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Preface

On-Farm Research Division is going to publish the reports of research of 2000-01 conducted at different farming systems research and development (FSRD) and multilocation testing (MLT) sites. Major thrust during that period was given on the improvement of existing farming systems through introduction of improved varieties and management practices. Component technology studies were also conducted to improve the existing cropping systems.

There has been a shift in the research approach for broadening the perspective of the cropping systems research towards a more comprehensive farming systems research by incorporating other farm components like homestead production systems, agroforestry and crop livestock interactions. However, these efforts were limited mainly to the understanding of the existing situations and constraints due to the lack of adequately trained human resources.

We hope it will be useful to the researchers and extension workers in the field.

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Content

Socio-economics of Farming Systems

Yield gap analysis of T.Aman rice under different management packages at Noakhali area

The study was carried out at FSRD site Atkapalia, Noakhali during December 1999 to April 2000 to estimate the yield gap under different management packages and to identify the probable reasons for the gap. Two management packages i.e. recommended packages (Demonstration plot) and farmers practices (Farmers plot) were included in the study for data collection. A total of 12 demonstration and 35 farmers' plots were selected for collection of necessary primary information. The study revealed that recommended packages gave higher yield (4543 kg/ha) than that of the farmers' practices (3932 kg/ha). The yield gap was 611 kg/ha (Table 1). Higher gross margin (Tk. 17552/ha) was also obtained from recommended package and the gap in gross margin was Tk. 3219/ha. This yield gap was due to reduced amount of fertilizer used by the farmers.

Table 1. Production packages, yield and economics of T.Aman rice at FSRD site, Atkapalia, Noakhali during Kharif-II 1999

Items	Recommended packages	Farmers practices	Gap
Variety	BRRI Dhan 32	BRRI Dhan 32	-
Planting time	July 17 – August 8	July 21 – August 10	-
Seed rate (kg/ha)	49	53	(-) 4
Seeding age (days)	30-35	22-30	8
Spacing (cm)	20 x 15	14 x 14	104 cm2/hill
Ploughing (no.)	3.5	3.5	-
Fertilizer (kg/ha)			
Urea	124	92	32
TSP	94	65	29
MP	76	57	19
Gypsum	None	None	-
Zinc sulphate	0.5	1.0	0.5
Cowdung	None	1356	1356
Irrigation	Not needed	Not needed	-
Weeding (no.)	2	2	-
Insecticide use (no.)	Not needed	Not needed	-
Yield (kg/ha):			
Main product	4543	3932	611
Byproduct	3710	3390	320
Total variable cost (Tk/ha)	17032.00	15755.00	1299.00
Gross margin (Tk/ha)	17552.00	14333.00	3219.00

Yield gap analysis of Boro, potato, mustard and wheat under different management packages at Jamalpur area

The study was conducted at the FSRD site Narikeli, Jamalpur during rabi 1999-2000 to estimate the yield gap between recommended packages and farmers practices to identify the probable reasons for the gap. Four dominant crops namely Boro, Potato, Mustard and Wheat were selected for this study. A total of 15 farmers' plots (farmers package) and 5 demonstration plots (recommended packages) for each of the crops were selected for primary data collection. The data collection was done by monitoring technique with the help of a pre-designed schedule. The study disclosed that higher yield was obtained from recommended management packages in all the four crops studied. The average yields from recommended management packages were 7.2 t/ha for Boro, 22.25 t/ha for Potato, 1.3 t/ha for Mustard and 3.2 t/ha for Wheat. The same yields for farmers' practices were 5.7 t/ha. 2.0 t/ha, 1.1 t/ha and 1.9 t/ha, respectively. The yield gaps were 1405 kg/ha (9.65%) for Boro, 2370 kg/ha (10.65%) for potato, 233 kg/ha (17.48%) for mustard and 1317 kg/ha (44.15%) for wheat. The gap in gross margin was Tk. 9007 (20.64%), Tk. 4739 (14.02%), Tk. 3348 (29%) and Tk. 7950 (72.24%) per hectare for Boro, Potato, Mustard and Wheat respectively (Table 2). The yield gap in Boro was contributed by late transplanting and reduced rate of fertilizer, irrigation and pesticide. While in potato the gap attributed mainly to late sowing, very close spacing, reduced irrigation, unbalanced and reduced rate of fertilizer use. In Mustard the gap was mainly due to very late sowing in one hand and reduced rate of fertilizer use on the other. Among the crops the gap was highest (41.15%) in wheat. This might be due to lower plant population and unbalanced use of fertilizers.

Table 2. Production packages, yield and economic of Boro, Potato, Mustard and Wheat at FSRD site, Narikeli, Jamalpur during rabi 1999-2000

Item	Boro		Potato		Mustard		Wheat	
	RP	FP	RP	FP	RP	FP	RP	FP
Variety	BRRI Dhan 29	BRRI Dhan 29	Diamont	Diamont	Tori-7	Tori-7	Kanchan	Kanchan
Planting time	Jan. 10-20	Feb.2-7	Oct. 25 Nov.12	Nov.25 Dec.10	Oct.25-Nov.10	Nov.25 Dec.12	Nov.27 Dec. 7	Nov.25 Dec. 2
Seed rate (kg/ha)	30	38	1152	1482	10	10	125	127
Seeding age (days)	25	30	-	-	-	-	-	-
Spacing (cm)	20x15	15x10	60x30	45x25	-	-	-	-
Plants/m2	-	-	-	-	295	252	295	252
Ploughing (no.)	4	3	4	4	4	4	4	4
Fertilizer (kg/ha)								
Urea	270	202	250	273	250	164	220	230
TSP	130	123	150	123	170	165	150	99
MP	120	87	250	122	85	88	60	80

Table 2. Contd.

Item	Boro		Potato		Mustard		Wheat	
	RP	FP	RP	FP	RP	FP	RP	FP
Gypsum	70	90	120	60	150	64	110	38
Zinc sulphate	10	-	10	-	5	-	-	-
Boric acid	-	-	-	-	5.5	4	-	-
Cowdung	-	2	6586	3404	-	-	350	440
Irrigation (no.)	24	19	2	1	2	1	2	2
Weeding (no.)	2	2	1	-	1	1	2	1
Insecticide/pesticide use (no.)	2	1	2	1	2	1	-	-
Yield (kg/ha):								
Main product	7150	5745	22250	19880	1333	1100	3200	1883
Byproduct	8580	8617	-	-	3145	2600	4800	3703
Total variable cost (Tk/ha)	20535	19726	32940	30569	10023	9804	11396	10567
Gross margin (Tk/ha)	33805	24798	33810	29071	11544	8196	11004	3054
Gap in yield (kg/ha)	1405 (19.65%)		2370 (10.65%)		233 (17.48%)		1317 (41.15%)	
Gap in gross margin (Tk/ha)	9007 (26.64%)		4739 (14.02%)		3348 (29%)		7950 (72.24%)	

RP = Recommended package, FP = Farmers practices

Yield gap analysis of T.Aus, T.Aman rice and Mustard under different management packages at Patuakhali area

The study was carried out at FSRD site Lebukhali, Patuakhali during kharif-I & II seasons of 1999 and rabi 1999-2000 to estimate the yield gap between recommended packages and farmers practices to identify the factors responsible for the gap. Three crops i.e. T.Aus, T.Aman and mustard was selected for this study. A total of 20 farmers owing 20 plots for each of the crops were selected randomly to monitoring farmers' practices and yield. Five plots were established with recommended packages to obtain necessary primary data. The study revealed that recommended management practices gave higher yield than that of farmers' practice in all the three crops. The average yields of recommended management were 4061 kg/ha for T.Aus, 4340 kg/ha for T.Aman and 830 kg/ha for mustard. Whereas the corresponding yield of farmer practices were 2730 kg/ha, 3600 kg/ha and 600 kg/ha, respectively. Thus the yield gap per hectare was 1330 kg (32.76%), 740 kg (17.05%) and 230 kg (27.71%) for T.Aus, T.Aman and mustard respectively. The gap in gross margin was Tk. 7193/a (56.49%) for T.Aus, Tk. 4700/ha (26.86%) for T.Aman and Tk. 2227/ha (44.54%) for mustard respectively (Table 3). The yield gap in T.Aus and T.Aman was due to wider spacing vis-à-vis lower plant population and unbalanced fertilizer use. The gap in mustard yield was attributed to reduced and unbalanced fertilizer use.

Table 3. Production packages yield and economics of T.Aus, T.Aman and mustard under FSRD site, Lebukhali, Patuakhali

Item	T.Aus		T.Aman		Mustard	
	RP	FP	RP	FP	RP	FP
Variety	BR2	BR2	BR23	BR23	Daulat	Daulat
Planting time	May 4-11	May 7-26	Sept. 6-10	Aug.28 - Sept.20	Dec. 4-10	-
Seed rate (kg/ha)	25	50	30	50	7.5	10
Spacing (cm)	25 x 15	30 x 25	25 x 15	30 x 25	-	-
Plants/m2	24	12	24	16	140	130
Ploughing (no.)	-	-	-	-	-	-
Fertilizer (kg/ha)						
Urea	76	50	76	80	87	82
TSP	28	-	28	-	66	-
MP	30	-	30	-	60	-
Gypsum	-	-	-	-	78	-
Zinc sulphate	-	-	-	-	-	-
Cowdung	-	-	-	-	-	-
Irrigation (no.)	-	-	-	-	-	-
Weeding (no.)	-	-	-	-	-	-
Insecticide/pesticide use (no.)	1	-	-	-	1	-
Yield (kg/ha):						
Main product	4060	2730	4340	3600	830	600
Byproduct	-	-	-	-	-	-
Total variable cost (Tk/ha)	13657	12205	15000	14200	11600	9227
Gross margin (Tk/ha)	12733	5540	17500	12800	5000	2773
Gap in yield (kg/ha)	1330 (32.76%)		740 (17.05%)		230 (27.71%)	
Gap in gross margin (Tk/ha)	71.93 (56.49%)		4700 (26.86%)		2227 (44.54%)	

RP= Recommended package, FP = Farmers practices

Yield gap analysis of Mustard and Wheat under different management packages in Kishoregonj area

The study on Mustard was conducted at Kendua MLT site Netrokona and on wheat at Katiadi MLT site, Kishoregonj during Rabi 1999-2000 to estimate the yield gap and identify its probable reasons. A total of 20 farmers as well as 20 plots for each of the crops (farmers' practices) and 5 demonstration plots (recommended package) for both the crops were selected for primary data collection. The study revealed that recommended packages gave higher yield than that of farmers' practice. The average yield of recommended package was 1050 kg/ha for mustard and 3210 kg/ha for wheat. The corresponding yield in farmers' practices was 694 kg/ha in mustard and 1250 kg/ha in wheat. Thus, the yield gap was 356 kg/ha (33.90%) in mustard and 1960 kg/a (61.06%) in wheat. The gap in gross margin was Tk. 1341/ha (58.87%) for mustard and Tk. 13402/ha (93.36%) for wheat (Table 4). The yield differences were due to lower plant population and use of low as well as unbalanced fertilizer in farmers package in both the crops.

Table 4. Production packages, yield and economics of mustard and wheat at Kishoregonj area during 1999-2000

Items	Mustard		Wheat	
	RP	FP	RP	FP
Variety	Tori-7	Tori-7	Kanchan	Kanchan
Spacing (cm)				
Plants/m2	125	90	520	410
Yield (kg/ha):				
Main product	1050	694	3210	1250
Byproduct	1075	975	5920	2160
Seed (Tk/ha)	112	140	1800	1560
Fertilizer cost (Tk/ha)	5210	2738	3195	1967
Total variable cost (Tk/ha)	10322	7878	16345	12877
Gross margin (Tk/ha)	2278	937	14355	953
Gap in yield (kg/ha)	356 (33.90%)		1960 (61.06%)	
Gap in gross margin (Tk/ha)	1341 (58.87%)		13402 (93.36%)	

RP= Recommended package, FP = Farmers practices

Exiting homestead vegetables production and utilization system

The study was undertaken to examine the existing homestead production and utilization system and to assess the economic importance of homestead production at the FSRD sites of Pabna, Faridpur and Sylhet. A total of 90, 80 and 60 farmers from different farm categories of Pabna, Faridpur and Sylhet respectively were selected for primary data collection. The survey was conducted during rabi 1999-2000. It revealed from the study that

largest homestead area was available in Sylhet (0.32 ha/farm) followed by Faridpur (0.15 ha/farm) and Pabna (0.13 ha/farm). The homestead areas increased with the increase in farm site (Table 5). The unutilized area in the homestead was also found more in Sylhet (0.10 ha/farm) than that of Pabna (0.02 ha/farm). Vegetables production in the homestead and consumption was found the highest in Sylhet (402 and 260 kg respectively). The corresponding figures for production and consumption for Pabna were 141 and 102 and that of Faridpur was 103 and 80.4 kg/farm, respectively (Table 6). A portion of the homestead vegetable production was found to be sold and distributed among the relatives and neighbors. Some constraints and problems were also identified in this study. Lack of good quality seed/seedling, insect pest infestation, unavailability of irrigation water and vegetables damaged by poultry/livestock were the main problems/constraints identified by the farmers of Pabna and Faridpur (Table 7).

Table 5. Distribution of homestead area by the sample farmers

Farm category	Homestead area (ha)			Unutilized area in homestead (ha)		
	Pabna	Faridpur	Sylhet	Pabna	Faridpur	Sylhet
Landless	-	0.06	-	-	-	-
Marginal	0.11	0.11	0.15	0.01 (9.09)	-	0.04 (26.67)
Small	0.12	0.16	0.26	0.03 (25.00)	-	0.07 (26.92)
Medium	0.17	0.27	0.34	0.02 (11.67)	-	0.11 (32.35)
Large	-	0.30	0.51	-	-	0.16 (31.37)
All	0.13	0.15	0.32	0.02 (15.38)	-	0.10 (31.25)

Figures in the parenthesis indicate percentage

Table 6. Production and consumption of homestead vegetable in Homestead

Farm category	Homestead area (ha)			Unutilized area in homestead (ha)		
	Pabna	Faridpur	Sylhet	Pabna	Faridpur	Sylhet
Landless	-	65	-	-	60	-
Marginal	167	91	290	113	75	178
Small	118	120	376	93	77	263
Medium	138	133	422	100	93	294
Large	-	135	518	-	97	305
All	141	103	402	102	80.4	260

Table 7. Constraints/problems of homestead vegetables production

Nature of problems	Homestead area (ha)	
	Pabna	Faridpur
1. Lack of extension services	49	-
2. Lack of knowledge	44	25
3. Lack of quality infestation	78	74
4. Insect pest infestation	78	55
5. Unavailability of irrigation water	72	28
6. Lack of storage facility	52	-
7. Damaged by poultry/livestock	11	39

Existing fisheries resources and their utilization at FSRD sites Sylhet and Jamalpur

The survey was conducted at FSRD sites of Sylhet and Jamalpur during April to December 1999 to assess the existing pond fish culture and to identify the constraints and potentials of production. A total of 75 ponds at Sylhet and 130 ponds at Jamalpur were selected randomly for primary data collection. The study revealed that the average pond size was 0.09 ha in Sylhet and that at Jamalpur was 0.12 ha. The age of the pond was more in Sylhet (35 years) than that in Jamalpur (12 years). Clay dominated the pond soil at Sylhet (50%) while in Jamalpur sandy loam soil dominated (80%). About 44% of the ponds are flood prune in Sylhet (Table 8). The study also revealed that productivity of fishpond is very poor in both the locations (Table 9). The most dominant constraints identified by the Jamalpur farmers were lack of modern know-how, unavailability of credit, diseases of fishes and low were depth in the pond during the dry season (Table 10).

Table 8. Characteristics of ponds at FSRD sites, Sylhet and Jamalpur

Characters	Sylhet	Jamalpur
Average gross area (ha)	0.09	0.12
Average net area (ha)	-	0.08
Water depth in September (m)	1.90	2.06
Water depth in April (m)	0.97	0.99
Average age of pond (Yr.)	35	12
Soil type (%)		
Loamy	22	20
Clay	50	-
Sandy loam	14	80
Silty	14	-
Flood affected (%)	44	-
Not flood affected (%)	56	-

Table 9. Production of fish (kg/ha) by different farm category

Farm category	Sylhet	Jamalpur
Landless	41	-
Marginal	66	-
Small	320	-
Medium	445	-
Large	472	-
All	270	451

Table 10. Constraints of pond fish production of FSRD site Narikeli, Jamalpur

Farm category	Sylhet
1. Lack of knowledge	73
2. Lack of credit facility	91
3. Disease	64
4. Low water depth in dry season	97

Livestock production and utilization systems at FSRD site Golapganj, Sylhet

The survey was conducted at the FSRD site, Golapgonj, Sylhet during January-February 2000 to assess the available livestock resources and to identify the constraints and potentials of livestock production. A pre-designed survey schedule was applied to stratified random samples of different farm categories. A total of 60 farmers were selected for primary data collection. The study revealed that livestock population was very poor in all farm categories. On an average 1.53 cattle and 0.54 goat was available per farm (Table 11). Lower number of cattle was found with landless farmers but in case of goat the landless farmers got higher number than other categories. It was found that 48% responded that these use their animals for dairy and draft purposes (Table 12). The average number of milking cow per farm was 0.53 and it was highest (0.68) in the medium farm category and lowest (0.23) in the landless farm category. The milk production per farm was very poor and it was around one liter for all the farm categories.

Table 11. Livestock population at FSRD site, Golapganj, Sylhet

Farm category	Cattle/farm	Goat/farm	Cow/farm	Milk production (liter/day)	Milk production (liter/cow)
Landless	0.33	0.65	0.23	0.89	3.86
Marginal	1.79	0.40	0.61	0.79	1.29
Small	1.92	0.44	0.54	1.03	1.91
Medium	1.73	0.60	0.68	1.08	1.59
Large	1.88	0.63	0.59	1.09	1.54
All	1.53	0.54	0.53	0.98	1.89

Table 12. Use of cattle by different farm categories at Golapganj, Sylhet

Farm category	Farmer responded (%)				
	Dairy	Draft	Dairy + Draft	Fattening	Fattening + Draft
Landless	-	-	41	23	37
Marginal	4	9	53	3	31
Small	7	16	45	6	26
Medium	10	15	51	5	19
Large	11	20	50	7	12
All	6	12	48	9	25

Existing poultry production and utilization systems at FSRD site Narikeli, Jamalpur

The study was carried out at Narikeli FSRD site, Jamalpur to evaluate the existing poultry production and utilization system and to identify the constraints of poultry production during February to December 1999. A total of 140 farmers from different farm categories were selected randomly for primary data collection. A pre-designed schedule was used for this purpose. The survey disclosed that chicken, duck and pigeon were available in the FSRD site Narikeli. A total of 7.9 local chickens and 1.3 exotic chickens were available per farm where duck and pigeon population was 2.5 and 4.3 per farm respectively (Table 13). Total production of egg and poultry bird showed that 130 chicken egg and 117 duck egg was produced per farm per year. Farmers sold most of their egg produced (Table 14). On the other hand production of poultry bird was recorded 19, 8 and 19 for chicken, duck and pigeon respectively. Farmers consumed most of the chicken (10/farm/year) but percentage of sale in case of duck and pigeon was higher than consumption. Lack of treatment facility, unavailability of medicine and poultry disease was the main problems of poultry rearing. Poultry also created problems by damaging vegetables and crops in and around homestead.

Table 13. Number of poultry per farm at FSRD site, Narikeli, Jamalpur

Farm category	Chicken		Duck		Pigeon	
	Local	Exotic	Local	Exotic	Local	Exotic
Landless	5.9	2.8	4.3	-	1.6	-
Marginal	6.8	1.7	1.9	-	1.2	-
Small	2.6	0.6	2.4	-	5.8	-
Medium	8.8	0.9	1.7	-	4.5	-
Large	8.9	0.7	2.5	-	8.3	-
All	7.9	1.3	2.5	-	4.3	-

Table 14. Production and utilization of egg and bird by the farmers

Item	Egg (no./farm/year)	Bird ((no./farm/year)

Chicken:			
	Total production	130	19
	Consumption	44	10
	Distribution	5	0.5
	Sale	72	7
	Hatching	9	-
Duck:			
	Total production	117	8
	Consumption	28	3
	Distribution	1	-
	Sale	79	4
	Hatching	9	
Pigeon:			
	Total production	-	19
	Consumption	-	6
	Distribution	-	1
	Sale	-	10
	Hatching	-	-

Household organic materials and crop residue management in different area of Bangladesh

The study was conducted at 7 locations namely Pabna sadar, Kaliakoir of Gazipur, Amtali of Borguna, Mithapukur of Rangpur, Jamalpur sadar, Patya of Chittagong and Rahmatpur of Barisal during November 1999 to April 2000 to identify existing organic materials available in the homestead and to assess the organic materials utilization and disposal pattern. The first five locations were selected from SFFP block demonstration and the rest two from multilocation test sites. A total of 167 farmers (62 from Patya, 30 from Rahmatpur and all the 15 farmers of each of 5 SFFP demonstrations blocks) were selected for primary data collection with the help of a pre-designed schedule. The study revealed that cowdung, cattle feed waste, kitchen waste, ash, poultry manure, rice bran and mustard/pulse stover were available in the homestead for organic materials recycling. In case of annual production of organic materials it was observed that 1262 kg cowdung, 341 kg cattle feed waste, 229 kg kitchen waste, 294 kg ash and 156 kg poultry manure per farm per year were available (Table 15). T.Aman (3225 kg), Boro (1581 kg) and Aus rice (1471 kg) were largest amount of crop residue product available in the homestead. Off course wheat (357 kg), rice bran (275 kg) and Oilseed and pulses stover were the other source of organic matter (Table 16). From the available organic materials 64, 63, 44 and 61 percent of cowdung, cattle feed waste, kitchen waste and Ash respectively were used as compost. On the other hand 30% of the poultry manure was used for compost. It was observed that 27% of cowdung, 26% of cattle feed waste, 54% of rice bran, 62% of mustard and pulses stover were used for household fuel. About 22% kitchen waste and 45% of poultry litter were not available for any use (Table 17). Utilization of rice straw was mainly as cattle feed. Sixty three percent of aman

straw, 62% of Boro straw and 49% of Aus straw was used as cattle feed. But for the wheat straw 64% was largely used as fuel (Table 18).

Farmers were found using homestead organic materials in making compost and crop residues and straw as feed, indicating favorable organic recycling. But that had to be improved further considering location specific variation.

Table15. Annual production of organic materials in the homestead at different locations of Bangladesh

Location	Annual production (kg/farm)				
	Cowdung	Cattle feed waste	Kitchen waste	Ash	Poultry litter
Pabna	360	170	179	104	-
Gazipur	783	377	306	278	-
Borguna	1020	363	-	177	72
Rangpur	767	350	110	427	119
Jamalpur	981	455	298	411	-
Chittagong	4598	427	341	551	259
Barisal	329	242	138	115	175
All	1262	341	229	294	156

Table 16. Annual production of crop residue in the homestead at different locations of Bangladesh

Location	Annual production (kg/farm)					
	Rice bran	Mustard/ pulse stover	Aus straw	Aman straw	Boro straw	Wheat straw
Pabna	300	208	367	870	-	333
Gazipur	509	81	-	-	1693	343
Borguna	327	81	5353	8333	-	-
Rangpur	153	-	1140	2385	1827	185
Jamalpur	-	-	-	4053	3600	567
Chittagong	-	-	232	749	466	-
Barisal	66	140	265	2910	318	-
All	271	128	1471	3225	1581	357

Table 17. Use of different organic materials at different locations of Bangladesh

Location	Cowdung (%)	Kitchen waster (%)	Ash (%)

	Com-post	Fuel	Other	Cattle feed	Com-post	Drop out	Com-post	Veg. Garden	Other
Pabna	76	22	2	35	55	10	86	11	3
Gazipur	25	70	5	24	41	35	54	46	-
Borguna	45	55	-	-	-	-	30	70	-
Rangpur	85	-	15	31	59	10	81	10	9
Jamalpur	74	21	4	36	46	18	84	10	6
Chittagong	95	5	-	-	50	50	85	15	-
Barisal	45	15	40	8	55	34	10	43	47
All	64	27	9	26	51	23	61	29	9

Table 17. Continued

Location	Cattle feed waste (%)				Poultry litter (%)			
	Com-post	Fuel	Veg. Garden	Other	Drop out	Com-post	Veg. Garden	Other
Pabna	76	22	-	2	100	-	-	-
Gazipur	36	60	3	-	100	-	-	-
Borguna	74	7	19	-	-	75	10	-
Rangpur	85	-	5	10	-	75	10	-
Jamalpur	73	13	-	14	-	-	-	-
Chittagong	41	59	-	-	-	-	-	-
Barisal	58	20	-	22	27	-	71	12
All	63	26	4	7	45	30	20	4

Table 18. Utilization of different crop residues by the farmers

Location	Aus straw (%)			Aman straw (%)			Boro straw (%)		
	Fuel	Cattle feed	Other	Fuel	Cattle feed	Other	Fuel	Cattle feed	Other
Pabna	13	86	1	9	85	6	-	-	-
Gazipur	-	-	-	-	-	-	-	92	8
Borguna	12	29	59	27	69	4	-	-	-
Rangpur	15	12	73	20	47	33	8	48	43
Jamalpur	-	-	-	10	76	14	20	64	16
Chittagong	4	96	-	26	56	18	16	68	15
Barisal	23	21	56	31	43	26	17	36	47
All	13	49	32	21	63	16	12	62	26

Table 18. Continued.

Location	Rice bran (%)	Wheat straw (%)	Mustard/pulse stover

	Fuel	Cattle feed	Other	Fuel	Cattle feed	Other	Fuel	Cattle feed	Other
Pabna	50	38	8	56	16	27	63	37	-
Gazipur	50	50	-	100	-	-	70	30	-
Borguna	45	43	12	-	-	-	-	-	-
Rangpur	55	27	18	60	13	27	-	-	-
Jamalpur	-	-	-	41	25	35	-	-	-
Chittagong	-	-	-	-	-	-	-	-	-
Barisal	70	-	30	-	-	-	53	35	12
All	54	32	14	64	14	22	62	34	4

Fertilizer management in major cropping patterns at different locations of Bangladesh

The survey was conducted at 6 locations namely Pabna sadar, Kaliakoir of Gazipur, Amtali of Borguna, Mithapukur of Rangpur, Jamalpur sadar and Rahmatpur of Barisal. A total of 105 farmers (30 from Rahmatpur and 15 each from other locations) were selected randomly to identify the major cropping patterns and to evaluate the existing fertilizer management practices of these patterns. The survey was conducted with the help of a pre-designed schedule by directly interviewing the selected farmers during November 1999 to April 2000. The collected information was edited, summarized and presented in tabular form. It is revealed from the study that all the major cropping patterns identified in the locations T.Aman based except in Gazipur. The major cropping patterns at Gazipur were Mustard-Boro and Wheat-Jute (Table 19). Other major cropping patterns are Wheat –Jute-T.Aman at Pabna, Potato-T.Aus-T.Aman at Rangpur, Mungbean-T.Aus-T.Aman at Borguna, Boro-T.Aman at Jamalpur and Fallow-T.Aman at Barisal. At Borguna the dominant cropping pattern should have been Fallow-T.Aman, which has not been reported, might be due to sampling error. It is evident that farmers used less amount of chemical in all the crops that their recommended dose (Table 20). Use of organic manure like cowdung, oil cake or poultry litter is also negligible except in potato at Rangpur. Farmers of Pabna also used a handsome amount of cowdung in wheat and lentil. It may be concluded from the study that use of chemical fertilizer is unbalanced and farmers mostly depended on nitrogenous fertilizers.

Mixed reactions were observed in case of trend in crop yield during last 5 years. Most of the farmers from Borguna and Barisal opined about increased trend in crop yield, but most of the farmers from Pabna and Jamalpur reported decreased trend of yield. On the other hand, most of the farmers from Gazipur and Rangpur opined that crop yield trend for the last 5 years remained stable.

