. There is no substantial report on absentee landowners. The land distribution in this polder is also more equal.

2. Reasons for low HYV Aman coverage

Reasons for low coverage of the HYV rice cultivation have been discussed below. The reasons that came up during the discussions and interview with the people of a polder have presented under the respective polder.

Char Majid Polder (CM)

Absentee landowners

About 80% landowners are absentees (in CM and CBD-II). They are not interested in HYV Aman cultivation rather they prefer low cost and low risk local Aman which also needs less management involvement.

Tenancy system

Many sharecroppers get land for r*abi* cultivation only. During r*abi* cultivation the sharecroppers take more care of land cultivation giving more manure and fertilizer. Moreover, the residual of the r*abi* crops increases soil fertility for Aman crops. The landowners take land back in Kharif-II season for local Aman cultivation.

The landowners do not bear any cost of production for any crops. The sharecroppers do not produce HYV Aman because it not only involves high risk but also high investment; both are beyond their capacity. Moreover, there is no long-term contract between the landowners and the sharecroppers, and a landowner can change a sharecropper at any time. In the area the competition over land for sharecropping is so high that a sharecropper has to give a *Hondi* (advance cash payment) to the landowners. If a sharecropper makes any investment on a piece of land for HYV cultivation the landowners might change him in the following year getting more *Hondi* from another sharecropper. So, sharecroppers do not get any interest for higher investment for improving the sharecropped in land.

Water management

Water management is another important limiting factor for HYV cultivation in *Kharif*-II season. The north-eastern part of the polder and the area around the Karim Sareng Bazaar are relatively higher than any other parts of the polder. The HYV cultivation is also higher re in these parts of the polder compared with any other parts of the polder. However, the knowledgeable people of the northeast parts of the polder have reported that the water logging has limited the potentiality of HYV coverage in this part too.

Pests and HYV Aman Rice coverage

Since HYV Aman cultivation does not have wide coverage some dispersed plots become very vulnerable to insecticides. Such a pestilence discourages the farmers to take initiative for HYV cultivation as it increases not only cost of production but also damages the crop yield. Moreover, pesticides in general and spray machine in particular are not easily available in the locality.

Excessive rainfalls damaged the seedling of many farmers. Water management is a problem as sometimes it is too much rain and sometimes it is too little water. Both cases are uncongenial for the HYV Aman cultivation. It needs more pesticides and more cost of production with high risk for crop failure.

People produce HYV on their own land. In sharecropped in land they do not grow HYV because the landowners do not bear the cost of production. Many farmers do not have their own land for HYV cultivation. Moreover, many farmers do not have suitable high land for Aman HYV cultivation.

In CM polder area there are about 50% suitable high land for HYV cultivation. So, the assumption for HYV coverage to calculate the IRR is not realistic.

Crop Management and migration

Many farmers go to the sea for fishing and migrate outside for jobs after the transplantation of Aman. As the traditional varieties do not need any additional care they can go outside easily. On the contrary, the HYV needs more care such as water management, application of pesticides, etc. they cannot remain outside for a longer period.

The main reason for low coverage of HYV is the water-logging problem. Moreover, absentee landowners are also responsible for such low coverage.

CBD-II

People produce Aus rice for home consumption and for cash to bear the Aman production cost. Moreover, Aus are a less costly crop compared with HYV Aman and it is less risky too. After Aus harvest they can produce local Aman. The combined production of the Aus and Aman are more attractive than high risked HYV Aman. *Rabi* is another demanding crop in the locality. After harvesting of Aus they can produce BR-21 and BR-22 but in that case r*abi* would be late. So, to grow *rabi* they need to remain land fallow during the Aus season for which they are not interested in.

People's perception about weeds and cultivation of HYV

To grow HYV Aman land should be cleaned of weeds. But such cleaning makes land barren of weeds, which is needed as the farmers think for generating organic matter.