Considering the yield performance of different crops in cropping patterns it was evident that better yield was found in Jamalpur for wheat and jute in Wheat- Jute-T.Aman cropping

pattern. T.Aman performed better in Pabna and Boro in Gazipur. Potato was included only in the major cropping pattern of Rangpur.

Table 19. Major cropping pattern identified in different areas

Area	District	Cropping pattern
Ataikula	Pabna	Wheat-Jute-T.Aman Lentil-B.Aus-T.Aman Wheat-B.Aus-T.Aman
Dewair	Gazipur	Mustard-Boro Wheat-Jute
Arpangasia	Borguna	Fallow-T.Aman Mungbean-T.Aus-T.Aman Grasspea-T.Aus-T.Aman Chilli-T.Aus-T.Aman
Chuhar	Rangpur	Potato-T.Aus-T.Aman Boro-T.Aman Potato-Jute-T.Aman
Chankanda	Jamalpur	Boro-T.Aman Mustard-Boro-T.Aman Wheat-Jute-T.Aman
Rahmatpur	Barisal	Fallow-T.Aman Mungbean-T.Aman Boro-T.Aman

Table 20. Tread of crop yield during last 5 years as reported by the farmers at different location

Location	Yield status	Farmer respondent (%)	Reasons
Pabna	Stable	8	Fertilizer use & regular intercultural operation
	Increasing	8	Use of organic manure & maintenances crop operation
	Decreasing	84	Unavailability of organic manure, lack of good quality seed, insect-pest infestation and adulteration in fertilizer
Gazipur	Stable	73	Fertilizer use & regular intercultural operation
	Increasing	7	Use of organic manure & chemical fertilizer
	Decreasing	20	No use of organic manure, lack of proper intercultural operation
Borguna	Increasing	100	Use of organic & chemical fertilizer, timely rainfall

Table 20. Contd.

Location	Yield status	Farmer respondent (%)	Reasons
Rangpur	Stable	73	Use of organic & inorganic fertilizer
	Increasing	27	Use of balance fertilizer and no use of organic manure
Jamalpur	Stable	13	Use of organic manure
	Increasing	13	Balance fertilizer use, use of organic manure
	Decreasing	74	Use less amount of fertilizer and no use of organic manure
Barisal	Stable	7	Disease & pest control
	Increasing	87	Use of good quality seed, fertilizer and modern cultivation method
	Decreasing	6	Lack of irrigation facilities

Appendix table 1. Nutrient/manure use in major cropping patterns and their productivity at different locations of Bangladesh

Location	Cropping patterns	Nutrient/manure used (kg/ha)								Yield (t/ha)
		N	P	K	S	Zn	CD	OC	Poultry litter	
Ataikula Pabna	Wheat	90	22	24	-	-	4656	17	-	2.98
	Jute	51	7	13	1	-	-	-	-	2.02
	T.Aman	110	18	28	14	1	-	-	-	4.13
	Lentil	10	4	5	-	-	2948	-	-	1.19
	B.Aus	39	8	11	-	-	-	-	-	1.49
	T.Aman	119	21	34	15	1	-	-	-	4.54
	Wheat	78	17	25	10	0.4	3195	-	-	2.32
	B.Aus	32	4	4	-	-	-	-	-	1.45
	T.Aman	114	23	44	18	2	-	-	-	4.35
Dewair Gazipur	Mustard	113	35	25	3	-	78	-	-	0.96
	Boro	104	17	12	1	-	-	14	-	5.72
	Wheat	95	20	17	10	-	-	-	-	2.34
	Jute	3	2	2	-	-	-	-	-	1.90

Appendix table 1. Contd.

Location	Cropping	Nutrient/manure used (kg/ha)	Yield

	patterns	N	P	K	S	Zn	CD	OC	Poultry litter	(t/ha)
Arpangasia	Mungbean	-	-	-	-	-	-	-	-	0.36
Borguna	T.Aus	52	2	1	-	-	-	-	-	1.35
	T.Aman	57	1	1	-	-	47	-	-	2.15
	Grasspea	-	-	-	-	-	-	-	-	0.86
	T.Aus	51	1	-	-	-	-	-	-	1.17
	T.Aman	56	-	-	-	-	-	-	-	2.58
	Chilli	40	6	7	-	-	116	36	48	25.59
	T.Aus	57	-	-	-	-	-	-	-	2.94
	T.Aman	57	1	-	-	-	-	-	-	3.35
Chuhar Rangpur	Potato	154	47	124	14	3	8770	60	48	0.44
	T.Aus	59	-	-	-	-	-	-	-	1.60
	T.Aman	81	3	5	-	-	838	-	-	2.39
	Boro	106	23	36	2	0.4	9108	12	72	4.09
	T.Aman	53	8	12	-	-	-	-	-	2.96
	Potato	153	42	109	13	3	9667	54	-	21.87
	Jute	23	2	2	-	-	537	-	-	2.32
	T.Aman	81	6	9	-	-	403	-	-	3.63
Chankanda Jamalpur	Boro	106	21	47	13	1	4383	-	-	4.78
	T.Aman	82	11	30	5	-	731	-	-	3.50
	Mustard	39	27	42	25	2	8754	-	-	1.06
	Boro	104	19	46	13	1	890	-	-	4.53
	T.Aman	39	26	42	25	2	226	-	-	3.23
	Wheat	83	18	32	13	-	2443	-	-	3.19
	Jute	50	12	17	-	-	-	-	-	4.46
	T.Aman	110	14	21	2	-	-	-	-	3.38
Rahmatpur Barisal	T.Aman	55	15	17	-	-	896	-	-	3.38
	Mungbean	-	7	9	-	-	165	-	-	0.63
	T.Aman	74	21	21	1	1	17	-	-	3.64
	Boro	113	23	29	3	-	960	-	63	4.75
	T.Aman	79	12	15	-	-	-	-	-	3.39

Improvement of Cropping Systems

Agro-economic performance of alternative cropping pattern against farmers' existing cropping pattern at FSRD site, Golapgonj, Sylhet

The alternative cropping pattern Mustard-T.Aus-T.Aman rice was evaluated against the farmers' existing cropping patterns T.Aus-T.Aman rice at FSRD site Golapgonj, Sylhet during 1999-2000 by replacing Purbachi and Pajam in T.Aus and T.Aman season with improved rice varieties BR-26 and BRRI-dhan-32 and BRR-dhan-32 respectively in one hand and introduction of Mustard variety Tori-7 in fallow period on the other. Results revealed that the agro-economic performance of alternative cropping pattern Mustard-T.Aus -T.Aman rice was better in terms of gross margin (Tk 56582/ha) and BCR (2.97) than those of the existing pattern (Table 1).

Table 1. Yield cost and return of the alternative-cropping pattern against farmers existing cropping patterns at FSRD site, Golapgonj, Sylhet during 1999-2000

Crops	Yield (T/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Alternate Cropping Pattern				
Mustard (Tori-7)	1.05	6850	12610	2.84
T.Aus (BR-26)	4.12	10600	17600	2.66
T.Aman (BRR-dhan-29)	5.06	11250	26372	3.35
Total	-	28700	56582	2.97
Farmers Cropping Pattern				
T.Aus (Purbachi)	2.14	8800	7435	1.84
T.Aman (Pajam)	3.40	9350	17525	2.87
Total	-	18150	24960	2.37

Performance of alternative cropping pattern Potato-Boro-T.Aman rice under irrigated condition at FSRD site, Palima, Tangail

Performance of an alternative cropping pattern Potato-Boro-T.Aman rice was evaluated against farmers' existing pattern Mustard-Boro-T.Aman rice under irrigated condition in medium high land at FSRD site, Palima, Tangail during 1998-99. Both agronomic and economic performances of the tested pattern Potato-Boro-T.Aman rice was found superior to the existing pattern Mustard-Boro-T.Aman rice. The alternative pattern gave higher gross margin (Tk 91797/ha) which was 46% higher than the existing pattern (Table 2).

Table 2. Yield, cost and return of Potato-Boro-T.Aman cropping pattern against the farmers pattern Mustard-Boro-T.Aman in irrigated condition at FSRD site, Palima, Tangail, 1998-1999

Crops	Yield (T/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Alternate Cropping Pattern				
Potato (Diamond)	32.0	3504	44986	2.28
Boro (BRRI-dhan-29)	6.30	14469	34756	3.40
T.Aman (BRR-dhan-32)	4.46	20520	12055	1.59
Total	-	70003	91797	2.31
Farmers Existing Pattern				
Mustard (Tori-7)	0.77	7043	6589	1.93
Boro (IR-8)	5.40	14789	28561	2.93
T.Aman (BR-11)	4.50	19700	143675	1.69
Total	-	41532	48825	2.18

Performance of alternative cropping pattern Wheat-Sesame-T.Aman rice under rainfed condition at FSRD site, Palima, Tangail

The alternative cropping pattern Wheat-Sesame-T.Aman rice was tested against the farmers existing cropping pattern Wheat-Jute-T.Aman rice at FSRD site, Palima under rainfed condition during 1998-99. Results revealed that the alternative pattern was superior to the farmer's pattern in terms of total gross margin (Tk 35477/ha) which was 47.97% higher than the existing pattern (Table 3).

Table 3. Yield, cost and return of Wheat-Sesame-T.Aman rice cropping pattern in rainfed condition high land at Palima FSRD site, Tangail, 1998-99

Crops	Yield (T/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Alternate Cropping Pattern				
Wheat (Kanchan)	1.85	8776	6984	1.80
Sesame (T6)	1.05	8454	10176	2.20
T.Aman (BRRI-dhan-33)	3.90	17283	18317	2.06
Total	-	34513	35477	2.02
Farmers Cropping Pattern				
Wheat (Kanchan)	1.51	8382	4578	1.54
Jute (Deshi)	1.95	15868	2683	1.16
T.Aman rice (BR-11)	3.10	19843	9757	1.49
Total	-	44093	17018	1.39

Performance of some alternative cropping patterns in Old Brahmaputra Floodplain Soil

Productivity and profitability of four alternative cropping patterns viz. (i) Potato-Sesame-T.Aman, (ii) Mustard-Sesame-T.Aman rice, (iii) Lentil-Sesame-T.Aman rice and (iv) Sunflower-Jute-T.aman were tested at the FSRD site, Narikeli, Jamalpur. Results revealed that the highest gross margin (Tk 85731/ha) and BCR (2.81) was obtained from Potato-Sesame-T.Aman rice cropping pattern (Table 4.)

Table 4. Yield, cost and return of different cropping patterns tested at the FSRD site, Narikeli during 1998-99

Cropping pattern	Yield (T/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Potato	24.19	47252	85731	2.81
Sesame	0.89			
T.Aman rice	3.76			
Mustard	1.21	30980	18510	1.60
Sesame	0.88			
T.Aman rice	3.75			
Lentil	0.98	28028	27707	1.99
Sesame	0.90			
T.Aman rice	3.77			
Sunflower	2.71	38285	27540	1.72
Jute	2.71			
T.Aman rice	3.77			

Performance of summer vegetables on the trellis followed by Bottle gourd

The trial was conducted at farmer's field of FSRD site, Syedpur, Rangpur to develop a creeper vegetables pattern on the trellis and for economic utilization of trellis made for bottle gourd production. A total of four crop sequence viz. Bottle gourd – Bitter gourd, Bottle gourd-Snake gourd-Bottle gourd Ribbed gourd and Bottle gourd – Ash gourd were studied. Higher gross margin (Tk 1319/dec) and BCR (7.20) were obtained from Bottle gourd-Ash gourd sequence. BCR of the other sequence ranged from 6.69 to 6.31 (Table 5).

Table 5. Cost and return analysis of growing summer vegetables on the same trellis at the FSRD site, Syedpur during kharif 1999-2000

Cropping pattern	Yield (t/ha)		TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Bottle gourd- Bitter gourd	174	40	183	1206	6.59
Bottle gourd- Snake gourd	174	53	183	1124	6.69
Bottle gourd- Ribbed gourd	174	45	183	1156	6.31
Bottle gourd- Ash gourd	174	85	183	1319	7.20

Performance of Potato yam, Bottle gourd and Snake gourd on the same trailnet under different seeding rates

The experiment was conducted at the Regional Agricultural Research Station, Jessore during 1999-2000. Four different seeding rates viz. (i) 1 pit, (ii) 2 pits, (iii) 3 pits and (iv) 4 pits per trailnet (with two yam plants in each pit) were studied. Seeds of 200-300 g were planted in each pit. Yield and number of yam per trailnet increased progressively with gradual increase of plant population (Table 6).

Treatment	Yam plant/trailnet	Snake gourd plants/trailnet	Bottle gourd plants/trailnet
T_1	2 plants in 1 pit	2 plants in 1 pit	4 plants in 2pit
T_2	4 plants in 2 pit	4 plants in 2 pit	3 plants in 2 pit
T_3	6 plants in 3 pit	6 plants in 3 pit	2 plants in 1 pit
T_4	8 plants in 4 pit	8 plants in 4 pit	1 plants in 1 pit

Table 6. Yield, cost and return of vegetable pattern growing in sequence on the trailnet at RARS, Jessore over the year 1996-97 to 1999-2000.

Treat-ment	Yield (t/ha)				TVC (Tk/ha)	Gross Return	BCR
	Snake gourd	Yam	Bottle gourd	Bottle gourd equivalent			
T_1	2.69c	6.92d	16.60a	31.79	169044.28	190710.92	1.13
T_2	8.93b	15.98c	19.69a	58.38	236777.54	278299.72	1.18
T_3	14.5a	24.64b	11.19b	71.93	218166.45	298710.90	1.37
T_4	14.11a	31.09a	9.7b	76.63	239166.43	307744.14	1.29

Comparative performance of different vegetables as intercropped with Sugarcane

To assess the comparative performance of five sugarcane based intercropping system with five vegetables namely Red Amaranthus, Tomato, Spinach, Cabbage and Turnip, the experiment was conducted at FSRD site, Ishan Gopalpur during 1998-99. The results revealed that sugarcane yield did not differ statistically due to inter-cropping. Cabbage inter-cropped with sugarcane was found to be the most promising system to produce the highest gross margin (Tk 157650/ha) and BCR 3.42). The other inter-cropping systems are also identical to the cabbage system but are better than the sole sugarcane in terms of gross margin and BCR (Table 7).

Table 7. Yield, cost and return of Sugarcane based intercropping system with vegetable at the FSRD site Ishan Gopalpur, Faridpur during 1998-99

Treatment	Yield (t/ha)		Sugarcane equivalent yield (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
	Sugarcane	Intercrop				
Sugarcane (sole)	79.48a	-	79.48b	48500	37338	1.77
S.cane+Lalsak	82.43a	6.75	113.68ab	51800	70974	2.37
S.cane+Tomato	82.08a	14.69	163.69ab	67200	109586	2.63
S.cane+spinach	81.58a	8.60	121.39ab	52600	78506	2.49
S.cane+Cabbage	77.75a	34.67	205.65a	65000	157659	3.42
S.cane+Turnip	84.57a	7.11	117.48ab	63500	63385	2.06
CV%	5.41	-	5.86	-	-	-

Intercropping turmeric with vegetables

Intercropping of Red Amanranthus, Amaranthus, Ghee kanchana and Gimakalmi with Turmeric were studied at Agril. Research Sub-Station, Daulatpur, Khulna during 1999-2000. In terms of turmeric equivalent yield and economic return all the vegetable system performed better than the sole turmeric system. Among the vegetable systems Gimakalmi system appeared to be the best (Table 8).

Table 8. Yield, cost and return of intercropping Turmeric with vegetable at ARS, Daulatpur, Khulan during 1999-2000

Treatment	Yield (t/ha)		Turmeric equivalent yield (t/ha)	Gross margin (Tk/ha)	TVC (Tk/ha)	BCR
	Sugarcane	Intercrop				
Turmeric (sole)	30.37	-	30.37	125253	26597	5.70
Turmeric+Red Amaranthus	28.12	4.81	32.93	137550	27100	6.07
Turmeric+Amaranthus	26.95	6.35	32.03	133050	27100	5.90
Turmeric+Dhee Kanchan	27.78	4.99	33.77	141750	27100	6.23
Turmeric+Gimakalmi	26.75	9.00	35.95	151350	27400	6.52
CV%	5.41	-	5.86	-	-	-

Technique of growing Aman rice for successful rabi crop cultivation under rainfed condition

To establish rabi crop in time after the harvest of T.Aman rice at the High Barind tract this experiment was designed and conducted for three years at the farmer's field of FSRD site, Rajshahi. Four rice varieties; Sharna, BRRIdhan-31, 32 and 33 were grown under direct seeding (DS) and transplanting (TP) method in a split plot design with three dispersed

replications. Results showed that planting methods did not significantly affect the yield of the tested varieties of aman rice but can be harvested 7-10 days earlier in DS method. The modern varieties BRRI dhan-31, BRRIdhan-32 and BRRIdhan-33 were found 22-30 days earlier than the Sharna rice variety and BRRI dhan-33 was the earliest one (Table 9).

Table 9. Yield (t/ha) of different varieties of T.Aman rice over two seeding methods during the year 1997-98 to 1999-2000 in High Barind situation

Name of the variety	Yield (t/ha)		Days to maturity	
	DS	TP	DS	TP
Sharna	3.11a	3.21a	140	147
BRRI dhan-31	3.12a	3.42a	129	135
BRRI dhan-32	2.43b	2.57b	123	130
BRRI dhan-33	3.29a	3.00a	110	121

Screening of winter vegetables under irrigated condition

The experiment was conducted during rabi season, 1998-99 and 1999-2000 at the FSRD site Golapgonj, Sylhet and MLT site, Sunamganj to assess the potentialities of growing winter vegetables (Cabbage, Cauliflower, Tomato, Radish, Carrot, Red Amaranthus, Lalsak, Spinach) at these locations. From the two years results it was observed that all the vegetables performed well at these locations. But the performances of the vegetables are better at Sunamganj than that Golapgonj FSRD site. The highest gross margin (Tk 330880/ha) and BCR (11.18) was obtained from Tomato whereas in Sunamganj MLT site Cabbage has given the highest gross margin (Tk. 315637/ha) and BCR (15.40) followed by Tomato (Table 10). Except Red Amaranthus and Spinach, all the vegetables performed better at Sunamganj.

Table 10. Yield, cost and return of growing winter vegetables at FSRD site and MLT site of Sylhet during rabi seasons over 1998-2000

Name of the crops	Location	Yield (t/ha)	TVC	Gross margin	BCR
Cabbage	FSRD	26.27	31875	99450	4.12
	MLT	85.68	22250	315637	15.4
Cauliflower	FSRD	26.48	31875	127005	4.98
	MLT	29.85	22250	122782	6.71
Tomato	FSRD	36.34	32500	330850	11.18
	MLT	31.47	22250	282275	13.92
Radish	FSRD	30.94	29625	94115	4.18
	MLT	48.26	22250	126940	6.49
Carrot	FSRD	7.50	29625	39375	2.33
	MLT	23.61	22250	152912	8.04
Red Amaranthus	FSRD	5.24	15000	16440	2.10
	MLT	5.20	15350	10800	1.69
Spinach	FSRD	4.73	15000	19845	2.30
	MLT	5.58	15350	12675	1.82

Screen of transplant aman rice varieties for succeeding rabi crop cultivation in saline area of FSRD site Atkapalia, Noakhali

The trial was conducted at the FSRD site, Atkapalia, Noakhali during kharif II, 1999 in order to select suitable rice varieties that could leave room for rabi crop cultivation in time. Five improved varieties i.e. BRRI dhan –30, 31, 33, 34 and Binashail were evaluated against local Kazalshail and Katharichinigura. Results revealed that except BRRIdhan-33 (1.34 t/ha) all the varieties produced statistically identical yields (ranged 4.49t-3.68 t/ha) but maximum benefit was obtained from BRRI dhan-34. Moreover all the new varieties could be harvested 10-15 days earlier than the local Kazalshail (Table 11).

Table 11. Yield, cost and return of some T.aman rice varieties in saline area during kharif-II 1999 season at FSRD site, Atkapalia, Noakhali

Name of the variety	Days to harvest for transplanting	Grain yield (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
BRRI dhan-30	118	3.98a	21663	12027	1.56
BRRI dhan-31	115	4.49a	21663	16837	1.79
BRRI dhan-32	107	4.68a	21663	20837	1.96
BRRI dhan-33	99	1.34b	21663	-9383	0.56
BRRI dhan-34	117	4.37a	21663	33527	2.45
Kajalshail	132	3.85a	21663	10697	1.51
Binashail	119	4.18a	21663	21817	2.00
Katharichinigura	122	3.68a	21663	24007	2.13

Screening of different rabi crops in saline area

A trail with 12 rabi crops was conducted at the farmer's field of Char-Jubilee in Atkapalia FSRD site, Noakhali in six dispersed replications during 1998-99 and 1999-2000. In both agronomic and economic point of view tomato, radish, chilli and wheat were found promising (Table 12).

Table 12. Yield, cost and return of rabi crops tested in saline area of Atkapalia during 1999-2000

Name of the crops	Fruit, root or grain yield		TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
	1999-2000	Average of 1998-99 and 1999-2000			
Tomato	32.25	30.16	44120	129000	2.92
Chilli	1.46	0.92	17609	65700	3.73
Khesari	1.15	0.90	6570	13360	2.03
Lentil	0.49	0.42	6300	11710	1.85

Table 12. Contd.

Name of the crops	Fruit, root or grain yield		TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
	1999-2000	Average of 1998-99 and 1999-2000			
Chickpea	0.46	0.42	9600	9660	1.10
Cowpea	0.88	0.73	7300	9680	1.32
Mungbean	0.39	0.28	8750	10580	1.20
Wheat	1.57	1.83	11500	13370	1.16
Triticale	1.62	1.62	10550	11790	1.11
Mustard	0.41	0.41	7000	4300	-
Maize	2.29	2.29	7730	22900	2.96
Radish	26.22	21.03	29835	78660	2.63

Screening of different Rabi crops in saline area

To identify crops suitable for growing in the saline area of Patuakhali, the screening was done with Chilli, Cowpea, Mungbean and Sesame at Kalapara MLT site during the rabi season of 1999-2000. The salinity level of experimental area ranged between 6-8 ds/m during dry season. Among the four crops, Chilli was found profitable in terms of gross margin (Tk 15850/ha) and BCR (1.68). Performance of Mungbean and Sesame were almost equal in terms of gross margin (Tk 1537/ha) and Tk 1400/ha respectively) (Table 13).

Table 13. Yield, cost and return of different crops grown at Kalapara during rabi 1999-2000

Crops	Yield (kg/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Cowpea	818	10467	167	1.01
Chilli	750	23150	15850	1.68
Mungbean	442	8629	1537	1.17
Sesame	1183	12820	1400	1.11

Performance of Maize as Fodder and grain at Sunamgonj, Sylhet

To assess the fodder and grain yielding potentialities of maize, singly and in combination, the experiment was conducted at MLT site, Sunamganj during rabi 1999-2000. Four treatments viz. (i) Maize as grain, (ii) Maize as fodder, (iii) Maize as grain and fodder (thinned down to two from three plants at 60 DAE) and (iv) treatment (iii) + removal of lower leaves at silking stage were included in the trial.

Results revealed that fodder harvest reduced the grain yield of maize. But from the point of gross margin duel purpose maize is better than either grain/or fodder production. Maize as

only fodder performed the least. In terms of gross margin and BCR maize as grain and fodder,(iii) performed the best (Table 14).

Table 14. Yield, cost and return of maize cultivation as fodder and grain at Sunamganj, Sylhet during 1999-2000

Treatment	Grain yield (t/ha)	Fodder yield (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Maize as grain (T_1)	5.12	-	8875	21845	3.46
Maize as fodder (T_2)	-	16.69	3450	4895	2.42
Maize as grain & fodder (Thinned down to 2 plants/hill at 60 DAE) (T_3)	4.98	12.38	9962	26108	3.62
T_3+revomal of lower leaves at silking stagem (T_4)	4.81	13.82	10495	25275	3.41

Adaptability of different rabi crops under minimum and conventional tillage

To find out suitable rabi crops under conventional (4 ploughing + 4 laddering) and minimum (1 ploughing+1 laddering) tillage practice, this trial was designed and tested at the MLT site, Sherpur during rabi, 1999-2000. Five rabi crops viz. Lentil (BARI mashur-2), Grasspea (local), Maize (Barnali), Wheat (Kanchan) and Chickpea (Nabin) were tested. It was observed that Wheat, Maize and Grasspea were found most profitable under minimum tillage whereas chickpea and Lentil produced better gross margin under conventional tillage (Table 15).

Table 15. Yield, cost and return of rabi crops under minimum and conventional tillage practices during rabi 1999-2000 at MLT site, Sherpur.

Crops		Yield (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Wheat	Minimum	3.72	18500	16680	1.90
	Conventional	3.80	20200	15900	1.78
Maize	Minimum	6.89	23800	32390	2.36
	Conventional	7.15	26800	31497	2.17
Chickpea	Minimum	1.46	10702	20332	2.87
	Conventional	1.59	11364	22503	2.92
Grasspea	Minimum	1.35	18850	11900	1.63
	Conventional	1.46	21850	11350	1.51
Lentil	Minimum	1.73	15600	4702	1.30
	Conventional	1.88	16500	4940	1.36

Effect of sowing time on the performance of Mustard varieties

To find out a suitable mustard variety in late sowing condition, this trial was designed and conducted at the MLT site Borguna during 1999-2000. Four varieties viz. Daulat, Ishurdi local, Rai-5 and Tori-7 were sown on four different dates i.e. Nov. 15, 23, 30 and Dec. 7,. Results revealed that irrespective of sowing time Daulat performed the best (1038 kg/ha) followed by Ishurdi local (1014 kg/ha). Rai-5 (681 kg/ha) and Tori-7 (749 kg/ha) produced lower yields. Among the sowing dates Nov. 15 produced the highest yield (1164 kg/ha) followed by Nov.23 (1002 kg/ha). The yields sharply declined from Nov. 30 (Table 16).

Table 16. Yield of Rapeseed and Mustard varieties on different sowing dates at MLT site, Borguna during 1999-2000

Name of the variety	Yield (kg/ha)				Mean (kg/ha)
	Nov.15	Nov.23	Nov.30	Dec.7	
Daulat	1360a	1170a	873 a	751a	1038
Rai-5	978b	725b	553b	468b	681
Tori-7	1163ab	1008a	438b	388b	749
Ishurdi local	1158ab	1105a	940a	855a	1014
Mean	1164	1002	701	612	

Effect of seed priming on the performance of Mungbean at Lebukhali FSRD site, Patuakhali

The trial was conducted at the FSRD site, Lebukhali, Patuakhali during 1998-99 and 1999-2000 to overcome poor germination and yield of Mungbean seed. Four different duration of seed soaking viz. 2, 4, 6 and 8 hours was tested under this trial. Due to rainfall (5mm) at 4 DAS, the treatments did not affect the germination as well as yield. During 1118.99 seed soaking upto six hours gave better population/m2 and grain yield (Table 17).

Table 17. Yield, cost and return analysis of BARI-Mung-5 is different seed soaking at FSRD site Lebukhali during 1998-2000

Treatment	Population/m^2 (no.)		Grain yield (kg/ha)		Gross margin (Tk/ha)	BCR
	98-99	99-2000	98-99	99-2000		
Seed soaking for 2 hrs.	44	46	1473a	1550	23950	2.53
Seed soaking for 4 hrs	51	46	1667a	1660	26200	2.71
Seed soaking for 6 hrs	48	39	1663a	1510	22450	2.46
Seed soaking for 8 hrs	35	47	1067b	1654	26050	2.70
No soaking	38	43	1100b	1706	27250	2.78

Effect of seed priming on the performance of chickpea cultivars at Barind, Rajshahi

The experiment was conducted in farmers field at FSRD site, Barind, Rajshahi during rabi season of 1998-99 and 1999-2000 to assess affect of seed priming of the yield of different varieties of chickpea. Two seed treatment techniques (Priming and no n priming) and five varieties released by BARI were used to soak for 2, 3, 4 and 5 hours before sowing. The results showed that there was no significant variation of yield due to seed priming of chickpea varieties. This was due to availability of sufficient moisture in soil out of two spell of rainfall (Table 18).

Table 18. Effect of seed priming on the yield of different varieties of chickpea at High Barind Tract during rabi 1998-99 and 1999-2000

Treatment	Name of the variety	Population/m2		Grain yield (T/ha)
		1999-2000	1998-99	1999-2000
Primed	BARI chola-2	36	1.19	1.27
	BARI chola-3	35	1.22	1.25
	BARI chola-4	45	1.25	1.26
	BARI chola-5	48	1.38	1.29
	Local	33	1.01	0.95
Mean			1.25	
Non-prime	BARI chola-2	31	1.32	1.14
	BARI chola-3	32	1.14	1.12
	BARI chola-4	34	1.19	1.21
	BARI chola-5	40	1.43	1.15
	Local	30	1.00	0.90
Mean				1.22

Effect of sowing time on the yield of Wheat in High Barind Tract

To assess the performance of wheat over different sowing dates the experiment was conducted at the FSRD site Chabbishnagar, Rajshahi during rabi season 1999-2000 under irrigated condition. The seeds were sown on Nov. 5, 30, Dec. 15, 30 and Jan. 15. Statistically identical grain yield (3.29 to 3.06 t/ha) was obtained by seeding wheat upto 15 December. After 15 December grain yield declined significantly (Table 19).

Table 19. Yield of wheat as affected by different sowing time in HBT during 1999-2000

Sowing time	Grain yield (t/ha)	Spike/me (no.)	Grain/spike (no.)	1000 grain wt. (g)	Crop duration (days)
Nov. 15	3.18a	244	34.21	53.30	111
Nov. 30	3.29a	245	34.12	48.87	109
Dec.15	3.06a	242	32.33	46.00	106
Dec.30	2.14b	201	28.15	41.57	98
Jan.15	1.32c	157	21.32	28.33	88
CV%	16.27	16.38	6.60	10.85	

Adaptive trial of fine rice in Comilla region

An adaptive trial on three fine rice varieties viz. Kataribhog, Kataribhog gira and Kalizira was conducted at Chandina MLT site, Comilla during Kharif II 1999. In terms of yield Kataribhog produced the highest grain yield (3.1 t/ha) but maximum gross margin (35370 Tk/ha) was obtained from Kataribhog gira (Table 20).

Table 20. Yield, cost and return of fine rice varieties at Chandina during Kharif -II 1999

Varieties	Yield (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Kaligira	2.2	17130	24120	2.40
Kataribhog	3.1	17140	25485	2.48
Kataribhog gira	2.4	17130	35370	3.00

Effect of sowing time on leaf minor infestation of Stringbean at Rangpur

An experiment was conducted at ARS, Rangpur during 1999 to assess the effects of sowing time on the leaf miner infestation in Stringbean. Twelve planting times starting form February 1 to July 15 at an interval of 15 days were included in the experiment. Plants of February 1 planting were damaged by dry rot and those of April 15 and July 15 planting were damaged by heavy rainfall. Leaf miner infestation was higher (about 100%) in February – March plantings. But the yield of crops was not affected by the plant infestation by leaf miner. But infestation on the leaf and tunnel formed on the leaf have some affect on the yield (Table 21).

Table 21. Leaf miner infestation in string bean as influenced by time of sowing at ARS, Rangpur during 1999

Date of sowing	% Infestation at 60 DAS			Pod yield (t/ha)
	Plant	Leaf/plant	Tunnel/leaf	
FEb-01	-	-	-	-
Feb-15	100a	22b	2.5b	13.32ab
March-1	100a	21b	3.8cde	15.72a
March-15	100a	26a	7.5a	9.34cde
April-1	85a	14c	2.8de	11.88bc
Aprli-15	-	-	-	-
May-1	85a	14c	5.0bc	10.96bcd
May-15	86a	13cd	5.5b	3.33g
June-1	83a	11de	7.0a	6.45efg
June-15	83a	8ef	4.0cd	7.92def
July-1	12b	8ef	3.0de	5.65fg
July-15	13b	6g	2.5e	-
CV%	9.1	9.8	20.3	23.4

Effect of spacing and time of vine planting on seed yield of Kangkong

The experiment was conducted at ARS, Rangpur during 1999-2000 to determine optimum spacing and time of vine transplanting for maximum seed yield of Kangkong. Five dates of planting starting Aug. 1 at an interval of 15 days and five plant spacing viz. 30x15cm, 30x20cm, 30x10cm, 25x15cm and 35x15cm were tried in split plot design with five replications. Results revealed that seed yield was significantly influenced by planting dates. August 15 may be the most optimum time of vine planting in muddy condition to get maximum seed yield of Kangkong. Spacing of vine planting failed to influence the seed yield of Kangkong (Table 22).

Table 22. Seed yield of Kangkong as affected by time of planting at ARS, Rangpur during 1999-2000

Date of planting	Pods/plant (no.)	1000 seed weight (g)	Seed yield (t/ha)
August 01	93b	38.70a	1.98b
August 15	127a	39.00a	2.50b
September 01	91b	36.10b	2.02b
September 15	101a	26.90ab	1.44c
October 01	78b	35.70b	1.20c
CV%	14.70	4.40	9.60

Effect of different dosages and forms of urea on the yield of Tomato at Rangpur

To estimate the effects of different dosages and forms of urea on the yield of tomato an experiment was conducted at ARS, Rangpur during rabi, 1999-2000. Two forms of urea viz. Prilled urea (PU) and Urea Super granule (USG) in three different dosage (150, 200 and 250 kg/ha) were included in this trial. The tiral was conducted in factorial RCB design with three replications. Results revealed that both source and dose significantly affected the fruit yield of tomato. Prilled urea significantly increased the fruit yield (66.04 t/ha) and the three dosages for prilled urea produced identical yield grain. But in case of USG 250 kg urea/ha produced the superior grain yield. It appeared that prilled urea is more effective than USG (Table 23.)

Table 23. Effect of different dosages and forms of urea on the fruit yield of tomato at ARS, Rangpur during rabi, 1999-2000

Dose of urea	Fibre yield (t/ha)		
	Kharif 1999		Kharif 1998
	Research management (132-25-42-28 kg N-P-K-S/ha)	Farmers management No fertilizer	Research management
OM-1	1.94ab	1.64a	2.06a
0-9897	2.10a	1.66a	2.14a
Atompat-38	1.82bc	1.54a	-
BINA Deshipat-2	1.86bc	1.54a	-
JRO-524(Local)	1.70c	1.32b	2.01a
Mean	1.88a	1.54b	

CV%	9.5

Trial with BARIMung varieties at Rangpur

Four mungbean varieties viz. BARI Mungb-2, BARI Mung-3, BARI Mung-4 and BARI Mung-5 were tested against a local variety at ARS, Rangpur during kharif, 1999. BARI Mung-5 has given superior grain yield (1185 kg/ha). Moreover the variety was 5-7 days earlier than the others. In terms of economic return the same variety was found superior to the others (Table 25).

Table 25. Yield comparison of different varieties of mungbean developed by BARI at ARS, Rangpur during khari-2, 1999

Name of the variety	Days to 80% maturity 1999	Grain yield kg/ha	
		1999	1998
BARI Mung-2	68b	887bc	831b
BARI Mung-3	65b	872c	545c
BARI Mung-4	66b	915b	1054a
BARI Mung-5	60c	1185a	824b
Local (control)	71a	470d	-

Variety trial of T.Aman rice at Rangpur

Five T.Aman rice varieties viz. BRRI dhan-30, 31, 32, and 34 were evaluated against BR-11 as check at FSRD site, Rangpur during kharif-II, 1999. Result revealed that BRRIdhan-31 yield the best (5.11 t/ha), which was identical to those of BRRIdhan-30 and 32. About 30% crop of BRRIdhan-32 was affected by lodging BRRIdhan-33 was found to be the shortest duration (82 days) variety (Table 26).

Table 26. Yield performance of T.Aman rice varieties at FSRD site, Syedpur, Rangpur during kharif-II, 1999

Name of the variety	Days to maturity (no.)	Effect tillers/hill (no.)	1000 seed weight (g)	Grain yield (t/ha)
BRRIdhan-30	106a	10ab	21.6b	4.97a
BRRIdhan-31	104a	8b	23.8a	5.11a
BRRIdhan-32	100a	9b	21.4b	4.79a
BRRIdhan-33	82b	8b	23.4a	4.32b
BRRIdhan-34	101a	11a	11.1c	3.02c
BR-11	103a	7c	23.0a	3.75c
CV%	4.6	14.5	3.0	5.6

Variety trial of Mustard at Rangpur

To find out a suitable mustard variety to fit the existing cropping pattern at FSRD site Rangpur the trial was conducted during rabi season of 1998-99 and 1999-2000. A total of seven varieties viz. BARI sharisha 6, 7, 8 Rai-5, Daulat, Sonali Sharisha and Toir-7 were tested among which BARI Sharisha-8 produced the superior yield (2.26 t/ha) and Tori-7 was found to have the shortest field duration (81 days) (Table 27).

Table 27. Yield obtained from different Mustard varieties at FSRD site, Rangpur 1999-2000

Name of the variety	Duration (days)	Grain yield (t/ha)	
		1999-2000	1998-99
BARI Sharisha-6	107a	1.48c	1.44b
BARI Sharisha-7	107a	1.83b	1.15c
BARI Sharisha-8	107a	2.26a	2.06a
Rai-5	105c	1.36d	1.44b
Daulat	106c	1.14c	1.30b
Sonali sharisha	106c	1.15e	1.19c
Tori-7	81d	1.19e	1.04d
CV%	0.50	3.90	-

Variety trial of Potato at Rangpur

Seven varieties of potato viz., Heera, Dheera, Diamont, Multa, Patrones, Cardinal and farmers seed (Cardinal) as check were tested to select a suitable variety for FSRD site, Rangpur. Results revealed that Heera, Dheera, Diamont and cardinal were statistically superior varieties (yield range 33.5t-31.36 t/ha) The least yield (16.89 t/ha) was obtained from local seeds of cardinal. Multa (26.14 t/ha) and Patrones (22.64 t/ha) gave intermediate yields but statistically different. Longest field duration (93-94 days) was required by Dheera and Cardinal. Multi had the shortest field duration (88 days). The other varieties were intermediate in days to maturity (Table 28).

Table 28. Yield obtained from different potato varieties at FSRD site, Rangpur during 1999-2000

Name of the variety	Days to maturity	Weight of tuber/plant (g)	Tuber yield (t/ha)
Heera	90b	666a	33.56a
Dheera	94a	668a	33.48a
Diamont	92b	654a	32.32a
Multa	88c	507e	26.14b
Patrones	91b	457b	22.64c
Cardinal	94a	645a	31.36a
Cardinal (Local)	93a	374c	16.89d

CV%	1.3	13.7	9.2

On-Farm adaptive trial on time of planting of tomato at Noakhali

To assess the effect of planting time on different varieties of tomato at the saline area the trial was conducted at Atkapalia FSRD site, Noakhali during 1999-2000. Six plantings at an interval of 15 days starting from Dec. 15 was included in the study. Irrespective of variety Dec. 15 planting yielded the best (40.10 t/ha) and March 01 planting yielded the least (1.14 t/ha). In case of early planting variety Ratan and Roma performed better whereas BARI-5 is suitable for late planting (Table 29).

Table 29. Yield of tomato at different date of transplanting at Atkapalia FSRD site Noakhali during 1999-2000

Date of transplanting	Fruits wt/plant (kg)			Mean over variety (kg/plant)	Yield (t/ha)
	Ratan	Roma	BARI-5		
Dec.15	2.08a	2.08a	0.77a	1.50	40.10
Dec.30	0.56b	0.91b	0.70ab	0.88	29.13
Jan-15	0.50b	0.56c	0.58bc	0.47	23.39
Jan.-30	0.28c	0.50c	0.58bc	0.41	20.98
Feb.-15	0.51b	0.28d	0.45c	0.19	17.10
Mar.-01	1.81b	0.11c	0.27d		1.14
Mean	0.712	0.74	0.56	0.67	

Study on the application of mulch and irrigation on the high value vegetables in the saline soil at Noakhali

The experiment was conducted at the farmers field of FSRD site, Atkapalia, Noakhali during rabi, 1999-2000 to estimate the effect of mulch and irrigation on vegetable yield in saline areas of FSRD site, Noakhali. It was observed that mulch improved the yield of all vegetables. Improvement of yield due to mulch was higher in cabbage (55.60%) and Potato (49.32%) (Table 30).

Table 30. Yield of Potato, Tomato, Brinjal and cabbage as influenced by mulch at the FSRD site, Noakhali during rabi 1999-2000

Name of the crops	Yield (t/ha)		Yield increase over no mulch (%)
	No mulch	With mulch	
Potato	11.09	16.56	49.32
Tomato	27.75	37.83	36.32
Brinjal	12.98	15.43	18.88
Cabbage	14.49	22.46	55.00

Effect of time of sowing and harvest on the yield and marketing of radish at Narsinghdi

The experiment was conducted at farmer's field of Narsingdi MLT site during rabi 1999-2000 to determine appropriate time of sowing and harvest of radish for higher profit. It was found that yield of radish was significantly affected by both sowing time and time of harvest. Early sowing (30 October) and late harvest (60 DAS) contributed significantly to higher yield (76.49 t/ha). In terms of gross return a 50 days crop sown on October 30 although gave lower yield (63.47 t/ha) than that of the 60 days crop but generated the highest gross return (Tk 317350/ha). In all the sowing dates, harvest of a 50-days crop appeared to be economically sound (Table 31).

Table 31. Yield and economic return of Radish as affected by sowing date and time of harvest at Narsingdi MLT site during rabi 1999-2000

Sowing date	Root yield (t/ha)			Gross return (Tk/ha)		
	40 DAS	50 DAS	60 DAS	40 DAS	50 DAS	60 DAS
30 October	24.33c	63.47b	76.49a	97320	317350	229470
10 November	19.95c	52.97b	67.79a	39900	158910	135580
20 November	16.31c	39.14b	49.45a	16310	78280	49470

Effect of irrigation on the growth and yield of chickpea in High Barind Tract

The experiment was conducted at the farmer's field of Chabbishnagar, Rajshahi during 1998-99 and 1999-2000 to assess the effect of irrigation on the performance of chickpea. Two chickpea varieties viz. BARI Chola 3 and BARI Chola 5 were tried under four irrigation management (no irrigation, irrigation at 20 days after germination, irrigation at 40 days after germination and irrigation at 20 and 40 days after germination. Results revealed that there was no significant variation of chickpea yield both due to variety and irrigation management during 1999-2000 but during 1998-99 there was significant variation of yield due to both variety and irrigation management. During crop season 1999-2000 there was two spells of rainfall, which might have influenced yield other than the irrigation management (Table 32).

Table 32. Effect of irrigation on the yield of chickpea varieties at FSR site, Chabbishnagar during 1998-99

Irrigation	Grain yield (t/ha)			
	1998-99		1999-2000	
	BARI Chola 3	BARI Chola 5	BARI Chola 3	BARI Chola 5
No irrigation	1.44abc	1.36bc	1.09	1.11
Irrigation at 20 DAE	1.64ab	1.74a	1.14	1.25
Irrigation at 40 DAE	1.44abc	1.49abc	1.11	1.13
Irrigation at 20 & 40 DAE	1.32bc	1.19c	1.04	1.05
Mean	1.46	1.45	1.09	1.14
CV%	13.75	-	34.39	-

Integrated Farming

The main objective of farming system research and development is to improve farming condition and livelihood by integrating available technologies to farm resources. The research system has developed a number of technologies but the farmers for varied reasons do not use all. It is expected that if the technologies suitable for the resource base of a farmer is identified and applied in an integrated approach, a positive impact on the farm economy is likely to be obtained. But such a well-contented and widely conceived work procedure is lacking for study of an integrated approach to Farming System Research and Development. The present study aims at developing some action module for integrating technologies to farm resources in one hand and improving farm productivity and profitability on the other.

The main objective of the study was to improve productivity and profitability of farm resources sustainably by generating and applying effective technologies in an environment friendly approach.

FSRD site Golapgonj, Sylhet: It was observed that the cooperator farmer before intervention used 6 technologies in crop, livestock, homestead and fisheries sectors, but after intervention the farmer was able to use 18 technologies (Table 1). The farmer obtained a good gross margin of Tk. 562457 from the intervened technologies as compared to a gross margin of tk. 16702 before intervention. For this intervention farmer had to use a total variable cost of Tk. 19853 against a pre-intervened total variable cost of Tk. 6693. The highest contribution to gross margin was obtained from the homestead intervention (Tk. 20090). Thus the marginal benefit cost ratio (MBCR) stood at 4.00 (Table 2).

Table 1. Number of Technologies used at Golapgonj, Sylhet

Sector	Before intervention (1997-98)	After Intervention (1999-2000)
Crop	2	6
Homestead	2	8
Livestock	1	2
Fisheries	1	2
Total	6	18

Table 2. Cost and benefit of the integrated technologies at Golapgonj, Sylhet during 1997-98 and 1999-2000

Sector	Before intervention (1997-98)		After intervention (1999-2000)		MBCR
	TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	
Crop	1735	3500	11021	23955	2.20
Homestead	4358	11402	5082	20090	12.00
Livestock	250	600	950	3500	4.14
Fisheries	350	1200	2800	8700	4.06
Total	6693	16702	19853	56245	4.00

TVC = Total variable cost, GM = Gross margin

FSRD site Palima, Tangail: It was found that the farmer used 15 technologies before intervention and 24 technologies during intervention (Table 3). These interventions of new technologies increased the TVC from Tk. 8045 to Tk. 39746, but the gross margin increased from Tk 18794 to Tk. 37755, which provided a MBCR of 1.60. The highest MBCR was found in fisheries sector (4.28) followed by that in crop sector (4.10) (Table 4).

Table 3. Number of Technologies used at Palima, Tangail during 1999-2000

Sector	Before intervention (1998-1999)	After intervention (1999-2000)
Crop	5	5
Homestead	9	14
Livestock	-	3
Fisheries	1	2
Total	15	24

Table 4. Cost and benefit of the integrated technologies at Palima, Tangail during 1998-99 and 1999-2000

Sector	Before intervention (1997-98)		After intervention (1999-2000)		MBCR
	TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	
Crop	7120	12276	8975	18027	4.10
Homestead	275	2410	1471	4898	2.08
Livestock	-	2558	27300	8880	1.23
Fisheries	650	1550	2000	5980	4.28
Total	8045	18794	39746	37755	1.60

FSRD site, Goyeshpur, Pabna: It was observed that the cooperator farmers used 4-24 technologies before intervention but the umber increased upto 17-42 intervention (Table 5). The intervention of new technologies gave good return to the farmers. The gross margin of farmer 1 increased from Tk 583660 to Tk 144004, that of farmer 2 from Tk 77450 to Tk. 150617, Farmer 3 from Tk. 325 to tk 6673, farmer 4 form Tk. 53071 to Tk 120375 and that of farmer 5 from Tk. 50690 to Tk 97977 (Table 6).

Table 5. Number of Technologies used a Goyeshpur, Pabna during 1998-99 and 1999-2000

Sector	Before intervention (1998-1999)	After intervention (1999-2000)
	Farmer- 1 (Medium)	
Crop	12	16
Homestead	8	18
Livestock	2	2
Fisheries	2	2
Total	24	38

Table 5. Contd.

Sector	Before intervention (1998-1999)	After intervention (1999-2000)

	Farmer –2	
Crop	15	22
Homestead	8	18
Livestock	-	1
Fisheries	-	1
Total	23	42
	Farmer – 3	
Crop	-	-
Homestead	4	15
Livestock	-	1
Fisheries	-	1
Total	4	17
	Farmer-4	
Crop	6	7
Homestead	4	15
Livestock	1	4
Fisheries	1	3
Total	12	29
	Farmer-5	
Crop	11	12
Homestead	9	15
Livestock	2	3
Fisheries	1	1
Total	23	41

Table 6. Cost and Benefit of the integrated farmers at Goyeshpur, Pabna during 1998-99 and 1999-2000

Sector	Before intervention (1997-98)		After intervention (1999-2000)		MBCR
	TVC(Tk)	GM(Tk)	TVC(Tk)	GM (Tk)	
		Farmer –1			
Crop	18230	48670	19560	96624	37.06
Homestead	10	5220	2010	21425	9.10
Livestock	0	1170	11960	11355	1.85
Fisheries	140	3300	2850	14600	5.17
Total	18380	58360	36380	144004	5.76
		Farmer –2			
Crop	17295	73700	25395	99765	4.22
Homestead	560	3750	983	9602	14.88
Livestock	-	-	53170	20450	1.38
Fisheries	-	-	300	800	3.67
Total	17855	77450	79848	130617	1.85

Table 6. Contd.

Sector	Before intervention (1997-98)		After intervention (1999-2000)		MBCR
	TVC(Tk)	GM(Tk)	TVC(Tk)	GM (Tk)	
			Farmer –3		
Crop	-	-	-	-	-
Homestead	100	325	330	2480	6.01
Livestock	-	-	65700	25270	1.38
Fisheries	-	-	543	2220	5.08
Total	100	325	66573	29990	1.45
			Farmer –4		
Crop	22854	42670	22655	60590	-
Homestead	1980	8521	2899	19602	10.93
Livestock	-	860	1680	11700	7.45
Fisheries	-	1020	16350	28470	2.68
Total	24834	53071	66584	29990	4.59
			Farmer –5		
Crop	22600	45860	17705	79457	-
Homestead	333	2860	802	3840	3.09
Livestock	30	520	559	10800	19.36
Fisheries	140	1450	650	3880	5.76
Total	23103	50690	19716	97977	

FSRD site, Chabbishnagar, Barind, Rajshahi: It was revealed that the cooperator farmers of Barind, Rajshahi used 10 to 15 technologies before intervention but the number of technology used increased up to 24 to 29 during intervention (Table 7). The gross margin of the farmer 1 increased from Tk. 26855 to Tk. 91894, that of the farmer 2 from Tk. 15885 to Tk. 61100 and farmer 3 from Tk. 6490 to Tk. 46889. The corresponding TVC of farmer 1 was Tk. 25298 and Tk. 92425, that of farmer 2 was Tk. 15320 and Tk. 63122 and farmer 3 Tk. 8605 and Tk. 28936. Marginal cost benefit ratio (MBCR) from fisheries was found the highest for all the farmer (Table 8).

Table 7. Number of technologies used at Chabbishnagar, Rajshahi during 1998-99 and 1999-2000

Sector	Before intervention (1998-1999)	After intervention (1999-2000)
	Farmer 1 (Medium)	
Crop	3	5
Homestead	4	14
Livestock	2	9
Fisheries	1	1
Total	10	29

Table 7. Contd.

Sector	Before intervention (1998-1999)	After intervention (1999-2000)
	Farmer 2	
Crop	3	5
Homestead	3	14
Livestock	2	6
Fisheries	1	1
Total	11	26
	Farmer – 3	
Crop	3	4
Homestead	9	14
Livestock	2	5
Fisheries	1	1
Total	15	24

Table 8. Cost and benefit of the integrated technologies at Chabbishnagar, Rajshahi during 1998-99 to 1999-2000

Sector	Before intervention (1997-98)		After intervention (1999-2000)		MBCR
	TVC(Tk)	GM(Tk)	TVC(Tk)	GM (Tk)	
		Farmer 1			
Crop	15278	10045	22135	25565	3.26
Homestead	970	4400	2655	15460	7.56
Livestock	550	6910	56135	38369	1.55
Fisheries	8500	5500	9500	12500	7.00
Total	23288	26855	92425	91894	1.97
		Farmer 2			
Crop	13355	10695	19595	31135	4.28
Homestead	1110	3390	2145	6235	3.56
Livestock	205	1250	40582	22510	1.53
Fisheries	650	550	700	1320	16.4
Total	15320	15883	63122	61100	1.95
		Farmer 3			
Crop	8025	4175	17721	30599	3.73
Homestead	245	800	950	2350	3.11
Livestock	135	1215	9935	13240	2.22
Fisheries	200	300	300	700	5.00
Total	8605	6490	28036	46889	2.99

FSRD site, Ishan Gopalpur, Faridpur: At the FSRD site, Ishan Gopalpur, Faridpur 2 farmers, one small and one marginal, were included in the study. the small farmers used 15 technologies before the intervention. In this study his resource base was intervened with 34 technologies. Similarly the marginal farmer was using 9 technologies on his farm. His resource base was applied with 24 technologies (Table 9). Before the intervention the

farmer obtained a gross margin of Tk. 34747. The gross margin increased up to Tk. 53932 after intervention with the technologies. For that benefit he had to increase his total variable cost from Tk 23838 to Tk. 42457. Similarly the marginal farmer was using nine technologies on his farm. In the intervention process he used 24 technologies. Use of these technologies could improve the gross margin (GM) from Tk. 11693 to Tk. 21832. For this purpose he had to increase his total variable cost (TVC) from Tk. 6694 to Tk. 14055 (Table 10).

The relative sectoral contribution in terms of gross margin for the small farm production system in descending order was Crop>Livestock>Homestead>Fisheries while that of the marginal farmer was crop>Homestead>Livestock>Fisheries. Marginal cost benefit ratio (MBCR) for both the farmers was the highest for homestead production system.

Table 9. Number of Technologies used at Ishan Gopalpur, Faridpur during 1998-99 and 1999-2000

Sector	Before intervention (1997-98)	After intervention (1999-2000)
	Farmer 1	
Crop	8	10
Homestead	6	20
Livestock	-	3
Fisheries	1	1
Total	15	34
	Farmer 2	
Crop	3	4
Homestead	6	17
Livestock	-	2
Fisheries	-	1
Total	9	24

Table 10. Cost and Benefit of integrated farmers at Ishan Gopalpur, Faridpur during 1998-99 and 1999-2000

Sector	Before intervention (1997-98)		After intervention (1999-2000)		MBCR
	TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	
		Farmer 1			
Crop	16789	22311	35138	35442	1.72
Homestead	239	2421	869	6180	6.97
Livestock	6200	9400	5480	10650	-
Fisheries	600	605	970	1660	3.90
Total	23838	34747	42457	53932	2.03
		Farmer 2			
Crop	6505	8258	10480	11530	1.82
Homestead	190	1845	695	5632	8.49
Livestock	-	1590	3200	3700	1.66
Fisheries	-	-	480	970	3.02
Total	6694	11693	14055	21832	2.24

Integrated Soil Fertility and Fertilizer Management

Subproject: Cropping Pattern Based Fertilizer Management

Development of fertilizer recommendation for different cropping patterns and environments

The experiment was conducted at different locations under different AEZs on different cropping patterns to find out a cropping pattern based fertilizer recommendation for dominant cropping patterns and to determine the economic use of fertilizer in promising pattern. A total of six dominant cropping patterns were tested at 10 different locations. The experiment was laid out in RCB design with six dispersed replications. The following six fertilizer management packages were verified-

T_1 (ED1) = Estimated mineral fertilizer dose for moderate yield goal
T_2 (ED2) = Estimated mineral fertilizer dose for high yield goal
T_3 (INM) = Integrated Nutrient Management for HYG
T_4 (FRG'97) = Fertilizer dose from BARC Fertilizer Recommendation Guide'97
T_5 (FP) = Farmers' practice
T_6 (Control) = Absolute control

The treatment concept was to compare the soil test based (STB) mineral fertilizer dose for High Yield Goal (HYG), Moderate Yield Goal (MYG), the high yield goal integrated with organic manure with current BARC's fertilizer recommendation'97 as well as the farmers prevailing practices. Details of the site characteristics and crop management are given in appendix table 1 & 2. The different cropping patterns studied at different locations are as follows-

Different cropping patterns tested in different locations

Location	Site	AEZ	Tested cropping pattern
Jamalpur	Narikeli	9	Wheat - Jute - T.Aman
Jamalpur	Narikeli	9	Mustard - Boro - T.Aman
Tangail	Palima	9	Mustard - Jute- T.Aman
Tangail	Palima	9	Boro - T.Aman
Hathazari	Hathazari	23	Mustard - Boro - T.Aman
Patuakhali	Lebukhali	13	Mungbean - T.Aus - T.Aman
Kishoregonj	Kendua	9	Boro - T.Aman
Rangpur	Syedpur	3	Boro - T.Aman
Rangpur	Polashbari	3	Boro - T.Aman
Rangpur	Nilphamari	3	Boro - T.Aman
Rajshahi	Paba	11	Wheat - T.Aman
Rajshahi	Chabbishnagar	25	Wheat - T.Aman

Location : Narikeli, Jamalpur
Cropping pattern : Mustard-Boro-T.Aman

In mustard, superior seed yield (1.2t/ha) was recorded from INM where additional 500 kg/ha mustard oil cake was applied, followed by ED2 (1.05 t/ha) and FRG'97 (0.97 t/ha).
In Boro and T.Aman rice ED2 and INM produced identical yield but were significantly higher than that from rest of the treatments. The control plot produced the lowest yield and the farmers' dose produced the intermediate yield.