Labour demand

HYV Aman production needs more labour compared with the traditional Aman varieties. Most of the farmers depend mainly on family labour. During the peak period of crop management, especially during the harvest period of Aman there remains labour shortage in the locality. It has been found that many farmers exchange labour among themselves instead of hiring labour. If they hire labour they need cash money for which they remain in dire need at this time. It has been reported that many farmers sell standing paddy taking *dadan* (crop sale in advance) to meet consumption as well the labour demand. So, more production of paddy means more demand for cash, which would lead them to take more *dadan*.

CBT

The land elevation in CBT seems very suitable for HYV Aman cultivation. The drainage system is also good compared with other areas. However, in some parts there is water-logging problem, particularly in the western side of the Nabagram Mauza.

Lodging and HYV Aman cultivation

People generally grow HYV rice in Aman season on the plots near their homestead because these lands are generally more fertile being fertilized by the household waste and other manure. On these plots the plants of the local varieties grow fast and tall and plants get lodged by wind. On the other hand, plants of the HYV varieties do not grow fast and it remain shorter. As a result, the plants do not get lodged.

a. CDSP Demonstration and Extension Farmers and HYV rice cultivation performance

The performances of the demo and the extension farmers of CDSP seem not encouraging so far acreage is concerned. Many of them have either left the cultivation or reduced their acreage over time. Some of them have complained about water logging and some of them have reported that they do not have their own land for expansion of HYV cultivation.

b. CDSP Demonstration and Extension Farmers and HYV crop other than rice cultivation

The performances of the demo and the extension farmers of CDSP for HYV crop other than rice cultivation seem very poor. Many of them have lost seeds. They have mixed the HYV chili seed local seeds somehow. Many of them have lost seeds for groundnut due to crop failure. It should be noted that these findings might be denied because of small sample size. However, the impression of the consultant is that an intensive survey might not give different picture though an intensive survey should be conducted for confirmation of these findings.

Aus HYV and *Rabi* coverage

The coverage of the rain fed HYV rice in the *Kharif*-I (Aus season) has been increasing gradually with a relatively faster pace. The adoption of *rabi* crops has also been increasing replacing long practiced *Khesari*.

Annex-3: Workshop proceeding on Potential Expansion of HYV Aman Coverage in CM

A workshop was conducted in Char Majid site office to identify the causes of the low adoption rate of HYV rice particularly HYV Aman cultivation. The participants were people of different categories including extension farmers of CDSP-I and the members of the water management committees (WMC) and knowledgeable farmers of the locality. Here the workshop proceeding is presented to have an field level opinion on the low adoption of HYV.

An unnamed participant

In 1998 the HVY Aman coverage was 25% as per DAE statistics. However, the workshop participants disagreed with this finding though they agreed that HYV Aman increased and decreased year to year. Reasons for such a decrease are draught and pests.

Anowar Master, secretary WMC of CM

It is true that after CDSP HYV rice cultivation has increased. However, it cannot increase as per expectation because of drainage problem. Within the polder water increases if it rains some consecutive days. As a result, HYV plantation becomes difficult as the seedlings get submerged and cannot survive.

During its first phase CDSP carried out extension service that made some progress in HYV cultivation. But when CDSP drew that service package the achieved progress got retrograde. The main reason for such retrograding trend was the poor selection of the Demo farmers who could not continue the programmes. Demo farmers themselves did not continue the programme, let alone the diffusion and dissemination.

Lutfur Rahman (Renu member), Member WMC of CM and UP member

People are inexperienced in HYV cultivation management. For example, if transplantation of HYV Aman rice is either late or early of the exact date of transplantation the growth of plants will be hampered and as a result, its harvest will be poor. We cannot prepare land in time, cannot apply fertilizer and pesticides for lack of knowledge coupled with lack of capital.

Demo farmers selected by CDSP were not in most cases actual farmers. The selected the small and marginal farmers who could not sustain the programme because they had neither capital nor they involve in agriculture all the year round. Moreover, there was no monitoring from CDSP or DAE. As a result, people went back to their traditional crop practice.

Project Direct, CDSP-II

There were demonstration farms as well as training programmes for the farmers. So they should the benefit from those programmes.

Abul Bashar (Monju member), Chairman, WMC of CM and UP member

Training was for Demo farmers not for all farmers. Most of the people within the polder are poor and they migrate outside for employment’s sake. If they have to migrate outside they cannot depend on farming solely.