The highest MBCR (4.41) was obtained from FRG'97 and was followed by ED2 (3.63). Farmers dose also recorded satisfactory MBCR (3.03).

Table 1. Effect of different fertilizers on the agro-economics performance of Mustard-Boro-T.Aman rice cropping pattern at Narikeli during 1998-99

Treatment	Grain yield (t/ha)			Straw/stover yield (t/ha)			Add. cost	Add. profit	BCR
	Mustard	Boro	T.Aman	Mustard	Boro	T.Aman			
T1 (ED2)	1.05b	6.8a	4.2a	3.3ab	12.6a	8.3a	10517	38190	3.63
T2 (INM)	1.20a	6.9a	3.9ab	3.5a	13.0a	7.9a	16578	38265	2.31
T3 (FRG'97)	0.97bc	6.6b	3.8b	3.1b	12.8a	7.8ab	7513	33160	4.41
T4 (FP)	0.88c	6.0c	3.6b	2.7bc	12.1a	7.2b	8872	26940	3.03
T5 (Control)	0.51d	3.0d	3.0c	1.9c	9.4b	6.2c	-	-	-

Table 1.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)		
	Mustard	Boro	T.Aman
ED2	77-14-28-14	140-17-56-10	98-12-35-6
INM	52-5-23-14 + 0.5 t/ha MOC	140-17-56-10	98-12-35-6
FRG'97	55-10-20-10	100-12-40-7	70-8-25-4
FP	30-25-20	58-25-31-0	16-15-0-0
Control	0-0-0-0	0-0-0-0	0-0-0-0

Location : Hathazari
Cropping pattern : Boro-T.Aman

Significantly higher grain yield was obtained from ED2 and INM in both Boro and T.Aman rice crop. Present BARC recommendation and ED1 produced similar result.

The higher gross margin values were obtained from ED2 and INM, respectively. But the highest MBCR was calculated from present BARC fertilizer recommendation followed by ED2

and ED1. Additional cost for cowdung (10 t/ha) in integrated nutrient management practice reduced the MBCR value, however it produced the highest yield.

Table 2. Effect of different fertilizers on agro-economics performance of Boro-T.Aman cropping pattern at Hathazari during 1998-99

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	4.80b	3.65bc	5.03b	3.91b	23502	34547	5.08
ED2	6.39a	4.15ab	6.71a	4.59a	29809	55271	5.67
INM	6.16a	4.36a	6.41a	4.58a	32300	54497	3.79
FRG'97	4.62b	3.50c	4.97b	4.00ab	22225	43585	6.12
FP	4.46b	3.15c	4.74b	3.81ab	23755	38064	3.88
Control	2.43c	2.00d	2.93c	2.60c	17400	19140	-

Table 2.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Boro	T.Aman
ED1	89-20-54-16	61-7-38-4
ED2	126-28-75-23	84-9-48-7
INM	116-22-65-23 + CD 10 t/ha	84-9-48-7
FRG'97	100-10-40-5	70-4-35-1
FP	86-25-16-0	75-26-17-0
Control	0-0-0-0	

Location : Palima, Tangail
Cropping pattern : Mustard-Jute-T.Aman

Different doses of fertilizers failed to produce any significant difference in seed/fiber/grain yield of mustard (range:0.84-0.7 t/ha) jute (range: 2.29-1.92 t/ha) and T.Aman rice (range: 4.02-3.67 t/ha). The initial soil status of the experimental plots suggested that the soil was very deficient in N, P and K but no response of these nutrient elements were observed even in any crop of the pattern. More study needed to explain the phenomena.

When the cost benefit analysis was done, it was found that the highest gross margin (47403 Tk/ha) was calculated from INM followed by FP and ED1.But regarding MBCR, the highest value was obtained from FRG'97 which was closely followed by ED1.

Table 3. Effect of different fertilizers on agro-economic performance of Mustard – Jute - T.Aman cropping pattern at Palima, Tangail during 1998-99

Treat-ment	Grain yield (t/ha)			Straw/stover yield (t/ha)			TVC (Tk/ha)	GM (Tk/ha)	BCR
	Mustard	Jute	T.Aman	Mustard	Jute	T.Aman			
ED1	0.71a	2.13ab	3.82a	2.02b	3.62ab	4.22a	36351	43957	4.17
ED2	0.72a	2.04ab	3.82a	2.13b	3.62ab	3.82a	38800	40465	2.85
INM	0.78a	2.29a	4.02a	2.17b	3.83a	4.06a	40565	47403	3.07
FRG'97	0.70a	1.92ab	3.67a	2.12b	2.97b	4.03a	35853	38123	4.69
FP	0.84a	2.12ab	3.89a	2.71a	3.75a	4.25a	38811	44943	2.66
Control	0.39b	1.76b	2.62b	0.85c	3.00b	2.60b	28953	28826	-

Table 3.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)		
	Mustard	Jute	T.Aman
ED1	80-20-25-4	90-18-40-4	75-12-25-4
ED2	110-30-35-6	125-25-60-6	105-18-35-6
INM	105-25-28-6 + CD 10 t/ha	125-25-60-6	105-18-35-6
FRG'97	60-15-20-15	55-7-25-5	70-8-25-4
FP	115-25-40-0	55-20-20-8	45-12-20-0
Control	0-0-0-0	0-0-0-0	0-0-0-0

Location : Narikeli, Jamalpur
Cropping pattern : Wheat-Jute-T.Aman

There was no significant difference was observed among the different fertilizer doses in grain/fiber yield of wheat, jute and T.Aman rice except with control. The experiment was started without soil test data and therefore, no soil test data is available to interpret the result.

From cost benefit study, it was found that the higher BCR values were obtained from present BARC fertilizer recommendation and estimated fertilizer dose for MYG.

Table 4. Effect of different fertilizers on agro-economic performance of Wheat-Jute-T.Aman cropping pattern at Narikeli during 1999-2000

Treat-ment	Grain yield (t/ha)			Straw/stover yield (t/ha)			Add. cost	Add. profit	BCR
	Wheat	Jute	T.Aman	Wheat	Jute	T.Aman			
ED2	2.8a	2.8a	4.0a	3.9a	7.5a	7.7a	8210	16900	2.06
INM	2.7a	2.7a	4.1a	3.9a	7.4a	7.7a	12578	16275	1.29
FRG'97	2.6a	2.6a	4.1a	3.9a	7.4a	7.6a	5863	14950	2.55
FP	2.5a	2.3b	3.9a	3.8a	6.9b	7.4b	6853	10975	1.60
Control	1.8b	2.0c	3.3b	2.9b	5.6c	7.1c	-	-	-

Table 4.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)		
	Wheat	Jute	T.Aman
ED2	84-21-35-12	77-10-35-7	98-12-35-6
INM	59-12-30-12 + 0.5 t/ha MOC	77-10-35-7	98-12-35-6
FRG'97	60-15-25-8	55-7-25-5	70-8-25-4
FP	30-22-28-0	29-25-31-12	58-3-31-0
Control	0-0-0-0	0-0-0-0	0-0-0-0

Location : Lebukhali, Patuakhali
Cropping pattern : Mungbean- T.Aus - T.Aman

In all the crops ED2, INM and present BARC fertilizer recommendation produced significantly higher grain yield then other treatments. The yield difference was occurred mainly due to the difference of N and P as the soil was deficient with these elements.

Similarly the higher gross margin and BCR were also calculated from the same treatments.

Table 5. Effect of different fertilizers on agro-economic performance of Mungbean- T.Aus - T.Aman cropping pattern at Lebukhali during 1998-99

Treatment	Grain yield (t/ha)			Straw/stover yield (t/ha)			TVC (Tk/ha)	GM (Tk/ha)	BCR
	Mungbean	T.Aus	T.Aman	Mungbean	T.Aus	T.Aman			
ED1	0.69bcd	4.28b	3.26bc	1.94	4.75	4.56	45883	11064	2.16
ED2	0.75abc	4.64ab	3.64ab	2.26	4.45	4.53	47206	15277	2.19
INM	0.81ab	4.92a	3.82a	2.30	5.02	4.40	50001	18679	2.19
FRG'97	0.89a	4.66ab	3.34bc	2.36	4.79	4.83	45718	17752	3.40
FP	0.61cd	3.67c	2.88c	2.12	3.79	4.90	41991	7674	1.07
Control	0.55d	3.70c	2.74c	1.81	3.80	4.36	38700	9090	-

Location : Palima, Tangail
Cropping pattern : Boro-T.Aman

In Boro rice, grain yield did not differ due to different fertilizer doses. There was no response of NPK was found however the soil was very deficient with these elements. Again, in T.Aman rice the response of the nutrients were evident and the highest grain yield was obtained from INM where an additional cowdung @ 10 t/ha was applied along with inorganic fertilizer for HYG. But when cost benefit analysis was done the scenario was completely different. Highest BCR values were calculated from present BARC recommendation and ED1 followed by farmers' practice. Due to the additional cost for cowdung in INM reduced the BCR in spite of its highest yield.

Table 6. Effect of different fertilizers on agro-economics performance of Boro-T.Aman cropping pattern at Palima during 1998-99

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Boro	T.Aman	Boro	T.Aman			
ED1	7.62a	3.83b	9.45a	5.97a	44440	45350	6.57
ED2	7.18a	3.99ab	9.20a	5.93a	45930	41140	4.31
INM	6.75a	4.19a	8.94a	6.45a	45530	40450	2.89
FRG'97	7.56a	3.85b	9.67a	5.95a	45670	44014	6.81
FP	7.37a	3.16c	9.25a	5.03b	43370	28330	4.98
Control	5.19b	2.12d	7.42b	3.47c	38910	10945	-

Table 6.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Boro	T.Aman
ED1	90-20-50-0	62-15-32-0
ED2	130-30-70-0	87-20-45-0
INM	123-55-57-0 + CD 10 t/ha	87-20-45-0
FRG'97	100-20-35-12	70-8-25-4
FP	110-10-20-0	45-12-20-0
Control	0-0-0-0	0-0-0-0

Location : Kendua, Kishoregonj
Cropping pattern : Boro-T.Aman

Significantly higher grain yield was recorded from INM and ED2 in both Boro and T.Aman rice. The lowest yield was obtained from farmers' dose.

Regarding BCR, the highest value was calculated ED1. In this trial there was no absolute control and the treatments were compared with farmers' dose. However, in INM the gross margin is highest but due to higher additional cost for cowdung the BCR is lowest.

Table 7. Effect of different fertilizers on agro-economic performance of Boro-T.Aman cropping pattern at Kendua during 1998-99

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Boro	T.Aman	Boro	T.Aman			
ED1	5.30b	4.43b	5.30b	5.83b	26550	42655	9.04
ED2	5.71a	4.79a	5.71a	5.87b	27150	46792	3.73
INM	5.76a	4.89a	5.76a	6.20a	27100	48042	1.84
FRG'97	5.13b	4.35b	5.13b	5.62bc	26550	41602	7.40
FP	4.93c	3.97c	4.93c	5.35c	26500	36925	-

Table 7.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)

	Boro	T.Aman
ED1	100-15-40-10	60-8-30-4
ED2	140-21-56-14	84-11-42-6
INM	130-15-46-14 + CD 10 t/ha	84-11-42-6
FRG'97	100-15-40-10	60-6-30-4
FP	100-10-35-18	50-10-13-0

Location : Rangpur
Cropping pattern : Boro-T.Aman

The trial was conducted at Syedpur FSRD site, Nilphamari MLT site and Polashbari MLT site of Rangpur. The result showed that INM and ED2 produced the significantly higher yield of rice in both the crops of the pattern irrespective of locations. Farmers' of Rangpur applied an additional 4-8 t/ha of cowdung along with chemical fertilizers as their traditional practice. But the yield was comparatively lower due to the imbalance use of chemical fertilizers.

Similarly highest additional profit was also obtained from the same treatments. But the highest BCR value was calculated fromED1. Application of cowdung along with chemical fertilizers in INM and FP leds to increase the additional cost for fertilizer and thus reduced the respective BCR.

Table 8. Effect of different fertilizers on agro-economic performance of Boro-T.Aman cropping pattern at different locations of Rangpur during 1998-99

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Boro	T.Aman	Boro	T.Aman			
Syedpur FSRD site							
ED1	4.93b	4.75b	6.15b	6.05a	25115	58425	7.65
ED2	5.36a	5.05ab	6.90ab	6.33a	26954	62941	6.44
INM	5.42a	5.26a	6.99a	6.56a	28355	63860	4.33
FRG'97	4.95b	4.82b	6.11b	6.07a	25056	59194	7.87
FP	4.64b	4.81b	7.08a	6.39a	27628	54707	4.48
Control	2.61c	2.13c	2.93c	2.62b	19336	21359	-
Nilphamari MLT site							
ED1	6.07bc	4.98bc	6.58bc	6.30bc	25133	69707	8.25
ED2	6.36ab	5.45ab	7.14ab	6.41ab	27133	74322	6.84
INM	6.76a	5.57a	7.56a	7.05a	28534	77411	4.84
FRG'97	6.31b	4.76c	7.01abc	6.12c	24792	70333	8.80
FP	5.78c	4.96bc	6.44c	6.27bc	26901	65374	4.84
Control	3.19d	2.21d	3.52d	2.96d	19210	27230	-

Table 8. Contd.

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	TVC	GM	BCR

	Boro	T.Aman	Boro	T.Aman	(Tk/ha)	(Tk/ha)	
Polashbari MLT site							
ED1	5.92b	5.09b	6.55b	6.25b	25467	69013	8.15
ED2	6.47a	5.78a	7.03ab	7.11a	27531	77503	6.88
INM	6.81a	5.84a	7.40a	7.27a	28932	79603	4.87
FRG'97	5.94b	4.87b	6.61b	6.15b	24813	68047	8.38
FP	4.38c	5.04b	7.10ab	6.49b	27854	54301	3.33
Control	3.40d	2.02c	3.74c	2.50c	19151	27329	-

Table 8.1. Fertilizer doses (NPKS kg/ha & CD 10 t/ha) of different locations of Rangpur

Treat.	Syedpur		Nilphamari		Polashbari	
	Boro	T.Aman	Boro	T.Aman	Boro	T.Aman
ED1	100-20-30-10	55-10-20-2	100-20-30-10	86-6-29-2	100-20-30-10	86-10-30-4
ED2	140-28-42-14	75-12-25-3	140-28-42-14	117-7-38-3	140-28-42-14	117-12-40-5
INM	130-22-32-14 + CD 10 t/ha	75-12-25-3	130-22-32-14	117-7-38-3	130-22-32-14 + CD 10 t/ha	117-12-40-5
FRG'97	100-20-30-10	65-7-20-3	100-20-30-10	65-7-20-3	100-20-30-10	65-7-20-3
FP	155-18-33-8 + CD 4 t/ha	97-18-28-0	86-16-23-2 + 7.5 t/ha	86-17-24	155-16-28-6 + CD 8 t/ha	86-16-25-2
Control	0-0-0-0	0-0-0-0	0-0-0-0	0-0-0-0	0-0-0-0	0-0-0-0

Location : Paba, Rajshahi
Cropping pattern : Wheat-T.Aman

In wheat, highest grain yield was recorded from INM. Response of cowdung was very distinct in wheat but the effect of NPK was not evident. In T.Aman, yield of rice increased with the increase of nutrient level. The treatment INM and ED2 produced higher yield but the other treatments were identical except the control.

Highest gross margin was also obtained from INM followed by ED2 and FRG'97. Incremental BCR value was highest in FRG'97. Other treatments gave almost the similar figure.

Table 10. Effect of different fertilizers on agro-economic performance of Wheat-T.Aman cropping pattern at Paba during 1998-99

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Wheat	T.Aman	Wheat	T.Aman			
ED1	2.88 bc	4.17 b	3.80 b	5.57	31098	26862	4.53
ED2	3.21 b	5.29 a	4.32 b	6.42	33139	36021	4.77
INM	3.96 a	5.19 a	5.00 a	6.25	36209	39741	4.26
FRG'97	3.30 b	4.60 b	4.27 b	5.81	30525	36045	6.56
FP	2.48 c	3.96 b	3.15 c	4.88	31072	21488	3.66
Control	1.56 d	2.1 c	1.82 d	3.61	25015	5295	-

Table 10.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Wheat	T.Aman
ED1	89-17-43-15	88-8-20-5
ED2	126-23-61-23	120-10-25-7
INM	116-17-51-23 + CD 10 t/ha	120-10-25-7
FRG'97	90-20-35-10	70-6-20-4
FP	67-22-26	97-22-30
Control	0-0-0-0	0-0-0-0

Location : Chabbishnagar, Barind, Rajshahi
Cropping pattern : Wheat-T.Aman

In wheat, statistically higher grain yield was obtained from INM and ED2. Fertilizer dose for MYG as per ED1 and FRG'97 produced the similar yield. But in T.Aman rice there was no variation in yield among the different levels of nutrients except farmers' dose and control.

From economic point of view, highest gross margin was received from ED2 followed by INM. But BCR was higher in ED1, ED2 and FRG'97. In INM, due to the inclusion of cost for cowdung reduced the incremental BCR.

Table 11. Effect of different fertilizers on agro-economic performance of Wheat-T.Aman cropping pattern at Barind during 1998-99

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Wheat	T.Aman	Wheat	T.Aman			
ED1	1.91b	3.83a	2.20a	5.50a	31979	13941	3.59
ED2	2.33a	4.41a	2.33a	5.74a	34719	19461	3.43
INM	2.33a	4.39a	2.21a	5.72a	37398	16572	2.67
FRG'97	1.45bc	4.30a	1.62b	5.60a	32648	11942	3.10
FP	1.09c	2.81b	1.23b	4.74b	28706	1884	2.62
Control	0.49d	2.08c	0.53c	3.76c	25200	-5300	-

Table 11.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Wheat	T.Aman
ED1	105-30-21-13	80-10-20-4
ED2	150-42-31-20	105-12-25-5
INM	140-36-21-20 + CD 10 t/ha	105-12-25-5
FRG'97	90-25-60-20	75-12-40-5
FP	62-25-15-8	62-13-16-8
Control	0-0-0-0	0-0-0-0

Appendix table 1. Initial soil status of the experimental site

Location with AEZ	Land type	R /I	pH	O.C (%)	Total N (%)	K (m.eq./100 g soil)	P	S	Zn	B
							ppm			
Muktagacha (9)	MHL	I	5.56	1.98	0.171 (L)	0.085 (VL)	7.33 (VL)	28.3 (Opt.)	-	-
Hathazari (23)	MHL	I	4.68	1.15	0.08	0.04	9.45	14.66	1.91	0.81
Hathazari (23)	MHL	I	5.23	1.90	0.11	0.29	9.83	6.67	-	0.09
Narikeli (9)	MHL	I								
Palima (9)	MHL	I	6.2	1.44	0.09 (VL)	0.16 (L)	6.83 (VL)	21.77 (Opt)	2.04 (H)	0.20 (L)
Palima (9)	MHL	I	5.3	2.08	0.10 (L)	0.12 (L)	5.0 (VL)	51.0 (H)	2.42 (H)	-
Narikeli	MHL	I								
Lebukhali	MHL	R	5.3	1.44	0.08 (VL)	0.28 (Opt)	4.4 (VL)	33.46 (Opt)	0.34 (VL)	-
Paba	MHL	I								
Barind (25)	MHL	I	8.48	1.53	0.08 (VL)	0.16 (L)	5.16 (L)	19.5 (M)	0.65 (L)	0.29 (L)
Munshiganj (19)	MLL	I	4.9	1.97	0.11 (L)	0.30 (Opt)	29.0 (Opt)	127.8 (VH)	4.36 (VH)	0.58 (Opt)
Atkapalia	MHL	R	7.06	1.41	0.03	0.23	5.7	65.2	0.66	-
Laxmipur	MHL	R								
Syedpur (3)	MHL	I	5.4	2.41	0.14 (L)	0.17 (M)	9.1 (L)	33.9 (Opt)	1.3 (Opt)	0.24 (L)
Polashbari	MHL	I	5.9	1.27	0.08 (VL)	0.09 (L)	10.1 (L)	12.5 (L)	1.1 (M)	0.19 (L)
Nilphamari	MHL	I	5.1	1.55	0.09 (VL)	0.12 (L)	16.5 (M)	18.5 (M)	1.24 (M)	0.27 (L)

Appendix table 2. Crop management practices

Site	Cropping pattern	Variety	Seed rate (kg/ha)	Planting time	Harvesting time
Muktagacha	Mustard	Tori-7	10	4th week of Nov	1st week of Feb
	Boro	BRRI Dhan 32	40	2nd week of Feb	3rd week of May
	T.Aman	BRRI Dhan 29	40	4th week of July	1st week of Nov
Hathazari	Mustard	Tori-7	10	1st week of Dec	Mid. Feb
	Boro	BR 3	35	4th week of Feb	Last week of May
	T.Aman	BR 11	35	Last week of July	4th week of Nov
Narikeli	Mustard	Tori-7	10	2nd week of Nov	3rd week of Jan
	Boro	BRRI Dhan 29	40	2nd week of Feb	Last week of May
	T.Aman	BRRI Dhan 32	40	Last week of July	2nd week of Nov
Palima	Mustard	Tori-7		3rd week of Nov	3rd week of Jan
	Jute	-		2nd week of May	2nd week of Aug
	T.Aman	BRRI Dhan 32		2nd week of Aug	2nd week of Nov
Narikeli	Wheat	Kanchan	120	4th week of Nov	4th week of March
	Jute	-	10	1st week of April	1st week of Aug
	T.Aman	BRRI Dhan 32	40	2nd week of Aug	2nd week of Nov
Lebukhali	Mungbean	Kanti	40	2nd week of Feb	4th week of April
	T.Aus	BR 2	40	Last week of May	Last week of July
	T.Aman	BR 23	40	2nd week of Aug	2nd week of Dec
Palima	Boro	BR 29	40	1st week of Feb	3rd week of May
	T.Aman	BRRI Dhan 33	40	1st week of Aug	Last week of Nov
Kendua	Boro				
	T.Aman				
Hathazari	Boro	BR 29	35	3rd week of Jan	2nd week of May
	T.Aman	BRRI Dhan 30	35	Last week of July	Last week of Nov
Syedpur	Boro	BR 14	40	1st week of Feb	2nd week of May
	T.Aman	BR 11	40	3rd week of July	Last week of Nov
Polashbari	Boro	BR 2	40	1st week of Feb	2nd week of May
	T.Aman	BR 11	40	3rd week of July	Last week of Nov
Nilphamari	Boro	BR 14	40	4th week of Jan	1st week of May
	T.Aman	BR 11	40	3rd week of July	Last week of Nov
Paba	Wheat	Kanchan	120	1st week of Dec	4th week of March
	T.Aman	BRRI Dhan 30	40	2nd week of July	1st week of Nov.
Barind	Wheat	Kanchan	120	Last week of Nov	4th week of March
	T.Aman	BRRI Dhan 29	40	2nd week of July	1st week of Nov
Munshiganj	Potato	Diamont	1500	Last week of Nov.	1st week of March
	Jute	-	-		
Atkapalia	T.Aman	BRRI Dhan 32	40	Last week of July	Last week of Nov

Laxmipur	T.Aman	BRRI Dhan 32	40	1st week of Aug	Last week of Nov

Effects of rice straw on the performance of Boro-fallow-T.Aman rice system

The experiment was initiated at Netrokona MLT site, Mymensingh during Boro season 1998-99 to assess the effect of Boro rice straw incorporation blended with different amount of fertilizer on the yield and economics of subsequent T.Aman rice. Boro rice was grown with recommended fertilizer management. T.Aman rice was grown with eight treatments with different fertilizers along with the previously incorporated Boro rice as follows-

1. T.Aman grown with RF_2
2. 1/3 Boro rice straw (2/3 should be harvested from top) incorporation then T.Aman with RF_2.
3. 2/3 Boro rice straw (1/3 should be harvested from top) incorporation then T.Aman with RF_2.
4. As of 2 but T.Aman with 65-22-25-20-5 kg NPKSZn/ha.
5. As of 3 but T.Aman with 50-18-16-20-5 kg NPKSZn/ha.
6. Recommended fertilizer for high yield goal (RF_1)
7. Recommended fertilizer for moderate yield goal (RF_2)
8. Farmers practices (Harvesting).

Results revealed that grain yield of T.Aman did not varied significantly with different treatments. The effect of Boro rice straw on the yield of T.Aman rice was not evident. The highest gross margin (19765 Tk/ha) and BCR (2.65) was calculated from T_2 treatment where 1/3rd Boro rice straw was incorporated and fertilized with 60-8-30-4 kg/ha of NPKS followed by $T_{7,}$ where recommended dose of fertilizer for MYG was applied.

Table 1. Effect of rice straw on agro-economic performance of T. Aman rice at Netrokona during ’98-99

Treatment	Rice straw incorporated (t/ha)	Grain yield (t/h)	Straw yield (t/h)	TVC (Tk/ha)	GM (Tk/ha)	B CR
T_1	1.94	3.80	4.30	11599	17151	2.40
T_2	2.65	4.19	4.85	11990	19765	2.65
T_3	3.74	3.93	4.68	11990	14080	2.17
T_4	2.62	4.06	4.73	13852	16933	2.22
T_5	3.68	3.96	4.76	13596	16504	2.21
T_6	2.01	4.26	4.67	13661	18494	2.35
T_7	1.95	4.00	4.56	11990	18290	2.53
T_8	1.97	3.89	4.65	14174	15381	2.09
		NS	NS	-	-	-

Subproject: Crop Response to Added Nutrients

Response of crops grown in different cropping patterns and environments to added fertilizer nutrients

The experiment was conducted during 1996-97 to 1998-99 at different major AEZs to determine optimum and economic dose of fertilizer nutrients for major crops grown in different environments. Details about site characteristics and crop management are given in appendix table 1 & 2, respectively. The experiment was laid out in RCB design with six replications across the field. Four different levels of NPK and S for different crops grown in different cropping patterns were tested all over the country. The treatment concept was as follows-

Levels	N	P	K	S
0	0	0	0	0
1	MYG	MYG	MYG	MYG
2	HYG	HYG	HYG	HYG
3	HYG □ 1.4	HYG □1.4	HYG □1.4	HYG □1.4

The crops grown in different cropping patterns were studied at different locations are shown below-

Different cropping patterns tested in different locations

Cropping pattern	Location
Mustard - Boro - T.Aman	Tangail, Jamalpur
Wheat-Jute-T.Aman	Kishoreganj, Jhenaidah
Boro-T.Aman	Mymensingh, Hathazari, Narshingdi
Wheat-T.Aman	Paba, Rajshahi
Potato-Jute	Munshiganj
Onion-T.Aus-T.Aman	Kushtia
Mungbean-T.Aus-T.Aman	Lebukhali

Location : Muktagacha, Mymensingh
Cropping pattern : Boro - T.Aman

Boro rice

Grain yield of Boro rice increased significantly up to 112 kg N/ha and there after the yield reduced slowly. Similar result was observed in two years of experimentation. Gross margin and BCR were also higher in the same treatment.

Highest grain yield was recorded from 25 kg/ha of P, which was identical to 18 kg/ha. Highest gross margin (17757 Tk/ha) was calculated from 25 kg/ha of P.

But K and S failed to produce any significant difference in the yield of Boro rice. But from the response curve it was clear that yield increase slowly up to the 30 kg/ha and 11 kg/ha of K and S respectively. Similarly, Gross margin and BCR also higher in the same treatment.

T.Aman rice

Grain yield increased with the increase of N levels and the highest yield (4.32 t/ha) was obtained from 88 kg N/ha. Gross margin and BCR were also higher in this treatment.

Yield increases with the application of P up to 15 kg/ha but it was not statistically higher. The gross margin and BCR suggested that 15 kg /ha of P for T.Aman is profitable.

A little response of potassium was observed towards the grain yield of T.Aman rice and the yield increased up to 50 kg K/ha. Similarly, a response of S was found up to 11 kg/ha. Gross margin and BCR were also satisfactory at this level.

Table 1a. Effects of different levels of fertilizer nutrients on the yield and economics of Boro in Boro-T.Aman cropping pattern at Muktagacha, Mymensingh, 1998-99

Fertilizer levels	Grain yield (t/ha)		Straw yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	1999	2000	1999	2000			
N levels (kg/ha)							
0	3.77b	3.95b	4.30b	4.50c	16269	12671	1.78
80	4.38a	4.37a	5.42ab	5.77a	17362	16008	1.92
112	4.48a	4.25a	5.67a	5.97ab	17793	16402	1.92
157	4.37a	4.20a	5.17b	5.00bc	18314	14861	1.81
P levels (kg/ha)							
0	4.20b	3.87b	5.3b	5.32	15628	16182	2.03
18	4.48ab	4.35a	5.12b	4.95	17142	15758	1.92
25	4.85a	4.52a	5.67a	5.77	17793	17757	1.98
35	4.60a	4.32a	5.57a	5.57	18606	17179	1.92
K levels (kg/ha)							
0	4.22	4.28	5.18	5.87	16733	15397	1.92
30	4.65	4.40	5.33	5.23	17504	17711	2.01
42	4.60	4.05	5.67	5.77	17793	16402	1.92
59	4.48	4.33	5.33	5.60	18033	16832	1.93
S levels (kg/ha)							
0	4.30	4.32	5.07	4.67	17498	15137	1.86
8	4.75	4.50	5.70	5.47	17726	18374	2.04
11	4.82	4.35	5.67	5.77	17793	16402	1.92
15	4.48	4.60	5.80	5.47	17881	18059	2.01

Table 1b. Effects of different levels of fertilizer nutrients on the yield and economics of T.Aman in Boro-T.Aman cropping pattern at Muktagacha, Mymensingh, 1998-99

Fertilizer levels	Yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Grain	Straw			
N levels (kg/ha)					
0	2.93c	4.12b	12557	17513	2.39
45	4.03b	5.02b	13196	17624	2.34
63	4.32a	5.58b	13392	17808	2.33
88	4.18ab	5.22a	13784	19216	2.39
P levels (kg/ha)					
0	3.95	4.87	11634	18601	2.59
15	4.17	5.12	12904	18846	2.46
21	4.08	5.28	13392	17808	2.33
30	4.10	5.22	14124	17186	2.22
K levels (kg/ha)					
0	3.58	4.13	11659	18766	2.61
50	4.08	4.95	12911	16654	2.29
70	3.90	4.28	13392	17808	2.33
98	3.80	4.93	14113	15652	2.11
S levels (kg/ha)					
0	3.88	5.10	13075	16635	2.27
8	4.03	5.10	13303	17457	2.31
11	4.08	5.28	13392	17808	2.33
15	4.02	5.18	13503	17227	2.28

Location : Kishoregonj
Cropping pattern : Wheat - Jute - T.Aman
Year of establishment : 1996-97 to 1998-99

The average yield of Wheat, jute and T.Aman rice increased with increase in the rate of nitrogen up to 100 kg/ha, 60 kg/ha and 90 kg/ha for Wheat, jute and T.Aman rice, respectively.

In Wheat grain yield increase up to 26 kg/ha of P. But in jute and T.Aman rice, fiber and grain yield increased upto the application of 12 kg/ha and 26 kg/ha of P in jute and T.Aman rice, respectively.

A little response of K was observed in all the crops. The average yield increased up to 83 kg/ha, 34 kg/ha and 50 kg/ha of K in wheat, jute and T.Aman rice, respectively.

Application of S @ 30 kg/ha, 10 kg/ha and 20 kg/ha in Wheat, jute and T.Aman rice are found to increase the average yield of the crops.

Considering the crop response and economics the following doses of N, P, K & S could be suggested for wheat, jute and T.Aman rice.

Crop	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (kg/ha)
Wheat	120	26	100	35
Jute	78	12	36	16
T.Aman	103	24	59	26

Table 2a. Effects of different levels of fertilizer nutrients on the yield of Wheat-Jute-T.Aman cropping pattern at Kishoregonj during 1995-96 to 1998-99 (Average result)

Fertilizer levels (kg/ha)			Grain/Fiber yield (t/ha)			Straw/stick yield (t/ha)		
Wheat	Jute	T.Aman	Wheat	Jute	T.Aman	Wheat	Jute	T.Aman
N levels (kg/ha)								
0	0	0	0.81	1.04	2.30	1.30	2.05	3.90
50	30	45	1.40	1.76	3.85	2.15	2.85	4.60
100	60	90	2.06	2.12	4.15	2.79	3.25	4.90
150	90	135	1.94	2.03	3.90	2.95	3.22	4.65
P levels (kg/ha)								
0	0	0	1.57	1.64	3.82	2.68	3.00	4.72
13	6	13	1.97	2.19	4.38	2.60	3.08	5.11
26	12	26	2.01	2.09	4.40	2.52	3.11	4.58
39	17	39	1.92	2.05	4.30	2.82	3.25	4.45
K levels (kg/ha)								
0	0	0	1.64	1.32	3.73	2.80	2.67	4.40
42	17	25	1.96	1.92	4.03	2.95	2.73	4.80
83	34	50	2.17	2.14	4.16	3.05	3.05	4.97
125	51	75	2.03	2.09	4.12	3.20	3.10	4.85
S levels (kg/ha)								
0	0	0	1.69	1.83	3.82	2.55	2.58	4.83
15	10	10	1.92	1.93	4.27	2.78	2.75	4.97
30	20	20	2.06	1.94	4.40	2.92	2.80	4.60
45	30	40	2.01	1.89	4.32	2.86	2.90	4.89

Table 2b. Effects of different levels of fertilizer nutrients on the economics of Wheat- Jute - T.Aman cropping pattern at Kishoregonj during 1995-96 to 1998-99

Fertilizer levels (kg/ha)			TVC			GM			BCR		
Wheat	Jute	T.Aman	Wheat	Jute	T.Aman	Wheat	Jute	T.Aman	Wheat	Jute	T.Aman
N levels											
0	0	0	10392	10258	11229	-1692	3642	11033	0.83	1.35	1.98
50	30	45	11097	10816	12107	3563	5178	15233	1.32	1.48	2.26
100	60	90	11791	11174	12785	7764	7168	17015	1.65	1.64	2.33
150	90	135	12388	11532	13463	5237	7580	13022	1.42	1.66	1.96
P levels											
0	0	0	8194	10577	10710	11061	7661	17900	2.35	1.72	2.67
13	7	13	9195	11177	11711	10435	7935	18344	2.13	1.71	2.57
26	13	26	9995	11577	12511	7630	6699	13904	1.76	1.58	2.11
39	19	39	11095	11977	13311	9950	8367	12264	1.89	1.69	1.92
K levels											
0	0	0	10098	10676	11857	8217	7984	16800	1.81	1.74	2.41
42	25	25	11050	11176	12507	8750	9168	13068	1.79	1.82	2.04
83	50	50	11802	11476	12957	10757	4556	16848	1.78	1.39	2.30
125	75	75	12552	11776	13407	9143	5280	15828	1.73	1.45	2.18
S levels											
0	0	0	11092	10808	11964	5958	6456	18751	1.53	1.59	2.56
15	10	10	11539	11173	12328	8016	5883	20618	1.69	1.52	2.67
30	20	20	11786	11338	12494	9834	5774	19156	1.83	1.51	2.53
45	40	40	12033	11503	12659	9722	7181	18536	1.81	1.62	2.46

Location : Jhenaidah, Jessore
Cropping pattern : Wheat-Jute-T.Aman

All the crops showed the positive response to nitrogen. The average yield of wheat, jute and T.Aman rice increased with the increase of nitrogen levels up to 100, 60 and 90 kg/ha of N in Wheat, jute and T.Aman rice, respectively.

Application of P @ 26, 12 and 26 kg/ha in Wheat, jute and T.Aman rice increase the yield of crops. Response of K in Wheat was not so evident. But in Jute and T.Aman rice response was observed and yields increase up to 34 kg and 50 kg/ha of K in jute and T.Aman rice respectively.

From the response of crops to nutrients the following fertilizer doses could be suggested.

Crop	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (kg/ha)
Wheat	137	13	83	33
Jute	58	13	36	17
T.Aman	105	30	45	20

Table 3. Effects of different levels of fertilizer nutrients on the yield and economics of Wheat-Jute-T.Aman cropping pattern at Jhenaidah during 1995-96 to 1998-99

Fertilizer levels (kg/ha)			Grain/Fiber yield (t/ha)			TVC	GM	BCR
Wheat	Jute	T.Aman	Wheat	Jute	T.Aman			
N levels (kg/ha)								
0	0	0	1.59	2.07	2.43	56070	24575	1.44
50	30	45	2.09	3.18	3.59	57703	40942	1.71
100	60	90	2.90	3.49	4.89	59326	52182	1.88
150	90	135	2.68	3.25	4.56	60893	60650	2.00
P levels (kg/ha)								
0	0	0	2.03	2.29	3.88	48826	54619	2.12
13	6	13	2.43	3.06	4.28	57289	48794	1.85
26	12	26	2.60	3.65	4.46	59326	52182	1.88
39	17	39	2.55	3.40	4.36	62776	47376	1.75
K levels (kg/ha)								
0	0	0	2.49	2.51	4.03	56266	50199	1.89
42	17	25	2.56	3.27	4.41	58606	53137	1.91
83	34	50	2.60	3.33	4.44	59326	52182	1.88
125	51	75	2.56	3.25	4.36	61636	48557	1.79
S levels (kg/ha)								
0	0	0	2.01	3.09	3.82	58435	48900	1.84
15	10	10	2.54	3.22	4.31	59080	53023	1.90
30	20	20	2.60	3.25	4.48	59326	52182	1.88
45	30	40	2.56	3.20	4.35	59123	48557	1.91

Location : Kushtia
Cropping pattern : Onion - T.Aus - T.Aman

Bulb yield of onion increased with the increase of N levels and the highest yield was recorded from 120 kg N/ha. Consistent result was found in the two years of study. Almost similar result was observed in both the years.

But the response of P was not evident. However, yield trended to increase up to 43 kg/ha. Application of K and S up to 125 kg/ha and 20 kg/ha respectively, but in 1999-2000 the bulb yield increased up to 30 kg S/ha.

Yield of T.Aus rice increased significantly with the increase of nitrogen level and the highest grain yield was recorded from 105 kg N/ha (3.51 t/ha). It was also identical to 70 kg N /ha.

But PK and S have no response on the yield.

Yield of T.Aman rice increased up to 105 kg N/ha but the yield was identical to 70 kg N/ha.

Potassium, K and S failed to produce any significant effect on the yield of rice.

Table 4a. Effects of different levels of fertilizer nutrients on the yield and economics of onion in Onion-T.Aus-T.Aman cropping pattern at Kushtia, 1998-99

Fertilizer doses	Bulb yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	1998-99	1999-00			
N levels (kg/ha)					
0	7.20d	7.0d	25844	70156	3.71
60	8.40c	9.2c	26624	74176	3.79
120	11.0a	13.2a	27410	103610	4.78
180	10.5b	12.8b	28390	95500	4.36
P levels (kg/ha)					
0	8.60	11.8	24240	94080	4.88
22	9.20	13.0	25775	91285	4.46
43	11.4	12.7	27410	95500	4.75
65	10.5	12.5	29145	95915	4.29
K levels (kg/ha)					
0	8.60c	9.70d	25169	76906	3.92
60	9.20bc	10.6c	26294	85231	4.39
120	11.4a	13.5b	27410	95500	4.75
180	10.2b	12.9a	28535	107785	4.78
S levels (kg/ha)					
0	8.60b	10.3b	27077	76123	4.55
10	8.50b	12.2a	27245	76715	4.55
20	10.2a	12.5a	27410	95500	4.75
30	10.0a	12.8a	27581	94339	4.42

Table 4b. Effects of different levels of fertilizer nutrients on the yield and economics of T.Aus in Onion-T.Aus-T.Aman cropping pattern at Kushtia, 1998-99

Fertilizer doses	Yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Grain	Straw			
N levels (kg/ha)					
0	2.09c	3.10	16923	-883	0.94
35	2.99b	3.86	17379	5481	1.31
70	3.24ab	4.19	17835	6940	1.39
105	3.51a	4.49	18225	8590	1.47

Table 4b. Contd.

Fertilizer doses	Yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Grain	Straw			
P levels (kg/ha)					
0	3.17	4.35	16530	7835	1.47
9	3.30	4.40	17190	8115	1.47
18	3.25	4.19	17835	6940	1.39
27	3.20	4.33	18495	6700	1.36
K levels (kg/ha)					
0	3.11	4.21	17385	7820	1.45
17	3.33	4.28	17610	7630	1.43
34	3.24	4.30	17835	6995	1.39
51	3.20	4.24	18060	5830	1.32
S levels (kg/ha)					
0	3.24	4.36	17667	7963	1.45
5	3.40	4.50	17751	8299	1.47
10	3.33	4.30	17835	6995	1.39
15	3.30	4.32	18084	7286	1.40

Table 4c. Effects of different levels of fertilizer nutrients on the yield and economics of T.Aman in Onion-T.Aus-T.Aman cropping pattern at Kushtia, 1998-99

N levels (kg/ha)	Yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Grain	Straw			
N levels (kg/ha)					
0	3.29c	5.41	16923	13012	1.77
35	4.40b	5.48	17379	16161	1.93
70	4.52ab	5.56	17835	17985	2.00
105	4.80a	5.72	18225	18155	2.00
P levels (kg/ha)					
0	4.16	5.56	16530	16530	2.00
9	4.47	5.55	17190	16815	1.98
18	4.52	5.52	17835	16565	1.93
27	4.50	5.53	18495	15770	1.85
K levels (kg/ha)					
0	4.21	5.58	17385	14880	1.85
17	4.40	5.56	17610	15970	1.91
34	4.45	5.56	17835	16085	1.90
51	4.31	5.61	18060	14915	1.82
S levels (kg/ha)					
0	4.00	5.57	17667	13118	1.74
5	4.22	5.51	17751	14544	1.82
10	4.66	5.56	17835	16585	1.93
15	4.52	5.63	18084	17351	1.96

Location : Munshiganj
Cropping pattern : Potato - Jute

Potato

The average of three years (1997-98 to 1999-2000) data showed that tuber yield of Potato increased with the increase of nitrogen and the highest value (28.0 t/ha) was recorded from 160 kg N/ha.

But PK and S failed to produce any significant effect towards the yield. The phenomena could be explained that the initial status of the soil was very rich in those elements and therefore, no response was observed at all.

Jute

Response of nitrogen towards the fiber yield of jute was observed. Fiber yield increase up to the application of nitrogen @ 60 kg/ha and then trended to decrease.

A very little response of P, K and S was found on the fiber yield of jute.

Considering the response of crops and yield and economics the following fertilizer doses was found optimum for Potato and Jute in Munshigonj.

Crop	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (kg/ha)
Potato	196	22	100	25
Jute	67	18	31	17

Table 5a. Effects of different levels of fertilizer nutrients on the yield and economics of Potato in Potato-Jute cropping pattern at Munshiganj, 1997-98 to 1999-00

Fertilizer levels	Avg. tuber yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
N levels (kg/ha)				
0	15.8	37670	56330	3.94
80	22.5	38710	85290	3.20
160	28.0	39750	99210	3.45
240	27.6	40790	96250	3.42
P levels (kg/ha)				
0	26.2	37800	93200	3.46
13	27.2	38775	95225	3.54
26	27.0	39750	96250	3.42
39	26.8	40725	93275	3.29
K levels (kg/ha)				
0	26.0	36870	96130	3.61
66	27.3	38310	95190	3.48
133	27.0	39750	96250	3.42
200	27.0	41190	94810	3.30
S levels (kg/ha)				
0	25.9	38910	90590	3.33
15	27.2	39330	95170	3.42
30	26.9	39750	96250	3.42

45	26.5	40170	92330	3.30

Table 5b. Effects of different levels of fertilizer nutrients on the yield and economics of jute in Potato-Jute cropping pattern at Munshiganj, 1998 to 1999

N levels (kg/ha)	Average yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Fiber yield	Stick yield			
0	1.75	4.5	14222	3000	1.20
30	2.70	5.6	14612	7438	1.51
60	3.15	6.0	15002	9698	1.65
90	3.10	6.3	15392	9808	1.63
P levels (kg/ha)					
0	2.85	4.2	13952	8098	1.58
7	2.95	4.1	14477	8223	1.57
14	3.00	5.0	15002	8498	1.57
21	3.00	5.1	15527	8023	1.52
K levels (kg/ha)					
0	2.60	5.7	14390	6660	1.46
17	2.90	5.6	14696	8404	1.57
34	3.00	5.8	15002	8898	1.59
51	2.86	5.8	15308	7612	1.50
S levels (kg/ha)					
0	2.85	5.8	14442	8408	1.58
10	2.90	5.6	14722	8378	1.57
20	3.00	5.7	15002	8618	1.57
30	2.90	5.8	15282	7918	1.52

Location : Palima, Tangail
Cropping pattern : Mustard - Boro - T.Aman

Mustard

In Mustard, response of nitrogen to certain extent was observed. Seed yield increased significantly up to 65 kg N/ha.

Similarly, phosphorus also showed some response towards the yield and yield increased up to 20 kg P/ha.

A little response of K was also found. Highest seed yield was recorded from 42 kg K/ha but it was identical to 20 kg/ha of K.

Boro rice

Grain yield of rice increased up to the application of N @ 126 kg/ha and thereafter the yield decreased slowly. However, it was identical to 90 kg N/ha. Similar trend was observed in

case of phosphorus and the superior yield (5.56 t/ha) was recorded from 20 kg P/ha. Potassium failed to produce any response towards the yield.

T.Aman rice

Response of nitrogen was found on the yield of T.Aman rice. Yield increased with the increase of nitrogen and the highest grain yield (4.26 t/ha) was recorded from 118 kg N/ha but it was identical to 84 kg N/ha.

In case of phosphorus similar result was observed and the higher yield (4.03 t/ha) was obtained from 15 kg P/ha.

Again, potassium failed to show any response towards the grain yield of T.Aman rice.

Table 6a. Effects of different levels of fertilizer nutrients on the yield and economics of Mustard in Mustard-Boro-T.Aman cropping pattern at Palima, 1998-99

Fertilizer levels	Seed yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
N levels (kg/ha)				
0	0.32b	8331	-2623	0.68
65	0.70a	9243	3247	1.35
90	0.71a	9277	3433	1.37
125	0.77a	10020	3766	1.37
P levels (kg/ha)				
0	0.36b	8632	-1917	0.78
20	0.71a	9300	3507	1.38
28	0.73a	9900	3433	1.35
40	0.71a	10800	3212	1.03
K levels (kg/ha)				
0	0.66b	9153	2800	1.30
20	0.78ab	9474	4369	1.46
42	0.85a	9690	4325	1.44
59	0.80ab	9996	4850	1.43

Table 6b. Effects of different levels of fertilizer nutrients on the yield and economics of Boro in Mustard-Boro-T.Aman cropping pattern at Palima, 1998-99

Fertilizer levels	Grain yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
N levels (kg/ha)				
0	3.28b	17690	6910	1.39
90	5.01a	19110	15960	1.83
126	5.56a	19650	19270	2.02
176	5.46a	20180	18040	2.12
P levels (kg/ha)				
0	3.73b	18220	7890	1.43
20	5.56a	19290	16130	1.84
28	5.53a	19650	19270	2.02
40	5.50a	20000	18710	1.93
K levels (kg/ha)				
0	5.01	19410	15660	1.81

55	5.56	19750	18470	1.93
77	5.46	20146	18774	1.93
108	5.40	20704	17726	1.85

Table 6c. Effects of different levels of fertilizer nutrients on the yield and economics of T.Aman in Mustard-Boro-T.Aman cropping pattern at Palima, 1998-99

Fertilizer levels	Grain yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
N levels (kg/ha)				
0	2.28c	13920	2040	1.15
60	3.64b	14680	10800	1.73
84	4.13ab	15190	13720	1.90
118	4.26a	15700	14120	1.89
P levels (kg/ha)				
0	3.18b	14520	7740	1.53
15	4.03ab	15645	12665	1.80
21	4.20a	16095	12815	1.79
30	4.13a	16770	12630	1.75
K levels (kg/ha)				
0	4.16	14640	14230	1.95
35	4.24	15270	14410	1.93
49	4.23	15522	14088	1.90
69	4.21	15882	13700	1.85

Location : Shibpur, Narshingdi
Cropping pattern : Boro-T.Aman

Boro rice

A positive response of N was observed towards the grain yield of rice. Yield increased significantly over nitrogen up to 100 kg/ha.

Phosphorus also showed some response to the grain yield and superior and identical yield (5.50 t/ha) was obtained with the application of 13 kg/ha.

Similarly, response of K and S was evident to some extent. Higher grain yield was recorded from 25 kg/ha and 10 kg/ha of K and S, respectively.

T.Aman rice

Grain yield of T.Aman rice increased with the increase of nitrogen and the superior yield was recorded from 90 kg N/ha.

But response of phosphorus on grain yield was not clear.

Yield of rice increased significantly up to 25 kg K/ha. After that the yield started to decrease.

Sulphur also showed some response towards yield and highest yield (4.06 t/ha) was recorded with the application of 20 kg S/ha.

Table 7a. Effects of different levels of fertilizer nutrients on the yield and economics of Boro rice in Boro-T.Aman cropping pattern at Shibpur, 1998-99

Fertilizer levels	Grain yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
N levels (kg/ha)				
0	3.87c	20884	8141	1.39
50	4.80b	21544	14456	1.67
100	5.40a	22204	18296	1.82
150	4.91b	22864	13961	1.61
P levels (kg/ha)				
0	4.17b	20224	11051	1.55
13	5.50a	21214	20036	1.94
26	5.60a	22204	19796	1.89
39	5.36a	23194	17006	1.73
K levels (kg/ha)				
0	4.01b	21009	9066	1.43
25	4.90a	21609	15366	1.70
f50	5.00a	22204	15271	1.68
75	4.98a	22801	14549	1.63
S levels (kg/ha)				
0	4.87b	21649	14876	1.68
10	5.51a	21927	19398	1.88
20	5.50a	22204	19046	1.85
30	5.27a	22481	17044	1.75

Table 7b. Effects of different levels of fertilizer nutrients on the yield and economics of T.Aman rice in Boro-T.Aman cropping pattern at Shibpur, 1998-99

Fertilizer levels	Grain yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
N levels (kg/ha)				
0	2.37c	15133	2642	1.17
45	3.50b	15727	10523	1.67
90	4.06a	16321	14129	1.86
135	3.97ab	16925	12850	1.75
P levels (kg/ha)				
0	3.57	14935	11840	1.79
13	3.85	15925	12950	1.81
26	3.92	16321	13079	1.80
39	3.87	17905	11120	1.62
K levels (kg/ha)				
0	3.34b	16317	8733	1.53
25	4.04a	16767	13533	2.23
50	3.78b	17667	10683	1.60
75	3.54b	18117	8433	1.46
S levels (kg/ha)				
0	3.33b	16321	8654	1.53
10	3.54b	16360	10190	1.62

Fertilizer levels	Grain yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
20	4.06a	16638	13812	1.83
30	3.74b	17193	10857	1.63

Location : Lebukhali, Patuakhali
Cropping pattern : Mungbean - T.Aus - T.Aman

In Mungbean, only the response of N was observed to some extent. An identical yield was recorded from 10, 20 and 30 kg N/ha. But P, K and S failed to produce any response towards seed yield of Mungbean.

In T.Aus rice response of N and P was found towards the grain yield. Yield increased with the increase of N and the highest yield (4.5 t/ha) was obtained from the highest level of N (135 kg/ha), which also identical to 90 kg N/ha. Similarly yield increased up to the application 21 kg P/ha but it was identical to 15 kg/ha. But K failed to show any response towards the yield of T.Aus rice.

In T.Aman rice grain yield increased up to the application of 90 kg N/ha. Phosphorus also shows some response towards the grain yield. Significantly higher yield was obtained from the application of 15 kg/ha of P. Again Potassium failed to produce any response towards the yield.

Table 8a. Effect of different levels of fertilizer nutrients on the yield and economics of Mungbean in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, 1998-99

N levels (kg/ha)	Seed yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	1998-99	1999-00			
N levels (kg/ha)					
0	690b	850b	13700	1700	1.12
10	840a	900a	13938	3462	1.25
20	850a	920a	14095	3605	1.25
30	820a	890ab	14253	2847	1.20
P levels (kg/ha)					
0	700	890	12415	3485	1.28
14	750	940	13535	3365	1.25
21	770	970	14095	3305	1.23
28	768	960	14655	2625	1.18
K levels (kg/ha)					
0	700	920	13895	2305	1.16
5	760	950	13995	3105	1.22
10	770	980	14095	3405	1.24
15	720	960	14195	2205	1.15

Table 8b. Effect of different levels of fertilizer nutrients on the yield and economics of T.Aus in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, 1998-99

N levels (kg/ha)	Yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Grain	Straw			
N levels (kg/ha)					
0	2.92c	3.24	17698	4362	1.25
45	3.62b	4.11	18383	9012	1.49
90	4.62a	4.86	18608	16162	1.87
135	4.50a	4.70	18783	15068	1.80
P levels (kg/ha)					
0	3.52b	4.12	17328	11172	1.63
15	4.50a	4.64	18448	15372	1.83
21	4.62a	4.86	18608	16162	1.87
29	4.50a	4.60	18848	13902	1.74
K levels (kg/ha)					
0	4.23	4.37	18296	13499	1.74
14	4.40	4.53	18553	14512	1.78
20	4.62	4.86	18608	16162	1.87
28	4.37	4.45	18673	14142	1.75

Table 8c. Effect of different levels of fertilizer nutrients on the yield and economics of T.Aman in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, 1998-99

N levels (kg/ha)	Yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	BCR
	Grain	Straw			
N levels (kg/ha)					
0	2.85c	3.80	15520	10500	1.68
45	3.90b	4.55	16360	16715	2.02
90	4.83a	4.90	16675	19585	2.17
135	4.56a	4.71	16920	17355	2.02
P levels (kg/ha)					
0	3.90b	4.39	14915	17800	2.19
15	4.60a	4.75	16044	18531	2.15
21	4.83a	5.01	16805	19510	2.16
29	4.56a	4.45	17405	15340	1.88
K levels (kg/ha)					
0	4.40	4.55	16015	17060	2.06
14	4.61	4.72	16543	18087	2.09
20	4.83	4.98	16675	19625	2.18
28	4.68	4.70	16795	17895	1.94

Location : Hathazari
Cropping pattern : Boro -T.Aman

In Boro rice, grain yield increased with the increase of nitrogen and the highest yield (5.27 t/ha) was recorded from 176 kg N/ha, which was identical to 126 kg N/ha. Almost similar trend was observed in case of P, K and S and grain yield increased up to the application 39 kg, 71 kg and 20 kg/ha of P, K and S respectively.

In T.Aman rice, a positive response of N was found and the highest grain yield (4.5 t/ha) was recorded from 118 kg N/ha, which was identical to 84 kg N/ha. Response of P, K and S was also observed to some extent and grain yield increased up to 19 kg, 36 kg and 10 kg/ha of P, K and S respectively.