Abul Bashar (Monju member), Chairman, WMC of CM and UP member

The high price of fertilizer and seeds is also a barrier for HYV Aman rice cultivation as it increases production cost. If one lose crop for a natural catastrophe one loses interest in continuing the HYV rice cultivation that incurs high production cost.

In the northern part of the polder, the older soil area, groundnut grows in plenty every year. But this year there is no groundnut cultivation in that area because of rains in November. Subsequently, the farmers have substituted the ground by *vendi* (okra). This year the acreage of okra is considerably higher than other years.

An unnamed participant

Due to soil salinity HYV rice cultivation is hindered. If there is no rain for a short spell even making a draught like situation the soil gets capillary saline.

The pest is a big hurdle for HYV Aman rice cultivation. Here the situation is worst because the coverage of HYV Aman cultivation is very small, a few dots in a large ocean of crop field covered with traditional Aman varieties. The farmers generally do not use any pesticides for the traditional Aman variety. As a result, if a farmer uses pesticides in his small plot of HYV rice he cannot get rid of the problem because pests from plots with traditional varieties again attack his plots.

The control of water in the polder area is not good. The soil fertility is low.

Abul Bashar (Monju member)

CDSP worked with 10/12 Demo farmers in a population (farmer) of say one thousand. So, the Demo farmers could make any visible impact for demonstration and for attracting other farmers.

Hasan (UAE)

The third week of last August experienced a weeklong spell of draught that affected the HYV Aman rice.

Monju member

Though within the polder there are well-designed canals and sluice gate yet the WMC cannot manage water efficiently because there are many tributary canals within the polder that need re-excavation. Moreover, the land elevation is not even in and outside the polder. The northern part is higher than the southern part and if water is kept for the northern part then the southern part remains submerged. Contrary if the water is kept at a level that is needed for the southern part then the northern part becomes dry. The same problem arises with the area north to the embankment i.e. inside the old CEP. Silt deposition outside the Sluice gate (Banshkhali) makes the drainage situation of the polder area worst.

An unnamed participant

Large farmers and share cropping, absentee landlords/land owners are the reasons for not expansion of HYV cultivation. Genuine farmers should be trained on HYV cultivation.

Mobinul Haque, Member, WMC of CM

He is a demo farmer of CDSP-I and explained his and his other fellow demo farmers' experience in HYV Aman rice cultivation as a demo farmers. Shafiul Alam, Nurul Haque and he got seeds from CDSP. But they could not get good harvest because of soil salinity, lack of water and draught. So they discontinued the HYV Aman cultivation. On the following year Shafi Alan produced *daincha* being persuaded by CDSP. However, he incurred loss again and never produced *daincha*.

Monju member

The extension service from CDSP was very short and it should have continued even after the first phase. Moreover, the coverage of the service should have been wider. From each water management area at least 10 demo farmers, a total of 80 farmers, could have been selected for extension service activities. It could create greater impetus through wider publicity and visible result oriented activities.

People representatives were not consulted about the selection of the demo farmers and not even the programme.

DR. Sattar (SAA, CDSP-II)

As there is no provision to continue work in old polders CDSP withdrew extension service. Under the changing circumstances, DAE was the potential party to continue it. But it was not possible for DAE too.

Monju member

CDSP can supply seed to 80 farmers, 10 farmers from each water management area. The WMC will take the responsibility of mobilizing and organizing and selecting the farmers.

Recommendation

- Select 80 farmers through WMC
- Training for the farmers in HYV cultivation.
- Demonstration of HYV cultivation
- Training without fees/honorarium, if necessary (budget constraint)
- Re-excavation of branch canals within the polder
- Fish project in the canal/burrow pit should be removed
- Supply shallow pump for supplementary irrigation
- Timely supply of seeds for HYV
- Agricultural department can supply seeds through dealer. Dealer should be selected from Zobeyer Bazar.
- Spray machine from CDSP should be supplied
- Agricultural extension Worker should be appointed by area
- Consultation Centre should be open.
- Farmer-to-farmer contact system should be introduced
- System loss free credit supply should be ensured