Table 9a. Effects of different levels of fertilizer nutrients on the yield of crops in Boro in Boro-T.Aman cropping pattern at Hathazari, 1998-99

Fertilizer levels	Yield (kg/ha)	
	Grain	Straw
N levels (kg/ha)		
0	2.77c	3.07c
89	3.95b	4.32b
126	5.39a	6.21a
176	5.27a	5.95a
P levels (kg/ha)		
0	3.40c	4.96c
27	4.61b	5.56b
39	5.39a	6.21a
55	5.01a	5.95a
K levels (kg/ha)		
0	3.60c	4.83
51	4.35b	5.68
71	5.39a	6.21
99	4.88ab	5.42
S levels (kg/ha)		
0	3.99c	4.00b
14	4.34bc	4.55b
20	5.39a	6.21a
28	4.56b	4.87b

Table 9b. Effects of different levels of fertilizer nutrients on the yield of crops in T.Aman rice in Boro-T.Aman cropping pattern at Hathazari, 1998-99

Fertilizer levels	Yield (kg/ha)	
	Grain	Straw
N levels (kg/ha)		
0	2.45c	3.04c
61	3.69b	4.23b
84	4.19ab	5.04ab
118	4.50a	5.33a
P levels (kg/ha)		
0	3.62b	4.66b
19	4.43a	5.70a
23	4.41a	5.30a
32	4.19a	5.04ab
K levels (kg/ha)		
0	3.45b	4.55b
36	4.45a	5.73a
46	4.25a	5.50a
64	4.19a	5.04ab
S levels (kg/ha)		
0	4.08	4.64
7	4.41	5.75
10	4.66	5.45
14	4.29	5.04

Location : Paba, Rajshahi
Cropping pattern : Wheat - T.Aman

In Wheat, grain yield increased with the increase of nitrogen and the highest yield (3.83 t/ha) was recorded from the highest level of N (140 kg/ha). However it was identical to 105 kg N/ha. Similar trend was observed in case of P and S and the yield increased up to the application of 30 kg and 20 kg/ha of P and S respectively. Potassium failed to show any response on the yield of Wheat.

In T.Aman rice, grain yield increased with the increase of nitrogen up to 90 kg N/ha and then trended to decrease. Similar trend was found in case of P, K and S and yield increased up to 15 kg, 30 kg and 20 kg/ha of P, K and S respectively.

Table 10. Effects of different levels of fertilizer nutrients on the yield of crops in Wheat - T.Aman cropping pattern at Paba, Rajshahi, 1998-99

Wheat		T.Aman	
Fertilizer levels	Yield (kg/ha)	Fertilizer levels	Yield (kg/ha)
N levels (kg/ha)		N levels (kg/ha)	
0	1.96c	0	2.43c
70	2.76b	60	4.28b
105	3.22a	90	4.98a
140	3.83a	120	4.56ab
P levels (kg/ha)		P levels (kg/ha)	
0	2.19c	0	3.20b
20	2.97b	10	4.25a
30	3.63a	15	4.98a
40	3.43a	20	4.54a
K levels (kg/ha)		K levels (kg/ha)	
0	3.08	0	3.25b
20	3.29	20	4.38b
30	3.30	30	4.98a
40	3.22	40	4.76a
S levels (kg/ha)		S levels (kg/ha)	
0	2.81b	0	3.42b
10	3.18a	10	4.39a
20	3.40a	20	4.98a
30	3.22a	30	4.50a

Location : Melandah, Jamalpur
Cropping pattern : Mustard - Boro - T.Aman

In Mustard, a positive response of N was observed. Seed yield increased with the increase of N level and the highest yield (1050 kg/ha) was recorded from the highest level of N (120 kg/ha) followed by 80 kg N/ha. Similarly P, K and S also have some response and yield increased up to 30 kg, 35 kg and 30 kg/ha of P, K and S respectively.

In Boro rice, grain yield increased up to 150 kg N/ha but it was identical to 120 kg N/ha. As regards P, K and S yield increased significantly up to 30 kg, 40 kg and 20 kg P, K and S respectively.

In T.Aman rice, the highest grain yield (3.81 t/ha) was obtained from 90 kg N/ha and then decreased slowly. Similarly P, K and S also produced some response and yield increased up to 20 kg, 40 kg and 10 kg/ha of P, K and S respectively.

Table 11. Effects of different levels of fertilizer nutrients on the yield and economics of Mustard - Boro - T.Aman rice cropping pattern at Melandah, 1998-99

Fertilizer levels	Mustard yield (kg/ha)		Fertilizer levels	Boro (t/ha)		Fertilizer levels	T.Aman (t/ha)	
	Grain	Straw		Grain	Straw		Grain	Straw
N levels (kg/ha)			N levels (kg/ha)			N levels (kg/ha)		
0	375d	1500	0	2.57c	3.05	0	2.12c	3.12
60	675c	2000	50	3.05b	4.08	45	3.16b	4.50
80	850b	2400	100	4.10ab	5.15	90	3.81a	5.30
120	1050a	3000	150	5.08a	6.40	135	3.74a	4.72
P levels (kg/ha)			P levels (kg/ha)			P levels (kg/ha)		
0	390c	1600	0	3.61c	4.35	0	2.41b	3.51
20	650b	1900	15	4.16b	4.98	10	2.91ab	3.80
30	1050a	3000	30	5.34a	6.40	20	3.87a	4.72
40	1000a	3100	45	5.08a	6.59	30	3.34a	5.52
K levels (kg/ha)			K levels (kg/ha)			K levels (kg/ha)		
0	385c	1700	0	3.71c	4.36	0	2.45c	3.51
25	710b	2100	20	4.27b	4.90	20	2.90b	4.16
35	1100a	3100	40	5.51a	6.40	40	4.22a	5.52
50	1080a	3200	60	5.31a	6.95	60	3.87ab	6.27
S levels (kg/ha)			S levels (kg/ha)			S levels (kg/ha)		
0	600c	1800	0	3.90c	4.70	0	2.69c	3.80
10	975b	2510	10	4.51ab	5.41	5	3.20b	4.61
20	1200a	3250	20	5.52a	6.91	7.5	4.22a	6.27
30	1250a	3325	30	5.40a	6.85	10	4.67a	7.12

Appendix table 1. Initial soil status of the experimental site

Location with AEZ	Land type	R/I	P^H	O.C (%)	Total N (%)	K (m.eq./ 100g soil)	P	S	Zn	B
							ppm			
Muktagacha (9)	MHL	I	5.42	2.12	0.18(M)	0.059(VL)	8.6 (L)	25.3(Opt.)	-	-
Phulpur (9)	MHL	I	5.22	1.17	0.078(VL)	0.152(M)	15.27(M)	11.64(L)	1.304 (M)	0.20(L)
Netrokuna (9)	MHL	I	5.08	1.38	0.093(L)	0.155(M)	4.68(VL)	14.12(L)	1.08 (M)	0.31(M)
Goyeshpur (11)	MHL	I	7.78	2.97	0.15(M)	0.41(M)	5.26(L)	19.5(M)	0.65 (Opt)	0.23 (Opt)
Palima (9)	MHL	I	5.07	2.33	0.1(L)	0.11(L)	5.83(VL)	39.43(VH)	3.17 (VH)	-
Shibpur (9)	MHL	I	5.3	1.97	0.16(M)	0.09(L)	16.3(M)	23.8(Opt)	-	-
Paba (11)	MHL	I	8.44	1.53	0.08(VL)	0.16(L)	5.52(L)	19.5(M)	0.65 (L)	0.29 (L)
Barind (26)	MHL	I	5.7	1.12	0.07(VL)	0.26(M)	6.17(VL)	15.0(L)	1.22 (M)	0.18 (L)
Palima (9)	MHL	I	5.3	2.08	0.10(L)	0.12(L)	5.0(VL)	51.0(H)	2.42 (H)	-
Lebukhali (13)	MHL	R	6.7	1.44	0.09(VL)	0.30(Opt)	5.4 (VL)	53.46(Opt)	0.34 (VL)	-
Barind (25)	MHL	I	4.48	1.53	0.08(VL)	0.16(L)	5.16(L)	19.5(M)	0.65 (L)	0.29 (L)
Munshigonj(19)	MLL	I	4.9	1.97	0.11(L)	0.30(Opt)	29.0(Opt)	127.8(VH)	4.36 (VH)	0.58 (Opt)

Appendix table 2. Crop management practices

Site	Cropping pattern	Variety	Seed rate (kg/ha)	Planting time	Harvesting time
Muktagacha	Boro	BRRI Dhan 32	40	2nd week of Feb	3rd week of May
	T.Aman	BRRI Dhan 29	40	4th week of July	1st week of Nov
Kishoreganj	Wheat	Kanchan	120	1st week of Dec	3rd week of March
	Jute	Falgunitosa	7.5	1st week of April	1st week of Aug.
	T.Aman	BR 11	40	2nd week of Aug.	last week of Nov.
Jhenaidaha	Wheat	Kanchan	120	Mid. Dec.	3rd week of March
Jessore	Jute	Local	7.5	1st week of April	Last week of July
	T.Aman	BR 11	40	1st week of Aug.	3rd week of Nov.
Lebukhali, Patuakhali	Mungbean	Kanti	40	2nd week of Feb	4th week of April
	T.Aus	BR 2	40	Last week of May	Last week of July
	T.Aman	BR 23	40	2nd week of Aug	2nd week of Dec
Palima, Tangail	Mustard	Tori-7	10	1st week of Nov.	Mid. Jan.
	Boro	BR 29	40	1st week of Feb	3rd week of May
	T.Aman	BRRI Dhan 33	40	1st week of Aug	Last week of Nov
Hathazari	Boro	BR 29	35	3rd week of Jan	2nd week of May
	T.Aman	BRRI Dhan 30	35	Last week of July	Last week of Nov
Paba, Rajshahi	Wheat	Kanchan	120	1st week of Dec	4th week of March
	T.Aman	BRRI Dhan 30	40	2nd week of July	1st week of Nov.
Munshiganj	Potato	Diamont	1500	Last week of Nov.	1st week of March
	Jute	-	-		

Subproject: Verification of Fertilizer Management Practices

On-Farm verification of fertilizer dose for growing banana at Shibpur,Narshingdi

The experiment was conducted at the farmers' field of Shibpur MLT site, Norshingdi during 1997-2000 to determine optimum and economic dose of fertilizers for growing Banana. The experiment was laid out in RCB design with six replications. Three different levels of fertilizers along with farmers' dose were tested. Full amount of P, S and Zn and 1/4th of N and K were applied as basal in the pit 5-7 days before planting. Rest of N and K were applied in three installments at two months interval from date of planting. Suckers of Amritsagar variety were planted during mid April.

Results of three years experimentation showed that yield of Banana increased significantly with increasing fertilizer doses. Highest Banana yield (32.5 t/ha) was recorded from highest level of fertilizer dose but it was identical to farmers' dose. Farmers also used a very high amount of NPK in Banana. From economic point of view, the highest gross margin was calculated from the same treatment followed by farmers' dose.

Table 1. Effect of different fertilizer doses on the yield and economics of Banana at Shibpur, Narshingdi during 1997-98 to 1999-2000

Fertilizer dose (NPKSZn kg/ha)	Yield (t/ha)				TVC (Tk/ha)	GM (Tk/ha)	BCR
	97-98	98-99	99-00	Average			
T_1=200-33-249-30-3	29.9a	32.8a	34.6a	32.5	59874	152070	3.53
T_2=150-22-166-20-2	26.5b	29.7b	31.7b	29.3	56585	147492	3.60
T_3=100-11-83-10-1	22.2c	21.2c	22.4c	22.0	53296	139181	3.61
T_4=265-73-126-0-0	28.8a	32.3a	34.2a	31.8	61780	148359	3.40
LSD	2.42	3.09	2.78	-	-	-	-

T_1= Higher than recommended dose for low soil fertility
T_2= Recommended dose for low soil fertility (FRG `89)
T_3= Recommended dose for medium soil fertility (FRG `89)
T_4= Farmers practice

IMPROVEMENT OF AGROFORESTRY SYSTEMS

Performance of potato yam grown on the existing homestead trees

The trial was conducted to see the performance of potato yam on the existing homestead trees of different FSRD and MLT sites during 1999-2000. Among the tree species Drumstick was found superior as support and maximum potato yam yield (6.12 kg/support) was recorded in drumstick. Over the locations the highest yam yield (8.85 kg/support) was produced at Faridpur. The result was similar to the findings of the experiments conducted previously (Table 1).

Table 1. Yield of potato yam on different supports over the locations.

Support	Faridpur	Sylhet	Patuakhali	Fatikchari	Satkania	Cox's Bazer	Muktagacher	Phulpur	Barind	Tangail	Mean
Drumstick	12.35b	-	-	-	-	-	-	-	2.32	3.5	6.12
Ziga	12.84b	-	7.00	2.00b	3.51a	-	5.67	0.76b	0.52	2.6	4.36
Mander	2.94c	-	-	1.39c	2.05c	1.61de	4.42	0.86b	1.08	1.4	1.97
Pitraj	1.36d	-	-	-	-	-	4.21	0.99b	-	2.5	2.27
Bamboo	14.14a	-	-	-	-	-	4.36	2.55a	-	5.5	6.79
Babla	-	-	4.50	-	-	-	-	-	2.02	-	3.26
Mehgony	-	-	-	-	-	-	-	-	-	3.7	3.70
Mango	-	3.2	-	2.70a	1.72cd	2.90ab	-	-	-	-	2.48
Jackfruit	-	-	-	1.88b	2.96b	2.29bc	-	-	-	-	2.34
Ber	-	-	-	2.11b	1.62d	1.04c	-	-	-	-	1.59
Blackberry	-	-	-	1.72bc	-	3.09a	-	-	-	-	2.41
Sissoo	-	-	-	-	-	2.01cd	-	-	-	-	2.01
Neem	-	-	-	-	-	-	-	-	1.43	-	1.43
Coconut	-	3.7	-	-	-	-	-	-	-	-	3.70
Betelnut	-	4.5	-	-	-	-	-	-	-	-	4.50
Raintree	-	1.9	-	-	-	-	-	-	-	-	1.90
Mean	8.85	3.33	5.75	1.97	2.37	2.16	4.67	1.29	1.51	3.2	-
CV(%)	6.3	-	-	10.3	11.4	15.1	26.78	26.49	-	-	-

Response of added nitrogen and potassium to potato yam

The experiment was conducted at Regional Agricultural Research Station, Hathazari, and Chittagong during April. 1999 to January 2000 to assess the effect of nitrogen and potassium on the yield of potato yam. Nine treatment combinations for 4 level of N and 4 levels of K along with one control and control with cowdung were tested in Randomized complete block design with 4 replications. The yield of yam was significantly influenced by the fertilizer treatments over no fertilizer use. Significant highest yield (5.84 kg/tree) was

obtained from the application of 50-23-68 g N, P and K/pit (Table 2). Nitrogen rates could not influence the yam yield but were superior to the yield obtained from without nitrogen (2.80 kg/tree) (Table 2.1). But potassium could influence the yam yield significantly. Superior yield (5.84 kg/tree) of yam was obtained from applying 69g K/pit. Least yield of yam/tree (2.72 kg/tree) was obtained from without applying potassium. The yields recorded from plant dressed with 23 and 46 g potassium/tree were identical and intermediate.

Table 2. Yield of potato yam as influenced by nitrogen and potassium combination at RARS Hathazari during 1999-2000

Treatment			Yam yield
N	P	K g/pit	Kg/plant
0	22	45	2.80c
25	22	45	4.07b
50	22	45	4.21b
75	22	45	3.67b
50	22	0	2.72c
50	22	23	3.91b
50	22	68	5.84a
0	22	0+CD	2.17cd
0	0	0	1.79d
	CV%		10.94

Table 2.1. Response of added N and K to potato yam yield

N-Level (g/pit)	Yam yield (kg/plant)	K-level (g/pit)	Yam yield (kg/plant)
0	2.80c	0	2.72c
25	4.07b	23	3.91b
50	4.21b	46	4.21b
75	3.67b	69	5.84a

Performance of potato yam on different support arrangement

Four plant population viz. single, double, triple and quadruple plantations were tested on multi storey wire support to assess the yield performance of potato yam at RARS Hathazari from 1997-98 to 1999-2000. Results revealed that yield was significantly influenced by intensification of population and the highest yam yield (28.23 t/ha) was obtained from quadruple plant population in all the year (Table 3).

Table 3. Yield of yam obtained from multistory wire support arrangement and planting system at RARS Hathazari, Chittagong in 1997-98 to 1999-2000

Planting density	Yam yield (t/ha)		
	1997-98	1998-99	1999-2000
1. Single plant	1.20	3.83	4.43d
2. Double plant	2.43	10.23	11.37c
3. Triple plant	8.83	21.26	20.90b

4. Quadruple plant	15.77	28.20	28.23a

Performance of black pepper and betel leaf on the homestead trees

To determine the compatibility of black pepper and betel leaf on homestead plant species viz. Mango, Jeckfruit, Betelnut, Drumstick and Bamboo stick, the experiment was conducted at FSR site Hathazari from April-July 1995. After five years it was found that the highest survivability of Black pepper was observed on Mango tree. Betel leaf did not survive on any of the homestead trees (Table 4).

Table 4. Survivability of Black pepper and betel leaf grown on homestead trees at RARS, Hathazari from 1997-98 to 1999-2000

Planting density	Yam yield (t/ha)		
	1997-98	1998-99	1999-2000
Mango	100	0	15
Jeckfruit	33	0	12
Betelnut	0	0	-
Drumstick	0	0	-
Bamboo stick	0	0	-

Feasibility of growing trees in the crop field

The experiment was conducted at Rangpur, Jessore and Mymensingh to study the performance of different tree species in the crop field. At Rangpur the experiment was started in 1998-99 and at Jessore and Mymensingh in 1995-96. Results revealed that survivability of trees at Rangpur were better than that of Jessore and Mymensingh. At Rangpur the survival percent of Neem, Suktani and Koroi were 100%. At Jessore Sissoo survived the best (61.11%) and Babla was poor to survive (37.50%), and at Mymensingh survivability of Koroi was very poor (16.67) than in the other two locations but Mehogoni performed best (60.87). In terms of plant height and diameter at breast height (DBH) Suktani performed the best followed by Mehogoni in Rangpur. In Jessore and Mymensingh Koroi was found superior to the other two species (Table 5 & 6).

Table 5. Survivability of different tree species planted in the crop field over locations.

Tree species	Rangpur		Jessore		Mymensingh	
	Sapling planted (no)	Survived at 2nd year (%)	Sapling planted (no)	Survived at 5th year (%)	Sapling planted (no)	Survived at 5th year (%)
Neem	2	100	-	-	-	-
Sissy	8	63	18	61.11	18	55.56
Mehogoni	5	60	-	-	23	60.87
Suktani	9	100	-	-	-	-
Babla	-	-	16	37.5	-	-
Koroi	6	100	14	50.0	12	16.67

Table 6. Performance of tree species planted on the crop field over locations

Tree species	Rangpur		Jessore		Mymensingh	
	After 2nd year		After 5 year		After 5 year	
	Pt. ht.(m)	DBH(cm)	Pt.ht.(m)	DBH(cm)	Pt.ht.(m)	DBH(cm)
Neem	2.05	2.60		-	-	-
Sissy	2.70	1.50	7.35	15.63	-	41.73
Koroi	2.30	1.90	9.43	19.51	-	43.25
Mehogoni	2.36	3.27	-	-	-	26.53
Suktani	6.00	11.00	-	-	-	-
Babla	-	-	6.80	15.35	-	-

Performance of potato yam grown on the existing homestead trees

The experiment was conducted at FSRD site, Narikeli, Jamalpur from March 1999 to January 2000 to determine the compatibility and yielding ability of potato yam on different homestead tree species. The experiment was laid out in a randomized complete block design in 5 dispersed replication. Tee species used were Shajna, Mandar, Ziga, Pitraj and were compared with vertical bamboo support in the open sun. Potato yam produced on all the living supports (ranged from 5.5 to 6.9 kg/support) was found identical. Significantly higher yield (9.2 kg/plant) of potato yam was obtained from the vertical bamboo support in the open sun (Table 7).

Table 7. Production of potato yam on existing homestead trees at FSRD site, Narikeli, Jamalpur during 1999-2000

Name of the support	Yam/plant(no)	Average weight of single yam (g)	Total wt. of yam/ plant (kg)
Shajna	28.4 b	244.2	6.9 b
Ziga	29.0 b	226.4	6.6 b
Mandar	24.4 b	226.4	5.5 b
Pitraj	23.8 b	245.5	5.8 b
Vertical bamboo support	32.9 a	279.6	9.2 a
CV %	29.65	14.42	37.17

On-Farm Trials with Advance Lines and Technologies

On-farm adaptability trial with promising Sweet Potato varieties developed by BARI

The yields of sweet potato varieties developed by BARI were evaluated against local varieties over the locations during rabi 1999-2000. The yields significantly differed among the varieties and over the locations. All the tested varieties performed the best at Kishoregonj and least at Hathazari where the yields obtained from local variety (11.83 t/ha), Kamlasundari (13.17 t/ha) and Tripti (12.77 t/ha) were identical but are superior to that from BARI SP-4 (8.63 t/ha). At Noakhali BARI SP-5 (25.00 t/ha), Tripti (24.84 t/ha), Kamala Sunduri (22.56 t/ha) and Daulatpuri (20.50 t/ha) gave identical yield and are superior to the yield of all the other varieties. The local variety (15.50 t/ha) gave the least yield. BARI SP-4 (19.24 t/ha) gave the intermediate yields. In Comilla Tripti (23.20 t/ha) produced the superior yield and was followed by that of BARI SP-4 (20.48 t/ha) and BARI SP-5 (18.13 t/ha). The later two yields were identical. The least yield at Comilla was produced by the local variety (11.68 t/ha). In Jamalpur superior yield was obtained from Tripti (27.60 t/ha) and was significantly followed by Kamlasundari (24.78 t/ha), BARI SP-5 (18.62 t/ha) and the local variety (13.69 t/ha). In Kishoregonj BARI SP-5 (34.57 t/ha) produced the superior yield and was significantly followed by the yields of BARI SP-4 (31.94 t/ha), Tripti (29.02 t/ha) and the local variety (21.25 t/ha). Across locations Tripti appeared to be the best yielder (Table 1).

Table 1. Yield obtained from different sweet potato varieties developed by BARI at different locations (1999-2000)

Name of variety	Yield on location (t/ha)					
	Noakhali	Hathazari	Comilla	Patuakhali	Jamalpur	Kishoregonj
K. Sundari	22.56b	13.17a	-	-	-	-
BARI SP-4	19.24c	-	20.48b	27.4	24.78b	31.94b
BARI SP-5	25.00a	8.63b	18.13bc	23.6	18.62c	34.57a
Daulatpuri	20.50b	-	-	31.8	-	-
Tripti	24.85a	12.77a	23.2a	-	27.60a	29.02c
Local	15.50d	11.83a	11.68d	21.6	13.69d	21.25d
CV (%)	23.81	12.8	3.67	13.1	-	-

On-farm trial with Rapeseed/Mustard lines at Jessore and Pabna

The trial was conducted in the farmers' field of FSRD sites, Jessore and Pabna to evaluate the yield performance of promising rapeseed and mustard lines. At Jessore 11 varieties/lines were tried. Result revealed that the advance line J-353-1 has given the highest yield (1.12 t/ha) at Jessore, which was identical with the yields obtained from J-2592 (1.09 t/ha), J-535-2 (1.05 t/ha), Daulat, J-4343 (0.99 t/ha) and J-7617 (0.96 t/ha) whereas in Pabna the highest yield was obtained from Nap-248 (1.54 t/ha) was identical with the yields of Nap-8509 (1.45

t/ha) and J-4343 (1.32 t/ha). Over the two locations satisfactorily consistent performance was obtained from J-4343 (Table 2).

Table 2. Yield obtained form different rapeseed and mustard varieties at FSRD sites, Jessore and Pabna during rabi season of 1999-2000

Lines/variety	Yield (t/ha)	
	Jessore	Pabna
J-4343	0.99abc	1.32ab
J-353-1	1.12a	0.96d
Nap-8509	0.81bc	1.46ab
Daulat	0.99abc	1.04ab
Tori-7	0.52d	0.91d
OTBC-1193	0.46d	0.98cd
J-535-2	1.05abc	-
J-7617	0.96abc	-
Dhali	0.84abc	1.24bc
J-2592	1.09ab	0.97cd
Nap-248	0.80bc	1.54a
CV (%)	22.5	1.27

On-Farm trial with some Rapeseed and Mustard lines/varieties at different locations

Four rapeseed and mustard lines/varieties named Nap-248, Nap-179, Jamalpur-1 and BARI Sharisha-8 were evaluated over different FSRD and MLT sites during rabi 1999-2000. Results revealed that none of the four varieties could perform the best across locations. Out of 9 locations, the variety Jamalpur-1 has given significant higher yields in Faridpur (1.91 t/ha), Tangail (1.94 t/ha), Pabna (1.67 t/ha), Jessore (2.12 t/ha) and Kushtia (1.81 t/ha). Nap-179 recorded superior yields at Sylhet (2.51 t/ha), Tangail (1.94 t/ha), Jessore (1.78 t/ha), Kushtia (2.10 t/a) and Noakhali (0.62 t/ha). Nap-248 could record superior yield only at Jessore and Mymensingh. BARI Sharisha-8 could record superior yield at Comilla (1.48 t/ha), Pabna (1.48 t/ha), Kushtia (1.71 t/ha) and Noakhali (0.55 t/ha). Variety means of the four tested materials did not vary statistically (Table 3).

Table 3. Yield performance of promising rape mustard lines/variety at the farmers' field over the locations during rabi 1999-2000

Mustard line/variety	Yield (t/ha)									
	Sylhet	Faridpur	Tangail	Comilla	Pabna	Jessore	Kushtia	Mymen singh	Noakha li	Mean
Nap-248	2.22b	1.43c	1.19b	1.23b	0.88c	1.68ab	1.72ab	0.63a	0.51b	1.28A
Nap-179	2.51a	1.65b	1.94a	1.20b	1.01bc	1.78ab	2.10a	0.51c	0.62a	1.48A
Jamalpur-1	0.78d	1.91a	1.94a	0.81c	1.67a	2.12a	1.81ab	0.55b	0.52b	1.35A
BARI Sharisha-8	1.89c	1.57b	1.28b	1.48a	1.43ab	1.65b	1.71ab	0.54bc	0.55ab	1.34A
Mean	1.85A	1.64AB	1.59AB	1.18B	1.25B	1.81A	1.84A	0.56C	0.55C	-
CV (%)	3.08	3.80	27.19	10.5	18.8	12.1	9.7	2.53	28.15	26.02

On-farm trial of turmeric under shade at Faridpur

The yield of new turmeric variety T-063 was evaluated against a local variety at the farmers' field under shade of fruit orchard at FSRD site, Faridpur during rabi 1999-2000. The turmeric variety T-063 produced significantly higher dry yield (5.83 t/ha) than that of local variety (2.70 t/ha) (Table 4).

Table 4. Yield performance of turmeric under shade at FSRD site, Faridpur during 1999-2000

Variety/line	Fresh yield (t/ha)	Dry yield (t/ha)
T-063	29.3	5.83
Local	13.5	2.70

Advance yield trial with Chickpea lines at Rajshahi

The trial was conducted at the FSRD site, Chabbishnagar, Rajshahi during rabi seasons of 1998-99 and 1999-2000. Fifteen advance lines were tried to find out lines with high yield potential. The study during 1999-2000 revealed that the highest yield of 1.91 t/ha was obtained from line ICCX-9100206-2 (E_4) and ICCX-890317-14P (E_{14}), which was identical to the yields obtained from the lines E_3 (1.35 t/ha), E_5 (1.61 t/ha), E_6 (1.38 t/ha), E_7 (1.23 t/ha), E_9 (1.61 t/ha), E_{11} (1.31 t/ha) and E_{12} (1.59 t/ha) and was significantly better than the yield of the check variety BARI Chola 5 (1.03 t/ha). In 1998-99 the line E_8 (BCCX-84005) yielded the highest (1.21 t/ha). All the tested lines except E_{10} (ICCS-890314-3P) performed better in 1999-2000 than that in the year 1998-99. Duration of all lines ranged from 120-124 days (Table 5).

Table 5. Performance of some advance lines of Chickpea at FSRD site, Chabbishnagar, Rajshahi during 1998-99 and 1999-2000

Advanced line/variety	Yield (t/ha)	
	1999-2000	1998-99
E_1=ICCX-900038-2	0.85b	0.57c
E_2=ICCX-900047-3	1.05b	0.58c
E_3=ICCX-860102-2	1.35ab	0.86abc
E_4=ICCX-9100206-2	1.91a	0.92abc
E_5=ICCX-91002-3	1.61ab	0.80abc
E_6=ICCX-90007-1	1.38ab	1.06ab
E_7=ICCX-90007-2	1.23ab	0.66bc
E_8=BCCX-84005	1.02b	1.21a
E_9=BCCX-84005	1.61ab	0.76bc
E_{10}=ICCX-890314-3p	0.89b	1.08ab
E_{11}=ICCX-890314-19p	1.31ab	0.78abc
E_{12}=ICCX-890317-6p	1.59ab	0.51c
E_{13}=ICCX-890317-8p	0.84b	0.74bc
E_{14}=ICCX-890317-14p	1.91a	0.93abc
E_{15}=BARI chola-5	1.03b	1.05ab
CV (%)	20.36	31.32

On-farm variety trial with some BINA released Mustard varieties at Rangpur

Four BINA released mustard varieties viz. BINA Sharisha-3, BINA Sharisha-4, Agroni and Shafal were tested against BARI sharisha-8 at the FSRD site, Syedpur, Rangpur during rabi season of 1999-2000 to evaluate their performance and to identify a suitable mustard varieties with good yield potentials to fit the existing cropping pattern. Results revealed that BARI Sharisha-8 produced significantly highest seed (2.31 t/ha) and also matured earlier (96 days) than the BINA released varieties (Table 6).

Table 6. Yield performance of BINA released Mustard varieties at the FSRD site, Syedpur, Rangpur during Rabi 1999-2000

Variety	Days to maturity	Seed yield (t/ha)
BINA Sharisha-3	98a	1.74b
BINA Sharisha-4	97b	1.54c
BARI Sharisha-8	96c	2.31a
Agroni	98a	1.46c
Shafal	98a	1.34d
CV (%)	0.2	5.7

On-farm trial with Sesame varieties at Tangail

To assess the yield performance of some advance lines of sesame the trial was conducted at the farmers' field of FSRD site, Palima, Tangail during rabi 1999-2000 to evaluate their performances. Advance line T_6 has given significantly higher yield (1006 kg/ha) and was identical to the yield of advance line No. 11 (997 kg/ha). The least yield was recorded in the line Jamalpur (790 kg/ha). Days to maturity did not vary significantly among the lines (Table 7).

Table 7. Yield performance Sesame at the FSRD site, Palima, Tangail 1999

Variety/lines	Days to maturity	Seed yield (t/ha)
No. 11	90	997ab
Jamalpur	94	790c
T_6	97	1006a

Evaluation of Chickpea varieties suitable for intercropping with Mustard at Jessore

Yield performance of two varieties of chickpea BARI Chola-2 and BARI Chola-5 were assessed against two intercropping systems viz. 2 rows and 4 rows of chickpea alternate with 2 rows of mustard (var. Daulat) at the farmers field of Chowgacha MLT site, Jessore during rabi 1999-2000. Results revealed that BARI Chola-5 produced significant higher yield than that of BARI Chola-2 in both the intercropping systems. The yield of both the variety was not affected due to planting system. Except 4 rows of BARI Chola 2 alternate with 2 rows of mustard, the other combination produced similar chickpea equivalent yield (Table 8).

Table 8. Yield obtained from two varieties of chickpea intercropped with mustard at MLT site, Keshobpur, Jessore during rabi 1999-2000

Treatments	Yield (kg/ha)		
	Chickpea	Mustard	Chickpea equivalent
Two rows of BARI Chola 2 alternate with 2 rows of Dualat	603.0b	550.8	1016.1
Two rows of BARI Chola 5 alternate with 2 rows of Dualat	671.6a	555.8	1088.5
Four rows of BARI Chola 2 alternate with 2 rows of Dualat	388.4b	548.2	799.6
Four rows of BARI Chola 5 alternate with 2 rows of Dualat	675.6a	550.8	1088.7

On-Farm adaptive trial with BINA Dhan 6 at Noakhali

The trial was conducted at MLT site, Feni, Noakhali during Boro season of 2000 to assess the yield performance of BINA Dhan 6 against BRRI Dhan 29 and other widely practiced varieties named Purbachi and Usha. Result revealed that BINA Dhan 6 produced significantly higher yield (5.46 t/ha) and Usha yielded the least (3.82 t/ha). The yield obtained from Purbachi (4.03 t/ha) was intermediate. Days to maturity of the tested varieties also differed significantly. The highest duration was observed in BINA Dhan 6 (148 days) and the lowest by the variety Purbachi (135 days) (Table 9).

Table 9. Yield obtained from different rice varieties at the Feni MLT site, Noakhali during Boro season of 2000

Rice varieties	Days to harvest	Grain yield (t/ha)
BINA Dhan 6	148a	5.46a
Purbachi	135c	4.03b
Usha	141b	3.82b
BRRI Dhan 29	144ab	4.33b
Mean	142	4.41
CV (%)	1.6	11.4

Performance of high beta carotene content advanced lines of Tomato at Rangpur

The experiment was conducted at the ARS, Rangpur during rabi 1999-2000 to estimate the fruit and seed yield of six advanced lines of Tomato with high beta carotene content. Significant difference was observed among the tested lines for both fruit and seed yield. Advanced line AT-110, 111 and 112 produced least number of fruits/plant. The highest numbers of fruits/plant was obtained from AT-114 (66.75). But the size was smaller. Intermediate number of fruits/plant was recorded with AT-115 (56.50). Superior fruit yield was obtained from the line AT-115 (81.85 t/ha) and the line AT-112 yielded the least (36.66 t/ha). The seed yields obtained from different lines were also significantly different. The highest seed yield (209 kg/ha) was recorded with the line AT-113 and the least with AT-110 (20.14 kg/ha) (Table 10).

Table 10. Fruit and seed yield of six advance lines of Tomato with high beta carotene content at ARS, Rangpur during 1999-2000

Advance lines	Fruits/plant (no.)	Fruit yield (t/ha)	Seed yield (t/ha)
AT-110	15.75c	38.88cd	70.14d
AT-111	14.75c	41.11b	122.55c
AT-112	16.00c	36.66e	79.07d
AT-113	57.25b	40.37bc	209.00a
AT-114	66.75a	37.78dc	156.57b
AT-115	56.50b	81.78a	141.64bc
CV (%)		2.9	14.1

Fertilizer management in hybrid Maize intercropped under irrigated condition

To determine the optimum fertilizer dose for hybrid Maize (Pacific II) and Soybean (Shohag) intercropping, the study was undertaken at the ARS, Rangpur during rabi 1999-2000. Two intercropping systems viz. i) Maize normal row with 2 rows of soybean and ii) Maize paired row with 4 rows of soybean, each with two level of fertilizer. It was observed that the yield of the component crops were not influenced either by intercropping systems or fertilizer management practices but in terms of gross margin-normal rows performed better and in terms of BCR (3.66) maize normal row with 2 rows of soybean fertilized with 200-80-80-20-5-1-10 kg/ha N-P_2O_5-K_2O-S-Zn-B and Mg respectively was found profitable (Table 11).

Table 11. Yield cost and return of soybean and hybrid Maize intercropping systems under different fertilizer management at ARS, Rangpur during rabi 1999-2000

Treatment	Grain yield (t/ha)			Gross return (Tk/ha)	TVC (Tk/ha)	BCR
	Soybean	Maize	Maize equivalent			
T_1	0.71	8.51	9.53	72910	22305	3.27
T_2	0.70	8.33	9.37	71690	19597	3.66
T_3	0.79	8.07	9.17	70390	22305	3.16
T_4	0.75	7.08	8.15	63190	19597	3.22
CV (%)	12.2	12.6				

T_1= Maize normal row + 2 rows of Soybean with 250-120-120-40-5-1-10 kg N-P_2O_5-K_2O-S-Zn-B-Mg/ha
T_2= Maize normal row + 2 rows of Soybean with 200-80-80-20-5-1-10-10 kg N-P_2O_5-K_2O-S-Zn-B-Mg/ha
T_3= Maize paired row + 4 rows of Soybean with 250-120-120-40-5-1-10-10 kg N-P_2O_5-K_2O-S-Zn-B-Mg/ha
T_4= Maize paired row + 4 rows of Soybean with 200-80-80-20-5-1-10-10 kg N-P_2O_5-K_2O-S-Zn-B-Mg/ha

Advanced yield trial with Potato at the saline areas of Noakhali

To find out suitable potato varieties or lines with high yield potentials for the saline area of Noakhali, the trial was conducted during rabi 1999-2000. Eleven varieties/lines were tested and the average yield (10.25 t/ha) obtained from the varieties was very low. The highest yield was obtained from the variety Cardinal (12.90 t/ha), which was identical to the yield obtained from the line 86.844 (11.93 t/ha). The other varieties gave identical yields (Table 12).

Table 12. Yield obtained from different advance lines/varieties of potato at saline area of Noakhali during rabi 1999-2000

Lines/variety	Tuber/hill (%)	Tuber yield (t/ha)
Cardinal	7a	12.90a
Provento	6ab	9.27b
Arinda	6ab	10.23b
Raja	5cd	10.07b
Kurada	6ab	8.57b
86.844	6ab	11.93a
86.140	5cd	8.57b
Mean	5.85	10.20
CV (%)	9.1	8.7

Tomato grafting on different root stocks at Rangpur

The experiment was conducted at ARS, Rangpur during rabi 1999-2000 to observe the field performance of grafted Tomato varieties and to select suitable root stocks. Three brinjal varieties viz. Khotkhotia, Singnath and Islampuri were used as rootstock and four Tomato varieties viz. Ratan, BARI Tomato-4, BARI Tomato-6 and BARI Tomato-9 were used as scion. The highest success on Khotkhotia stock was obtained from BARI Tomato-4 (92.5%), that on Singnath from BARI Tomato-4 (93.8%) and BARI Tomato-6 (90.8%) and that on Islampuri from BARI Tomato-4 (96.4%). As a whole BARI Tomato-4 (90.8%) and BARI Tomato-6 (89.2%) provided better success (Table 13). In terms of yield both Khotkhotia and Singnath as stock recorded better yield with BARI Tomato-4 as scion (36.48 and 36.06 t/ha) respectively. But Islampuri as stock produced better yield with BARI Tomato-9 as scion (44.25 t/ha) (Table 13 & 14)

Table 13. Interaction effects of stock (Brinjal varieties) and scion (Tomato varieties) on the success (%) of grafting at ARS, Rangpur during rabi 1999-2000

Tomato	Success (%)			
	Khotkhotia	Singnath	Islampuri	T-Mean
Ratan	82.3b	76.0b	72.5d	76.9
BARI Tomato-4	82.5b	93.8a	96.3a	90.8
BARI Tomato-6	92.5a	90.8a	84.6c	89.2
BARI Tomato-9	69.8c	71.0c	92.0b	77.6
V.Mean	81.8	82.9	86.3	83.6

Table 14. Interaction effects of stock (Brinjal varieties) and scion (Tomato varieties) on the Tomato yield

Tomato as scion	Yield (t/ha)			
	Khotkhotia	Singnath	Islampuri	T-Mean
Ratan	18.33d	26.72c	22.74c	22.60
BARI Tomato-4	36.48a	36.06a	36.50b	36.50
BARI Tomato-6	28.48b	30.22b	36.94b	31.88
BARI Tomato-9	21.79c	27.88c	44.25a	31.31
V.Mean	26.27	30.22	35.11	30.53

On-farm evaluation of hybrid rice at different location of Bangladesh

To evaluate the yield performance of three-hybrid rice Sonar Bangla-1, Sonar Bangla-2 and Sonar Bangla-3 under different agroecological zones of Bangladesh a number of trials were conducted at the different FSRD and MLT sites of OFRD during Kharif-II season of 1999. The trials were conducted under three sets of treatments and three modern rice varieties developed by BRRI were included to compare the yield of the hybrid rice.

The hybrid rice Sonar Bangla-1 yielded the highest (7.13 t/ha) at Faridpur, which was followed by those at Rangpur (6.62 t/ha) and Laksham (6.23 t/ha). The variety yielded the least (1.78 t/ha) at Noakhali. Hybrid rice Sonar Bangla-2 was tested over 15 locations and yield obtained ranged from 6.92 t/ha to 2.73 t/ha (at Sylhet and at Noakhali) and the mean yield was 5.32 t/ha. Except Pabna, Jessore, Hathazari and Noakhali grain yields obtained were more than 5 t/ha in all other locations (Table 15).

Out of 23 locations Sonar Bangla 3 produced maximum yield of 7.57 t/ha at Rangpur and minimum of 3.28 t/ha at Feni and the mean yield over the locations was 5.42 t/ha. The maximum, minimum and mean yield of BR11 were 6.24 t/ha, 2.55 t/ha, 4.69 t/ha and those of BRRI Dhan 32 were 6.37 t/ha, 3.18 t/ha and 4.76 t/ha, respectively. The same yield for BRRI Dhan 33 was 6.18 t/ha, 1.50 t/ha and 4.35 t/ha, respectively.

Table 15. Yield obtained from different rice varieties obtained over the locations during Kharif II during 1999

Name of the locations	Grain yield (t/ha)					
	Sonar Bangla-1	Sonar Bangla-2	Sonar Bangla-3	Sonar Bangla-4	BRRI Dhan-32	BRRI Dhan-33
Pirgacha, Rangpur	6.62	6.57	7.01	6.24	5.58	5.19
Lalmonirhat	-	6.81	7.32	5.43	5.41	6.18
Nilphamari	-	-	5.91	4.26	5.39	5.02
Sylhet	5.68	6.92	4.89	-	5.17	-
Faridpur	7.13	6.83	7.57	4.70	4.37	4.60
Comilla sadar	5.00	5.03	4.17	5.50	6.17	4.07
Chandina	-	6.77	6.39	5.53	5.87	-
Laksham	6.23	5.90	5.87	-	5.06	5.16
Pabna	3.44	3.11	3.39	-	3.18	3.16
Bagherpara	3.84	3.67	4.92	4.56	3.33	3.56
Chougacha	-	5.97	5.79	4.48	4.21	4.56
Jhenaidah	-	-	6.19	4.90	4.51	4.48
Hathazari	4.43	4.45	4.80	4.30	4.23	4.30
Fatikchari	-	4.75	5.45	5.00	5.30	4.70
Satkania	-	-	4.59	4.61	5.02	4.90
Noakhali	1.78	2.73	4.60	-	4.52	1.50
Feni	-	-	3.28	3.60	3.90	3.38
Laxmipur	-	-	5.64	3.44	4.81	4.85
Jamalpur	-	5.15	6.20	4.70	4.17	4.96
Kushtia sadar	-	5.15	5.32	4.87	4.80	4.22
Gangni	-	-	3.72	2.55	3.18	3.09
Mymensingh	-	-	4.91	-	4.93	5.03
Kishoregonj	-	-	6.76	-	6.37	4.43
Mean	4.91	5.32	5.42	4.69	4.76	4.35
Maximum	7.13	6.92	7.57	6.24	6.37	6.18
Minimum	1.78	2.73	3.28	2.55	3.18	1.50

Advanced yield trials on Bread wheat lines at different locations

The performance of 5 advanced lines of bread wheat viz. BAW-917, BAW-923, BAW-936, BAW-944, BAW-966 were evaluated against a previously released wheat variety Protiva at different FSRD and MLT sites during rabi 1999-2000. The yields of the tested lines differed significantly among themselves and over the locations. All the lines performed best at Rangpur (5.33 t/ha) followed by Jessore (3.99 t/ha), Jamalpur (3.57 t/ha), Kishoregonj (3.29 t/ha) and the least at Comilla (2.28 t/ha). At Rangpur significantly the highest yield was obtained from the wheat variety Protiva (5.71 t/ha). The advance line BAW-936 yielded the best at Pabna (4.59 t/ha), Jessore (4.37 t/ha), Kishoregonj (3.60 t/ha) and Keshabpur (3.82 t/ha) whereas at Jamalpur and Comilla BAW-344 and BAW-917 produced the maximum yield of 4.01 t/ha and 2.50 t/ha respectively. The new lines BAW-917, BAW-923, BAW-936 performed better than the other lines at Pabna and Jessore but in other locations they have showed similar yield potentialities and advance lines BAW-936 produced maximum average yield of 3.99 t/ha over the locations (Table 16).

Table 16. Yield obtained from different advance lines/varieties of bread wheat at different locations during rabi season of 1999-2000

Variety/ lines	Yield on locations (t/ha)							
	Rangpur	Pabna	Jessore	Kishore gonj	Keshabpu r	Jamalpur	Comilla	Mean
BAW-917	5.40abc	3.49b	4.03a	3.02b	3.63b	3.38b	2.50a	3.04AB
BAW-923	5.13cd	4.57a	4.28a	3.22b	3.37c	3.58ab	2.20b	3.76AB
BAW-936	5.55ab	4.59a	4.37a	3.60a	3.82a	3.73ab	2.24b	3.99A
BAW-944	5.22bcd	2.67c	3.97ab	3.08b	3.78a	4.01a	2.24b	3.57AB
BAW-966	4.95d	2.60c	3.88ab	3.72a	3.15a	3.30b	2.30b	3.41B
Protiva	5.71a	2.80c	3.38b	3.10b	3.37c	3.42b	2.19b	3.42B
Mean	5.33A	3.45C	3.99B	3.29C	3.52BC	3.57BC	2.28D	-
CV (%)	7.0	7.3	5.68	-	1.02	6.7	-	11.09

Screening of advanced lines/varieties of Potato at Noakhali

Twenty advance lines/varieties of potato were tested at FSRD site, Noakhali during rabi 1999-2000 to find out suitable varieties for this region. Results revealed that performance of all the tested varieties were poor. However, the maximum yield of 13.74 t/ha was obtained from the line 94.186 followed by that from Cardinal (13.30 t/ha) (Table 17).

Table 17. Screening of advance lines/varieties of Potato at Atkapalia, Noakhali 1999-2000

Lines/varieties	Tuber/hill (no.)	Tuber/hill (t/ha)	Skin color
Kuroda	5.73bcd	7.8bcde	R
Raja	4.06cde	5.65de	R
Provento	5.76bcdf	10.77bcd	W
Chamak	6.43bcde	8.58bcde	W
Dheera	10.86a	18.25a	W
Heera	5.56bcde	9.82bcde	W
Cardinal	7.5abcd	13.30ab	W
Arinda	9.19def	9.19bcde	W
Preludo	8.76ab	10.74bcd	W
Samanta	5.3bcde	8.6bcde	W
384558.10	4.76cde	6.54cde	W
Red pontiac	4.76cde	9.79bcde	R
Mariella	5.96bcde	8.18bcde	W
86.844	9.26bcde	9.66bcd	R
86.140	5.86bcde	4.93de	W
87.573	3.63de	11.44bcd	W
94.66	7.7abc	8.44bcde	W
94.186	6.16bcde	13.74b	W
384011.3	5.96bcde	9.02bc	W
4382013.5	2.7e	3.28e	W
Mean	5.98	9.05	
CV (%)	32.75	38.91	

R= Redish, W= Whitish

On-Farm evaluation of Botrytis Gray Mold technology on Chickpea

To test and validate the suitability of Botrytis Gray Mold (BGM) management options on Chickpea, the experiment was conducted at the farmers' field of FSRD sites. Faridpur and Jessore during rabi 1999-2000. It was observed from the result that in both the locations chickpea yields were significantly improved by Bavistin treatment and BARI Chola 5 produced significantly higher yields than the local ones. Untreated local variety of chickpea yielded the least in both the locations. The yields were supported by severity of disease score (Table 18).

Table 18. Effect of BGM technology on performance of chickpea during rabi season of 1999-2000

Treatment	Yield (t/ha)			BGM severity score (1-6 scale)		
	Faridpur		Jessore	Faridpur		Jessore
	1998-99	1999-2000	1999-2000	1998-99	1999-2000	1999-2000
T_1= BARI Chola-5 treated with Bavistin	-	16.3a	2.16a	-	2b	2b
T_2= BARI Chola-5 treated with Bavistin	1.63a	1.37b	1.70b	2	4a	4ab
T_3= Local treated with Bavistin	1.37b	0.97c	1.45b	4	3ab	2b
T_4= Local without treatment	0.97c	0.77d	1.15c	3	4a	6a
CV (%)	0.77	2.4	10.2	4	-	3.18

On-farm trial with phosphorus efficient genotypes

Four advance lines/varieties of wheat (Kanchan, Mayoor, BAW-923, BAW-936) were tested with three levels of phosphorus (0, 30 and 60 kg P_2O_5/ha) in the farmers' field at FSRD site, Syedpur and MLT sites Nilphamari and Lalmonirhat MLT site during rabi 1999-2000. Among the genotypes tested Kanchan produced significantly higher grain yield (5.26 t/ha) followed by Mayoor and BAW-936 (4.49 and 4.19 t/ha) respectively (Table 19).

Table 19. Interaction effect of variety, levels of P_2O_5 and locations on the grain yield (t/ha) of wheat during rabi, 1999-2000

Levels of P_2O_5 (kg/ha)	Variety	Locations		
		FSRD site	Nilphamari	Lalmonirhat
0	Kanchan	5.58b	4.79a	5.38a
	Mayoor	6.23a	4.55ab	2.28b
	BAW-923	3.20c	4.20b	1.60c
	BAW-936	5.90ab	4.45ab	1.75c
30	Kanchan	5.33b	5.02a	4.85a
	Mayoor	6.08a	5.14a	2.45c
	BAW-923	4.10c	4.32b	1.80c
	BAW-936	5.55b	5.28a	1.80c
60	Kanchan	5.95a	5.08a	5.38a
	Mayoor	5.38b	5.56a	2.80b
	BAW-923	4.95b	5.15a	2.45b
	BAW-936	5.95a	5.42a	1.68c

Pilot production and Technology Transfer

Pilot production program

	Title	Location	Area (ha/pit)	Farmer (no.)	Yield/Impact
1.	Performance of Potato under zero tillage	Sylhet Khulna	0.12 0.10	4 5	20.5-16.29 t/ha
2.	Pilot production of BARI Lau-1	Mymensingh Rangpur Jamalpur Pabna	16 pits 5.28 456 pits 56 pits	16 321 130 28	17.3-4.3 kg/pit 34.5-19.0 t/ha 15.0 kg/ha 40 nos. of pit Color is not attractive. Farmers less interested to purchase
3.	Pilot production of newly developed BARI Dheros-1	Tangail Mymensingh Kushtia Rangpur	1.19 0.01 0.12 0.31	19 1 2 123	18.7-7.68 t/ha BARI Dheros-1 is virus resistant
4.	Pilot production of Mustard BARI Sharisha-8	Comilla Rangpur Narsingdi	0.08 0.71 0.18	8 249 3	1.72-1.46 t/ha Boro transplanting delayed
5.	Pilot production of low toxin Khesari	Kushtia	0.15	3	1.4 t/ha
6.	Pilot production of BARI Mushur-4	Jessore	0.33	3	1.8 t/ha
7.	Pilot production of BARI Sheem-1	Pabna Jamalpur Rangpur	168 pits 456 pits 3.58	28 130 304	10.6 kg/pit 4.7 t/ha 25-16 t/ha Farmers liked it for early harvest
8.	Pilot production of Wheat	Kushtia	0.28	5	2.7 t/ha
9.	Pilot production of TPS-I & II	Rangpur	0.02	30	2.7 t/ha 26.0 t/ha
	Total	20	12.46 1152 pits	1412	

Technology Transfer

a. Crops and cropping pattern

Technology	Location	Area(ha)/ Pit (no)[a]	Farmers involved (no)	Yield/Impact
BARI Lau-1	Faridpur	0.2	100	Yield: 23.7 t/ha
	Noakhali	0.76	70	Yield: 25.2 t/ha
	Rangpur	1.02	43	Yield: 41.0 t/ha
	Sylhet	35[a]	35	Yield: 24.72-12.3 kg/pit
	Tangail	81[a]	25	Yield: 19 nons/pit
Carrot	Sylhet	0.26	4	Yield: 26.5 t/ha
Onion	Sylhet	0.41	9	Bulb yield: 1.6 t/ha
BARI Sheem-1	Faridpur	0.09	15	Yield: 19.2t/ha
	Noakhali	0.34	75	Yield: 18.0t/ha
	Rangpur	0.92	41	Yield: 16.0t/ha
	Tangail	107[a]	25	Yield: 5kg/pit
BARI Sheem-2	Tangail	65[a]	13	Yield: 6kg/pit
	Noakhali	0.065	125	Yield: 8.3 t/ha
BARI dherosh-1	Faridpur	0.06	12	Yield: 10.5 t/ha
	Rangpur	1.46	42	Yield: 17.25t/ha
	Lebukhali	0.2	35	Yield: 10.0t/ha
	Kalapara	0.05	15	Yield: 8.0t/ha
Radish (Tasakisan)	Faridpur	0.1	20	Yield: 60.0t/ha
	Noakhali	0.028	7	Yield: 47.0t/ha
	Feni	0.032	2	Yield: 44.0t/ha
	Tangail	0.97	16	Yield: 45.0t/ha
	Pabna	0.71	7	Yield: 42.79t/ha
Radish (Pinki)	Tangail	0.72	12	Yield: 43.0t/ha
BARI Tomato-1	Tangail	0.16	8	Yield: 15.66t/ha
BARI Tomato-5	Tangial	0.25	8	Yield: 16.95t/ha
Tomato (Ratan)	Tangail	0.2	8	Yield: 13.95t/ha
	Feni	0.064	4	Yield: 30.75t/ha
	Pabna	0.5	2	Yield: 10.94t/ha
Summer tomato	Noakhali	00.1	5	Yield: 23.8t/ha
	Patuakhali	0.023	1	BARI Tomato-4:21.30t/ha
		0.0046		BARI Tomato-5.23.91t/ha
Cabbage (Atlast-70)	Pabna	0.53	4	Yield: 78.25 t/ha
Cauliflower (White contesa & Snow grace)	Pabna	0.8	6	Yield: 43.55t/ha
Year round homestead vegetable production	Rangpur	0.144	24	Lalsak: 50.55t/ha Radish: 32.7t/ha Brinjal: 6.76t/ha
	Barind	0.049	10	I.spinahc: 11.2 kg/ha Lalsak: 13.6 kg/ha Brinjal: 25.0 kg/ha
	Patuakhali	0.2	25	Production is continuing as per model
Composting with kitchen	Faridpur	6a	6	Vegetable production is

Technology	Location	Area(ha)/ Pit (no)[a]	Farmers involved (no)	Yield/Impact
and FY waste				increased by using the compost
BARI Chola-5	Faridpur	5.0	25	Grain yield:1.30t/ha
BARI ashur-2	Feni	0.02	2	Grain yield: 0.85t/ha
BARI Mashur-4	Faridpur	20.0	50	Yield: 0.090t/ha
	Pabna	2.97	16	Yield: 0.93t/ha
BARI Mash-1	Tangail	1.15	7	Yield: 1.36 t/ha
Hybrid Maize (Golda)	Faridpur	1.5	3	Yield: 11.25 t/ha
Maize (Barnali)	Noakhali	0.48	6	Yield: 3.64t/ha
	Laxmipur	0.4	5	Yield: 3.98t/ha
	Feni	0.25	5	Yield: 3.66t/ha
	Pabna	0.15	2	Yield: 6.03t/ha
	Patuakhali	0.12	5	Yield: 1.50t/ha
Sunflower (Kironi)	Noakhali	0.18	3	Grain yield: 1.47 t/ha
Minimum tillage mustard	Noakhali	3.94	7	Yield: 0.44t/ha
	Laxmipur	0.4	10	Yield: 0.54t/ha
	Feni	0.2	5	Yield: 0.73t/ha
Minimum tillage wheat	Noakhali	5.62	15	Yield: 1.15t/ha
	Laxmipur	0.4	10	Yield: 1.94t/ha
Zero tillage potato	Laxmipur	0.02	4	Yield: 13.94t/ha
Sweet potato	Patuakhali	0.04	3	BARI-5S.Potato: 25.0 t/ha Daulatpuri: 32.0t/ha
Cowpea+Maize	Laxmipur	0.056	5	Chilli: 0.41 t/ha Maize: 0.94 t/ha
Sweet potato+ Maize	Laxmipur	0.076	5	Sweet potato: 8.44 t/ha Maize: 0.94 t/ha
Soybean + Maize	Laxmipur	0.016	2	Soybean: 0.809t/ha Maize: 1.33 t/ha
Ashgourd+Bottle gourd	Rangpur	12a	12	Ash gourd: 11 nos/roof Bottle gourd: 14 nos/roof
Sweet gourd +Bottle gourd	Rangpur	12a	12	Sweet gourd: 9 nons/roof Bottle gourd: 15 nos/roof
Sweet gourd+Country bean	Rangpur	12a	12	Sweet gourd: 11 nos/roof Country bean: 18 kg/roof
Indian spinach+Bottle gourd	Rangpur	12a	12	Indian spinach: 22 kg/roof Bottle gourd: 16 kg/roof

b. Seed exchange program

Technology	Location	Area (ha)/ Pit (no)[a]	Farmers involved (no)	Yield/Impact
A. Through OFRD				
Mustard	Barind	2.70	4	Seed: 1.10 t/ha
Chickpea	Barind	18.2	46	Seed: 1.19 t/ha
Wheat	Barind	0.8	5	Seed: 2.78 t/ha

Technology	Location	Area (ha)/ Pit (no)[a]	Farmers involved (no)	Yield/Impact
Sunflower	Barind	0.96	3	Seed: 1.32t/ha
B. Through DAE				
Mustard		50.0	30.0	Seed: 0.93 t/ha

c. Seed production program

Technology	Location	Area(ha)/ Pit(no)[a]	Farmers involved (no)	Yield/Impact
Mustard : BARI-7 BARI-8	Barind	11.83	46	Seed:1.32 t/ha
BARI Chola 2,3,4,5,6 & 7	Barind	19.33	52	Seed:1.23 t/ha
Wheat : Kanchan Inkilab	Barind	19.33	52	Seed: 2.80 t/ha Seed: 3.12 t/ha
Sunflower (Kironi) Safflower	Barind	0.39	2	Seed: 1.2 t/ha
	Barind	1.06	2	Seed: 0.92 t/ha
Linseed (Nila)	Barind	0.85	1	Seed : 0.60 t/ha
BARI Sharishai-8	Tangail	1.2	12	Yield: 1.42 t/ha
	Pabna	25.2	81	Yield: 1.72 t/ha
Intercropping dhaincha in T.Aman	Barind	35.0	110	T.aman yield not hampered Dhaincha seed: 139 kg/ha Biomass (Fuel): 435 kg/ha
Dhaincha in waste land & pond bank	Barind	0.13 0.06	2	Waste land Dhaincha seed: 923 kg/ha Biomass(fuel): 8.5 t/ha Pond Bank Dhaincha Seed: 8.33 kg/ha Biomass (fuel): 7.0 t/ha

d. Crop museum

Technology	Location	Area(ha) /Pit(no)[a]	Farmers involved (no)	Yield/Impact
Wheat	Barind	0.13	4	Knachna: 2.15 t/ha Akbar: 2.32 t/ha Protiva: 2.29 t/ha Inkilab: 3.2 t/ha
Maize	Barind	0.18	4	Pacific-11: 10.10 t/ha
Chickpea	Barind	0.06	4	BARI chola-5: 1.92 t/ha BARI chola-3: 1.43 t/ha Anigeri: 0.86 t/ha ICC-4958: 0.74 t/ha Local: 1.18 t/ha
Kaon	Barind	0.06	4	Grain: 1.80 t/ha

Technology	Location	Area(ha) /Pit(no)[a]	Farmers involved (no)	Yield/Impact
China	Barind	0.06	4	Grain: 2.08 t/ha
Linseed	Barind	0.04	4	Grain: 1.16 t/ha
Safflower	Barind	0.26	4	Grain: 0.91 t/ha
Sunflower	Barind	0.22	4	Grain: 1.02 t/ha
Gujitil	Barind	0.06	4	Grain: 0.65 t/ha
Potato	Barind	0.20	4	Cardinal: 35.0 t/ha
Intercropping paired row sugarcane with potato onion & chilli	Patuakhali	0.72	12	Sugarcane: 57 t/ha Potato: 8 t/ha Onion: 5 t/ha Chilli: 125 kg/ha
Intercropping dhaincha with T.aman rice	Rangpur	8.16	86	Dhaincha seed: 8.75 kg/ha Biomass (fuel): 141.5 kg/ha
Sonarbangla-1	Patuakhali	0.15	1	Grain yield: 4.2 t/ha
Boro rice (Bina-6)	Faridpur	0.67	20	Grain yield: 7.51 t/ha
	Tangail	0.6	5	Grain yield: 5.81 t/ha
	Patuakhali	0.15	1	Grain yield: 3.85 t/ha
Boro rice (BR-29)	Faridpur	0.67	20	Grain yield: 6.50 t/ha
	Tangail	0.6	5	Grain yield: 5.90 t/ha
	Pabna	4.07	12	Grain yield: 5.22 t/ha
	Patuakhali	0.15	1	Grain yield: 4.30 t/ha
Boro rice (Alok)	Faridpur	0.66	20	Grain yield: 7.31 t/ha
	Patuakhali	0.15	1	Grain yield: 5.60 t/ha
BR-32	Tangail	2.15	15	Grain yield: 4.15 t/ha
BR-11	Tangail	2.15	15q	Grain yield: 3.17 t/ha
Jute(0-9897) seed production	Rangpur	0.16	8	Seed yield: 3.2 t/ha By product: 19 t/ha
Mustard-Boro-T.aman CP	Faridpur	0.04	2	Tori-7: 0.90 t/ha BR-29: 5.80 t/ha BR-32: 4.70 t/ha
	Rangpur	6.04	33	BARI Sharisha-8: 1.57 t/ha Improved Tori-7: 0.98t/ha BR-28: 4.96 t/ha BR-29: 5.52 t/ha
Wheat-Jute-T.aman CP	Faridpur	0.72	6	Kanchan: 3.07 t/ha 0-9897: 2.20 t/ha BR-32: 4.50 t/ha
	Tangail	1.65	15	Khanchan: 2.19 t/ha 0-9897: 2.29 t/ha BR-32: 3.45 t/ha
Jute-T.aman-Potato CP	Rangpur	6.22	36	0-9897: 2.29 t/ha BR-32: 3.80 t/ha Cardinal: 27.41 t/ha Diamont: 26.13 t/ha
Jute-T.Aman-Wheat CP	Rangpur	5.48	33	0-9897: 2.22 t/ha BR-32: 3.76 t/ha Kanchan: 2.87 t/ha Protiva: 2.76 t/ha

Technology	Location	Area(ha) /Pit(no)[a]	Farmers involved (no)	Yield/Impact
GM-T.Aman-Wheat CP	Barind	15.0	-	Dhaincha: 13.7 t/ha
		10.0	-	Shama: 3.20 t/ha
		17.0	-	Kanchan: 2.87 t/ha
GM-T.Aman-Chickpea CP	Barind	7.0	-	Dhaincha: 13.0 t/ha
Barind		15.0	-	Sharma: 3.05 t/ha
		20.0	-	BARI Chola: 0.85 t/ha
Wheat-GM-T.Aman CP	Pabna	10.57	60	Kanchan: 2.08 t/ha Dhaincha: Crop is not established due to heavy rainfall BR-32: Crop is in the field
Potato (No tillage)-T.Aus-T.Aman CP	Patuakhali	2.0	42	Potato: 15.0 t/ha BR-27: 3.4 t/ha BR-32: 4.5 t/ha
Mungbean-T.Aus-T.Aman CP	Patuakhali	4.0	40	Kanti: 900 kg/ha Bina-Mungb: 500 kg/ha BR-27: 3.87 t/ha BR-32: 4.60 t/ha

e. BARI-GKF Program

Technology	Location (no.)	Area(ha)/ Pit(no)[a]	Farmers involved (no)	Yield/Impact
A. Winter vegetables				
Radish (Tasakisan)	11	8.95	61	Vegetable: 6.29-1.86 t/ha Seed: 651-606 kg/ha
Bottle gourd (BARI Lau-1)	18	5.59	87	Vegetable: 63.84-36.70 t/ha Seed: 146-35 kg/ha
Country bean (BARI sheem-1)	13	6.57	92	Vegetable: 21.74-2.09 t/ha Seed: 953-226 kg/ha
Brinjal				Vegetable: 33.59-12.0 t/ha
Uttara	5	0.46	13	Seed : 33.5 kg/ha
Singnath	2	0.18	3	Vegetable: 31.8-82 t/ha Seed: 41-37 kg/ha
Islampuri	1	0.16	4	Vegetable: 14.82 t/ha Seed: 37 kg/ha
Kangkong (Gimakalmi)	11	2.25	17	Seed: 1212-908 kg/ha
Spinach (Kopipalong)	7	1.20	21	Vegetable: 5.76-4.94 t/ha Seed: 1275-445 kg/ha
I. Spinach (Shabuj)	5	0.38	14	Vegetable: 6.42-3.0 t/ha Seed: 808-445 kg/ha
Tomato (Ratan)	18	11.64	117	Vegetable: 33.44 +1.11 t/ha Seed: 120-5 kg/ha
R.Amaranth				
Altapeti	10	5.20	105	Vegetable: 3.46-0.99 t/ha
BARI-1	04	1.16	18	Seed: 1071 –414 kg/ha

Technology	Location (no.)	Area(ha)/ Pit(no)[a]	Farmers involved (no)	Yield/Impact
Amaranth (Bashpata)	7	0.99	11	Vegetable: 2.54-0.70 t/ha Seed: 834-445 kg/ha
Batishak (BARI)	6	1.72	8	Seed: 679-656 kg/ha
Chinasha (BARI)	5	1.72	10	Seed: 826-772 kg/ha
Cauliflower (Agrani)	5	0.21	5	Vegetable: 27.17-6.92 t/ha Seed: 232-64 kg/ha
Hybrid	1	24.0	345	Vegetable: 70.50 t/ha
Local	3	48.86		9.29-6.47 t/ha
Cabbage: Hybrid & local	5	60.75	377	Vegetable: 23.59-17.32 t/ha
B. Kharif vegetables				
Okra:BARI Dherosh-1	15	11.0	143	Vegetable: 3.36-1.49 t/ha Seed: 829-609 kg/ha
Stringbean:Kegornatki	13	6.16	57	Vegetable: 3.21-1.53 t/ha Seed: 1157-594 kg/ha
Snakegourd:Jhumlong	16	1.95	29	Vegetable: 3.00-0.59 t/ha Seed: 520-146 kg/ha
Bittregourd: Gajkarala	4	1.24	27	Vegetable: 5.02-4.52 t/ha Seed: 127-110 kg/ha
Cucumber: Baromashi	5	0.91	23	Vegetable: 14.82-12.08 t/ha Seed: 40-31 kg/ha
Sweetgourd: Local	2	1.20	13	Vegetable: 12.78-7.05 t/ha Seed: 21-17 kg/ha
R.amaranth: Altapeti	14	7.14	91	Vegetable: 2.59-1.16 t/ha Seed: 708-447 kg/ha
Potato: Cardinal	9	190.60	428	Vegetable: 20.07-18.8 t/ha
Potato: (BARI TPS-1)	2	1.47	17	Vegetable: 2.01 t/ha
BARI TPS –1 & 2 Late	4	0.22	27	Seed: 31.28-29.76 t/ha
Jute seed (Var. 9897)	12	2.95	37	Vegetable:7.41-0.65 t/ha Seed: 795-568 kg/ha
Hybrid maize (Var. Pacific 11 & 60)	7	140.43	1012	Grain: 7.24 t/ha
Wheat (Kanchan & protiva)	8	95.94	513	Grain: 2.42 t/ha
Mustard (Ihurdi local)	1	1.68	24	Grain:980 kg/ha
Tori-7	3	15.67	117	Grain: 988-790 t/ha
BVARI-8	1	0.81	17	Grain: 1442 kg/ha
Boro rice (Var. BR-14, 28& 29)	8	1694	7525	Grain: 467 t/ha
T.aman rice (Var. BR-11, BRRIdhan-30 & 32	8	1363	7923	Grain: 3.82 t/ha
Aro;id (local)	2	76	352	Yield: 11.19 t/ha
Palwal (local)	2	237	277	Yield: 17.55 t/ha
Onion(local)	2	430	1180	Yield: 17.55 t/ha
Banana (Amritosagar Mehersagar)	2	135	535	Yield: 56.04 t/ha

f. Plantation crops

Technology	Location	Area(ha)/ Pit(no)[a]	Farmers involved (no)	Yield/Impact
Amrapali	Faridpur	24a	12	Planted in August 1999
Mohananda	Faridpur	24a	12	Planted in August 1999
Mollicka	Faridpur	24a	12	Planted in August 1999
BARI Sofeda-1	Faridpur	6a	6	Planted in August 1999
BARI Coconut 1&2	Faridpur	24a	12	Planted in August 1999
	Tangail	5a	5	Planted in August 1999
BARI Lichi-1	Faridpur	6a	6	Planted in August 1999
BARI Guava-1	Rangpur	34a	32	Planted in 1999
Ashwina (Mango)	Rangpur	12a	8	Planted in 1999
China-3 (Litchi)	Rangpur	25a	20	Planted in 1999
	Tangail	11a	5	Planted in 1999
Mozaffarpura (Lichi)	Rangpur	25a	2	Planted in 1999
Seedless lemon	Tangail	10a	5	Planted in 1999
Papaya	Tangail	30a	5	Bearing stage
Olive tree	Tangail	5a	5	Planted in 1999
Haugh pulm	Tangail	5a	5	Planted in 1999
Drumstock	Tangail	3a	3	Planted in 1999
BARI Guava	Jamalpur	60a	30	Planted in 1998-99
	Faridpur	30a	12	Planted in 1998-99
Kazi payara	Tangail	30a	5	Bearing stage
BARI Guava & Poly papaya	Patuakhali	50a	35	Expected bearing next year
Kagji lemon	Jamalpur	30a	30	Planted in 1998-99
	Faridpur	24a	12	Planted in 1998-99
Bangra	Jamalpur	40a	30	Planted in July 1999
	Rangpur	20a	16	Planted in July 1999
	Tangail	8a	5	Planted in July 1999
Fazli	Jamalpur	40a	30	Planted in July 1999
	Rangpur	20a	16	Planted in July 1999
Khirshapati	Jamalpur	40a	30	Planted in July 1999
Gopalbhog	Jamalpur	40a	30	Planted in July 1999
Mango hopper control	Faridpur	800a	200	Production increased 12
	Rangpur	21a	21	times. Gross margin range Tk 1765-108/tree. Farmers are enthusiastic.
Mango hopper control	Patuakhali	300a	90	Produced 30-40 kg/sprayed trees
Fertilizer management on fruit trees	Faridpur	18a	12	Production of fruits is
	Coconut	27a		increased. The program
	Mango	41a		creates a good impact in
	Jackfruit			the locality.

g. Livestock

Technology	Location	Number	Farmers involved (no)	Yield/Impact
Beef fattening with UMS	Sylhet	10	10	Treated cattle gained body weight 275g/day against untreated cattle (75g/day)
	Faridpur	20	10	Treated cattle gained body weight 375g/day against untreated cattle (95g/day)
	Noakhali	1	1	Strong motivation should be needed
	Barind	8	4	Treated cattle gained body weight 613g/day/bull
	Tangail	20	20	Treated cattle gained body weight 477g/day against untreated cattle (183g/day)
	Pabna	12	12	Treated cattle gained body weight 450g/day against untreated cattle (95g/day)
Dewarming of cattle	Sylhet30	30	30	Farmers are motivated animal health, its growth and milk production is increased considerably than control
	Faridpur	50	40	Body weight and milk production of treated cow is increased by 57% and 40% respectively over non treated cow
	Noakhali	38	10	Dewarming causes a benefactory result to the cattle
	Barind	58	19	Feed intake, body weight, milk production and lactation period is increased. Brightens skin colour
	Tangail	50	20	Dewarmed cattle were comparatively better than controlled animal
	Pabna	30	25	Body weight and milk production is increased by 67% and 67% over untreated cow

Technology	Location	Number	Farmers involved (no)	Yield/Impact
Poultry rearing in semi-scavenging condition	Sylhet	120	4	Experiment initiated in April 2000. Data collection is continuing
Poultry rearing in different management condition	Pabna	135	3	Sonali layer in full intensive management system is better. Motivation work is needed
Broiler rearing at farmers level	Sylhet	2400	3	Data collection is continuing
	Faridpur	6000	15	It creates good impact. After 7 weeks body weight gain 2.2 kg/bird
	Noakhali	1440	5	Weight gain 1.66 kg/bird. Feed conversion ratio is 2.18
	Barind	300	1	Weight gain 1.78 kg/bird after 7 weeks
	Tangail	400	16	After 7 weeks star-brow gain 1.72 kg/bird which is higher than Arboracores and Hybro
	Pabna	200	1	After 5 weeks broiler gain 1.5 kg. BCR is 1.34
	Patuakhali	150	2	The program earned a high level appreciation in the area
Rearing of Pigeon	Barind	34	2	A total of 17 pairs pigeon of about 7 months of age was distributed. After 9 3months the population attained in 50 pairs. Housing and feeding cost is minimum. So pigeon rearing is economic
Rearing of Black Bengal Goats	Barind	4	3	Woman and children are utilized for goat rearing. Average weight gain/day is 29g. Milk yield is 240 ml/day
Production of algae as cattle feed	Tangail	10	10	Motivation is needed for utilization of algae and alternate source of cattle feed

Technology	Location	Number	Farmers involved (no)	Yield/Impact
Chick rearing in bamboo cage	Noakhali	910	10	Laying of eggs started on 16 week and the highest hen day egg production (78%) attained on 36 weeks
Commercial rearing of Brown nick layer	Barind	50	1	It was revealed that lying of eggs started on 20 week and the highest hen-day egg production (78%) attained on 37 weeks
Layer rearing in cage system	Patuakhali	76	2	It created a positive impact among the farmers. B/C ratio is 1:3
Vaccination to cattle and buffalo	Faridpur	325	90	Mortality is creased. Treated animals were free from diseases
	Noakhali	261	117	Vaccinated cattle has not been affected by foot and mouth and other infectious diseases
	Barind	58	20	Mortality is decreased. It improves livestock production
	Tangail	211	94	Vaccinated cattle were free from infection diseases. Mortality is decreased

h. Fisheries

Technology	Location	Area (ha)/ number*	Farmers involved (no)	Yield/Impact
Monoculture of Rajpunti	Faridpur	0.2	6	Farmers should be motivated. After 5 months Rajpunti gain a weight of 105g
	Tangail	0.07	3	After 3½ months Rajpunti gain a weight of 88g/piece
	Barind	6*	6	After 5 months Rajpunti gain a weight of 87 g/piece
Fish culture in T.Aman rice and water taro	Rangpur	0.66	9	BR11: 3.75 t/ha Rajpunti : 288 kg/ha BR11: 4.0 t/ha Rajpunti + Carpio: 407 kg/ha

Technology	Location	Area (ha)/ number*	Farmers involved (no)	Yield/Impact
	Tangail	0.012	4	BR14: 6.5 t/ha & Rajpunti: 288 kg/ha
	Pabna	1.5	12	Rice field: Common carp, Rajpunti and GIF Telapia yielded 263 kg/ha. Common carp & Rajpunti yielded 388 kg/ha. Water Taro field: Common carp, Rajpunti and GIF Telapia yielded 314 kg/ha. Common carp and Rajpunti yielded 339 kg/ha.
Polyculture of fish	Sylhet	0.54	8	Farmers should be motivated to use supplementary feeds. After 7 months the yield 3.31 t/ha. The BCR is 4.68.
	Faridpur	0.148	3	After 5 months the yield is 3.17 t/ha.
	Rangpur	2.88	24	After 6 months the yield is 3.03 t/ha. BCR is 7.23.
	Tangail	0.09	10	After 7 months the yield attained at 2.62 t/ha. BCR is 3.91.
	Pabna	0.88	4	After 7 months the yield is 1.69 t/ha. BCR is 2.94.
Monoculture of Thai Pangus	Sylhet	0.108	2	Farmers should be motivated to use supplementary feed regularly. After 8 months the yield is 3.90 t/ha but the BCR is 1.73.
	Pabna	0.432	4	Farmers are motivated. The highest yield was obtained in the pond where supplementary feed with boiled rice was applied. The BCR is 1.92.
Rearing of fish fry (Silver carp)	Pabna	0.10	1	The stocking density of silver carp fish fry was 375 g for 0.10 ha pond area. After 5 months 285 kg fingerlings were harvested. Farmers were very much happy with the technology.

i. Other technologies

Technology	Location	Number	Farmers involved (no)	Yield/Impact
BARI plough	Jamalpur	5	5	Depth of BARI plough is 15-17.5 cm and 0.05-0.06 ha land is tilled/hour which is better than country.
BARI Pedal thresher	Jamalpur	5	5	BARI pedal thresher is less laborius and it saves time. It cleans 33.5 kg wheat/hr. while local practice cleans 23.3 kg wheat.
Improved BARI Chula	Jamalpur	20	20	Improved BARI Chula saves 30.62%. Mango wood and 19.97% time in comparison to traditional Chula. Its use is progressively increased.

Training and Field day

Training

a. Training under ARMP

	Title	Location	Participants (no.)
1.	ATC meeting on expanded FSRD program	Sylhet	27
2.	Research – Extension regional review workshop	”	45
3.	Farmers training on Farm machinery developed by BARI	”	35
4.	Two days farmers’ training on Integrated Farming at FSRD site, Golapgonj site	”	45
5.	Fifteen days farmers training on modern technologies of crop livestock and fisheries	”	76
6.	Two days training of farmers	Faridpur	30
7.	Farmers’ Training on farming system research and development	Pabna	30
8.	Farmers’ training on development program	Tangail	30
9.	Progress review and monitoring of kharif-I & II program	”	15
10.	Training on field plot technique and data collection	Jamalpur	49
11.	Farmers’ training on production technology (crops, livestock and fisheries)	”	30
12.	Workshop on program review and field monitoring	”	30
13.	Cropping pattern of T.Aus-T.Aman-Mungbean and T.Aus-T.Aman-Potato	Patuakhali	30

	Title	Location	Participants (no.)
14.	Crop production and data collection	”	48
15.	Farmers orientation on the FSRD program, 1999-2000	Rangpur	81
16.	Review of on-going FSRD activities	”	21
17.	Research review and program planning workshop 98-99-2000	”	53
18.	Farmers training on ARMP program	Rajshahi	30
19.	Workshop on site working team	”	30
20.	Farmers training on strengthening of technlogy transfer	Noakhali	30
21.	Training of SSA/SA on field plot technique and data collection	”	22
	Total	21	802

b. Training under BARI-AVRDC

	Title	Location	Participants (no.)
1.	Grafting technique of vegetables crops for field staff-Nurserymen and farmers’	Rangpur	120

c. Training under SFFP

	Title	Location	Participants (no.)
1.	Farmers’ training on Soil Fertility and Fertilizer Management	Sylhet	18
2.	On day training of farmers	Faridpur	12
3.	Integrated Soil Fertility and Fertilizer Management Technology	Pabna	18
4.	Farmers training on SFFP	Tangail	15
5.	Farmers training on SFFP	Hathazari	18
6.	Role of cooperated farmers as expected	Patuakhali	15
7.	Integrated Management of organic and inorganic fertilizer in soil fertility preservation	”	15
8.	BNF fertilizer and its importance	”	15
9.	Training of SSA/SA on field plot technique and data collection	Rangpur	23
10.	Officer orientation on the SFFP program, 1999-2000	”	13
11.	Training of SSA/SA on SFFP	Rajshahi	12
12.	Farmers training on Integrated Soil Fertility and Fertilizer Management	Mymensingh	18
13.	Farmers training on Integrated Soil Fertility and Fertilizer Management	Kushtia	24

14.	Orientation training on SFFP	Noakhali	19
15.	Farmers training on Integrated Soil Fertility and Fertilizer Management	”	18
16.	On-Farm Soil Fertility Management for Scientists	Joydebpur	26
17.	Training course on Field Plot Technique and data collection for SSA/SA	”	31
18.	Training on accounts management	”	30
19.	Training course on Block Demonstration for BS/SSA/SA	”	15
20.	Training course on Field plot technique and data collection for SSA/Sa	Jessore	23
	Total	**20**	**378**
	Grand total	**42**	**1300**

Field day

a. Field day under ARMP

	Title	Location	Participants (no.)
1.	Field day on BRRI dhan 32	Sylhet	50
2.	Field day on Mustard (Tori-7)	`”	57
3.	Field day on Integrated Farming Systems	”	37
4.	Production program of chickpea	Faridpur	50
5.	Mixed fish culture of seasonal pond	”	50
6.	Development of fertilizer recommendation for Onion-B.Aman cropping pattern	”	100
7.	Field day on BARI Sharisha 8	Pabna	34
8.	Field day on Maize/Wheat-M.Bean-T.Aman	”	31
9.	Field day on BARI Sharisha 8	Tangail	50
10.	Field day on Integrated farm activities	”	50
11.	Field day on BARI developed sweet potato	Jamalpur	55
12.	Field day on production technology of BARI Dherosh 1	”	55
13.	Sorjan cropping in tidally flooded area	Patuakhali	50
14.	Screening of different rabi crops in saline area	”	50
15.	On-farm trial of BARI Mung	”	50
16.	Hybrid and BRRI developed HYV’s T.Aman rice production	Rangpur	75
17.	Jute seed production through late seeding	”	53
18.	Performance of BARI Sharisha 8	”	50
19.	Current activities under FSRD program 1999-2000	”	100
20.	Demonstration of crop museum	Rajshahi	111

Title	Location	Participants (no.)
21. Demonstration of ARMP program	”	81
22. Demonstration of Broiler production	”	55
23. Field day on ARMP	”	100
24. Hybrid rice varieties	Kushtia	52
25. Mustard production by minimum tillage	Noakhali	50
26. Wheat and Potato production through minimum tillage	”	50
27. Rearing of poultry fattening of livestock	”	50
Total	**27**	**1596**

b. Field day under SFFP

Title	Location	Participants (no.)
1. Integrated Soil Fertility and Fertility Management	Pabna	100
2. Field day on fertilizer management of Pineapple	Tangail	50
3. Development of fertilizer recommendation for Onion-B.Aman CP	Faridpur	100
4. Field day on BARI developed machinery and BARI Chula distribution	Jamalpur	60
5. BNF technology on Groundnut and cowpea	Patuakhali	50
6. Response of added nutrients to CP	”	50
7. Response of added nutrients to CP	Shibpur	50
8. Fertilizer trial on Boro-T.Aman CP	Rangpur	106
9. Field day on SFFP	Rajshahi	50
10. Demonstration of different chickpea varieties	”	65
11. Response of crop grown in different fertilizer nutrients	Kushtia	52
12. Development of fertilizer recommendation on Onion	Kushtia	52
13. Response of added nutrients to CP	Munshigonj	50
Total	**13**	**835**

c. Field day under BARI-AVRDC

Title	Location	Participants (no.)
1. Adaptive trial of BARI Mungbean varieties	Rangpur	420
2. Production of tuber let from TPS and Potato from	`”	450
3. Production program of seed and vegetables of BARI developed varieties	”	430
Total	**27**	**1596**

d. Field day under BARI-GKF

Title	Location	Participants (no.)
Field days on different crops	Rangpur Kurigram Lalmonirhat	
Total	**25**	**3860**
Grand total	**68**	**7591**